



GLASS UNLIMITED

Glazing instructions

Traditional setting

September 2007

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1 INTRODUCTION

Designing large bay windows is no longer a problem, regardless of climate or the façade performance required. AGC offers a wide range of products that respond to thermal insulation, solar control, acoustic insulation or safety (e.g. protection against injury, break-ins or fire) requirements. These properties can also be combined with each other and with aesthetic criteria.

However, this glazing will only reach the advertised performance level if it is correctly set in an environment that is compatible with the specific functions required of a glass surface.

This brochure draws on many years of experience and aims to specify the optimum conditions for using AGC glazing so as to ensure that it performs well over time.

It should be noted that the guarantee for the glazing depends on compliance with the instructions.

Glazing setters must:

- ensure that the products used for setting blocks and tighten the assembly are compatible with the glazing and with each other;
- install the glazing in accordance with regulations, standards and codes of good practice in force and also with specific instructions issued by AGC;
- avoid any factor that is likely to damage the glazing through stress, scratches or corrosion caused by use of unsuitable products during assembly or maintenance.

Architects and users must ensure that:

- the correct dimensions are used for glazing in accordance with maximum manufacturing or weight dimensions, the stresses to which the glazing is subjected and in accordance with the performance required
- the national standards and regulations concerning thermal insulation, safety, security, acoustics, fire protection, ... are respected
- adjacent construction components allow for maintenance, repair and, if necessary, replacement of the glazing and joints at a low cost.

COMMENTS

- 1) Instructions for setting AGC glazing in special applications (e.g. ceilings or portholes), structural glazing, VGG and point fixed glazing are provided in other documents.
- 2) The setting of Pyrobel fire-resistant glasses is also covered in specific regulations that can be obtained upon request.

2 BASIC PRINCIPLES FOR SETTING GLAZING REBATES

The basic principles given in this section must be respected for glazing rebates. Additional clarifications are given in Section 3 for façade glazing and Section 4 for roof glazing.

2.1 BASIC PRINCIPLES

The correct setting of glasses and application of the guarantee to the glazing depend on compliance with the points mentioned above and expanded upon below:

1. Correct dimensions of glazing
2. Quality of frame (durability, rigidity and drainage)
3. No contact between the glass and frame via the intermediary of setting blocks (adequate material and dimensions) and adequate glazing clearance between the frame and the glazing
4. The glazing must not be subject to any deteriorations or modifications, intentionally or accidentally, after it has been set; e.g. chipping, cutting, edge treatment, application of solar control films or varnish
5. Corrosive products must not be used during setting and maintenance
6. There must not, under any circumstances, be any stagnant water in the rebate platform and the sealing products must not retain water either; the glazing must not be set in a putty bed
7. The maximum pressure on the perimeter of insulating glasses must not exceed 10 N per running centimetre
8. Seals (sealant or rubber profile) must be and remain perfectly weatherproof
9. All materials used to set the glazing must be compatible with each other, the glazing and the frame. A particular attention must be given to silicone. The use of painting or maintenance products for wood may also have a negative influence on the durability of the glazing. A statement of compatibility of these material with the glazing must be asked to the producer
10. Joints for insulating glazing must be protected against UV
11. Thermal stresses in the glazing must be limited.

2.2 TAKING GLASS DIMENSIONS

Glass dimensions are measured taking into account:

- perimeter glazing clearances
- glazing rebates to be respected
- any grooves in the rebate platform (clipping grooves)
- tolerance of frame and glazing to be used.

2.3 DETERMINING THE THICKNESS OF THE GLAZING

The thickness of the glazing used depends on the stresses to which it is subject:

- façade glazing (i.e. inclined at a maximum of angle of 15° from the vertical): wind
- roof glazing: wind, snow and its own weight.

To determine loads, the principal will refer to standards and regulations or good practices in force in the construction sector and define the specific factors that need to be considered (e.g. height and shape of building or the location of the construction site).

These criteria are used to establish the thickness of the glazing required.

2.4 FRAME REQUIREMENTS

2.4.1 RIGIDITY

Seals must be sufficiently rigid to avoid excessive deformation of the glazing used and, more specifically, the spacers and seals for insulating glazing. Deformation of the glazing supports must not exceed 1/200th of the span, up to a maximum of 12 mm (under working load).

