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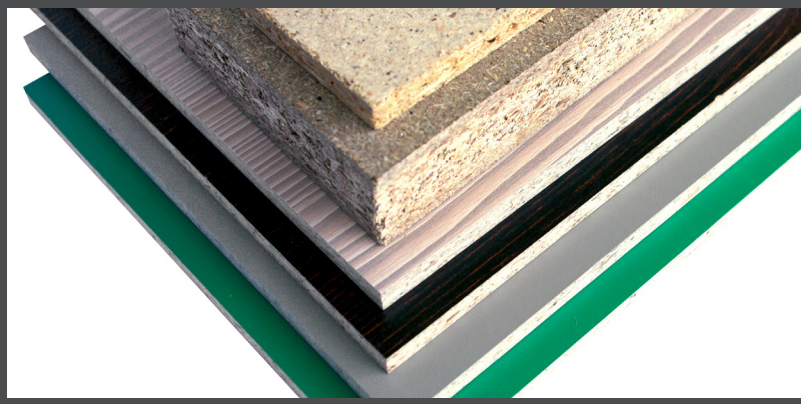
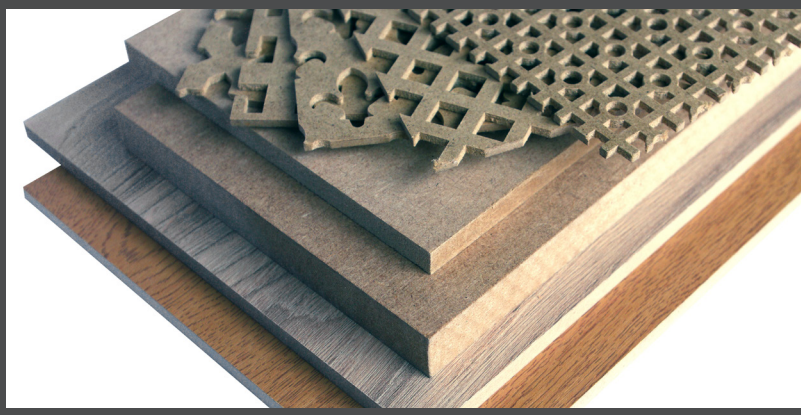
Panel Guide

Version 4







6 Health and safety

6.1 Introduction

Wood-based panels provide the designer, processor and user with a material that is safe. As with any material, risks to the health and safety of a handler or user can arise as a result of particular handling or processing operations.

Because of their size and weight, wood-based panels can present manual handling risks. Cutting operations will release wood dust which also carries certain risks, particularly at the occupational level.

These risks can be controlled by following relatively simple procedures, a useful guide to which is set on the HSE Woodworking website:

www.hse.gov.uk/woodworking/getting-started.htm

This indicates that:

- Operations shall be assessed for risk and appropriately managed.
- Machinery shall be maintained and operated only by trained and competent persons.
- Manual handling, noise, dangerous substances and transport shall be specifically assessed and controlled.

6.2 Health and safety legislation (UK)

The following is not intended to be a definitive list, but instead identifies those regulations that impact significantly on the workplace where activities involving the use or handling of wood-based panels may be undertaken.

6.2.1 Health and Safety at Work Act 1974

This Act sets out the general duties which employers have towards employees and members of the public, and that employees have to themselves and to each other.

It places a duty on each of those parties to 'ensure so far as is reasonably practicable', that health, safety and welfare in the workplace are maintained. The law requires the risks to be identified and appropriately managed.

6.2.2 Management of Health and Safety at Work Regulations 1999

Health and safety in the workplace needs to be managed in order for continuous improvements to be made. The Management of Health and Safety at Work Regulations require employers to:

- Identify and assess risks to their employees and others.
- Introduce effective arrangements to implement appropriate preventative and protective measures to control risk.
- Ensure that risks are periodically reviewed and the effectiveness of control measures regularly checked.

6.2.3 The Construction (Design and Management) Regulations 2007 (CDM)

The CDM Regulations have an impact on all stages of the planning and management of health and safety of a construction project; they place duties on clients, designers and construction organisations.

While a designer cannot eliminate all health and safety risks, he or she can make a significant contribution by:

- tackling risks at source
- giving priority to measures which give protection to everyone affected by the risk
- passing on health and safety information.

