BS 6262-6:2005

Glazing for buildings —

Part 6: Code of practice for special applications —

ICS 81.040.20

British Standards

Committees responsible for this British Standard

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British Adhesives and Sealants Association
British Plastics Federation
British Woodworking Federation
Consumer Policy Committee of BSI
Council for Aluminium in Building
Flat Glass Manufacturers' Association
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Contents

Foreword

This part of BS 6262 has been prepared by Subcommittee B/520/4. It partially supersedes BS 6262:1982, which will be withdrawn upon publication of all seven parts of the newly revised and restructured BS 6262. BS 6262:1982 is being revised and restructured to simplify its use and will be published in seven parts:

Part 1: General methodology for the selection of glazing;

Part 2: Energy, light and sound;

Part 3: Fire, security and wind loading;

Part 4: Safety related to human impact;

Part 5: Frame design considerations;

Part 6: Special applications;

Part 7: Provision of information

Since the correct selection of materials to be used in glazing for buildings depends on many factors, the recommendations in this part of this standard should be used in conjunction with the recommendations in the other parts.

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification, and particular care should be taken to ensure that claims of compliance are not misleading.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 20, an inside back cover and a back cover.

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1 Scope

This part of BS 6262 gives information and recommendations for vertical glazing in the external walls and interiors of buildings, with respect to:

a) structural sealant glazing;

b) bolt fixed structural glazing;

c) frameless doors and entrances;

d) mirrors.

e) Bolt fixed structural glazing with countersunk holes is not specifically covered.

NOTE Some guidance is also given on non-vertical use of mirrors.

These recommendations do not apply to:

1) patent glazing (see BS 5516-1);

2) glass in non-vertical applications (see BS 5516-2);

3) glazing for furniture and fittings (see BS 7376 and BS 7449);

4) glazing for commercial greenhouses (see BS 5502-21);

5) glazing for domestic greenhouses.

Requirements for standards of workmanship for the application of sealants have been published separately as BS 8000-16, and therefore this subject is not dealt with in this standard.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 952-1, *Glass for glazing — Part 1: Classification.*

BS 6180, *Barriers in and about buildings — Code of practice.*

BS 6262-2, *Glazing for buildings — Part 2: Code of practice for energy, light and sound.*

BS 6262-3, *Glazing for buildings — Part 3: Code of practice for fire, security and wind loading.*

BS 6262-4, *Glazing for buildings — Part 4: Code of practice for safety related to human impact.*

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1
glazing (noun)
glass or plastics glazing sheet material, for installation into a building

3.2
glazing (verb)
action of installing glass, or plastics glazing sheet material, into a building

3.3
insulating glass unit
an assembly consisting of at least two panes of glass, separated by one or more spaces, hermetically sealed along the periphery, mechanically stable and durable
[BS EN 1279-1:2004, definition **3.1**]

NOTE The individual panes may be of different sizes and/or thicknesses.

3.4
pane
single piece of glass or plastics glazing sheet material, in a finished size ready for glazing

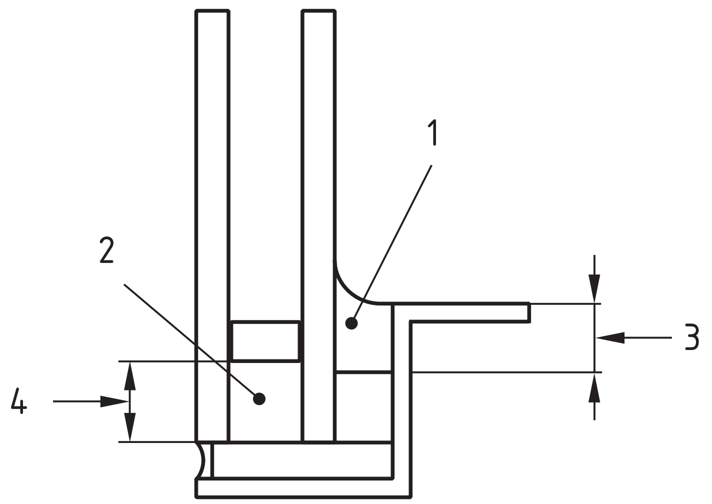
3.5
plastics glazing sheet material
plastics materials in the form of a single sheet, or a combination of sheets laminated together, or an extruded multi-wall sheet

3.6
sealant bite
depth of the structural sealant (and also the edge sealant in the case of insulating glass units), as shown in Figure 1, that contributes to the structural adhesion in structural sealant glazing

3.7
vertical glazing
glazing which is vertical, or within 15° of vertical

3.8
four edge bonded structural sealant glazing
structural sealant glazing where the pane or insulating glass unit is held in place by the adhesive properties of the structural sealant along all four edges

3.9
two edge bonded structural sealant glazing
structural sealant glazing where the pane or insulating glass unit is held in place by the adhesive properties of the structural sealant along two opposite edges and by conventional beaded framing systems on the other two edges



Key
1 Structural sealant
2 Igu edge sealant
3 Sealant bite
4 Sealant bite

Figure 1 — Definition of sealant bite in structural sealant glazing

4 Structural sealant glazing

4.1 General

This method of glazing uses the adhesive qualities of silicone sealants to retain the glass in the frame by adhesion, without the necessity of any mechanical retention such as beads, clips or bolt fixings. The system can be either two edge or four edge structural sealant glazing.

A structural seal support frame is mounted onto the glass in a factory, complete with any appropriate setting blocks, location blocks and distance pieces. On site, the support frame is attached to the building structure by mechanical means and sealed.

Figure 2 shows the principles of a structural glazing system.

NOTE Structural glazing is not appropriate for fire resistant glazing.

Further information on all aspects of structural sealant glazing can be found in:

— prEN 13022, *Glass in building — Structural sealant glazing*; and

— the EOTA publication, *Guideline for European Technical Approval for structural sealant glazing systems*.

4.2 Design principles

4.2.1 *Glass selection*

The type of glass or insulating glass unit should be determined as if it were fully supported on all edges.

It is recommended for four edge structural sealant glazing that the inner pane of an insulating glass unit is not manufactured from monolithic toughened glass, since, if this is accidentally fractured, there is a possibility that the rest of the unit will become detached from the adhesive.

The glass selection should take into account the likely loading (e.g. see BS 6262-3, BS 6399-1, 2 and 3 and BS 6180) and safety requirements (e.g. see BS 6262-4), and be appropriate for environmental factors (such as thermal insulation, solar control and sound insulation, e.g. see BS 6262-2).

