Wood-based panels - Fibreboard, particleboard and OSB.

STEP lecture A11
D.R. Griffiths
University of Surrey

Objectives

To introduce the manufacture, properties and uses of fibreboards, particleboards and OSB. To identify how design data is derived for use with EC5.

Summary

The various types of fibreboards, particleboards and OSBs are noted and their manufacturing processes detailed. An overview is given of board properties and this is linked to the methods adopted by CEN for the specification of boards and the derivation of design values. The range of uses in construction for the board types described is tabulated.

Introduction

Wood has been designed in nature to meet very specific engineering and environmental needs, but man seeks to adapt it to a very much wider range of uses. In order to overcome the shortcomings of timber in size and anisotropy, new man made forms of wood have had to be introduced. Glulam and plywood developed with the advent of structural glues and the rotary peeling process. More recently, developments have concentrated on reconstituted forms of wood such as particleboards, OSB, fibreboards and parallel strand lumber. These developments contribute much to improving the efficiency of the forest resource. More energy is consumed in the conversion process but this is far outweighed by the benefits of using either waste or fast growing small timbers and in fabrication costs. The main use of this reconstituted or composite wood is in wood-based panels. Table 1 shows the five main groups of wood-based panels and details the three which form the subject of this lecture.

Production and consumption data show a marked increase in the use of wood-based panels in the last decade. 30 million cubic metres were consumed in the 12 EC countries in 1989 and of this more than two thirds was particleboard. Furthermore, Europe is self sufficient in particleboards and fibreboards but imports nearly two thirds of the plywood used. Wood based panels are very versatile and are used in many different industries including furniture, wall panelling, packaging and do-it-yourself; 50% of the product is used structurally, principally in the construction industry, and is covered by the Construction Products Directive (CPD) of the EU. Structural uses include flooring and roofing, wall sheathing, formwork and specialist structural uses such as web members in I and box beams. The CPD also includes internal fitments such as doors and stair units which represent a further major market for wood based panels.

Many types of wood based panels are relatively new materials and not all the boards suited to structural use have had their characteristic strength and moduli evaluated so that they can be used in conjunction with the k_{mod} and k_{def} factors and joint information contained in EC5. Where panel products have a history of structural use and this experience has been incorporated in national standards then this information has been used in the derivation of characteristic values. Other materials are put through extensive test programmes, using tests specially formulated by CEN committees to meet the varying requirements of different panel products, in order to produce design data. At the same time materials' specifications and performance requirements are being produced so that manufacturers can achieve conformity and use the CE mark which indicates compliance with the essential requirements of the CPD. Product standards are likely to remain the most common means of assessing the structural suitability of fibreboards, particleboards and OSB for many years to come.

WOOD-BASED PANELS

- Plywood (STEP lecture A10)
- **Boards Detailed in This Lecture**
  - Particleboard
    - *Bonded with Organic Binders*
      - Chipboards
    - *Mineral Bonded*
      - Cement-Bonded Particleboards
  - OSB
  - Fibreboard
    - *Bonded with Organic Binders*
      - Hardboards, Mediumboards, Softboards, MDF
    - *Mineral Bonded*
      - Gypsum Fibreboards
- Special Board Products

Table 1 Types of wood-based panel.

Board types and manufacture

Particleboards

A particleboard may be defined as a panel material manufactured under pressure and heat from particles of wood (wood flakes, chips, shavings) with the addition of an adhesive. The main types are named in Table 1. In the past, boards made using larger particles such as wafers and strands have been included under the generic term particleboards. However, the major differences between OSB and chipboard and the continued growth in use of OSB has resulted in it being awarded a separate status in CEN codes.

