BRITISH STANDARD

BS 7449:1991

Incorporating Amendments Nos. 1 and 2

This Standard is confirmed.
See the BSI Catalogue for details.
November 1997

Specification for

Inclusion of glass in the construction of furniture, other than tables or trolleys, including cabinets, shelving systems and wall hung or free standing mirrors

ICS 97.140

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Consumer and Contract Goods Standards Policy Committee (CCM/-) to Technical Committee CCM/48, upon which the following bodies were represented:

Association for Consumer Research (ACRE)
British Association for Accident and Emergency Medicine
British Contract Furnishing Association
British Furniture Manufacturers' Federation
British Shops and Stores Association (BSSA)
Child Accident Prevention Trust
Consumer Policy Committee of BSI
Department of Trade and Industry (Consumer Safety Unit, C A Division)
EEA (The Association of Electronics, Telecommunications and Business Equipment Industries)
Faculty of Medicine, Leeds University
Flat Glass Manufacturers' Association
Furniture Industry Research Association
Glass and Glazing Federation
Ice (Ergonomics)
Institute of Trading Standards Administration
Royal Society for the Prevention of Accidents
Society of Glass Technology

This British Standard, having been prepared under the direction of the Consumer and Contract Goods Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 28 June 1991

The following BSI references relate to the work on this standard:
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Amd. No.	Date	Comments
9376	January 1997	
10565	February 2000	Indicated by a sideline

Contents

Foreword

This British Standard has been prepared under the direction of the Consumer and Contract Goods Standards Policy Committee at the request of the Department of Trade and Industry's Consumer Safety Unit. The purpose of this British Standard is to provide designers, manufacturers, retailers, consumers and other interested parties with requirements that should minimize the risks of serious accidents with glass included in the construction of furniture other than tables or trolleys, including cabinets, shelving systems and wall hung or free standing mirrors, and it complements BS 7376. It is anticipated that BS 6250-3 will be amended to require that, when glass is included in the construction of cabinet furniture, the cabinet furniture will comply with this British Standard.

The safety requirements for glass in kitchen cabinets are now contained in BS EN 1153:1996 and have therefore been removed from the scope of this standard. It should be noted that the UK voted against EN 1153 at the formal vote stage with the following comment.

> Research undertaken has shown by modelling and laboratory testing that the impact test for vertical glass components as currently specified is not adequate to ensure that serious accident to adults and children will be prevented.

In this respect it should be noted that meeting the requirements for glass in cabinets of BS 7449 will cover the much less demanding requirements of BS EN 1153 but not vice versa. Attention is therefore drawn to the General Product Safety Regulations: 1994, which places a general duty on suppliers of consumer goods to supply products that are safe.

This British Standard calls for the use of test procedures that may be injurious to health if adequate precautions are not taken by the person carrying out the test. It in no way absolves those responsible for testing from statutory obligations relating to health and safety.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

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1 Scope

This British Standard specifies general requirements, performance requirements and thickness requirements necessary to ensure reasonable safety of flat glass, greater than 0.06 m^2, included in the construction of furniture other than tables or trolleys, including cabinets, shelving systems, wall hung or free standing mirrors, storage furniture and bathroom cabinets but excluding catering furniture. The standard takes account of the foreseeable use of the furniture, shelving system or mirror.

This standard does not apply to glass in kitchen cabinets. The safety requirements for glass in kitchen cabinets are contained in BS EN 1153:1996.

NOTE 1 The titles of the publications referred to in this standard are listed on the inside back cover.

NOTE 2 This standard does not cover glass under 0.06 m^2, but this does not imply glass under 0.06 m^2 is considered safe in all circumstances. Potential hazards will depend on the application which, for small sections of glass, cannot be fully predicted in a general standard such as this. Attention is therefore drawn to the General Product Safety Regulations 1994 [1] which place a general duty on suppliers of consumer goods to supply products that are safe in normal or reasonably foreseeable use.

2 Definitions

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

2.1
unbacked glass

glass which either has no backing immediately behind its entire area or has a backing that does not retain its integrity or is cracked or broken when tested as described in appendix A

NOTE Vertical glass that is parallel to and less than 25 mm from a wall, when in the intended position of use, is not classed as unbacked glass.

2.2
enclosed shelf

shelf that is completely enclosed within the cabinet when the cabinet doors are closed

2.3
annealed glass

glass which has been heated to the annealing temperature to remove internal stresses and cooled under controlled conditions

NOTE 1 When broken, annealed glass tends to break into dagger-like shards.

NOTE 2 Annealed glass is sometimes referred to as ordinary glass.

2.4
toughened glass

glass, the surface of which has been rapidly cooled from near the softening point so that a residual compressive stress remains in the surface after complete cooling

NOTE 1 This process increases the thermal and mechanical strength of glass and tends to make it shatter into smaller and less angular fragments than an ordinary glass when it is subject to a breaking stress.

NOTE 2 Toughened glass is also known as tempered glass.