4.2.2 *Structural sealant selection*

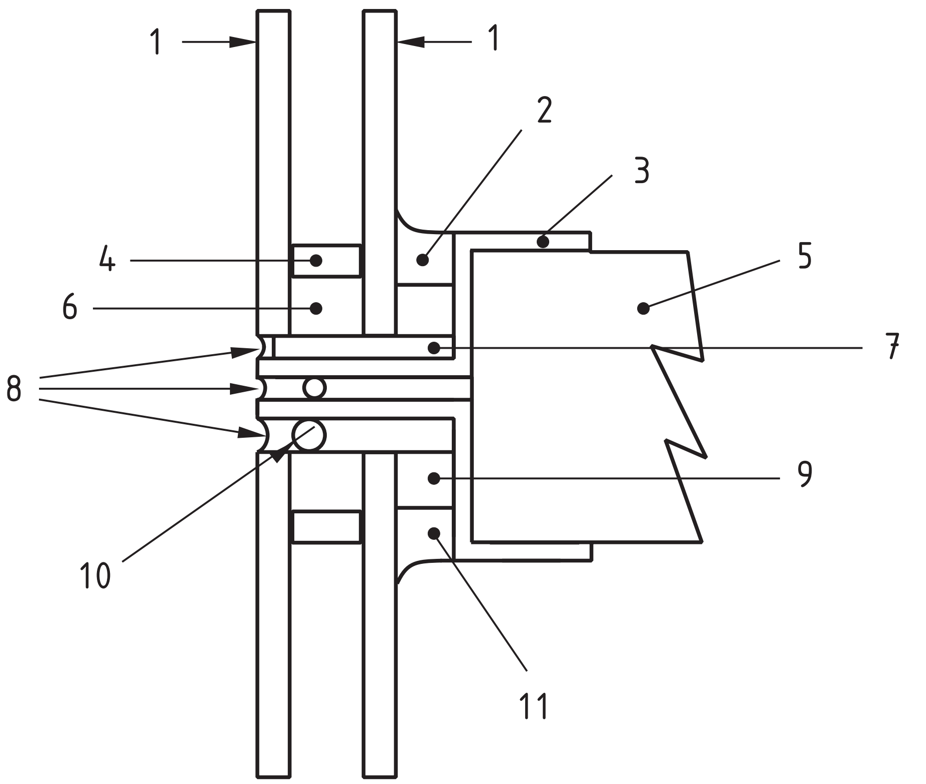
The adhesive sealant is the only, or the principal means, of retaining the glazing in position, so the type of sealant is important. Only silicone sealants recommended by the manufacturer should be used.

The sealant bite should be determined from the design loads on the glass and the allowable stress of the sealant. Annex A describes the design method.

With an insulating glass unit, both the edge sealant and the structural sealant serve a structural purpose in retaining the glass in position, and the sealant bite for both of these should be not less than the calculated figure.

The glazing should be designed in such a way that the sealant is only subjected to short duration tensile forces, e.g. wind suction or live loads. Dead loads or sustained loads should be supported by other means, e.g. setting blocks to carry the glass weight (see Figure 2).

The design of the glazing should eliminate shear stresses on the structural sealant.



Key

1	Glass	7	Setting block
2	Structural sealant	8	Weather seals
3	Structural sealant support frame	9	Spacing material
4	Spacer bar	10	Backer rod
5	Building structure	11	Structural sealant
6	Igu edge sealant		

Figure 2 — Principles of a structural sealant glazing system

4.2.3 *Bonding*

The sealant will only perform its function if the adhesive bonds between the sealant and the surfaces of the glass and the sealant and the support frame are adequate and durable. Tests should be performed on the adhesion at all the interfaces with the proposed substrates to ensure that the joint is capable of developing the required strength and that this can be sustained for the expected life of the glazing, assuming regular inspection and maintenance.

Adhesion is product and surface specific. Once the adhesion tests have been completed satisfactorily, the specification for the glass, the support frame, the adhesive sealant and any primers should not be changed. If any changes are made, the full range of tests should be repeated.

4.3 Compatibility of materials

The insulating glass units should have the edge sealant manufactured from neutral curing silicone.

Care should be taken to ensure that the structural sealant is compatible with the insulating glass unit edge sealant.

Setting blocks, location blocks, weather seals and any other organic materials used in the glazing system should be compatible with the structural sealant and the insulating glass unit edge sealant.

Care should be taken to obtain compatibility between the various sealants and the interlayer of laminated glass.

4.4 Assembly

Assembly of the glass and the support frame should be performed in controlled factory conditions, working to a prepared method statement. The adhesive qualities of the joint can be adversely affected by changes in temperature and humidity or the presence of moisture, so structural glazing adhesive joints should not be made on site.

5 Glazing using structural glass fins

5.1 General

The recommendations of BS 6262-2, BS 6262-3 and BS 6262-4 should be followed in respect of the general selection and design of the glass. **5.2** and **5.3** supplement the recommendations given in those parts.

5.2 Design

Display windows should be designed to resist the expected design wind load (see BS 6262-3), but as they may only be subjected to low wind loads, the psychological effects of possible deflections should also be assessed. In the absence of any other loading criteria, or if the wind load is lower than 600 N/m^2, a minimum wind load of 600 N/m^2 should be applied.

Where panes in the same plane are butt-jointed without fins, they are not as strong as a single pane of the same overall size and thickness. The butt joint cannot be regarded as a fully supported glass edge. The pane thickness should be calculated by assuming that they are two-edge or three-edge supported, i.e. supported by the surround only.

Depending on the span and wind exposure, glass fins of minimum 15 mm thickness can be necessary, secured to the building structure and bonded to the glazing with a suitable sealant. The adhesive sealant should therefore have sufficient bond strength to resist wind suction whilst allowing for movement. When these conditions apply, the façade panes can be considered to be fully supported on four edges.

The stability and robustness of the rebates and their ability to withstand the effects of wind and glass weight are particularly important in large openings.

Where frames are cantilevered they should be designed to take the weight of the glass when installed. With very large panes it can be necessary to introduce rigid frame supports below the setting block positions to support the weight of the glass. The normal studding type of stall riser framework might be inadequate for this purpose.

Annealed glass fins should not be notched.