Chipboard

Chipboard dates from the 1940s and was originally developed to utilise waste timber; it was generally of low quality. After a slow start, growth has been tremendous and quality and finish have been improved and can be designed to suit end use by varying the materials, the lay up of the board and the pressing cycle. The wood chips form 85% of the board and are normally from coniferous softwoods such as spruce and pine although hardwoods such as birch may be used for heavy duty boards. The chips are cut by a series of rotating knives to produce thin flakes/chips which are screened, dried and then sprayed with adhesive. The chips are next blown on to a forming platten and, by using different sized chips stored in separate hoppers, a multi-layered matt can be built up. Fine chips at the top and bottom of the matt provide a smooth surface suitable for painting; long (30 *mm*) thin chips provide a strong dense layer just under the surface and larger chips form a more economic, lower strength and lower density core. The chips are randomly oriented such that the board performance will be similar in all directions in the plane of the board. The common binders are synthetic resins, either urea formaldehyde (UF) for boards intended for use only in dry conditions or the more expensive melamine urea formaldehyde (MUF) for boards with enhanced moisture resistance properties. Resin content varies from 11% in outer layers to 5% in the core.

Other binders include phenol formaldehyde (PF) or isocyanate resin (MDI), although this is usually restricted to core layers. The layered matt is cut to length before passing into the press where it is held for 0,1 to 0,2 minutes per millimetre of board thickness at temperature of up to 200°C. Board thicknesses range from 6 to greater than 40 *mm* and densities range from 450 to 750 kg/m^3. Press sizes allow boards up to 5 *m* long and 2,5 *m* wide but these will normally be cut down depending on end uses to 2,4 *m* x 1,2 *m* for sheathing and 2,4 *m* x 0,6 *m* for flooring. Board edges may also be prepared for tongue and groove flooring or surfaced for specialist uses.

Cement bonded particleboard

This type of board was developed in the 1950s and 60s using planer shavings and thin wood chips with ordinary portland cement to produce a dense, fine surfaced, highly durable board.

The chips are randomly oriented but are separated into surface and core material. They are mixed with cement and water in the ratio approximately 3:1:1 by weight, with other additives to speed cement hardening. The matts are then formed in three layers and are first pressed to about a third of their thickness. They are then heated to 70 to 80°C for 6 to 8 hours to allow the cement to harden and finally the boards are dried, trimmed and stacked for 12 to 18 days to allow the cement to cure. Board thicknesses range from 6 to 40 *mm* with a typical density of 1200 kg/m^3.

OSB

OSB (Oriented Strand Board) was first developed in Germany but was then massively developed in the North American market as a structural board to replace the lower grades of plywood. In America OSB technology developed from the production of large particle boards known as waferboards or flakeboards. These boards used almost square wafers up to 75 *mm* long and approximately 0,4 to 0,6 *mm* thick cut tangentially from the wood. Resins used were similar to chipboard and were between 2 and 4% by weight with the flakes randomly orientated. Commonly aspen (*Populus tremuloides*), grown for only 10 years to take full advantage of its very fast growth rate, was used for waferboard. Waferboards were semistructural boards and lost their market with the development of OSB. Aspen continues to be used in North America for OSB but in Europe, where in 1994 there were two manufacturers with further plants planned, higher quality wood, such as Scots pine (*Pinus sylvestris*) forestry thinnings, is preferred. The OSB particles are more rectangular than for waferboard being typically 50 to 75 *mm* long in the direction of the grain of the wood with a width less than half the length. They are laid into a three ply structure with the strands oriented as they form the matt. The surface plies are equal in thickness, with the strands running basically parallel to the length of the matt and the core strands, normally accounting for up to 50% of the volume, are transversely aligned or occasionally randomly laid. The resin used is normally phenol formaldehyde and when in powdered form will be approximately 2,5% by weight. Boards thicknesses range between 5 and 25 *mm* with densities of 550 to 750 kg/m^3. Surface quality is achieved by sanding and edge finishes are available as for chipboard.

Fibreboards

Fibreboard is a generic name for seven different board types with widely differing densities and properties. They may be categorised by density and manufacturing process as shown in Table 2.