2.5
laminated glass

two or more layers of glass permanently bonded together by one or more interlayers of plastics, and considered as one piece of glass

NOTE The fracture characteristics of laminated glass are similar to those of the type of glass present in the laminate. Impact energy can be absorbed by the interlayers of plastics intended to hold together pieces of glass when broken.

2.6
film backed glass

glass to which a film of flexible plastics has been applied

NOTE The film is intended to hold together pieces of glass if broken.

2.7
cast glass

glass manufactured by the rolling process

NOTE Cast glass is also known as patterned glass.

2.8
nominal thickness

thickness of glass prior to edge working or surface decoration

2.9
decorated glass

glass, the surface of which has been worked (e.g. by acid etching or embossing, sandblasting, brilliant cutting or engraving) to give a decorative effect (see BS 3447) or has been fired with enamels or screen printed

3 Edge work, bevelling and drilling

Exposed edges of glass shall be edge worked or bevelled (see Table 1 of BS 952-2:1980).

The edge of laminated or film backed glass shall be protected from moisture.

NOTE 1 Manufacturers should follow the recommendations given in appendix B.

NOTE 2 If the glass is to be fixed with screws the furniture manufacturer should consult the glass processor or supplier regarding the location and size of holes and the proposed washer system (see **E.2**).

4 Film backed glass

When film backed glass is used the glass surface shall be the working surface.

5 Horizontal glass supported over its entire area

5.1 Glass which has an area no greater than 1.5 m^2 shall comply with the relevant nominal thickness given in Table 1. Glass which has an area greater than 1.5 m^2 shall be either toughened glass with a nominal thickness of at least 4 mm or laminated glass with a nominal thickness of at least 4.4 mm.

5.2 When annealed glass is used the furniture, with the glass removed but a non-structural compensating weight equivalent to that of the glass replacing the glass, shall pass the horizontal static load, vertical impact and horizontal fatigue tests given in BS 4875-5 at test level 3.

NOTE The interpretation of results is explained in BS 4875-5.

6 External glass surfaces excluding horizontal glass supported over its entire area

NOTE 1 Examples of external glass surfaces include glass doors, mirror doors, mirrors and glass panels.

NOTE 2 Glass suppliers should be consulted regarding which of the alternative types of glass is most appropriate for a given application.

6.1 Unbacked glass, including mirrors, with a minor dimension of less than 900 mm shall comply with Class C of BS 6206. When fully framed, the glass shall have a nominal thickness (see **2.8** and clause **9**) of at least 3 mm; when partially framed or unframed the glass shall have a nominal thickness of at least 4 mm.

6.2 Unbacked glass, including mirrors, with a minor dimension of 900 mm or greater shall comply with Class B of BS 6206. When fully framed the glass shall have a nominal thickness (see **2.8** and clause **9**) of at least 4 mm; when partially framed or unframed the glass shall have a nominal thickness of at least 6 mm.

6.3 Where static or sliding glass is contained in a rebate or groove, the overlap of the rebate or groove with the glass shall be at least 4 mm and shall be equal to or greater than the nominal thickness of the glass.

7 Hinged doors, lids or flaps incorporating glass whether framed or unframed

When a hinged component incorporating glass is tested by the methods described in appendix C, there shall be no damage to the glass and the component shall not become wholly or partially detached from the unit either by structural failure of a hinge or slippage in a hinge mounting.

8 Glass shelves

8.1 Maximum safe load

The maximum evenly distributed safe load of a glass shelf when determined in accordance with appendix D shall be equal to or greater than the load stated by the manufacturer and marked on the label (see **12.3**).

8.2 Support of glass shelves

8.2.1 When the glass is moved to extreme positions in any direction horizontally it shall overlap all supports simultaneously by at least 4 mm. Furniture with doors shall comply with this requirement with its doors open.

8.2.2 A shelf shall be retained when the furniture or shelving system of which it is part is tilted in any direction by 30 ± 2° to the horizontal (see Figure 1). Furniture with doors shall comply with this requirement with the doors open.

8.2.3 A shelf shall not tip and the supports shall remain intact when a load, equivalent to 50 % of the maximum evenly distributed safe load (see **8.1**) and covering an area of 75 mm × 75 mm, is placed at any position on it for at least 10 s.

8.3 Shelves that are not enclosed shelves (see **2.2**)

Glass shelves that are not enclosed shelves shall comply with Class C of BS 6206.

