



Specification for
**Wood chipboard and methods of test
for particle board**

Spécification des panneaux de particules de bois et méthode d'essai
des panneaux de particules

Spezifikation für Holzspanplatten und Prüfverfahren für Spanplatten

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Foreword

This British Standard is published under the direction of the Timber Standards Committee.

This standard is a revision of BS 2604 'Resin-bonded wood chipboard' Part 2 : 1970 'Metric units' and includes, as appendix A, methods of test previously given in BS 1811 'Methods of test for wood chipboards and other particle boards' Part 2 : 1969 'Metric units', both of which standards will be withdrawn on the publication of this standard. BS 1811 : Part 2 contained methods of test not only for chipboard, but also for 'other particle boards' not specified in this standard. However some of the tests for 'other particle boards' have been retained in appendix A for reference, and not all of the tests in appendix A are specified in this standard for chipboard. It is intended to give more information to users of wood chipboards than has hitherto been possible, in order to assist users to select the most suitable types and apply them in ways most suited to a given purpose.

Since BS 2604 and BS 1811 were last revised, many manufacturing developments have occurred, and a greater range of types of wood chipboard has become available to users. It is intended that this document should present an authoritative and up-to-date assessment of these developments.

Many materials used in the construction and finishes of buildings are known to be capable of emitting small amounts of formaldehyde gas (HCHO), wood chipboard being an example. Very low concentrations of this gas, less than 2 parts per million for an average adult, can produce discomfort and irritation in the eyes. Rare cases of discomfort levels in buildings have been reported, and in some of these the source was wood chipboard. A method of estimating the total extractable formaldehyde content was included in BS 1811, and the present, combined, standard now gives limits for this property*. The use of boards complying with these limits is intended to minimize the risks of discomfort levels occurring in buildings where the boards are used. The level is based on current knowledge and research in the UK and other European countries. The application of paint, lacquer, veneer, or other overlays can further reduce the risk of HCHO emission; conversely, the risk of discomfort levels arising is increased by poor ventilation, excessive humidity and/or heat. All these factors should, therefore, be noted by designers and specifiers where the application of wood chipboard in buildings is being considered.

The most reliable method of assessing the quality of wood chipboards is by statistical examination of a large number of test results from appropriately selected samples. For this reason this British Standard expresses values as a mean value within a defined range.

The best assurance of wood chipboard quality is obtained by examination of the properties of boards at frequent intervals during manufacture. For this reason, provision is made in clause 6, table 3 and appendix B for compliance to be judged on the basis of records of quality control tests made by the manufacturer. This method is advantageous to both the manufacturer and the purchaser.

The manufacturer keeps himself continuously informed of the quality of his output and can take immediate steps to remedy any significant deficiency that may develop. The purchaser, through examination of the manufacturer's testing procedure and test records by an independent inspector, can be assured that the quality of the product is being constantly maintained and is spared the cost of sampling and testing for himself.

The application of statistical methods of the quality control of factory production is explained in BS 600 and BS 2564, and the specific application of such methods to wood chipboard is further discussed in this standard. When such quality control is adopted in the factory, the manufacturer may apply for a licence to use the Kitemark scheme operated by the Quality Assurance Department of the British Standards Institution. BSI then assumes responsibility for inspecting the manufacturer's testing procedure and test records, and a licence to use the Kitemark may be granted on that basis.

For those who are unable, or do not wish, to rely upon inspection of control charts, alternative provision is made in the less efficient procedure based on the sampling of consignments by the purchaser, and limits in table 4 are included for this purpose. Consignment testing has limitations and this is the reason for recommending reliance upon the manufacturer's control charts. Information on consignment testing is given in BS 6000, BS 6001 and BS 6002†.

In preparing this revision it has become increasingly apparent that correct selection of the type of wood chipboard cannot depend solely on a knowledge of mechanical and physical properties, nor is it possible to list the optimum properties for every end-use. Appendix C of this standard therefore gives guidance for the application of wood chipboard in various situations, as well as suggesting the most important requirements of wood chipboard chosen for a given purpose.

The information in appendix C is of an advisory nature and it is not part of the specification. It is strongly recommended that its advice should be taken into account with the information in the relevant code of practice and other available literature. Where there is doubt on the suitability of chipboard in a particular case it is recommended that specialist advice be sought.