The two processes start in a similar manner. Raw material, normally softwood forestry thinnings, but varying from sawdust to hardwood wastes and always excluding bark, is chipped and mechanically reduced to basic wood fibre. The chips are steamed under high pressure to soften the lignin, the natural gluing agent in the wood, which is thermoplastic and will provide all or part of the bond in the formed board. Alternatively, for wet process boards only, the Masonite (or explosion) process is employed where the sudden ejection of the chips from a steam heated pressure vessel causes them to disintegrate.

Manufacturing process	Board density		
	Low $< 400\ kg/m^3$	Medium $\geq 400\ kg/m^3$, $< 900\ kg/m^3$	High $\geq 900\ kg/m^3$
Wet	Softboard (SB)	Low Density Mediumboard (MBL)	Hardboard (HB)
	Impregnated Softboard (SB.I)	High Density Mediumboard (MBH)	Tempered Hardboard (HB.I)
Dry		Medium Density Fibreboard (MDF)	

Note: Board symbols shown in brackets; I means "with additional properties".

Table 2 Types of fibreboard.

Wet process manufacture

This is the older method of forming boards. The fibrous mass is mixed with hot water to form a pulp and additives are mixed in, as required by the final use of the board, such as flame-retardant chemicals and bitumen emulsion or other water repellent treatments. The pulp is then drained of water by suction pumps acting through the forming mesh and by the action of the thicknessing rollers.

Softboard is formed at this stage by cooling and drying the board. The density will be between 200 and 400 kg/m^3 and thicknesses of 9 to 25 *mm* are common. For more dense boards, the material must first be pressed at a temperature of 160 to 180°C. The need to remove further water at this stage results in the typical board finish of one smooth face formed against a polished plate and one rough 'screen' face formed against a wire mesh. Medium boards are in the density range 400 to 900 kg/m^3 with thicknesses from 6 to 13 *mm*. Hardboards are 900 to 1100 kg/m^3 in density with thicknesses between 3 and 8 *mm*. Tempered hardboard is a special quality structural hardboard of higher density, with added water repellency which is obtained by passage of the material through a hot oil bath, and possibly of higher strength achieved through the use of additives such as phenol formaldehyde.

Dry process manufacture

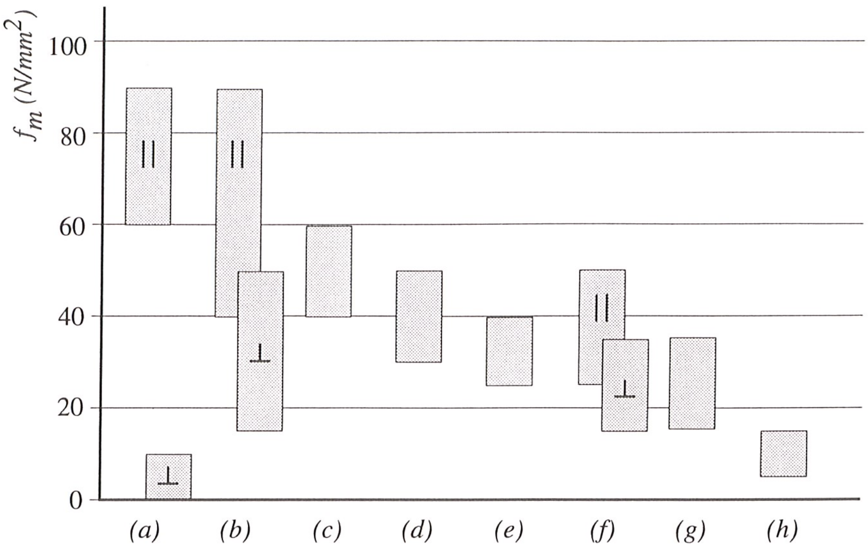
In this more modern process the fibrous mass is conveyed in an air stream to the matt forming station. The fibres must be coated with resin, either UF, MUF or MDI (isocyanate) and up to 10% by weight, to achieve good bonding. The matt may be up to 500 *mm* thick and is then pre-pressed between steel belts to remove air. Cut lengths are hot pressed into sheets giving two very finely finished surfaces. Medium Density Fibreboard (MDF) is available in thicknesses up to 40 *mm* and in densities in the range 600 to 1000 kg/m^3. Board edges may readily be profiled for specialist use.