Table 1 — Nominal thickness of horizontal glass that is supported over its entire area

Area of glass	Nominal thickness requirement (see **2.8** and clause **9**)			
	Annealed glass	Toughened glass	Laminated glass	Film backed glass
m^2	mm	mm	mm	mm
≤ 0.5	≥ 4.0	≥ 4.0	≥ 4.4	≥ 4.0
> 0.5 to ≤ 1.0	≥ 5.0	≥ 4.0	≥ 4.4	≥ 4.0
> 1.0 to ≤ 1.5	≥ 6.0	≥ 4.0	≥ 4.4	≥ 4.0
> 1.5	See **5.1**	≥ 4.0	≥ 4.4	See **5.1**

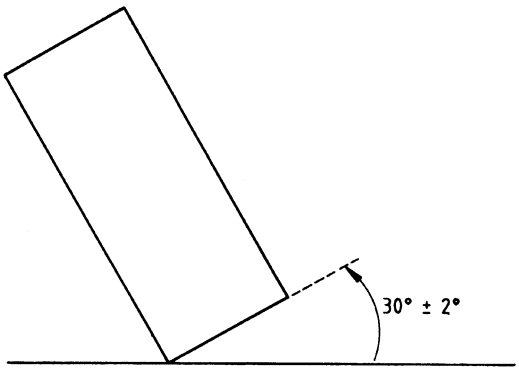


Figure 1 — Tilt test angle

9 Nominal thickness tolerance

The tolerance on nominal thickness (see **2.8**) of toughened, annealed and film backed glass, and of the individual layers of glass in laminated structures, shall be as given in Table 2 when the nominal thickness is determined by the method described in BS 952-1. The tolerance on nominal thickness of laminated glass shall not exceed the sum of the tolerances of the individual layers of glass in the laminate.

Table 2 — Tolerance on nominal thickness for toughened, annealed and film backed glass

Nominal thickness	Tolerance on nominal thickness	
	Plain glass	Cast glass (see **2.7**)
mm	mm	mm
3.0 to 6.0	± 0.2	± 0.5
8.0 to 12.0	± 0.3	± 0.8
15.0	± 0.5	—
19.0 to 25.0	± 1.0	—

10 Stability

10.1 Furniture that is not office furniture, and which incorporates glass, shall either pass the tests described in BS 4875-8 or shall be supplied with wall fixings. If supplied with wall fixings, the furniture shall be labelled in accordance with item 5) of **12.3** d).

10.2 Furniture that is office furniture, and which incorporates glass, shall either comply with the overbalancing requirement in **4.2** of BS 5459-3:1983 at test level G or be supplied with wall fixings. If supplied with wall fixings, the furniture shall be labelled in accordance with item 5) of **12.3** d).

11 Mirrors

Mirrors or mirrored glass shall comply with relevant requirements given in clauses **3** to **9**.

NOTE Where mirrors rely on an adhesive bond, clips or screws to retain or support them, manufacturers should follow the recommendations given in appendix E.

12 Marking

12.1 Where glass that complies with Class A, B or C of BS 6206 is used the glass shall be marked in accordance with BS 6206.

12.2 Furniture other than tables or trolleys, including cabinets, shelving systems and wall hung or free standing mirrors that incorporates glass, shall be clearly marked with the following information either permanently or on an adhesive label which cannot be removed without destroying the label:

a) the number and date of this British Standard, i.e. BS 7449:1991[1)];

b) the manufacturer's or supplier's (i.e. agent's, importer's or retailer's) name and address;

c) a means of identifying the furniture, shelving system, cabinet or mirror, e.g. the model number, and batch number or date of manufacture;

d) details of the glass incorporated into the furniture, shelving system, cabinet or mirror, i.e. nominal thickness, whether annealed, laminated, film backed or toughened, and whether or not it complies with Class A, B or C of BS 6206;

e) the following statement:

"If a glass component is chipped or broken replace with glass of the type described on this label. Consult the manufacturer, retailer or agent with regard to obtaining a manufacturing specification and shape for replacement glass quoting the model number, and batch number or date of manufacture".

This label should be applied by the manufacturer.

NOTE 1 Where possible this label should not be applied to glass components.

[1)] Marking BS 7449:1991 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

NOTE 2 The label should not be removed by retailers or by persons delivering the furniture, shelving system, cabinet or mirror.

12.3 Manufacturers shall give additional information concerning the use and care of the furniture, shelving system, cabinet or mirror in an instruction leaflet.

This information shall include the following:

a) the words "Keep these instructions for further use";

b) the information specified in items a) to e) of **12.2**;

c) for each shelf a safe load, in kilograms, that does not exceed the maximum evenly distributed safe load of the shelf;

d) the following warnings:

"WARNINGS

1) Do not place very hot or very cold items against or in close proximity to glass surfaces unless an adequately thick insulating material is used to prevent such items from coming into contact with the glass.

2) Do not strike the glass with hard or pointed items.

3) When cleaning glass panels or mirrors use a damp cloth or leather with washing up liquid or soft soap if necessary; do not use washing powders or any other substance containing abrasives since these substances scratch glass."

and if applicable

4) "Do not sit or stand upon horizontal glass surfaces.

5) It is essential that this unit is fixed to a wall with the fixings provided." (See clause **10**.)

Appendix A Impact test

A.1 Apparatus

The impacter (see Figure 2) shall consist of a basketball made of synthetic material and having a circumference of 750 mm to 780 mm inflated to a pressure of 72.5 ± 2.5 kPa and attached by a network of elastic cords to a ball mounting ring. The ball mounting ring shall consist of a ring having an outside diameter of 150 ± 5 mm and an inside diameter of 90 ± 5 mm. The rear face of this ring shall be attached to the main body of the impacter and its front face shall be shaped to fit the ball.