Wood-based panels will fall within these Regulations during delivery, handling and site installation. Particular consideration must be given in circumstances where machining or processing operations are undertaken as part of the construction site operations.

6.2.4 Provision and Use of Work Equipment Regulations 1998 (PUWER)

PUWER 1998 applies to the provision of all work equipment, including mobile and lifting equipment. The main objective of PUWER is to ensure the provision of safe work equipment and the safety of its use. The Regulations place a responsibility on the employer to ensure that any work equipment is suitable for the task undertaken, equipment is properly maintained and that appropriate training and instruction is provided.

PUWER originally came into force from 1 January 1993 and are intended to sit alongside and complement other health and safety legislation, in particular: the Health and Safety at Work Act (1974), The Control of Noise at Work Regulations (2005) and The Control of Substances Hazardous to Health Regulations (2002).

6.2.5 Control of Substances Hazardous to Health Regulations 2002 (COSHH)

The COSHH Regulations identify occupational exposure levels (OEL) and workplace exposure levels (WEL) for a range of chemical compounds and some material types (including wood dust) that could cause harm if the exposure levels are exceeded. They set out a system of management including the implementation of the following:

- risk assessment
- control procedure for each risk
- control monitoring
- information, instruction and training for employees
- record keeping

- health surveillance
- review procedures.

6.2.6 Manual Handling Operations Regulations 1992 (MHOR)

These important regulations cover the transporting or supporting of loads by hand or bodily force. They set out a clear hierarchy of measures including:

- Avoid hazardous manual handling as far as is reasonably practicable.
- Assess any hazardous handling operations that cannot be avoided.
- Reduce the risk of injury so far as is reasonably practicable.

6.2.7 Further reading

- Management of health and safety at work. Management of Health and Safety at Work Regulations 1999. Approved Code of Practice and guidance L21 (Second edition), ISBN 978 0 7176 2488 1, HSE Books, 2000, www.hse.gov.uk/pubns/books/l21.htm
- Safe use of woodworking machinery. Provision and Use of Work Equipment Regulations 1998 as applied to woodworking machinery. Approved Code of Practice and guidance, L114, ISBN 978 0 7176 1630 5, HSE Books, 1998, www.hse.gov.uk/pubns/books/L114.htm
- Manual Handling Solutions in Woodworking, INDG318 (rev1), HSE, 2013 www.hse.gov.uk/pubns/indg318.htm

6.3 Hazards associated with wood-based panels

6.3.1 General

The hazards (the way in which an object or a situation may cause harm) associated with wood-based panels can be divided into two categories: handling wood-based panels and cutting wood-based panels.

6.3.2 Handling wood-based panels

The general handling issues that arise in the woodworking industry can equally be applied to the handling of wood-based panels.

Because of their dimensions and weights, incorrectly handling wood-based panels can result in:

- strain and sprain injuries
- hand and back injuries
- lacerations to the hands
- crush injuries.

Poor storage of panels can lead to injury if they become unstable and fall. Consult PanelGuide *Section 4.2* and *Section 4.3*. Detailed information on the safe stacking of sawn timber and panel materials is also given in Health and Safety Executive (HSE) Woodworking Sheet No. 2 (Revised)[1].

6.3.2.1 Assess the risks

The law does not expect you to eliminate all risk, but you are required to protect people as far as is 'reasonably practicable'. The HSE provides guidance on assessing risk in each individual workplace – the HSE document 'Five steps to risk assessment'[2] will guide you through the process of carrying out a risk assessment in the workplace.

6.3.2.2 Handling solutions[3]

Many manual handling solutions involve the use of some form of work equipment. Where you use work equipment to reduce the risks of manual handling, you should ensure that it is safe and suitable for the purpose for which it is intended as required by the Provision and Use of Work Equipment Regulations (PUWER) 1998.

The large size and weight of wood-based panel products presents a real handling hazard: handling a full-sized panel single-handed and without a handling aid is not recommended. There are however a number of solutions to this problem.