Board properties

Wood-based panels overcome some of the deficiencies of natural timber in that they have a lower degree of variability, lower anisotropy and higher dimensional stability in the plane of the board; they are available in very much larger sizes and provide a wide range of finishes.

The variability is reduced by the random distribution of the components into a more even consistency. The reduction in variability increases as the size of the components decreases. This improves the characteristic value of a structural property in comparison with the mean performance determined from tests.

However, in comparing bending strength and stiffness for boards of a similar density, performance in general will reduce with component size. Unless the boards are very heavily densified, performance will be much lower than for solid timber; this is in part due to the reduction in anisotropy. All particleboards and fibreboards except OSB are nominally isotropic in the plane of the board. Timber, in both strength and movement, has a value of anisotropy of up to 40:1. Plywood can reduce this value to 5:1 in simple 3 ply lay ups and to 1,5:1 in more expensive multi lay ups, whereas OSB is normally about 2 to 2,5:1. Figure 1 compares strength ranges for typical timber and wood based materials.



Key:

(a) Softwood (b) Softwood Plywood
(c) Tempered Hardboard (d) Hardboard
(e) MDF (f) OSB
(g) Chipboard (h) Cement Bonded Particleboard
|| Parallel to grain or strong direction ⊥ Perpendicular to grain or weak direction

Figure 1 *Comparison of bending strengths f_m of sawn timber and wood-based panels.*

Isotropy considerations also affect the dimensional stability of wood based panels as shown in Table 3. Dimensional stability in the plane of the board is relatively constant for single board types and even between board types. It is much better than for timber across the grain. As a consequence sheet materials are ideal where large widths are required such as in flooring and wall sheathing but even so must be laid with 2 to 3 *mm* gaps to allow for the small moisture movements.

Stability across the thickness of the board is less good but depends very much on board type and can be reduced by additives or by conditioning the board prior to use. This process brings the moisture content of the board much closer to its end use condition compared with the as-manufactured state and effectively reduces the problem of thickness changes and differential movements which could lead to bowing of the boards once they are fixed in position.

Timber or wood-based panel type	Percentage change in dimension		
	Parallel to grain or board length	Perpendicular to board length	Through thickness
Solid Timber			
Douglas Fir	<0,10	0,80 (R)	1,00 (T)
Beech	<0,10	1,20 (R)	2,00 (T)
Plywood			
Douglas Fir	0,15	0,15	2,00
Chipboard			
Loadbearing dry	0,25	0,25	7,00
Loadbearing humid	0,20	0,20	4,00
Cement Bonded Particleboard	0,18	0,18	0,50
OSB	0,20	0,20	10,00
Fibreboards			
Hardboard	0,15	0,15	3,50
Tempered Hardboard	0,15	0,15	3,50
MDF	0,20	0,20	3,50
Notes:	R is radial direction. T is tangential direction.		

Table 3 *Dimensional stability of timber and wood-based panels: percentage change in dimension from 65% to 85% relative humidity.*

Particleboards and fibreboards comprising mainly timber are visco-elastic and susceptible to creep. However, due to the smaller component size, the rate of creep is substantially higher than for timber and plywood. In design this affects the k_{mod} and k_{def} factors quoted in EC5 (see Table 4). Creep effectively results in very low stresses and moduli being used for permanent and long term loads, although the effect diminishes for medium and short term conditions.

In addition to the standard effects of moisture, load intensity and duration, the effect of creep in wood based panels increases as the quality of the board decreases, usually related to density and glue quality, and as the size of particle decreases.

One of the most important factors affecting the end use of a panelboard is moisture. Humid conditions encountered in kitchens, bathrooms and roof spaces reduce the performance of boards, as is the case with all timber materials. Lower quality boards show very little recovery on subsequent drying. However, higher quality boards, usually denoted by the use of moisture resistant glues such as MUF, PF and MDI or by specialist processing such as oil tempering, are capable of very considerable recovery and are therefore able to be used in service class 2 conditions. Cement bonded particleboard is very stable under humid conditions and is the only wood based panel that can be fully recommended for exposed external cladding use (service class 3).