The main body of the impacter shall consist of a mass supported by cords or flexible wire 850 ± 50 mm long so that the longitudinal axis of the impacter remains horizontal when the support cords are displaced from the vertical. The main body of the impacter shall be of such a mass that the total mass of all moving parts, excluding the support cords, shall be 40 kg.

A.2 Procedure

A.2.1 Remove the glass covering the backing structure to be tested (see **2.1**) and place the item of furniture or mirror backing structure as intended to be used, e.g. against a wall, hung on a wall, away from a wall.

A.2.2 Position the impacter such that when hanging at rest it is not in contact with the intended impact surface and the distance between the intended impact surface and the striking point of the impacter is no more than 10 mm, and such that the actual point is within 20 mm radially of the desired impact point.

Raise the impacter along its arc of suspension through a vertical height of 30 ± 1 mm. Release the impacter so that it swings in a pendular arc and strikes the backing structure as follows:

a) once at the geometric centre of the backing structure;

b) once on the vertical centreline down the backing structure at a distance from its top of one-quarter of its height;

c) once on the vertical centreline down the backing structure at a distance from its top of three-quarters of its height.

A.2.3 Record whether the backing structure has retained its integrity or is cracked or broken.

Appendix B Recommendations on the contact of glass with other materials

B.1 Hard materials, for example glass, metal or stone, likely to cause damage to the surface or edge of glass should not be in contact with the glass.

B.2 Allowance should be made for any difference in coefficients of thermal expansion of glass and surrounding components, having regard to manufacturing tolerances on the dimensions of the glass.

NOTE If light fittings are included in the construction of furniture or shelving systems, film backed glass and laminated glass should not be used in positions where they become heated when the light fittings are switched on.

Appendix C Method of test for hinge strength of hinged components incorporating glass

C.1 General

Throughout the tests described in **C.2** and **C.3** units shall be secured to prevent them tipping over.

C.2 Strength of pivoted doors or flaps test

C.2.1 *Components pivoted in the vertical plane*

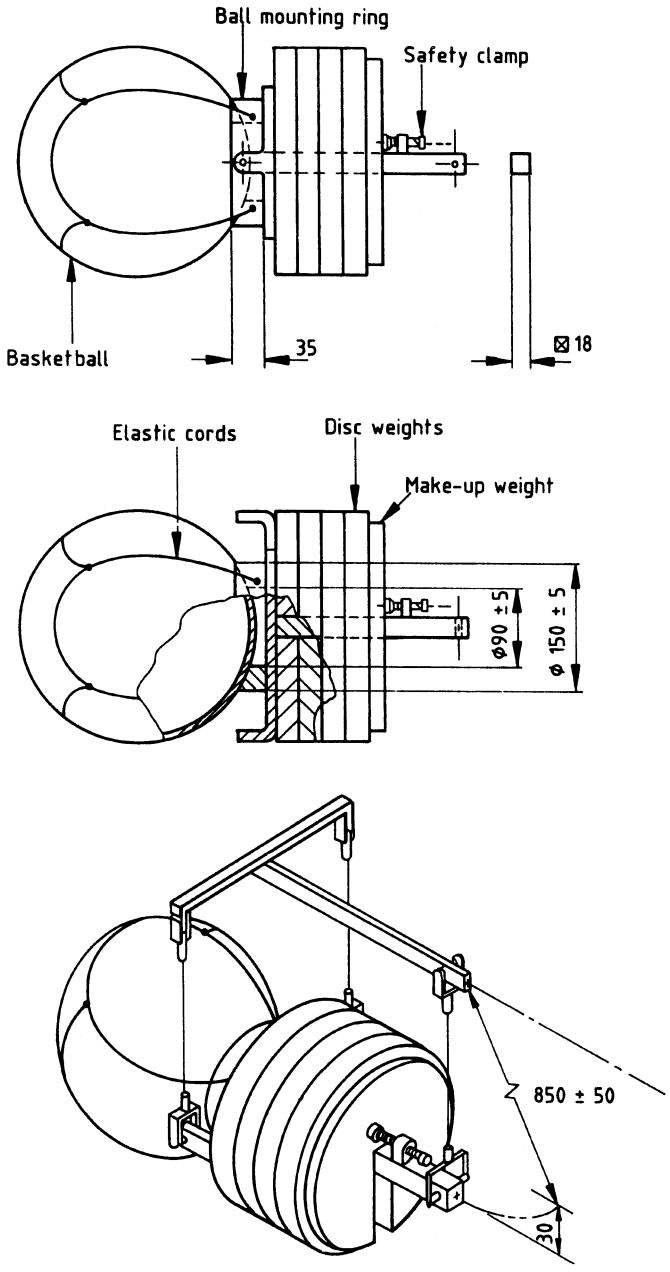
Place the unit as it is intended to be used. Attach a mass of 25 kg, so that it is equally distributed on both sides of the door, at a position 100 mm from the outer edge of the door (see Figure 3). Swing the door through 10 cycles from a position 10° from the fully closed position to a position 10° from the fully open position.