Lifting hooks

These enable one person to move smaller panels without the need to bend, and enable the panel to be properly gripped. All that is needed is an adjustable steel rod (60 to 80cm long) with a hook on one end and a handle on the other. A variety of other similar devices are also available for this task, such as handles incorporating roller grips at one end.

Panel trolleys

These are available with locking castors, tilting bed, moveable fence and a rise and fall table. They enable a single machinist to load, manoeuvre and machine a large number of panels.

Vacuum handling system

A wide variety of equipment is available for stacking, handling and turning panel products. These have many uses such as feeding machines including beam panel saws, wall saws and CNC routers.

6.3.3 Cutting wood-based panels

6.3.3.1 Wood dust hazards

When wood or wood-based products are cut, particles of wood dust are released. Exposure to wood dust may irritate the nose, respiratory system, eyes and skin.

Wood dust may act as a carrier for other chemicals that are contained in such things as paints, lacquers, wood preservatives and wood adhesives, which may themselves cause health effects if inhaled.

Some wood species may cause dermatitis and allergic respiratory effects, such as asthma, because of naturally occurring chemicals in them.

A rare type of nasal cancer has been linked to the prolonged exposure (20 to 30 years) to wood dust.

Wood dust is flammable and it can be (under certain industrial processing situations) an explosion hazard.

6.3.3.2 Regulations

The elimination or control of risks from wood dust is required by:

- Health and Safety at Work Act 1974
- Factories Act 1961
- Control of Substances Hazardous to Health (COSHH) Regulations 2002.

The employer (this includes anyone responsible for wood-cutting operations in craft workshops, schools, theatres etc, as well as in factories) has an obligation under COSHH Regulations to assess any risk and prevent exposure to any hazardous substance. If prevention is not reasonably practicable, suitable control measures must be adopted.

Wood dust must be reduced as far as is reasonably practicable below its assigned maximum workplace exposure limit of 5 mg/m^3 (8-hour time-weighted average) by mechanical extraction; if this is not possible or practicable, respiratory protective equipment (RPE) should be used. RPE is in addition to control at source, not in place of it.

Any health risks arising from exposure to wood dust can and should be controlled effectively by compliance with the COSHH Regulations.

An employer has an obligation to provide the necessary control and protection equipment.

Employees and others engaged in woodworking activities must take reasonable care for their own health and safety and that of others who may be affected by their actions.

6.3.3.3 When to take care

Activities likely to produce high levels of wood dust include:

- sawing by machine and by hand
- machinery operations, particularly sawing, routing, turning
- sanding
- hand assembling machined or sanded components
- bagging dust from dust extraction systems
- using a compressed airline to blow dust off furniture and other articles before spraying (to be avoided)
- workplace cleaning, particularly if compressed airlines are used for blowing dust from surfaces etc (to be avoided).

6.3.3.4 How to take care

- Whenever possible, fit dust extraction equipment even when using hand-held machines.
- Where extraction is inadequate or impracticable, wear a suitable respirator.
- Wear the correct clothing and use other safety equipment as necessary.

6.3.4 Respiratory protective equipment (RPE)

RPE must meet approval standards and it must:

- be suitable for the purpose to which it is to be used
- provide effective protection to the wearer
- fit the wearer
- be replaced or maintained according to manufacturers' recommendations
- be supported by appropriate instructions in its use and maintenance.

6.3.4.1 Types of RPE

Factors to consider when choosing appropriate RPE include:

- face size and shape
- facial hair
- spectacles.

Work-related considerations: detailed information on selection and use is given in HSE Wood Working Information Sheet No. 14 'Selection of respiratory protective equipment suitable for use with wood dust'[4].

6.3.5 Hazard assessment summary

In panel or processed form wood-based panels are non-classifiable under the COSHH Regulations. *Table 6.2* summarises the most common hazards and appropriate control methods to minimise the risk of harm actually occurring.

6.4 Formaldehyde and wood-based panels

6.4.1 Formaldehyde release from wood-based panels

In those panel types where a formaldehyde-based synthetic resin binder is used, the amount of free formaldehyde given off by an individual panel can be estimated to be relatively small in respect of overall indoor air concentrations.