A type of wood chipboard with improved moisture resistance is defined in this standard. Boards meeting the requirements of type III given in table 1 are known to retain and recover an acceptable strength after exposure to water and/or high humidity for limited periods, e.g., in transit, storage, or during installation. It has to be stressed that this does not imply that they are suitable for continuous use out-doors or at high equilibrium moisture contents. This type of wood chipboard may not have increased resistance to attack by micro-organisms. The requirements of flooring-grade wood chipboards for use in floors supported on discontinuous supports,

*It has to be appreciated that the figures obtained by this method relate to total formaldehyde extractable at the boiling point of toluene. Such amounts of formaldehyde should not be regarded as necessarily freely available to promote formaldehyde gas in the atmosphere surrounding the chipboard and cannot be directly related to Threshold Limit Value.

†In course of preparation.

BS 5669 : 1979

e.g. timber joists, mainly in domestic applications, are specified by a separate range of properties given in table 1.

Values are given for 'thin' wood chipboards, i.e. less than 6 mm thickness, and for 'thick' wood chipboards, i.e. greater than 25 mm in thickness and up to and including 50 mm in thickness. These were not previously within the scope of this standard.

Wood chipboards should not be used in damp or poorly ventilated conditions without suitable protection. Information on methods of protection is given in appendix C.

In this revision, attention has been paid to work in Technical Committee ISO/TC 151, Particle boards, of the International Organization for Standardization (ISO).

The relationship between ISO standards and documents is given below:

ISO 820-1975 Particle boards — definition and classification. Technical content agrees with 3.6.

ISO 821-1975 Particle boards — determination of dimension of test pieces. Technical content agrees with A.3.3.

ISO 822-1975 Particle boards — determination of density. Technical content agrees with A.4.

ISO 823-1975 Particle boards — determination of moisture content. Technical content agrees with A.5.

ISO DIS 4025 Particle boards — determination of the apparent modulus of elasticity in bending and the bending strength. Technical content does not agree with A.6. The values in tables 1 to 4 would have to be altered to take account of the differences in test methods.

ISO P 5606 Particle boards — dimensions and tolerances — thicknesses. Technical content does not agree with A.2.

British Standard Specification for

Wood chipboard and methods of test for particle board

1. Scope

This British Standard specifies requirements for four types of wood chipboard. Methods of test for particle board are specified in appendix A.

The four types of wood chipboard are distinguished, either by their properties or by their intended use, as follows:

- | | |
|-------------|--|
| Type I | standard |
| Type II | flooring |
| Type III | improved moisture resistance |
| Type II/III | combining the strength properties of type II with the improved moisture resistance of type III |

Type II/III boards may be used for flooring.

This standard does not cover requirements for extruded particle board, flaxboard, waferboard, flakeboard or particle board other than wood chipboard.

2. References

The titles of the standards publications referred to in this standard are listed on the inside back cover.

3. Definitions

For the purposes of this British Standard the following definitions apply.

3.1 dubbing. A thickness deficiency along the edge of a particle board caused by faulty sanding.

3.2 extruded particle board. A particle board made by extrusion through a die. The particles lie with their larger dimensions mainly at right angles to the direction of extrusion.

3.3 particle board. Panel material manufactured under pressure, essentially from particles of wood and/or other ligno-cellulosic fibrous materials (for example, wood chips, sawdust and flax shives) with or without the addition of an adhesive, hydraulic binders being excluded.

3.4 waferboard. A wood chipboard made exclusively from wood chips at least 32 mm in length.

3.5 flakeboard. A particle board made wholly from wood flakes, as distinguished from other particle boards made from various forms of wood residue such as planer shavings.

3.6 wood chipboard. A particle board made from particles of wood bonded with synthetic resin and/or organic binder.

4. Requirements

4.1 General. Properties of type I (standard) wood chipboard given in this standard are for boards intended for general use in thickness of up to 50 mm. Density is not a requirement of this specification because it is not directly related to specified properties.

This standard also specifies type II (flooring) wood chipboard, a structural flooring grade suitable for load-bearing applications on timber joists. Although such boards are primarily suitable for the loads encountered in joisted floors in domestic applications, they may be suitable for other applications, depending on design conditions. Unless suitable protection is provided (see appendix C), it is essential that these boards are not used in situations where their moisture content would exceed 20 % for prolonged periods after installation. Such moisture content can be permanently exceeded in certain parts of some kitchen and bathroom floors. Type II/III wood chipboards are also suitable for flooring.