C.2.2 *Components pivoted in the horizontal plane from their top edge*

Place the unit as it is to be used. Attach a mass of 25 kg from the bottom edge of the flap at a position 100 mm from one side of the flap (see Figure 4). Apply the load for 30 s, 10 times.

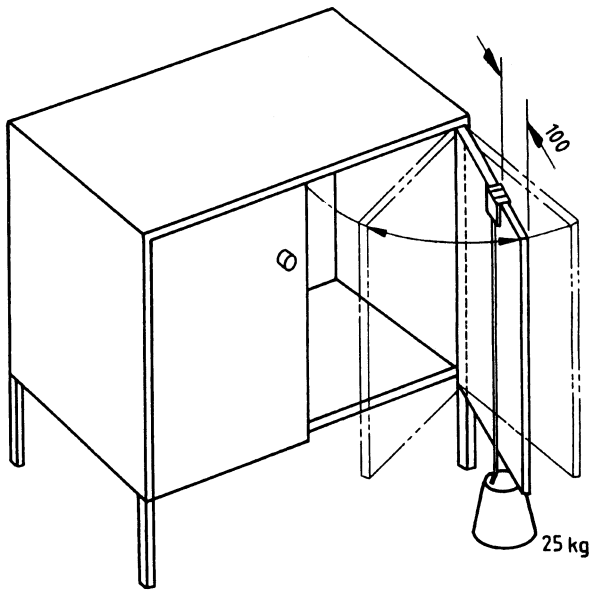
C.2.3 *Components pivoted in a horizontal plane from their bottom edge*

Place the unit as it is to be used with the flap open. Place a mass of 25 kg on the flap at a position such that its centre of gravity is over a point 100 mm from one side of the flap and 50 mm from the outer edge of the flap (see Figure 5). Apply the load for 30 s, 10 times.



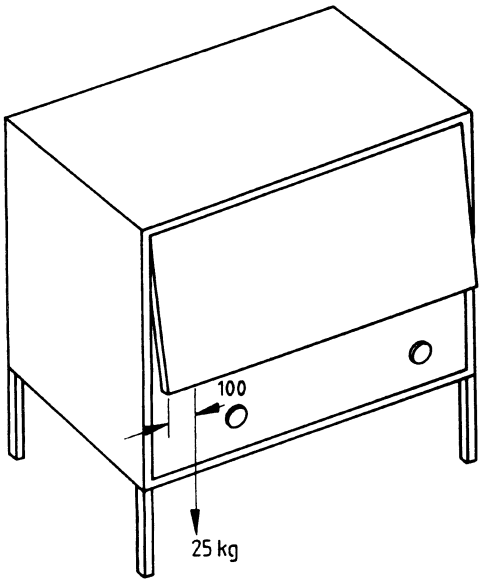
All dimensions are in millimetres.

Figure 2 — Impacter



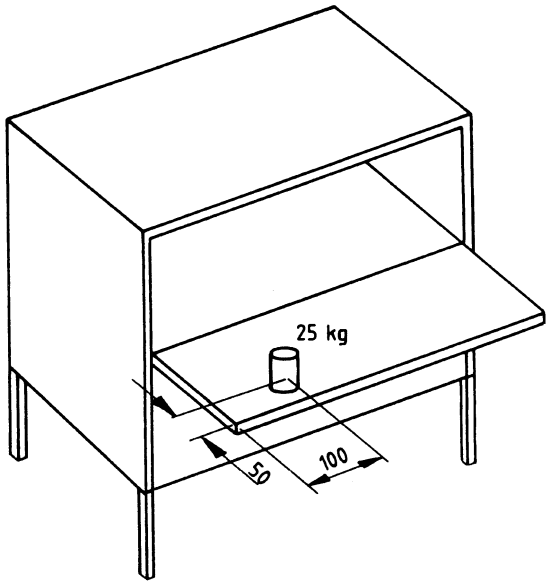
Dimension is in millimetres.

Figure 3 — Strength of doors pivoted in a vertical plane



Dimension is in millimetres.

Figure 4 — Strength of top hung flaps



Dimensions are in millimetres.

Figure 5 — Strength of bottom hinged flaps

C.3 Slamming open test for doors pivoted in a vertical plane and bottom hinged flaps

NOTE Top hinged components are not subjected to this test.

Place the unit as it is intended to be used. If the door is a bottom hinged flap fitted with an adjustable frictional stay, adjust the frictional stay so that the flap just opens under its own weight. Position the door 30° from fully open and allow it to open freely under the influence of a force of 15 + 0, – 0.5 N applied to the middle of the edge opposite the hinges and in a direction perpendicular to the plane of the door when fully open (see Figure 6 and Figure 7). If a weight, string and pulley are employed, use braided nylon cord and position the pulley 1 000 ± 50 mm from the door when fully open, and support the weight at the point of full opening. Perform the test 10 times.

C.4 Inspection after testing

After each test inspect each pivoted component and hinge mechanism for damage that might cause the component to become detached from the cabinet either by structural failure of a hinge or slippage in a hinge mounting.