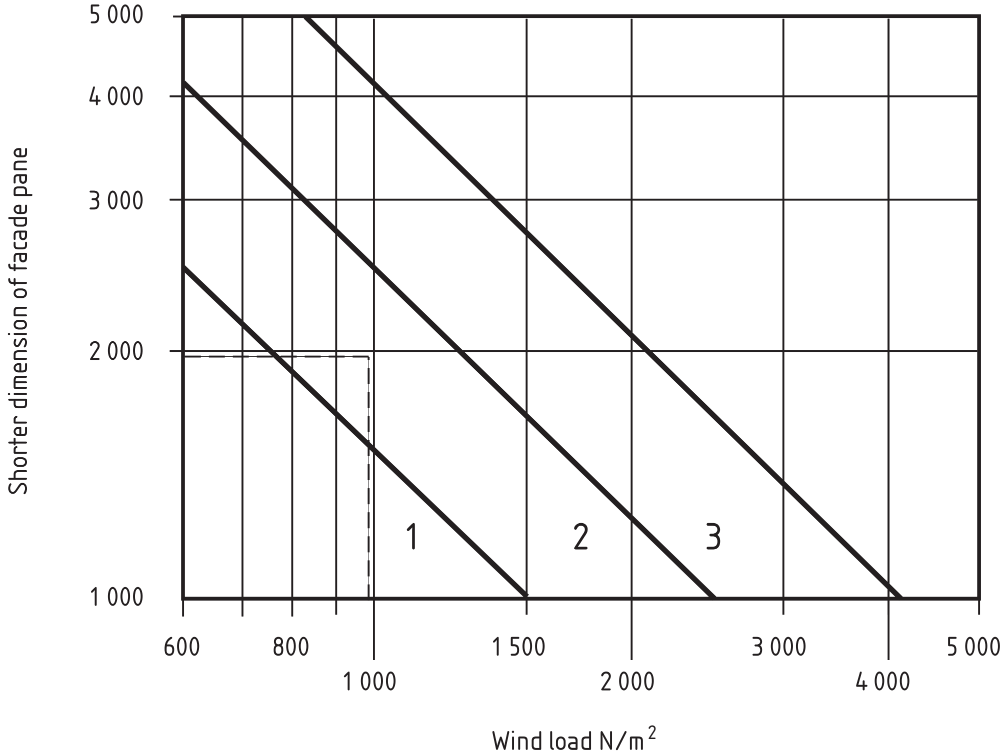
5.3 Performance of glass with fin supports

The thickness of the glass for the façade panes, taking account of wind loading, should be determined according to BS 6262-3, by considering the panes as fully supported on all four edges. Figure 3 and Figure 4 determine the width and thickness of supporting fins, based on a design stress for the sealant of 0.275 N/mm^2.

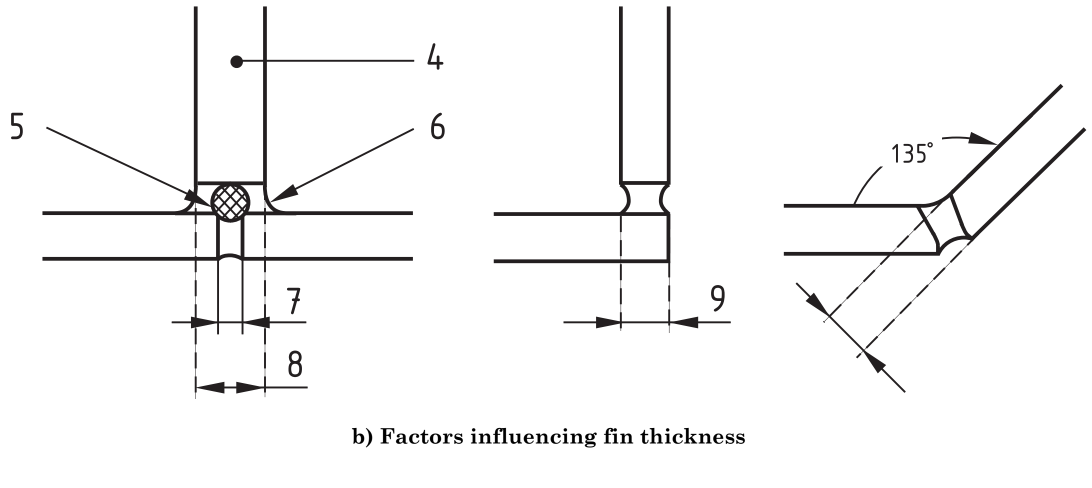
The recommendations of the sealant manufacturer should be followed at all times. Figure 3 and Figure 4 are applicable to installations up to 5 m in height. Above 5 m, the glass supplier should be consulted to determine the suitability of proposals.

To facilitate application of the sealant in a joint, a joint separator of, for example, self-adhesive polyethylene foam strip should be used. It is important to ensure a minimum sealant contact to the fin of 3 mm on each side and the gap between panes should not be less than 3 mm.

Dimensions in millimetres



a) Determination of fin thickness



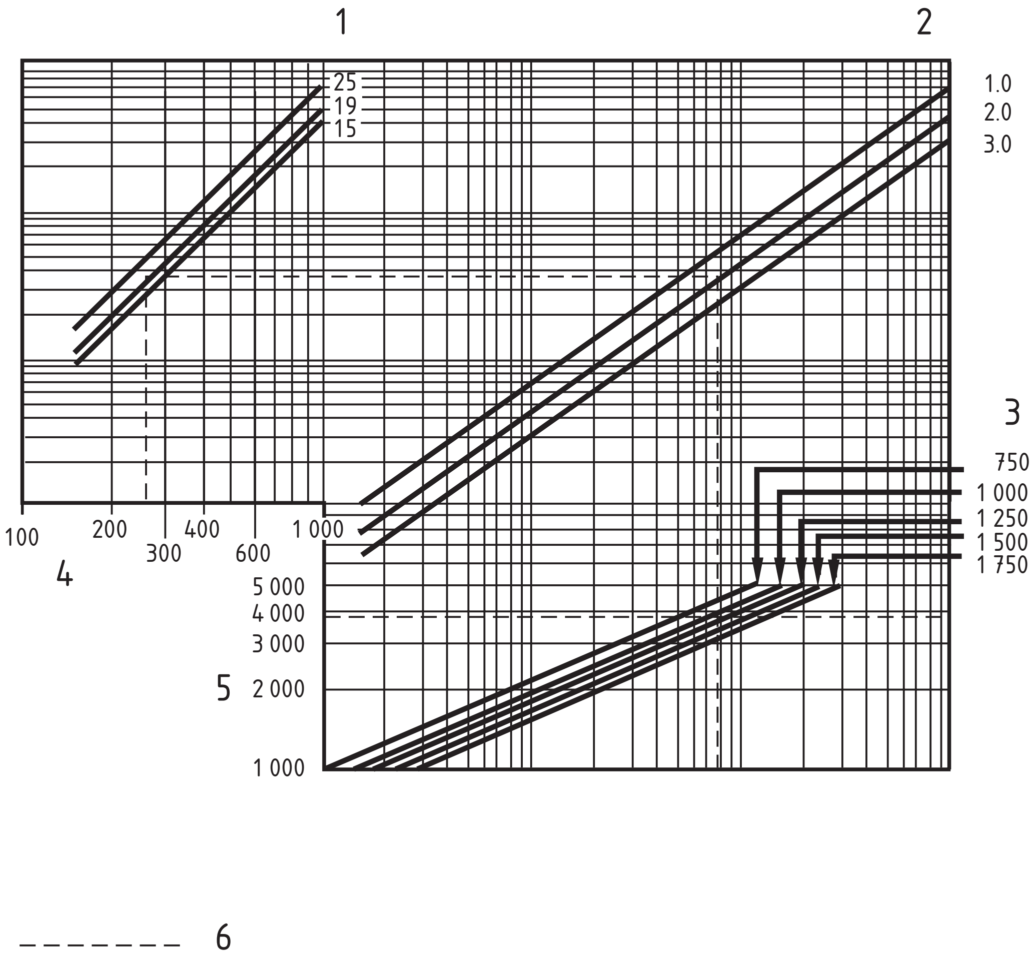
b) Factors influencing fin thickness

Key

1	15 mm	6	High modulus silicone
2	19 mm	7	Gap minimum 3 mm, maximum 9 mm
3	25 mm	8	Minimum fin thickness
4	Fin	9	At least half the minimum fin thickness
5	Joint separator		