The requirements for type III (improved moisture resistance) wood chipboard are also defined. Such board recovers an acceptable strength after exposure to water and/or high humidity for limited periods. It does not necessarily resist prolonged exposure to weather, attack by micro-organisms or persistent damp conditions.

4.2 Dimensional tolerances. Unless otherwise agreed between the supplier and the purchaser, each board shall be essentially rectangular, with straight square edges, and, when measured in accordance with the methods given in appendix A, shall have the relevant dimensional tolerances specified in table 1 for board of types I, II and III.

The dimensions of boards are closely related to moisture content, and if after leaving the factory the moisture content exceeds the 7 % to 13 % range normally present at despatch from the factory the boards will expand. On drying out to the moisture content present at despatch from the factory, the dimensions may not contract to their original values. For this reason the measurement of thickness, length, width and flatness for the purpose of verifying compliance with the specified requirements is normally applied at or prior to despatch from the factory.

4.3 Strength, swelling, resistance to impact, stiffness and total extractable formaldehyde. Using either of the methods for verification of compliance defined in clause 5, the quality of production for each type of wood chipboard shall be maintained at such a level that the mean values for the properties given in table 1, when tested by the method given, shall not be inferior to, or greater than in the case of thickness swelling, the mean values specified in table 1 for the type of board.

The variability of quality levels shall not be greater than those specified in table 2 for each type of board. If, however, a greater value of mean indicates an improvement of quality (other than for thickness swelling) proportional increases in values for between-board standard deviation σ_B , within-board standard deviation σ_W and mean range are permissible.

Relevant limits for manufacturers' control charts for types I, II and III board are given in table 3 and consumers' acceptance limits for these three types are given in table 4.

4.4 Joist centres for flooring. Type II wood chipboard meeting the requirements of table 1, or type III wood chipboard having the mean quality levels appropriate to the thickness corresponding with type II, shall not be used in domestic floors for joist spacings exceeding the following:

18 mm or 19 mm thickness 450 mm joist centre spacing
22 mm thickness 610 mm joist centre spacing

See also C.3.5 and C.3.7. For other applications reference should be made to the manufacturer for specific design information.

4.5 Size of boards. The size of the boards shall be as agreed between the purchaser and the supplier. However, the standard sizes of boards produced primarily for use in dimensionally coordinated buildings designed in accordance with BS 4330 shall be as recommended in BS 4606.

Where boards are provided with special or profiled edges, for example tongued and grooved, the area of the board is defined by the net length and width of the top face of the board excluding the additional width of the profile as shown in figure 1.

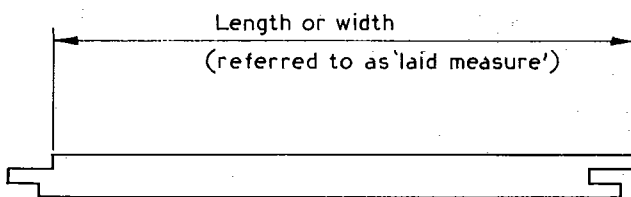


Figure 1. Measurement of length and width of boards with profiled edges

4.6 Test boards. Boards required for testing, or to provide test specimens, may be of any size of whole platen-pressed boards currently available or may consist of 2400 mm lengths cut from board made by a continuous process.

4.7 Density. This British Standard does not specify requirements for densities of board of types I, II and III. However, should measurement of density be required, this shall be carried out in accordance with the method specified in A.4.

4.8 Freedom from foreign matter. The boards shall be free from such foreign matter as might cause excessive damage to woodworking tools.

4.9 Moisture content. When the boards are despatched from the manufacturer's premises the moisture content,

tested in accordance with the method specified in A.5, shall be not less than 7 % and not more than 13 %.

4.10 Thermal conductivity. Sufficient test specimens shall be cut from one board selected at random and one determination of thermal conductivity shall be carried out in accordance with BS 874. The value of thermal conductivity so obtained shall be not greater than 0.14 W/(m K) [0.12 kcal/(m h °C)].

Tests for thermal conductivity require elaborate equipment. Routine testing of this property is not required, and a test certificate issued by a competent authority shall be considered to be evidence of compliance with the requirements of this clause.

4.11 Surface spread of flame. When tested in accordance with BS 476 : Part 7, the surface spread of flame for the board shall not be inferior to that specified for class 3.