Appendix D Determination of the maximum evenly distributed safe load of a glass shelf

D.1 General

The maximum evenly distributed safe load that a glass shelf could support is a function of type of glass and its dimensions (see Table 3).

NOTE The maximum (concentrated) safe load may be taken as equal to half the maximum evenly distributed safe load.

D.2 Rectangular shelves supported as in Figure 8

Calculate the maximum evenly distributed safe load (in kg) from the following equation:

$$\text{maximum evenly distributed safe load} = \frac{XLB}{10^6}$$

where

X is the maximum evenly distributed safe load; per unit area (in kg/m^2), obtained from Table 3;

L is the unsupported length of the shelf (in mm) (see Figure 8); and

B is the depth of the shelf (in mm).

NOTE Table 3 is used to determine X, the maximum evenly distributed safe load per unit area (in kg/m^2), for glass of a given thickness t and unsupported length L, for insertion into the equation above.

For intermediate values of unsupported length L of glass, determine X, the maximum evenly distributed safe load per unit area (in kg/m^2) by linear interpolation using the two adjacent maximum evenly distributed safe load per unit area values in Table 3.

D.3 Non-rectangular shelves and rectangular shelves not supported as in Figure 8

Measure the major, i.e. longest, unsupported dimension L' of the shelf in millimetres. Gradually increase an evenly distributed load on the shelf until the maximum deflection (in mm) of the major unsupported dimension is equal to L'/500 in the case of annealed, laminated or film backed glass or L'/ 200 in the case of toughened glass. Record this load in kilograms; this is the maximum evenly distributed safe load.

Appendix E Recommendations for fixing mirrors

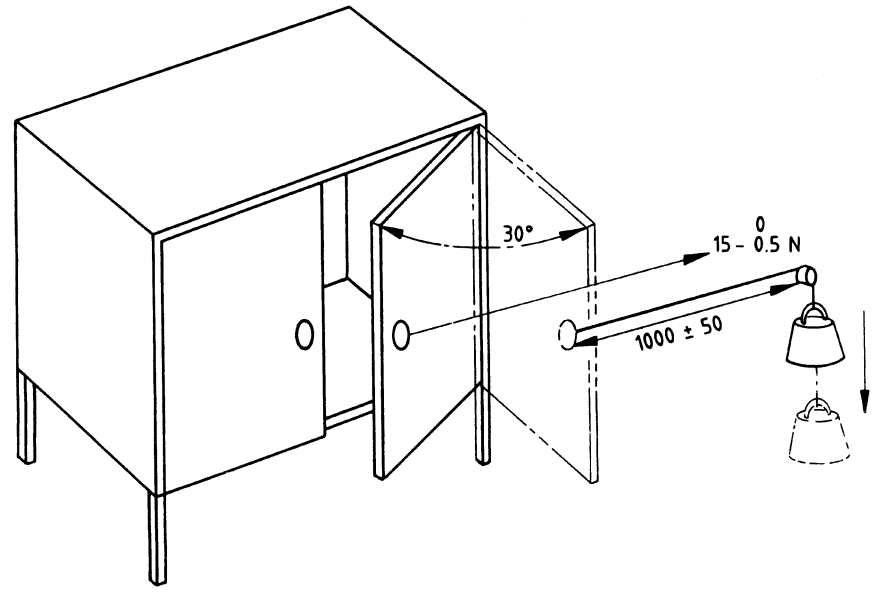
E.1 Pressure sensitive adhesive materials

E.1.1 *Introduction*

It is important for furniture manufacturers to consult adhesive manufacturers regarding the compatibility of an adhesive system with the surfaces of the mirror and component to be bonded.

A furniture manufacturer in conjunction with the adhesive manufacturer should test over a period of time the proposed adhesive with the mirror and component to be bonded under slightly more adverse environmental conditions than would normally be encountered. The bond should perform satisfactorily in the relative humidity range 35 % r.h. to 85 % r.h. and in temperatures of up to 50 °C, since high temperatures can arise in well lit retail display areas.

Furniture factories are not always ideal environments in which to apply pressure sensitive adhesive tapes. Bond strength is severely reduced if the surface of the adhesive material, mirror or component to be bonded becomes contaminated, e.g. with grease or wood dust. Not only is the selection of the bonding system important, but it is also important to set up and maintain appropriate environmental and application procedures.



Linear dimension is in millimetres.