Figure 3 — Fin thickness

Dimensions in millimetres



Key

1	Fin thickness	4	Fin width
2	Aspect ratio = $\frac{\text{pane height}}{\text{pane width}}$	5	Fin height
3	Wind loading	6	Indicates example

Figure 4 — Determination of annealed float glass fin width to resist the design wind load

EXAMPLE

The following example illustrates the use of Figure 3 and Figure 4.

a) *Design brief*. A pane 2 000 mm wide × 4 000 mm high in a shop front, that has an area of 8 m^2, an aspect ratio of 2:1, and a fin height of 4 000 mm. The pane has to withstand a wind loading of 990 N/m^2.

b) *Determination of pane thickness*. For an area of 8 m^2, to withstand a wind loading of 990 N/m^2, BS 6262-3 shows that 10 mm float glass, 10 mm laminated glass or 6 mm toughened glass will withstand the wind load.

c) *Determination of fin thickness*. In Figure 3, the strength of an adhesive sealant joint depends on the width (and hence area) of the fin edge fixed to the glass it is required to support. The minimum fin thickness is given by the diagonal line to the right of the intersection of the horizontal line representing the smaller dimension of the façade pane and the vertical line representing wind loading.

d) In this example, a pane of smaller dimension 2 000 mm to withstand a wind loading of 990 N/m^2 requires a fin thickness of 19 mm (see broken line in Figure 3).

e) *Determination of fin width*. Referring to Figure 4 and knowing the height of the fin, the wind loading, the aspect ratio (between the height of the fin and the width of the glass which it is to support) and the fin thickness, then the width of the fin can be determined.

f) For a fin 4 000 mm high having to withstand a wind loading of 990 N/m^2, where the aspect ratio is 2:1 and the fin thickness is 19 mm, the width of the fin is found to be 260 mm (see broken lines on Figure 4).

NOTE If desired, the fin width can be determined by calculation from the following formula.

$$d = \frac{1}{1000}\left\{\frac{6Ps^3}{17.8t} \times \frac{\left(1 - \frac{1}{3r^2}\right)}{8r}\right\}^{0.5}$$

where

d is the fin width (mm);

P is the wind load (N/m^2);

s is the fin height (mm);

t is the fin thickness (minimum tolerance for the glass from BS 952-1) (mm);

r is the ratio of fin height to pane width (if $r < 1.0$ then r should be set as 1.0).

Where a glazed area, without mullions, includes right-angled returns or has butting panes with the internal angle not exceeding 135°, panes may be mitre bevelled and joined by a suitable adhesive sealant without the need for additional support, provided the size of the joint is similar to that shown in Figure 3. Each of the two panes meeting at the angle may be considered as fully supported along that edge and also satisfying the wind loading recommendations of BS 6262-3.

5.4 Fixing

Any of the glazing methods described in BS 6262-5, employing beads or structural gaskets, may be applied to the edges of the façade panes.

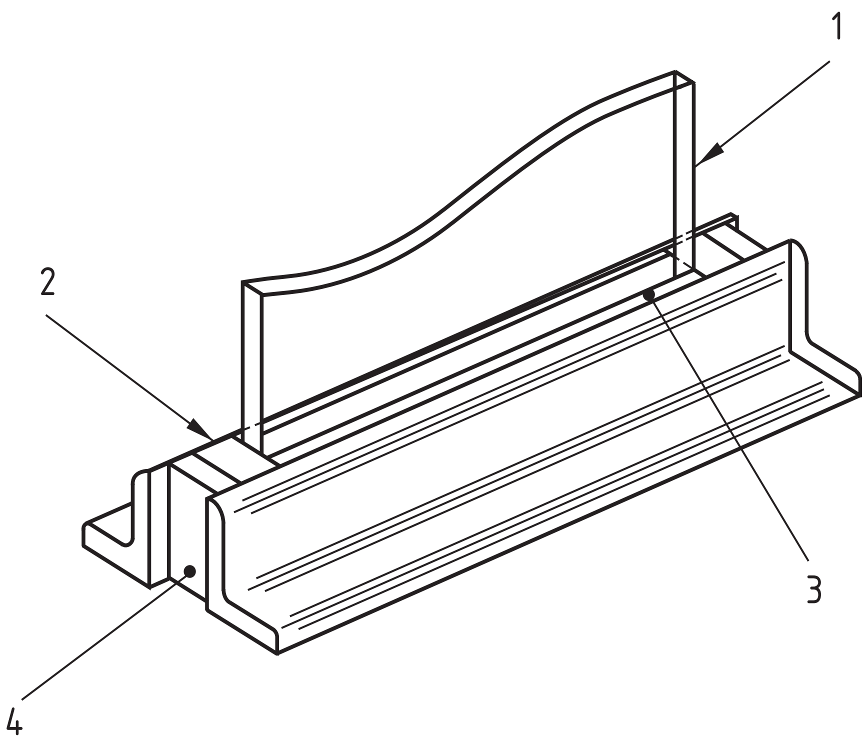
A suggested design for a fin support box is shown in Figure 5.

6 Suspended glazing with annealed glass

When glazed conventionally, glass has to support its own weight, and for very tall panes this can result in considerable stress being induced. By suspending the glass from above, such stress can be eliminated and settlement or other movement of the main structure of a building can be accommodated. Annealed glass can be suspended by two sets of clamps attached to the glass by a combination of a suitable adhesive and mechanical pressure, thus avoiding drilling or notching, which almost inevitably leads to breakage of annealed glass when it is subjected to applied loads.

This system of suspending glazing should be carefully designed to ensure optimum performance and it is essential that the specialist glazier is consulted at an early stage in the development.

The vertical edges of such suspended glass should be supported against wind loading. This can be achieved by a conventional mullion system, provided that the glass is allowed to “ride” in the rebates when deflection takes place, or by the use of glass fins mechanically joined to the panes. In certain conditions this can be achieved by joining with sealant, but for exposed situations, particularly where a high degree of movement is expected, a combined glass and metal bar might be necessary.



Key

1	Glass fin	3	10 mm hardwood packing
2	25 mm hardwood thrustpad	4	Welded fin box with steel base plate

The glass fin should be on poly-chloroprene to ensure no contact with the metal base plate of the bottom fin box. For a top fin box the base plate and poly-chloroprene should be omitted to allow adequate clearance at the top of the fin.