Material	Solid timber Glulam Plywood	Particleboards (heavy duty) OSB grades 3 and 4	Particleboards (loadbearing) OSB grade 2 Hardboards (load bearing humid)	Fibreboards (loadbearing dry)

Load duration class	k_{mod}[1]	k_{def}[1]	k_{mod}[2]	k_{def}[2]	k_{mod}[2]	k_{def}[2]	k_{mod}	k_{def}
Permanent	0,60	0,80[3]	0,40	1,50	0,30	2,25	0,20	3,00
Long term	0,70	0,50	0,50	1,00	0,45	1,50	0,40	2,00
Medium term	0,80	0,25	0,70	0,50	0,65	0,75	0,60	1,00
Short term	0,90	0,00	0,90	0,00	0,85	0,00	0,80	0,35
Instantaneous	1,10		1,10		1,10		1,10	

Notes:
[1] Values also given in EC5 for service classes 2 and 3.
[2] Values also given in EC5 for service class 2.
[3] Value for plywood, use 0,6 for solid timber and glulam.

Table 4 *Comparison of k_{mod} and k_{def} factors for service class 1 (dry conditions) only for different timber and wood based panel materials.*

Moisture content also affects the durability of the board with respect to fungal attack. In general, this will not be a problem as the board should not be used in conditions which will support fungal growth. However, most particleboards and standard fibreboards (i.e. those without specially improved properties) will be less durable than the wood species from which they are made. The incorporation of fungicides will increase the resistance of the board and give more confidence when boards have been exposed to accidental wetting. Wood based panels will not normally be attacked by the rodents and wood boring insects common to most of Europe; specialist treatments would be necessary where abnormal conditions prevail.

Certain types of board offer specialist properties, for instance the thermal insulation of softboards, but in general where the board density is in the normal range for timber, then thermal, acoustic and fire properties will not be significantly different from those of solid timber.

Specification and design values

In order that wood based panels may be safely used, it is necessary to set standards for board quality. Minimum specifications are defined which relate to the type of board and the general properties important to its end use. Test methods are detailed which allow manufacturers to control the quality of their board and demonstrate its performance relative to the minimum level.

Initially CEN standards categorise wood based panels into the board types defined earlier. These types are then graded into their potential for end use, including both structural and non-structural applications. Table 5 identifies the grades of board.

General requirements are detailed for each board type, covering dimensional accuracy, density variation and moisture content, together with others specific to a type of board, such as surface soundness and formaldehyde content. Further specifications are then set for strength properties which are used for factory quality control tests covering:

- bending strength and modulus of elasticity related to a small specimen three point bending test,
- transverse tensile strength which measures the internal bond for a small 50 *mm* square specimen,
- thickness swelling measured over 24 hours in cold water,

- bending strength, modulus of elasticity and transverse tensile strength tests after accelerated ageing; restricted to boards specified for use in humid conditions.

Supplementary properties may be supplied by the manufacturer based on CEN tests to cover properties such as impact and/or static point loading on the board surface, creep and axial screw withdrawal. Other information important to specification could cover thermal movement, thermal conductivity and vapour transmission.

The strength properties of chipboards and OSB are very dependent on thickness and require thickness classes to be introduced in their specification. Fibreboards are more consistent through thickness, requiring fewer classes, but their specification is made more complex by the range of densities of board and types of manufacture. (see Tables 2 and 5).

The strength properties covered by the specification of wood-based panels must not be used directly in structural design. Two approaches are then available to the engineer. Either to use characteristic values for the structural properties together with the k_{mod}, k_{def} factors given in EC5 or to use performance specification standards for particular components such as floors, walls and roofs. The latter standards will relate grades of board to an end use based on their material specification and their performance in the relevant special prototype tests which are in preparation by CEN. These tests will enable the performance of all materials to be evaluated in relation to the problems defined by their end use. Of particular relevance to floors and walls is impact damage and it is clear that this cannot be directly related to the properties covered in the material specifications.