Routine testing of this property is not required, and a test certificate issued by a competent authority shall be considered to be evidence of compliance with the requirements of this clause.

4.12 Dimensional stability. When tested in accordance with A.18, the dimensional stability of the board shall not exceed the values given in table 1.

The time required for specimens to reach equilibrium is too long to allow for this test to be used in standard quality control procedures. Manufacturers shall therefore measure this property at suitable intervals in order to provide assurance to consumers that the specified values are met.

5. Verification of compliance

5.1 Verification of compliance with the appropriate requirements of this standard shall preferably be by referring to the records of quality control tests carried out by the manufacturer in respect of the properties referred to in 4.3, (see clause 6), together with satisfactory evidence that the requirements of 4.8 to 4.12 inclusive are also met.

5.2 If the procedure recommended in 5.1 is unacceptable or inapplicable, tests shall be carried out on samples drawn from the consignment or consignments under consideration in respect of the properties referred to in 4.3 (see clause 7). In addition satisfactory evidence shall be provided that the requirements of 4.8 to 4.12 inclusive are also met.

6. Quality control

When quality control charts are used, the boards shall be deemed to meet the requirements of 4.3 if an independent inspector acceptable to both the purchaser and the manufacturer is satisfied from an inspection of the manufacturer's control charts, coupled with such other enquiries as he may deem it necessary to make, that the production is being maintained at or above the levels of quality indicated in 4.3. One-in-forty probability limits for these manufacturers' control tests are given in table 3. For swelling, the value given is the upper limit; for the other properties the values are lower limits.

NOTE. The limits are 1-in-40 probability limits for a sample of three test pieces taken from one board. The lower limits for sample means are calculated as follows:

$$\text{lower limit} = \bar{x} - 1.96 \sqrt{\sigma_B^2 + \frac{\sigma_W^2}{3}}$$

where

σ_B and σ_W have the values given in table 2.

Table 1. Summary of dimensional tolerances and mean quality levels for boards of types I, II and III, thickness below 26 mm

Property	Units	Type of board			Method of test
		I	II	III	
Dimensional tolerances for all boards up to and including 25 mm *Length and width (nominal) unless specified as in 4.5	mm	± 5 mm on the nominal length and width			A.2.4
*Thickness (mean) unsanded	mm	± 0.8			A.2.1
sanded	mm	± 0.4			
*Thickness (at any point on the board) unsanded	mm	± 1.0			A.2.2
sanded	mm	± 0.3			
Edge straightness	mm/mm	1 per 1000			A.2.3
Squareness	mm/mm	2 per 1000			
Mean quality level for boards 6 mm thick or less					
Bending strength	MPa†	18.0	not specified	not specified	A.6
Modulus of elasticity <i>E</i>	MPa	2000			A.6
Tensile strength perpendicular to plane of board	MPa	0.8			A.9.1
Thickness swelling 1 h immersion	%	8.0			A.17.1
† Dimensional stability (r.h. 65 % to 90 %)					
length	%	0.4			A.18
thickness	%	12			
Total extractable formaldehyde	%	0.05		0.05	A.21
Mean quality levels for boards of thickness over 6 mm and up to and including 19 mm					
Bending strength	MPa	13.8	17.0	19.0 min. 15§	A.6
Modulus of elasticity <i>E</i>	MPa	2000	2500	2750	A.6
Tensile strength perpendicular to plane of board	MPa	0.34	0.5	0.5	A.9.1
Tensile strength after cyclic test	MPa			0.25	A.9.2
Surface soundness	N	1100			A.10
Edge screwholding	N	360			A.11
Thickness swelling					
1 h immersion	%	12	10	8	A.17.1
24 h immersion	%			8	A.17.1
after cyclic test	%			max. 8	A.17.2
‡ Dimensional stability (r.h. 65 % to 90 %)					
length	%	0.35	0.35	0.35	A.18
thickness	%	7.00	7.00	7.00	
Impact strength	mm		525		A.8
Total extractable formaldehyde	%	0.05	0.05	0.05	A.21
Mean quality levels for boards of thickness over 19 mm and up to and including 25 mm					
Bending strength	MPa	12.5	17.0	17.0 min. 12§	A.6
Modulus of elasticity <i>E</i>	MPa	1850	2500	2750	A.6
Tensile strength perpendicular to plane of board	MPa	0.25	0.5	0.5	A.9.1
Tensile strength after cyclic test	MPa			0.2	A.9.2
Surface soundness	N	1100			A.10
Edge screwholding	N	250			A.11
Thickness swelling					
1 h immersion	%	12	10	8	A.17.1
24 h immersion	%			8	A.17.1
after cyclic test	%			max. 8	A.17.2
‡ Dimensional stability (r.h. 65 % to 90 %)					
length	%	0.35	0.35	0.35	A.18
thickness	%	7.00	7.00	7.00	
Impact strength	mm		525		A.8
Total extractable formaldehyde	%	0.05	0.05	0.05	A.21