Figure 5 — Fin support box

7 Bolt fixed structural glazing

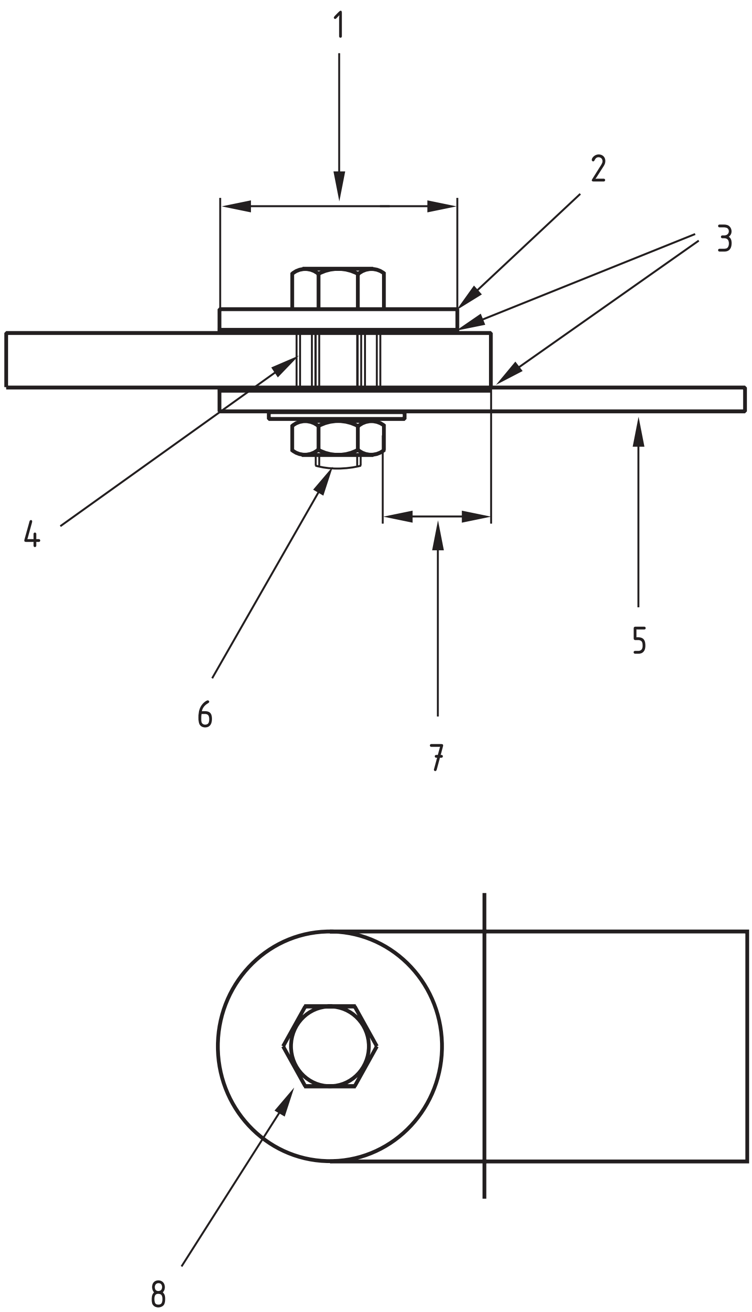
NOTE This information only applies to monolithic thermally toughened soda lime silicate safety glass. Information on the used of laminated thermally toughened soda lime silicate safety glass can be obtained from the manufacturer.

7.1 General

Use of bolts to fix through glass will inevitably result in stress concentrations around the bolt holes. These are a weak point in annealed glass, because drilling or notching almost inevitably leads to breakage of annealed glass when it is subjected to applied loads. Toughened glass should be specified where bolt fixings in glass are to be used.

The frame and/or fixings should always be designed so that they do not tend to distort the glass panel. This is more important with bolted connections, which can exert considerable forces on the glass, where particular attention should be paid to the alignment and position of the fixings in order to avoid unnecessary stresses being developed.

A bolted fixing will generally consist of two metal spreader plates (e.g. see Figure 6), one of which is attached to the structure, with one or more bolts passing through the glass and clamping it between the spreader plates. The spreader plates should be separated from the glass by a gasket that should preferably be not more than 1 mm thick and incompressible (e.g. vulcanized fibre gasket — not polychloroprene gasket). A nylon, or similar, incompressible bush 2 mm to 3 mm thick should be used to prevent the bolt from contacting the edges of the hole. The hole in the glass should be at least 10 mm larger in diameter than the bolt passing through it, to allow for tolerance adjustment and the presence of a bush. The spreader plate should give a minimum of 15 mm cover to the glass around the hole when the bolt is centrally positioned in the hole.



Key

1	Diameter = glass hole diameter + 30 mm	5	Spreader plate fixed to structure
2	Spreader plate	6	Bolt tightened to maximum torque
3	1 mm incompressible fibre gaskets	7	Min. 2 × glass thickness
4	Nylon or hard plastic bush, 2 mm to 3 mm thick	8	Glass hole diameter = bolt diameter + 10 mm

Figure 6 — Principles of a toughened glass infill panel bolted connection

The bolt size, spreader plate diameter and spreader plate thickness should be chosen to suit the specific design of the glazing. The design should ensure that the glazing can carry the anticipated loads without the glass fracturing and without excessive deflection.

The general relationship between the components of a bolted fixing can be determined after the appropriate size of bolt has been chosen. The thickness of the spreader plate should be about 75 % of the bolt diameter, but not less than 6 mm. The diameter of the spreader plate should be about eight times its thickness. Table 1 gives a brief summary of the relationship.

Table 1 — Relationship between bolt size, spreader plates and glass thickness

Loading	Bolt diameter	Spreader plate		Touchened glass thickness
		Diameter mm	Thickness mm	mm
Light	M6	50	6	8
Normal	M6, M10	50	6	8, 10[a]
Heavy	M10	60	8	10, 12
	M12	75	10	12, 15
	M16	100	12	15, 19, 25

[a] For bolted fixings used simply to locate a pane in position, not intended to form a clamp and resist applied bending moments, then the fixing for normal loading should be appropriate for all thicknesses of toughened glass.

7.2 Bolt fixing of glass in barriers

7.2.1 *General*

The barrier and the glass panels should be designed to meet the recommendations of BS 6180.

7.2.2 *Bolt fixing of glass infill panels*

At the bolted connections there should be clamping plates and gaskets (see **7.1**) on both sides of the glass, a minimum of 50 mm diameter. These plates should be not less than 6 mm thick in steel or an equivalent stiffness in other materials. Figure 6 shows a typical fixing.

Where the length of a glass pane is much greater than the span between the bolted connectors, giving rise to a cantilevered portion of the pane, the cantilevered portion should be less than one-quarter of the span between the bolted connectors.

Under the design loads, the barrier should be designed such that the relative in-plane movement of the bolted connections in the same panel is not greater than 2 mm.