In the former design approach, characteristic values for boards will have been derived by one of two means. Firstly, where boards have a history of safe use and have in the past been subjected to rigorous test programmes, then the available information has been adjusted to calculate the required characteristic values. Secondly, where there is no history of previous structural use, the values are based on a new set of structural tests which have been introduced by CEN to enable all wood-based panels to be assessed in terms of bending, tension, compression, panel shear and planar shear properties. These tests have been developed for a "medium size of sample" which has reduced the effect of the variability in cross-section of the larger component type boards such as OSB and plywood but without requiring expensive full sheet testing. The tests determine a five minute strength and a stiffness modulus in the range between 10% and 40% of the strength values. These tests are detailed in prEN789 "Testing of wood-based panels for the determination of mechanical properties for structural purposes". Environmental conditions are defined to determine the performance at the boundaries between climate classes. Additional creep information may then be required to determine k_{mod} and k_{def} factors appropriate to the board and thus derive long, medium and short term strengths from the test data if these factors are not included in EC5.

Board type and description by use	CEN Code for specification	Notation of boards in CEN code	Characteristic values for design available
Particleboards			
Chipboard	EN312-1		
- General purpose, dry	EN312-2	P2	
- Interior fitments, dry	EN312-3	P3	
- Loadbearing, dry	EN312-4	P4	Yes
- Loadbearing, humid	EN312-5	P5	Yes
- Heavy duty, loadbearing, dry	EN312-6	P6	Yes
- Heavy duty, loadbearing, humid	EN312-7	P7	Yes
Cement bonded	EN634-1		
- Single grade only	EN634-2	CB	
OSB	EN300		
- General purpose and interior fitments, dry		OSB/1	
- Loadbearing, dry		OSB/2	
- Loadbearing, humid		OSB/3	
- Heavy duty, loadbearing, humid		OSB/4	
Fibreboards	EN622-1		
Hardboards	EN622-2		
- General purpose, dry		HB	
- General purpose, humid		HB.H	
- General purpose, exterior		HB.E	
- Loadbearing, dry		HB.LA	
- Loadbearing, humid		HB.HLA1	
- Heavy duty, loadbearing, humid		HB.HLA2	Yes
Mediumboards	EN622-3		
- General purpose, dry		MBL, MBH	
- General purpose, humid		MBL.H, MBH.H	
- General purpose, exterior		MBL.E, MBH.E	
- Loadbearing, dry		MBL.LS, MBH.LA1	
- Loadbearing, humid		MBH.HLS1	
- Heavy duty, loadbearing, dry		MBH.LA2	Yes
- Heavy duty, loadbearing, humid		MBH.HLS2	
Dry process boards	EN622-4		
- General purpose, dry		MDF	
- General purpose, humid		MDF.H	
- Loadbearing, dry		MDF.LA	
- Loadbearing, humid		MDF.HLS	
Softboards	EN622-5		
- General purpose, dry		SB	
- General purpose, humid		SB.H	
- General purpose, exterior		SB.E	
- Loadbearing, dry		SB.LS	
- Loadbearing, humid		SB.HLS	

Table 5 CEN code grading of wood-based panels.

The assessment of existing structurally used boards has been restricted to chipboard and types HB.HLA2, and MBH.LA2 fibreboards (see Table 5). Their characteristic values are included in CEN document EN112.406 "Wood-based panels: Characteristic values for established products", and design factors are given in EC5. OSB has been the first material to go through the CEN test procedures and is also included in EC5. Other boards, such as cement bonded particleboard, have the durability qualities to be used structurally and may well be included in revisions to EN 112.406 and EC5 when characteristic values become available, but at present their structural use is restricted to the performance specification route.

Table 6 compares characteristic values for typical wood based panels for a datum thickness as close to an 18mm datum as possible, and notes the appropriate thickness class.