For nominal thicknesses greater than 25 mm, quality levels shall be subject to agreement between manufacturer and purchaser.

* See second paragraph of 4.2.

† 1 MPa = 1 MN/m²

‡ This property is not considered as a mean level of quality, see 4.12.

§ No single value may be less than the minimum.

|| No single value shall exceed this figure.

NOTE 1. Impact values for boards less than 6 mm thick vary considerably with the thickness of the board and the methods specified in A.8 might not be appropriate to all thicknesses.

NOTE 2. Type II boards are not normally available for nominal thicknesses of less than 18 mm.

Table 1(a). Summary of dimensional tolerances and mean quality levels for boards of types I and III, thickness 26 mm to 50 mm

Property	Units	Type of board		Method of test
		I	III	
Dimensional tolerances for all boards over 25 mm and up to and including 50 mm *Length and width (nominal) unless specified as in 4.3	mm	± 5 mm on the nominal length and width		A.2.4
*Thickness (mean) unsanded	mm	± 1.0		A.2.1
sanded	mm	± 0.5		
*Thickness (at any point on the board) unsanded	mm	± 1.0		A.2.2
sanded	mm	± 0.3		
Edge straightness	mm/mm	1 per 1000		A.2.2
Squareness	mm/mm	2 per 1000		A.2.3
Mean quality levels for boards of thickness over 25 mm and up to and including 32 mm				
Bending strength	MPa†	10.0	14.0 min. 10§	A.6
Modulus of elasticity <i>E</i>	MPa	1500		A.6
Tensile strength perpendicular to plane of board	MPa	0.2	2100	A.9 (A)
Tensile strength after cyclic test	MPa		0.4	A.9 (B)
Surface soundness	N	1100	0.15	A.10
Edge screwholding	N	200		A.11
Thickness swelling				
1 h immersion	%	12	8	A.17.1
24 h immersion	%		8	A.17.1
after cyclic test	%		max. 8	A.17.2
‡Dimensional stability (r.h. 65 % to 90 %)				A.18
length	%	0.35	0.35	
thickness	%	7.00	7.00	
Total extractable formaldehyde	%	0.05	0.05	A.21
Mean quality levels for boards of thickness over 32 mm and up to and including 40 mm				
Bending strength	MPa	8.0	12.0 min. 8§	A.6
Modulus of elasticity <i>E</i>	MPa	1200	1800	A.6
Tensile strength perpendicular to plane of board	MPa	0.17	0.35	A.9 (A)
Tensile strength after cyclic test	MPa		0.15	A.9 (B)
Surface soundness	N	1100		A.10
Edge screwholding	N	150		A.11
Thickness swelling				
1 h immersion	%	12	8	A.17.1
24 h immersion	%		8	A.17.1
after cyclic test	%		max. 8	A.17.2
‡Dimensional stability (r.h. 65 % to 90 %)				A.18
length	%	0.35	0.35	
thickness	%	7.00	7.00	
Total extractable formaldehyde	%	0.05	0.05	A.21
Mean quality levels for boards of thickness over 40 mm and up to and including 50 mm				
Bending strength	MPa	6.5	10.5 min. 6.5§	A.6
Modulus of elasticity <i>E</i>	MPa	1000		A.6
Tensile strength perpendicular to plane of board	MPa	0.13	1600	A.9 (A)
Tensile strength after cyclic test	MPa		0.32	A.9 (B)
Surface soundness	N	1100	0.13	A.10
Edge screwholding	N	100		A.11
Thickness swelling				
1 h immersion	%	12	8	A.17.1
24 h immersion	%		8	A.17.1
after cyclic test	%		max. 8	A.17.2
‡Dimensional stability (r.h. 65 % to 90 %)				A.18
length	%	0.35	0.35	
thickness	%	7.00	7.00	
Total extractable formaldehyde	%	0.05	0.05	A.21

*See second paragraph of 4.2.