7.2.3 *Base fixing of free standing glass barriers*

7.2.3.1 *Localized fixing clamps*

The fixing clamps on each side of the glass should be not less than 100 mm × 150 mm and be made of 12 mm thick steel or an equivalent stiffness in other materials.

There should be not less than two fixing clamps for every 1 000 mm length of barrier.

Figure 7 shows a typical localized fixing clamp.

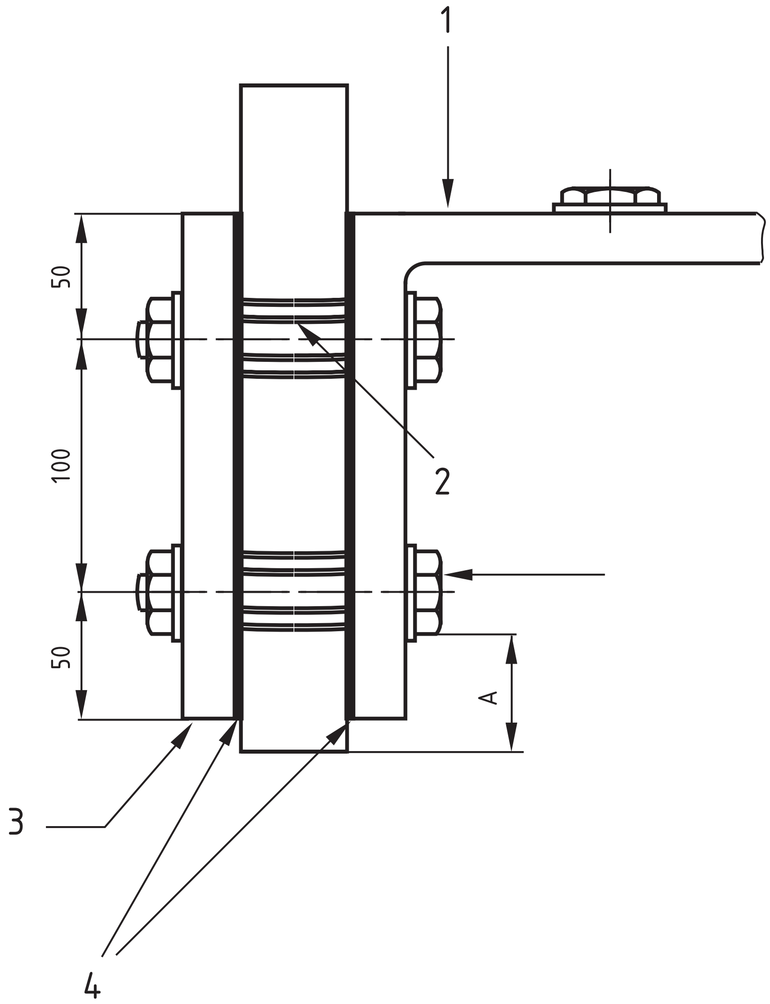
7.2.3.2 *Continuous fixing clamps*

The fixing clamps on each side of the glass should be not less than 100 mm wide and be made of 12 mm thick steel or an equivalent stiffness in other materials.

The clamps should be continuous for the entire length of the glass pane and have a maximum bolt spacing of 500 mm.

Figure 8 shows a typical continuous fixing clamp.

Dimensions in millimetres



Key

1 100 mm wide 200 × 200 × 12 RSA

2 3 mm thick nylon or similar bush

3 Steel clamp plate 12 mm thick × 100 mm wide

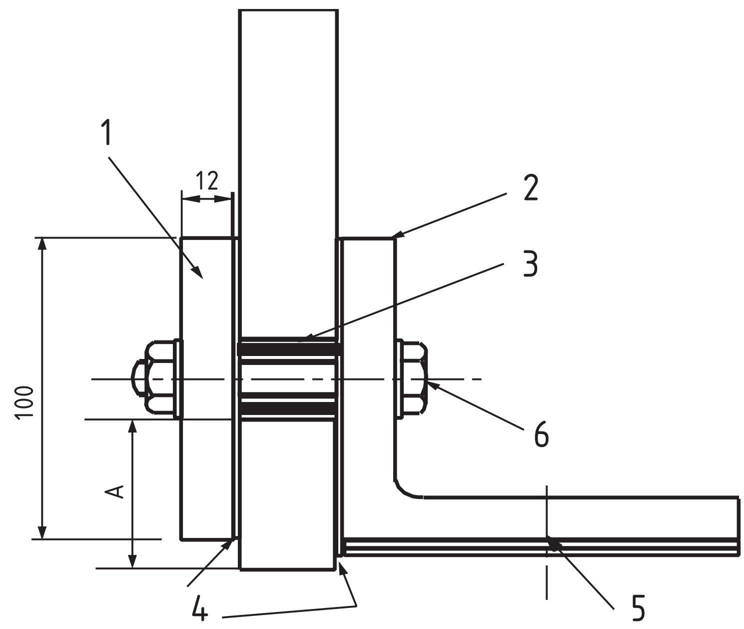
4 1 mm incompressible gaskets

NOTE 1 A = minimum 2 × glass thickness from edge of glass to edge of hole.

NOTE 2 Glass hole diameter = bolt diameter + 10 mm.

Figure 7 — Typical localized fixing clamp for free standing glass barrier

Dimensions in millimetres



Key

1 Continuous steel plate

2 Continuous 100 × 100 × 12 RSA

3 3 mm thick nylon or similar bush

4 1 mm incompressible gasket

5 Fixing bolts sufficient to resist turning moment

6 M16 bolts torqued to 125 N·m at 500 mm centres maximum

NOTE 1 A = minimum 2 × glass thickness from edge of glass to edge of hole.

NOTE 2 Glass hole diameter = bolt diameter + 10 mm.

Figure 8 — Typical continuous fixing clamp for free standing glass barrier

7.3 Frameless doors and door assemblies

7.3.1 *Toughened glass*

7.3.1.1 *General*

The recommendations in BS 6262-2, BS 6262-3 and BS 6262-4 should be followed. The recommendations given in **7.3.1.2** and **7.3.1.3** supplement the recommendations given in these parts.

Toughened glass doors are usually specially designed for a particular location and the manufacturer should be consulted.

Full details of all aspects of toughened glass door installations and assemblies should be considered at an early stage of the design.

However, Table 2 gives guidance on appropriate toughened glass thicknesses for normal applications.

Table 2 — Recommended frameless toughened door thicknesses

Length of door diagonal mm	**Thickness of toughened glass** mm
≤ 1 700	8
> 1 700 and ≤ 2 500	10
> 2 500 and ≤ 3 300	12

7.3.1.2 *Exterior doors*

Transparent and translucent glass doors for exterior use are normally fitted with rails and/or patch fittings at the top and/or bottom edges. Matching side panels and transoms may be used to fill the entire opening in an assembly securely fixed with patch fittings and toughened glass supporting fins as required.