Figure 6 — Slamming open of doors pivoted in a vertical plane

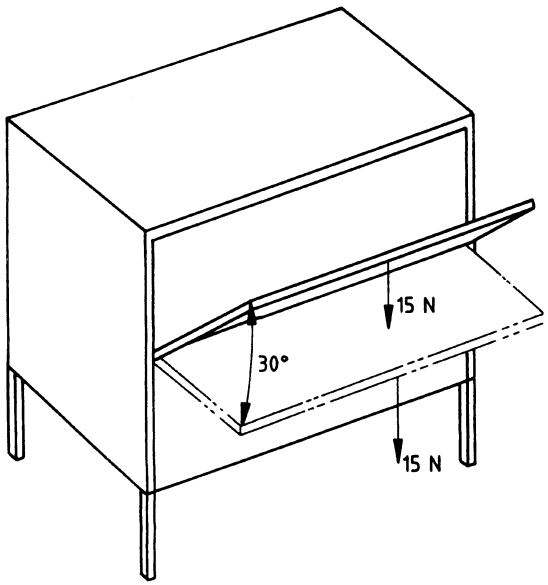


Figure 7 — Slamming open of bottom hinged flaps

The recommendations in **E.1.2** apply to pressure sensitive adhesives embodying a foam carrier. At present other adhesives are not considered suitable for fixing mirrors to furniture. Because the consequences of the failure of an adhesive bonding system may be serious and expensive, the recommendations in **E.1.2** concerning pressure sensitive adhesive materials and their use in fixing mirrors should be followed.

E.1.2 ***Recommendations***

E.1.2.1 Pressure sensitive adhesive materials should never be used to suspend mirrors in a horizontal position or at such an angle that the adhesive bond is subjected to significant tensile stress. In these situations mirrors should be mechanically fixed.

E.1.2.2 When a mirror is to be fixed to a textured surface, a thicker foam carrier should be used so that the bond area can be maximized (see **E.1.2.6**).

E.1.2.3 The area of pressure sensitive adhesive material per unit mass of mirror should be not less than 4 000 mm^2/kg including any trim or material fixed to the mirror. It should be evenly distributed over the surface of the mirror with a minimum of four application points. When strips of tape are used they should be applied horizontally in the plane of application.

NOTE If an adhesive manufacturer recommends the use of more than 4 000 mm^2/kg then the adhesive manufacturer's recommendations should be followed.

E.1.2.4 The component to which a mirror is to be fixed should be of balanced construction and should not bow or distort significantly when the relative humidity or temperature fluctuates.

E.1.2.5 If the component to which the mirror is to be fixed is a moving part of the item of furniture, e.g. a door, then the moving part should be attached to the item of furniture in such a way that it will not bow or twist significantly in use.

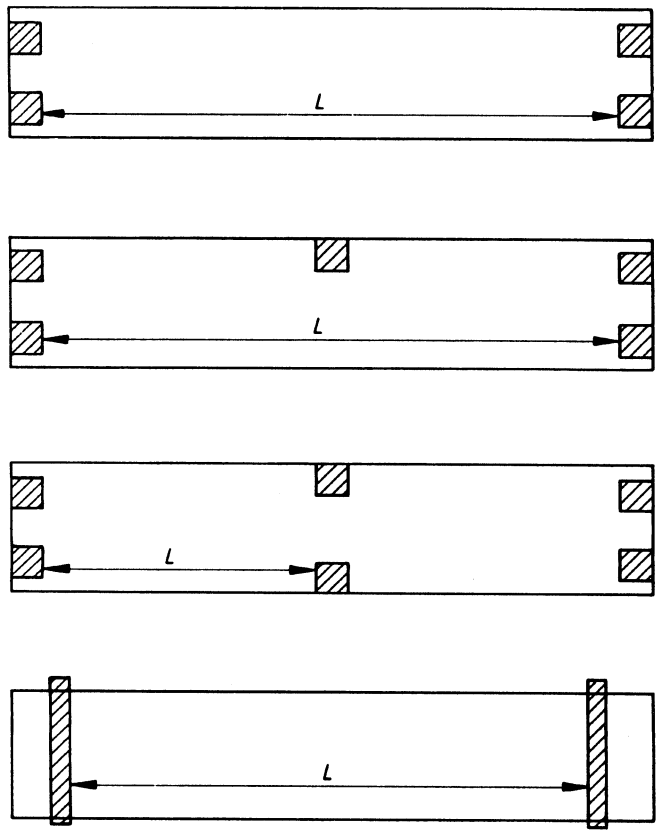
E.1.2.6 The surface to which the mirror is to be fixed should be as smooth as possible to maximize bond area and therefore bond strength; if the surface is rough, bonding of the pressure sensitive adhesive is restricted to the high points on the surface and the area bonded is less than the area of pressure sensitive adhesive material used.

E.1.2.7 Pressure sensitive adhesive material should not be used on partially cured lacquers or partially cured paints, friable surfaces, porous surfaces, e.g. unfinished wood or wood based surfaces, nor on surfaces contaminated with grease, wax or dust.

NOTE Pressure sensitive adhesive materials should not be stuck to painted or lacquered surfaces too soon after painting or lacquering as solvents may adversely affect the adhesive.

E.1.2.8 Immediately prior to bonding the back of the mirror should be thoroughly cleaned with a solvent that is compatible with the mirror backing paint and the adhesive system, and the surface of the component to which the mirror is to be fixed should be thoroughly cleaned with a solvent that is compatible with its surface finish and with the adhesive system.

E.1.2.9 The exposed adhesive surface of pressure sensitive adhesive materials should not be touched and should not be exposed to the atmosphere for longer than necessary prior to bonding.