†1 MPa = MN/m².

‡This property is not considered as a mean level of quality, see 4.12.

§No single value may be less than the minimum.

||No single value shall exceed this figure.

NOTE. This table does not cover separate boards bonded together to form a thicker board.

Table 2. Levels of quality of boards of types I, II and III, thickness below 26 mm

Property	Units	Type I			Type II			Type III			Method of test
		Mean $\bar{X}$	Between-board standard deviation σ_B	Within-board standard deviation σ_W	Mean $\bar{X}$	Between-board standard deviation σ_B	Within-board standard deviation σ_W	Mean $\bar{X}$	Between-board standard deviation σ_B	Within-board standard deviation σ_W	
Boards of thickness 6 mm or less	Bending strength	13.0	2.8	2.8	4.7	not specified			not specified		A.6
	Modulus of elasticity E	2000	305	305	520						A.6
	Tensile strength perpendicular to plane of board	0.80	0.16	0.16	0.27						A.9.1
	Thickness swelling 1 h immersion	8.0	1.7	1.7	2.8						A.17.1
	Total extractable formaldehyde	0.05				0.05		0.05			A.21
Boards of thickness over 6 mm and up to and including 19 mm	Bending strength	13.8	1.9	2.1	3.5	2.2	1.7	19.0	2.5	2.5	A.6
	Modulus of elasticity E	2000	275	300	500	300	300	2750	330	550	A.6
	Tensile strength perpendicular to plane of board	0.34	0.08	0.07	0.12	0.10	0.07	0.5	0.10	0.11	A.9.1
	Tensile strength after cyclic test							0.25			A.9.1
	Surface soundness	1100	180	180	300						A.9.2
	Edge screwholding	360	70	90	150						A.11
	Thickness swelling 1 h immersion	12	2.5	2.5	4.2	2.0	2.0	8	1.6	2.7	A.17.1
	24 h immersion after cyclic test							8			A.17.1
	Impact strength				525	50	50	max. 8			A.17.2
	Total extractable formaldehyde	0.05			0.05			0.05			A.8
Boards of thickness over 19 mm and up to and including 25 mm	Bending strength	12.5	1.9	2.1	3.5	2.2	1.7	17.0	2.2	2.2	A.6
	Modulus of elasticity E	1850	275	300	500	300	300	2750	330	550	A.6
	Tensile strength perpendicular to plane of board	0.25	0.08	0.07	0.12	0.10	0.07	0.5	0.10	0.11	A.9.1
	Tensile strength after cyclic test							0.2			A.9.2
	Surface soundness	1100	180	180	300						A.10
	Edge screwholding	250	50	60	100						A.11
	Thickness swelling 1 h immersion	12	2.5	2.5	4.2	2.0	2.0	8	1.6	2.7	A.17.1
	24 h immersion after cyclic test							8			A.17.1
	Impact strength				525	50	50	max. 8			A.17.2
	Total extractable formaldehyde	0.05			0.05			0.05			A.8

* MPa = 1 MN/m²

NOTE 1. Impact values for boards less than 6 mm thick vary considerably with the thickness of the board and the methods specified in A.8 might not be appropriate to all thicknesses.

NOTE 2. See appendix B for an explanation of the headings of the table.

NOTE 3. Type II boards are not normally available for nominal thicknesses less than 18 mm.

Table 2(a). Levels of quality of boards of types I and III, thickness 26 mm to 50 mm