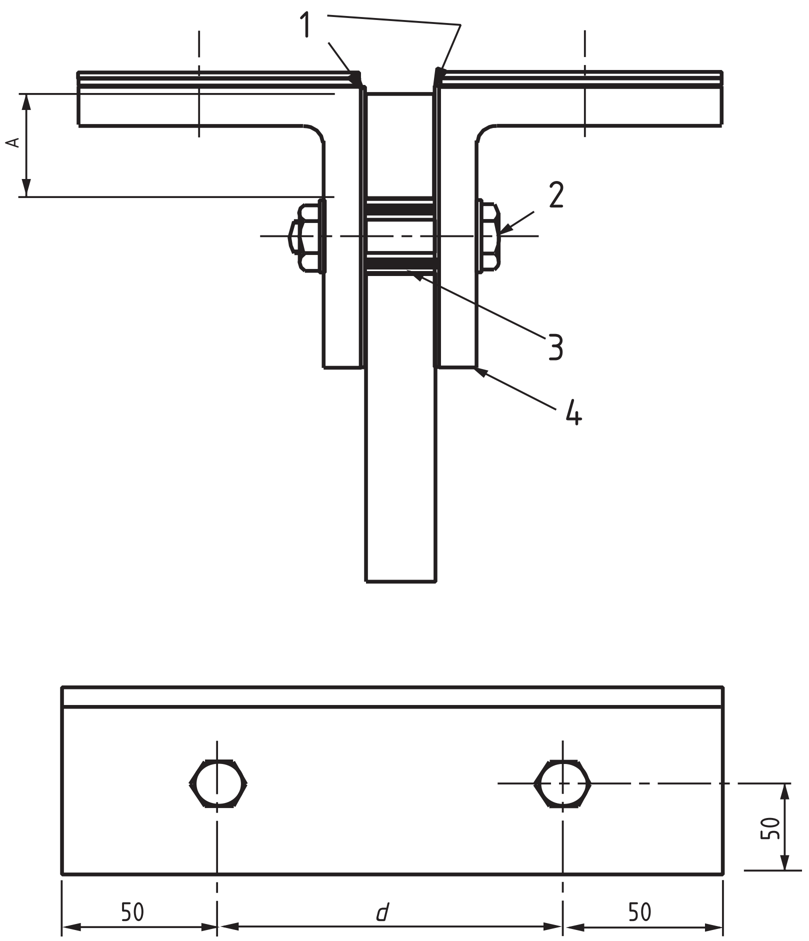
7.3.1.3 *Interior doors*

Transparent and translucent glass doors for interior use are normally fitted with patches at top and bottom corners, from which the doors are pivoted, or with hinges. Pivoted doors may be provided with matching side and transom panels as for exterior doors, thereby filling an opening in an assembly fixed with patch fittings and toughened glass supporting fins as required.

7.3.1.4 *Cantilever fin support fixings*

Where toughened glass supporting fins are cantilevered from the upper structure of an opening, the fins should be clamped in a friction grip bolted system as shown in Figure 9. The distance between the bolts, indicated by *d* in Figure 9, should be determined depending on the door height, the spacing of the fins, the length of the fins and the applied loadings, but should be not less than 100 mm.

Dimensions in millimetres



Key

1 1 mm thick incompressible gasket

2 Grade 8.8 M16 bolts tightened to 240 N·m torque

3 3 mm thick nylon or similar bush

4 12 mm thick 125 × 125 RSA

Figure 9 — Principles of a cantilever fin support

Table 3 gives the suggested bolt separation for a standard width and height double door configuration (2 × 900 mm × 2 100 mm, where the 2 represents the two doors), with a cantilevered fin supporting the upper corners of the door opening, when the design wind load does not exceed 1 000 N/m^2.

Table 3 — Spacing of bolts in cantilevered fin support systems

Length of fin mm	**Spacing between fin support bolts, (see Figure 9)** mm
600	100
800	100
1 000	110
1 200	140

7.3.2 ***Frameless plastic doors***

7.3.2.1 *General*

The recommendations in BS 6262-2, BS 6262-3 and BS 6262-4 should be followed. The recommendations given in **7.3.2.2** supplement the recommendations given in those parts.

7.3.2.2 *Design*

Frameless plastics doors may have panels fitted to the bottom edge and, where handles are not used, over the area contacted by the hand. Corners and exposed edges of doors should be rounded.

Hinges and locks should not be attached by systems that require screw threads to be tapped in the plastics sheet material. If bolts are used, the perimeter of the clearance holes should be at least 35 mm from any edge. The bolts should not be over-tightened and the recommendations of the plastics glazing sheet materials manufacturer on hole drilling and bolt assembly should be followed.

7.4 Toughened glass suspended assemblies

7.4.1 ***General***

The recommendations in BS 6262-2, BS 6262-3 and BS 6262-4 should be followed. The recommendations given in **7.4.2** and **7.4.3** supplement the recommendations given in those parts.

7.4.2 ***Design***

Suspended glass assemblies consist of a series of toughened glass panes secured together at their corners, and can be designed to provide a method of glazing large openings in buildings without the use of full height mullions.

The façade so produced is hung from the building structure by its top edge and sealed to the building. The gaps between the panes can be sealed.

Support against wind loads is provided by toughened glass fins fixed at vertical joints on the façade and are secured to the building fabric and to each pane corner fitting. The fins may be cantilevered or continuous, according to design and aesthetic considerations.

7.4.3 ***Performance***

It is the responsibility of the architect and/or structural engineer of a project to ensure that the building structure is able to support the load of the suspended glass. The following should be determined prior to a project study being undertaken:

a) opening size;

b) design wind loading;

c) deflections of the structure under wind, live and dead loads.

8 Mirrors

8.1 General

Mirrors should conform to BS 952-1.

NOTE 1 Opaque, decorative glass or plastics facings can generally be fixed in the same way as mirrors and require the same care and precautions.

NOTE 2 BS EN 1036 specifies minimum quality requirements and durability tests for mirrors from silvered float glass, for internal use in building.

8.2 Safety

The mirror should meet the safety glazing provisions and recommendations of BS 6262-4.

NOTE For all non-vertically fixed mirrors, including those for overhead use, additional care is needed. Even if the mirror is made from safety glazing, that is, the glass conforms to BS EN 12600 or plastics glazing sheet material conforms to BS 6206, it is essential that it is also fixed by a method that substantially retains the pieces in place against the ceiling or backing panel if it is broken. A material conforming to BS 6206 and having no sharp edges or points might still cause injury if either the whole pane, or fragments of appreciable weight, can fall through a significant height.

8.3 Glass mirrors

8.3.1 *General*

Wherever the edge of the mirror is visible (as opposed to being under a bead or other feature overlapping the cut edge) then the edge should be ground or arrissed to minimize the risk of injury. **8.3.2** to **8.3.6** indicate precautions to be taken to limit various problems when fixing mirrors.

NOTE Glass mirrors for non-vertical applications require special consideration.