NOTE. Shaded areas represent shelf supports

Figure 8 — Unsupported length *L* of shelf for calculation of maximum evenly distributed safe load

Table 3 — Maximum evenly distributed safe load per unit area supported by a glass shelf for determining safe loading capacity (in kg/m^2) for a given unsupported length, thickness and type of glass

Type of glass	Nominal thickness t of glass (in mm)	X, the maximum every distributed safe load per unit area (in kg/m^2) supported by the following lengths L of glass (in mm)															
		300	400	500	600	650	700	750	800	850	900	1 000	1 100	1 200	1 300	1 400	1 500
Annealed	4	153	86	55	38	33	28	24	21	19	17	14	11	10	8	7	6
	5	244	137	88	61	52	45	39	34	30	27	22	18	15	13	11	10
	6	356	200	128	89	76	65	57	50	44	40	32	26	22	19	16	14
	8	627	353	226	157	134	115	100	88	78	70	56	47	39	33	29	25
	10	995	559	358	249	212	183	159	140	124	111	90	74	62	53	46	40
	12	1 447	814	521	362	308	266	232	203	180	161	130	108	90	77	66	58
Laminated	4	69	39	25	17	15	13	11	10	9	8	6	5	4	4	3	3
	6	166	93	60	41	35	30	27	23	21	18	15	12	10	9	8	7
	8	305	172	110	76	65	56	49	43	38	34	27	23	19	16	14	12
	10	487	274	175	122	104	89	78	69	61	54	44	36	30	26	22	19
	12	711	400	256	178	152	131	114	100	89	79	64	53	44	38	33	28
Toughened	4	988	417	213	123	97	78	63	52	43	37	27	20	15	12	10	8
	5	1 991	840	430	249	196	157	127	105	88	74	54	40	31	24	20	16
	6	2 997	1 482	759	439	345	276	225	185	154	130	95	71	55	43	35	28
	8	5 283	2 972	1 775	1 027	808	647	526	433	361	304	222	167	128	101	81	66
	10	8 383	4 716	3 018	2 054	1 615	1 293	1 051	866	722	608	444	333	257	202	162	131
	12	12 197	6 861	4 391	3 049	2 598	2 240	1 845	1 520	1 268	1 068	778	585	450	354	284	231
Cast	4	129	73	47	32	28	24	21	18	16	14	12	10	8	7	6	5
	6	320	180	115	80	68	59	51	45	40	36	29	24	20	17	15	13
	10	895	503	322	224	191	164	143	126	111	99	81	67	56	48	41	36

E.1.2.10 Pressure sensitive adhesive materials should be applied at a temperature in the range 15 °C to 30 °C.

E.1.2.11 The pressure sensitive adhesive material should be applied first to the rougher of the two surfaces to be bonded; it should be rubbed, rolled or pressed down over its entire area with a firm, positive pressure in order to maximize bond area over surface irregularities. Once applied the pressure sensitive adhesive material should not be lifted or repositioned. The other surface to be bonded should then be positioned on the other surface of the adhesive and rubbed, rolled or pressed down over its entire area with a firm, positive pressure.

E.1.2.12 Some pressure sensitive adhesive bonds may take one or two days to attain maximum bond strength. In such cases the mirror/adhesive/component assembly should remain horizontal until the adhesive bond has attained maximum strength.

E.1.2.13 When a mirror and the component to which it is to be fixed are for self-assembly the pressure sensitive adhesive material should be fixed to the mirror or relevant component by the manufacturer in accordance with the recommendations given in **E.1.2.1** to **E.1.2.12** and **E.1.2.14**. Detailed instructions on surface preparation and how to fix the mirror to the component should be included in the kit.

E.1.2.14 If the above recommendations cannot be followed then a mechanical fixing method should be used.

E.2 Recommendations for fixing mirrors by means of clips or screws

E.2.1 Mirrors should not be forced into clips or screwed down too tightly.

E.2.2 Screws should not be in contact with the glass; sleeves and washers should be used.

E.2.3 Holes in the glass should be large enough to accommodate both sleeves and screws.

Publication(s) referred to

Standards publications

BS 952, *Glass for glazing*.

BS 952-1*, Classification*.

BS 952-2*, Terminology for work on glass*.

BS 3447, *Glossary of terms used in the glass industry*.

BS 4875, *Strength and stability of furniture*.

BS 4875-5, *Methods for determination of strength of tables and trolleys*.

BS 4875-8, *Methods for determination of stability of storage furniture*.

BS 5459, *Specification for performance requirements and tests for office furniture*.

BS 5459-3, *Storage furniture*.

BS 6206, *Specification for impact performance requirements for flat safety glass and safety plastics for use in buildings*.

BS 6250, *Domestic and contract furniture* [2)].

BS 6250-3, *Specification for performance requirements for cabinet furniture*.

BS 7376, *Specification for inclusion of glass in the construction of tables or trolleys* [2)].

Other publications

[1] GREAT BRITAIN. General Product Safety Regulations 1994. London: The Stationery Office.

[2)] Referred to in the foreword only.

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