Property	Units	Type I					Type III					Method of test
		Mean $\bar{X}$	Between-board standard deviation σ_B	Within-board standard deviation σ_W	Mean range $\bar{w}$	Mean $\bar{X}$	Between-board standard deviation σ_B	Within-board standard deviation σ_W	Mean range $\bar{w}$			
Boards of thickness over 25 mm and up to and including 32 mm Bending strength Modulus of elasticity E Tensile strength perpendicular to plane of board Tensile strength after cyclic test Surface soundness Edge screwholding Thickness swelling 1 h immersion 2 h immersion after cyclic test Total extractable formaldehyde	MPa	10.0	1.4	1.5	2.5	14.0	1.8	1.8	3.1	A.6		
	MPa	1500	210	205	350	2100	250	250	425	A.6		
	MPa	0.20	0.05	0.04	0.07	0.4	0.08	0.06	0.20	A.9 (A)		
	N	1100	180	180	300	0.15				A.9 (B)		
	N	200	40	50	85					A.10		
	%	12	2.5	2.5	4.2	8	1.6	1.6	2.7	A.11		
	%					8				A.17.1		
	%					max. 8				A.17.1		
	%	0.05								A.17.2		
	%									A.21		
Boards of thickness over 32 mm and up to and including 40 mm Bending strength Modulus of elasticity E Tensile strength perpendicular to plane of board Tensile strength after cyclic test Surface soundness Edge screwholding Thickness swelling 1 h immersion 24 h immersion after cyclic test Total extractable formaldehyde	MPa	8.0	1.1	1.2	2.0	12.0	1.6	1.6	2.7	A.6		
	MPa	1200	200	180	305	1800	220	220	370	A.6		
	MPa	0.17	0.04	0.03	0.05	0.35	0.07	0.05	0.07	A.9 (A)		
	N	1100	180	180	300	0.15				A.9 (B)		
	N	150	30	40	68					A.10		
	%	12	2.5	2.5	4.2	8	1.6	1.6	2.7	A.11		
	%					8				A.17.1		
	%					max. 8				A.17.1		
	%	0.05				0.05				A.17.2		
	%									A.21		
Boards of thickness over 40 mm and up to and including 50 mm Bending strength Modulus of elasticity E Tensile strength perpendicular to plane of board Tensile strength after cyclic test Surface soundness Edge screwholding Thickness swelling 1 h immersion 24 h immersion after cyclic test Total extractable formaldehyde	MPa	6.5	0.9	1.0	1.7	10.5	1.4	1.4	2.4	A.6		
	MPa	1000	165	150	255	1600	200	200	340	A.6		
	MPa	0.15	0.04	0.03	0.05	0.32	0.06	0.05	0.09	A.9 (A)		
	N	1100	180	180	300	0.13				A.9 (B)		
	N	100	20	25	42					A.10		
	%	12	2.5	2.5	4.2	8				A.11		
	%					8				A.17.1		
	%					8				A.17.1		
	%	0.05				0.05				A.17.2		
	%									A.21		

* $\sigma_B = 1 \text{ MN/m}^2$

NOTE 1. This table does not cover separate boards bonded together to form a thicker board.

NOTE 2. See appendix B for an explanation of the heading of the table.

Where the manufacturer takes a different sample size the appropriate factor should be used to convert w and s , and to find the upper limit for s .

The 1-in-40 probability limit for sample means becomes

$$\text{lower limit} = \bar{X} - 1.96 \sqrt{(\sigma_B^2/n_b) + (\sigma_W^2/n_b n_t)}$$

where

n_b is the number of boards in the sample;

n_t is the number of test pieces from each board;

σ_B and σ_W have the values given in table 2.

See appendix B.

For measuring total extractable formaldehyde, the following sampling procedure shall be used. At intervals the manufacturer considers appropriate, three test specimens shall be selected and cut from a single board as described in B.2.2. Each of these three test specimens shall be further subdivided to provide the necessary mass described in A.21.2.1. The three quantities shall be mixed thoroughly and a random sample of 160 g to 170 g shall be selected for a single determination in accordance with A.21.

7. Consignment testing

When a consignment is to be tested, the sample shall consist of six boards taken at random, and six test pieces shall be cut at random from each board for each test. The consignment shall be deemed to meet the requirement if the sample mean values of these properties are not worse than the values given in table 4. If any sample mean value so obtained is found not to comply with the requirements of this clause, all the tests for all the properties shall be repeated using a further sample of six boards, with six test pieces cut from each board. The sample mean value shall then be taken for the total 72 results so obtained for each property, and if the values so obtained are not worse than those in table 4 the consignment shall be deemed to comply with the requirements of this standard.

For measuring total extractable formaldehyde, the procedure described above shall apply except that the sample shall consist of three boards taken at random, and three test specimens shall be cut at random, from each board for the test. Using the procedure described in clause 6, a sample of 160 g to 170 g shall be selected for a single determination in accordance with A.21.