Release of free formaldehyde from wood-based panels is influenced by a number of factors including, binder type, temperature, humidity, panel thickness and percentage concentration of formaldehyde. Experiments have demonstrated that in a stable environment (temperature and humidity) formaldehyde release does decrease over time and the low initial values of typical particleboards and MDF will decrease by at least 50% within a few weeks of manufacture.

Under the provisions of the harmonised European standard (hEN) *EN 13986*, (implemented in the UK as *BS EN 13986 Wood-based panels for use in construction*.

Table 6.1: Respirators for wood working

Typical operations	Respirator type		
	Disposable respirator	**Re-usable respirator (half mask)**	**Powered respirator**
All woodworking operations, eg use of routers, lathes, planers, saws and vertical spindle moulders (VSMs)	BS EN 149[5] class FFP2 for low residual dust levels for lower risk woods such as pine	Filter to BS EN 143[6] class P2 fitted to either a half mask to BS EN 140[7] or a full face mask to BS EN 136[8]	Lightweight powered hood, visor or helmet to BS EN 12941[9] class TH1 (equivalent protection to FFP2)
	BS EN 149 class FFP3 for higher residual dust levels such as when sanding (hand, disc, bobbin, pad etc). Also for all work involving MDF plus the more toxic woods such as hardwoods and western red cedar	Filter to BS EN 143 class P3 fitted to either a half mask to BS EN 140 or a full face mask to BS EN 136 Note: A combined organic vapour filter type A (organic), either class 1 or 2, will provide protection against any formaldehyde vapours present from wood-based panels	Lightweight powered visor or helmet to BS EN 12941 class TH2 (equivalent to FFP3)
Changing dust collection bags on simple recirculating dust collectors in the workroom	BS EN 149 class FFP3	Filter to BS EN 143 class P3 fitted to either a half mask to BS EN 140 or a full face mask to BS EN 136	Lightweight powered visor or helmet to BS EN 12941 class TH2
Entry into dust collection room/vaults **Entry into very dusty filter galleries for bag changing** **Work inside heavily contaminated ducts** **Ensure none of these are confined spaces (oxygen deficient atmosphere)**	Disposable respirators not suitable	Filter to BS EN 143 class P3 fitted to a full face mask to BS EN 136	Lightweight powered hood, visor or helmet to BS EN 12941 class TH2

Table 6.2: Common hazards and methods of control

Activity	Hazard	Control
Manual handling (in full panel form)	Large panel 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:** • **Sanding by machine and hand** • **Sawing, routing and turning** • **Hand assembling machined or sanded components** • **Cleaning workshop**	• Wood dust in general (including dust from wood-based panels) has health risks • MDF can produce a higher proportion of fine dust compared with other wood products • 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 (RPE) Note: any health hazards arising from the use of wood-based panels at work can and should be controlled by compliance with the requirements of the Control of Substances Hazardous to Health (COSHH) Regulations 2002
Dust collection bag changing	• Wood dust in general (including dust from wood-based panels) has health risks • MDF can produce a higher proportion of fine dust compared with other wood products • Wood dust is flammable	• Respiratory protection equipment (RPE) • Good ventilation
Dust collection rooms or other very dusty environments (not oxygen deficient atmospheres)	• Wood dust in general (including dust from wood-based panels) has health risks • MDF can produce a higher proportion of fine dust compared with other wood products • Wood dust is flammable	• Respiratory protection equipment • Good ventilation

Characteristics, evaluation of conformity and marking[10]) the formaldehyde release from wood-based panels used in internal applications will be classified as either Class E1 or Class E2.

The test requirements for both initial type testing and factory production control/continuous surveillance are laid down in *Table 6.3* for E1 products and *Table 6.4* for E2 products.

NOTE 1: Boards of Class E1 can be used without causing an indoor air concentration greater than 0.1ppm HCHO. The test requirement does not apply to wood-based panels to which no formaldehyde containing materials were added during production or in post-production processing. These may be classified E1 without testing (see Note 2).

NOTE 2: Examples of such panel products are:

- cement-bonded particle boards (uncoated)
- wet process fibreboard (uncoated), when no formaldehyde emitting resin has been added to the process
- uncoated or coated wood-based panels glued with resins emitting either no formaldehyde or negligible amounts of formaldehyde after production as, for example isocyanate, phenol or phenol-resorcinol glue.