8.3.2 *Mechanical damage*

Mirrors can be distorted or broken when being forced into clips or screwed down too tightly. Where local irregularities occur in the surface to which the mirror is to be fixed, they should be overcome by the use of compensation washers, and for large areas of irregularity the mirror should be bedded on to a minimum thickness of 5 mm of fixing compound.

Screws should be prevented from coming into contact with the glass by sleeves and washers made of fibrous material, hard nylon or similar. The holes in the glass should therefore be large enough to accommodate both sleeves and screws.

Adjacent glasses should never be butt jointed. There should always be a clearance of at least 1 mm maintained by inserting a suitable separating material.

8.3.3 *Damage by sulfur*

Some building materials, e.g. clinker blocks and certain fixing media, such as latex cement, contain sulfur. This can attack the metal layers of mirrors and a barrier between the supporting structure and the mirror back might be required. Polyethylene sheet is a recommended barrier material.

Care should also be taken to ensure that any sleeve or washer materials do not contain sulfur compounds, as these migrate through the protective mirror backing and attack the silver film.

8.3.4 *Damage by alkali*

Where a mirror is to be in contact with mortar, concrete or plaster, it is liable to damage by alkali, which can attack any unprotected backing paint of a mirror. A barrier layer, e.g. lead or aluminium foil, might be required. Alternatively, the risk of alkali attack can be largely avoided by spacing the mirror from the wall, leaving a gap of 3 mm to 5 mm.

8.3.5 *Damage by excessive exposure to water*

In places where high humidity occurs, as in bathrooms and kitchens, provision should be made for the free circulation of air behind the mirror, to prevent deterioration from protracted exposure to water vapour. This can be achieved by using distance pieces (washers where screws are used, and packing pieces behind clips) to leave a gap of 3 mm to 5 mm.

8.3.6 *Compatibility with fixing materials*

Where mirrors are to be fixed with mastic, a suitable product should be chosen that will not attack the backing paint and silvering of the mirror. The wall surface should also be sealed to prevent oil absorption from the mastic.

It should be ensured that any other fixing materials, e.g. silicones, solvent based sealants, are compatible with the mirror backing paint and metal layers.

8.3.7 *Fising methods*

Mirrors may be fixed in any one of the following ways:

a) directly to a permanently dry background (as in a living room), or to an independently fixed backboard, using clips or screws with decorative covers.
For all mirrors over 1 m^2 in area and fixed by clips or screws, additional support adequate to carry the weight of the mirror should be provided at the bottom edge by, for example, supplementary clips, anchors or a fixing bead.
For overhead fixing of mirrors the use of screws through drilled holes is not recommended. Solid fixing, and the use of a retaining bead wherever possible, is the preferred method for overhead and/or high level installation of mirrors.

b) with a freely ventilated airspace between the mirror and the wall, using clips or screws with spacing washers or packing pieces.

c) with edge beads, either to a flat surface or on battens spaced not more than 400 mm apart.
The battens should be sealed and fixing compounds used as a bedding.

d) to a backboard using an adhesive.
The manufacturer should be consulted. To protect the backing paint, silver and adhesive from timber backboards, the timber should first be sealed.

e) to a flat background using foam self-adhesive strips or pads applied directly to the backing paint.
The mirror manufacturers should be consulted. This method of fixing should be limited to mirrors up to 1 m^2 in area and should never be used in overhead or high level situations.

8.4 Plastics mirrors

8.4.1 *General*

Plastics sheet mirrors are frequently used in areas where impact resistant properties are of importance or in those situations where a material is required that can be easily cut and drilled.

Plastics sheet mirrors can be subject to significant dimensional changes caused by variations in ambient temperature or moisture content, so fixing systems should be capable of accommodating any dimensional changes that might occur after installation.

Most plastics sheet mirrors are coated on the rear surface with a lacquer to protect the mirrored finish. Adhesives used for attachment should not contain solvents that could damage the protective coating.

8.4.2 *Fixing*

Plastics sheet mirrors can be fixed directly to a wall by screws. To allow for dimensional changes, screw holes should be made oversize. Minimum pressure should be used when tightening screws to prevent optical distortion of the mirror.

Plastics sheet mirrors can also be fixed to walls by double-sided adhesive foam tape.

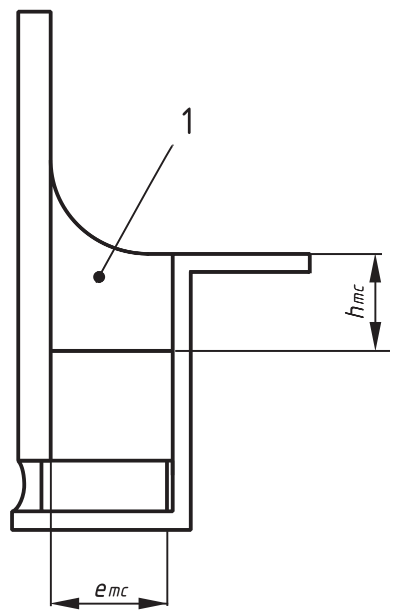
NOTE Either of the above methods can be used to attach plastics sheet mirrors to ceilings. For ceiling fixtures using double-sided adhesive foam tape it is recommended that at least 30 % of the sheet area is covered by tape.

Any frame used to hold a mirror should be capable of accommodating dimensional changes.

Annex A (informative) Simplified calculation of sealant dimensions for structural sealant glazing

A.1 General

This method is used to define the dimensions of the structural sealant as shown in Figure A.1.



Key

1 Structural sealant

Figure A.1 — Structural sealant dimensions

A.2 Symbols

a	shorter dimension of pane (m)
e_{mc}	thickness of structural sealant (mm)
h_{mc}	structural sealant bite (mm)
l	length of side considered (m)
R	characteristic stress of structural seal (N/mm^2)
w_g	central deflection of the glass under load (m)
W_d	design wind pressure (N/m^2)
α_f	thermal expansion coefficient of frame
α_g	thermal expansion coefficient of glass
Δt_f	average temperature change of frame
Δt_g	average temperature change of glass

A.3 Limitations of the method

The simplified calculation is applicable provided:

$$w_g \leq \frac{a}{100} \quad \text{and} \quad \frac{h_{mc}}{2} \leq e_{mc}$$

A.4 Calculation

The minimum dimensions of the structural sealant are given by the two following equations:

$$h_{\mathrm{mc}} = \frac{W_{\mathrm{d}}a}{2\alpha_{\mathrm{d}}}$$

$$e_{\mathrm{mc}} = \frac{\Delta l}{0.15}$$

where

$$\Delta l = l(\alpha_f \Delta t_f - \alpha_g \Delta t_g)$$

and

$$\alpha_d = \frac{R}{4}$$

If the value of e_{mc} derived from the above calculation is less than half the value of h_{mc}, then the minimum value of e_{mc} is $h_{\mathrm{mc}}/2$.

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