Properties	Board type			
	Particleboards P4 loadbearing, dry	Particleboards P7 heavy duty, loadbearing, humid	Fibreboards MBH.LA2 loadbearing, dry	Fibreboards HB.HLA2 heavy duty, loadbearing, humid
Thickness range *mm*	13 - 20	13 - 20	> 10	>5,5
Density kg/m^3	600	600	600	800
5th Percentile Characteristic Strengths (N/mm^2)				
Bending f_m	12,5	16,7	15	32
Tension f_t	7,9	10,6	8	23
Compression f_c	11,1	14,7	8	24
Panel shear f_v	6,1	8,1	4,5	16
Planar shear f_r	1,6	2,2	0,25	2,5
Mean Modulus of Elasticity (N/mm^2)				
Bending E_m	2900	4230	3900	4600
Tension E_t	1700	2485	2900	4600
Compression E_c	1700	2485	2900	4600
Panel shear G_v	830	1195	1200	1900

Table 6 CEN characteristic values for established wood-based panels.

Joints

For nailed, screwed and bolted panel to timber joints, the rules for timber to timber joints apply. However there are very few characteristic values available for embedment strength and head pull through strength for fibreboards, particleboards and OSB. Hence, it may often be necessary to undertake CEN performance tests on fasteners and panels to determine the resistance of joints in panels to lateral and axial loads.

In many end uses of wood-based panels, such as timber frame walls, the fixing performance is not individually assessed but is covered by tests on a typical full scale structural member which may incorporate many fixings.

Use

The use of wood-based panels is wide ranging and dependent on the nature and properties of the different board types. Being a composite material, it is often possible to build a specification for a board based on a projected end use; an example of this would be the development of MDF for the furniture and semi-structural fittings industries. For structural use, many types of board will be eliminated based on their quality and durability. Boards may then be limited to a narrow range of uses due to their special properties and to negative influences such as cost; for instance, the density of tempered hardboard makes it difficult to nail as a sheathing but ideal as a web material in I beams. However, the majority of boards which are of a similar density to timber will compete with one another and with plywood in a range of markets. The grading of the board in terms of strength and moisture resistance will then determine its specific use in the various domestic, commercial and industrial construction situations.

Table 7 details typical end uses and the types of wood-based panel that might be most appropriate.

Use	Board type			
	Particleboards	OSB	CBPB[1]	Fibreboards
Roofing				
Sarking	P5	OSB/3	CB	SB.H, MB.H, HB.H
Flat roof decking	P5	OSB/3	CB	-
Walling				
Sheathing	P5, P7	OSB/3, OSB/4	CB	SB.HLS MBH.HLS1 HB.HLA1
Cladding	-	-	CB	MBH.HLS1 HBH.HLA1, HB.E
Fascias	-	-	CB	HB.E
Soffits	-	OSB/3, OSB/4	CB	HBH.HLA1, HB.E
Linings				
Ceilings and partitions	All boards may be suitable but will be limited by special requirements for impact, fire, moisture and sound.			
Flooring				
Domestic	P4, P5	OSB/2, OSB/3	CB	-
Commercial	P5	OSB/3, OSB/4	-	-
Industrial	P7	OSB/3, OSB/4	-	-
Formwork	P7	OSB/3, OSB/4	-	HB.HLA1/2
Structural beams	P7			
Webs or stressed skins	P7	OSB/4	-	HB.HLA1/2

Notes: [1] Single grade of board, notation defined in Table 5 not used by CEN.

Table 7 Use of wood-based panels.

Concluding summary

Fibreboards, particleboards and OSB are relatively new structural materials. They are efficient in their use of waste or low quality timber and small diameter logs. As composites their properties may be developed to suit their end use and they are now able to replace solid timber and plywood, in many situations. Board development is on going and not all boards have had their characteristic structural properties defined. Thus alternative methods of specification are sometimes necessary to enable them to be used in structural situations, typically in flooring, roofing and wall sheathing.