The limit values for the formaldehyde Class E1 are given in *Table 6.3* and for Class E2 in *Table 6.4*.

The *BS EN 120 Wood based panels. Determination of formaldehyde content. Extraction method called the perforator method*[11] values for particleboards and MDF apply to boards conditioned to a moisture content of 6.5%. In the case of particleboards or MDF with different moisture contents, the *BS EN 120* test result (known as the perforator value) should be multiplied by the F factor given in *BS EN 312 Particleboards. Specifications*[12] (particleboard) or *BS EN 622-1 Fibreboards. Specifications. General requirements*[13] (MDF) respectively. The F factors in these two standards are only valid for boards within the specified moisture content ranges given in the two standards.

NOTE 3: Experience has shown that to guarantee compliance with the limits in *Table 6.3* the rolling average of the *BS EN 120* values found from the internal factory control over a period of ½ year should not exceed 6,5mg HCHO/100g panel mass for particleboards and OSB or 7mg HCHO/100g panel mass for MDF.

NOTE 4: The corresponding upper requirement limits for Class E2 boards are found from the *BS EN 120* or *BS EN 717-2 Wood-based panels. Determination of formaldehyde release. Formaldehyde release by the gas analysis method*[14] factory production/external control tests.

Table 6.3: Formaldehyde emission Class E1: classification and control requirements

		Panel product		
		Uncoated	**Coated**	
		Particleboards OSB MDF	Plywood Solid wood panels	Particleboards OSB MDF Plywood Solid wood panels Fibreboards (wet process) Cement-bonded particle-boards
Initial type testing[a]	Test method	BS EN 717-1 Wood-based panels. Determination of formaldehyde release. Formaldehyde emission by the chamber method[15]		
	Requirement	Release ≤ 0,124 mg/m^3 air		
Factory production control	Test method	*BS EN 120*	*BS EN 717-2*	
	Requirement	Content ≤ 8mg/100g oven-dry board (see Note 3)	Release ≤ 3,5 mg/m^{2}h or ≤ 5 mg/m^2 h within 3 days after production	
[a] For established products, initial type testing may also be done on the basis of existing data with *BS EN 120* or *BS EN 717-2* testing, either from factory production control or from external inspection				

6.5 Exposure to formaldehyde

6.5.1 General

Formaldehyde is a pungent, colourless gas composed of the elements carbon, hydrogen and oxygen. A naturally organic substance that is present all around us, it occurs naturally within wood at a very low level. Formaldehyde does not accumulate in the environment because it is broken down within a few hours by sunlight or by bacteria present in soil or water. It metabolises quickly so it does not accumulate in the body.

For industrial use it is usually sold as a 36–50% solution in water. This solution is known as formalin. Formaldehyde has been used in the manufacture and composition of industrial products for nearly 150 years. It is a raw material in as many as 85 industries and is used for the production of hundreds of everyday products. A

Table 6.4: Formaldehyde emission Class E2: classification and control requirement

			Panel product		
			Uncoated	**Uncoated**	**Coated**
			Particleboards OSB MDF	Plywood Solid wood panels	Particleboards OSB MDF Plywood Solid wood panels Fibreboards (wet process) Cement-bonded particleboards
Initial type testing	Either	Test method	BS ENV 717-1		
		Requirement	Release ≤ 0,124 mg/m^3 air. See Note 4		
	or	Test method	BS EN 120	BS EN 717-2	
		Requirement	Content > 8mg/100g to ≤ 30mg/100g ovendry board	Release > 3,5 mg/m^{2}h to ≤ 8 mg/m^{2}h or > 5 mg/m^2 h to ≤ 12 mg/m^2 h within 3 days after production	
Factory production control		Test method	BS EN 120	BS EN 717-2	
		Requirement	Content > 8mg/100g to ≤ 30mg/100g ovendry board	Release > 3,5 mg/m^{2}h to ≤ 8 mg/m^{2}h or > 5 mg/m^2 h to ≤ 12 mg/m^2 h within 3 days after production	

major use is in the manufacture of adhesive resins for woodworking industries. Products such as paper and textiles, cosmetics, disinfectants and medicines, and many paints, varnishes and lubricants may also contain formaldehyde.