8. Marking

Chipboards complying with the requirement for types II, III or II/III of this standard shall have the following particulars clearly printed on the back at the time of manufacture:

- (a) number of this standard, i.e. BS 5669*;
- (b) name, trade name or trademark, of the manufacturer;
- (c) type of board, i.e. II, III or II/III.

They shall also be colour coded at the time of manufacture by applying a coloured stripe to either the two long or two short edges of the board. The stripes shall be at least 25 mm wide and applied near to diagonally opposite corners. The code for each type of board shall be as follows:

Type	Code
II	Red
III	Green
II/III	Red and green

In the case of type II/III boards, the red and green stripes shall be applied as above and be separated by not less than 25 mm.

NOTE. These requirements do not preclude the marking and colour coding of type I boards; the appropriate colour stripe for type I board is black.

*Marking BS 5669 on or in relation to a product is a claim by the manufacturer that the product has been manufactured in accordance with the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility. Enquiries as to the availability of third party certification to support such claims should be addressed to the Director, Quality Assurance, British Standards Institution, PO Box 375, Milton Keynes MK14 6LO in the case of certification marks administered by BSI or to the appropriate authority for other certification marks.

Table 3. Manufacturer's control chart limits for boards of types I, II and III, thickness below 26 mm

Property	Units	Type I				Type II				Type III				Method of test
		Limits for sample mean ($\bar{x}$)	Upper limits for within-sample standard deviation (s)	Upper limits for within-sample range (w)	Limits for sample mean ($\bar{x}$)	Upper limits for within-sample standard deviation (s)	Upper limits for within-sample range (w)	Limits for sample mean ($\bar{x}$)	Upper limits for within-sample standard deviation (s)	Upper limits for within-sample range (w)	Limits for sample mean ($\bar{x}$)	Upper limits for within-sample standard deviation (s)	Upper limits for within-sample range (w)	
Boards of thickness 6 mm or less														
Bending strength	MPa*	11.7	4.4	10.2	not specified			not specified						A.6
Modulus of elasticity E	MPa	1310	480	1130										A.6
Tensile strength perpendicular to plane of board	MPa	0.44	0.25	0.58										A.9.1
Thickness swelling 1 h immersion	%	11.8	2.7	6.0										A.17.1
Boards of thickness over 6 mm and up to and including 19 mm														
Bending strength	MPa	9.4	3.2	7.7	12.3	2.7	6.1	13.3	3.9	9.1	13.3	3.9	9.1	A.6
Modulus of elasticity E	MPa	1360	470	1090	1820	470	1080	2000	520	1190	2000	520	1190	A.6
Tensile strength perpendicular to plane of board	MPa	0.17	0.11	0.26	0.29	0.11	0.24	0.29	0.11	0.24	0.29	0.11	0.24	A.9.1
Tensile strength after cyclic test	MPa													A.9.2
Surface soundness	N	710	280	670	14.7	3.1	7.4	9.8	2.5	5.4	9.8	2.5	5.4	A.10
Edge screwholding	N	190	140	330	410	78	184							A.11
Thickness swelling 1 h immersion	%	17.7	3.9	9.3										A.17.1
Impact strength	mm													A.8
Boards of thickness over 19 mm and up to and including 25 mm														
Bending strength	MPa	8.0	3.3	7.7	12.3	2.7	6.1	12.0	3.4	8.0	12.0	3.4	8.0	A.6
Modulus of elasticity E	MPa	1210	470	1080	2000	470	1080	2000	520	1190	2000	520	1190	A.6
Tensile strength perpendicular to plane of board	MPa	0.08	0.11	0.26	0.29	0.11	0.24	0.29	0.11	0.24	0.29	0.11	0.24	A.9.1
Tensile strength after cyclic test	MPa													A.9.2
Surface soundness	N	710	280	670	14.7	3.1	7.4	9.8	2.5	5.4	9.8	2.5	5.4	A.10
Edge screwholding	N	130	94	215	410	78	184							A.11
Thickness swelling 1 h immersion	%	17.7	3.9	9.3										A.17.1
Impact strength	mm													A.8

*1 MPa = 1 MN/m²

NOTE 1. Impact values of boards less than 6 mm thick vary considerably with the thickness of the board and the methods specified in A.8 might not be appropriate to all thicknesses.

NOTE 2. See appendix B for an explanation of the headings of the table.

NOTE 3. Type II boards are not normally available for nominal thicknesses of less than 18 mm.



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