6.5.2 Hazards associated with exposure to formaldehyde

Under test conditions, concentrations of formaldehyde vapour in the air is expressed in parts per million (ppm) or milligrams formaldehyde per cubic metre of air (mg/m^3). For formaldehyde 1 mg/m^3 = 0.81ppm. At levels of 1 to 3ppm it can be moderately irritating to the eyes and nose, depending on the sensitivity of the individual. At levels above 10ppm it causes immediate strong discomfort, and long-term continuous exposure at these extreme concentrations would result in serious health effects. There are extreme cases known where highly allergic individuals could be affected by exposure over a wide range of chemicals even at very low concentrations.

Formaldehyde is classed by the International Agency for Research on Cancer as a carcinogen, basing this classification on the possible effects of large doses of formaldehyde to which workers in some chemical and manufacturing plants were formerly exposed. There is no evidence that small dosages (much lower than the World Health Organization (WHO) guideline limit for indoor air) have any carcinogenic effect. A scientific conference in 2007 concluded that 'the common uses of formaldehyde in consumer products and other applications does not pose a risk to human health'[16].

6.5.3 Formaldehyde exposure in the home

Indoor air levels of formaldehyde are not generally the subject of official regulations. However the generally accepted guideline figure for the amount of formaldehyde that should not be exceeded in ambient air from all formaldehyde emitting sources is 0.1 milligrams per cubic metre of air (equivalent to about 0.08ppm) measured over a 30-minute reference period (WHO).

The UK's Building Research Establishment (BRE) has tested the air quality in typical British homes[17,18] and found the average concentration of formaldehyde is less than one quarter of the guideline limit from all formaldehyde emitting sources in the home.

Not all wood-based panels contain added formaldehyde and while it is difficult to make any accurate projection, it has been estimated that the contribution of formaldehyde from wood-based panel emissions to the ambient indoor air level would be less than one-eighth of the WHO guideline limit.

6.5.4 Formaldehyde exposure in the workplace

Under the COSHH Regulations 2002, formaldehyde in the workplace atmosphere has a workplace exposure limit (WEL) of 2 parts per million (determined over both long term (8-hour time weighted average (TWA) reference period) and short term (15-minute reference period)).

6.6 References

1 Stacking round timber, sawn timber and board materials. Safe working practices, HSE Woodworking Information Sheet No 2 (revision 2), HSE, www.hse.gov.uk

2 'Five steps to risk assessment, INDG163(rev3), ISBN 978 0 7176 6440 5, Health and Safety Executive, 2011, www.hse.gov.uk

3 Manual Handling Solutions in Woodworking, INDG318(rev), Health and Safety Executive, 2013 (Contains public sector information published

by the Health and Safety Executive and licensed under the Open Government Licence) www.hse.gov.uk/woodworking/manualhandling.htm http://www.hse.gov.uk/woodworking/wooddust.htm

4 Selection of respiratory protective equipment suitable for use with wood dust, HSE Woodworking Sheet No 14 (revision 1), HSE, www.hse.gov.uk

5 BS EN 149. Respiratory protective devices. Filtering half masks to protect against particles. Requirements, testing, marking, BSI

6 BS EN 143. Respiratory protective devices. Particle filters. Requirements, testing, marking, BSI

7 BS EN 140. Respiratory protective devices. Half masks and quarter masks. Requirements, testing, marking, BSI

8 BS EN 136. Respiratory protective devices. Full face masks. Requirements, testing, marking, BSI

9 BS EN 12941. Respiratory protective devices. Powered filtering devices incorporating a helmet or a hood. Requirements, testing, marking, BSI

10 BS EN 13986. Wood-based panels for use in construction. Characteristics, evaluation of conformity and marking, BSI

11 BS EN 120. Wood based panels. Determination of formaldehyde content. Extraction method called the perforator method, BSI

12 BS EN 312. Particleboards. Specifications, BSI

13 BS EN 622-1. Fibreboards. Specifications. General requirements, BSI

14 BS EN 717-2. Wood-based panels. Determination of formaldehyde release. Formaldehyde release by the gas analysis method, BSI

15 BS EN 717-1. Wood-based panels. Determination of formaldehyde release. Formaldehyde emission by the chamber method, BSI

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