Additional instructions may be issued at national level or as part of specific projects/instructions.

2.4.2 REBATE DRAINAGE

Water must not be allowed to stagnate in the rebate platform. The following must be used to apply this principle:

- drained glazing rebates, i.e. the platform is fitted with a drainage channel and a drainage opening in wooden frames and drainage outlets in metal or synthetic frames
- ventilated glazing rebates which, in addition to draining water from the rebate platform, have decompression openings in the upper part of the frame to allow air to circulate.

This allows any water that might enter or condense in the rebates to escape.

Ways of draining the rebate platform are listed below; all other validated solutions are of course also acceptable:

- When setting with mastic:
 - an opening with a diameter of 8 mm close to the corners of the frame
 - maximum distance of 80 cm gap between two openings
- When setting with rubber profile:
 - an opening of maximum dimensions 35 mm x 5 mm close to the corners of the frame
 - maximum distance 80 cm between two openings.

The drainage channel at the base of the rebate must be at least 8 mm wide and 3-4 mm deep.

If ventilated rebates are used, the decompression openings at the top of the frame must have a diameter of at least 5 mm. There must be at least two openings.

Particular care must also be taken when setting glazing bead so as to avoid any infiltration.

Figure 1 outlines these principles and the tightness design between the opening and fixed sections of a frame.

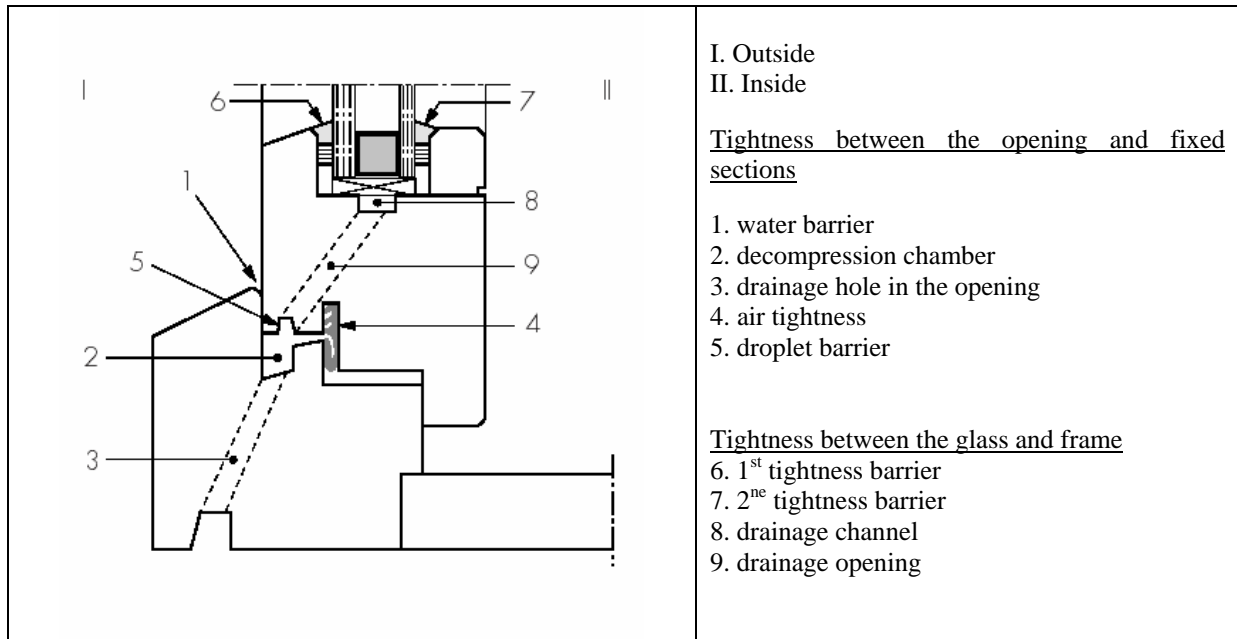


Figure 1 – Drainage and tightness of frame

2.4.3 SPECIAL FRAMES

If special safety glazing is being used (burglary, protection against fire arms, protection against fire, fire resistance), the frame must offer performance levels that are at least equivalent to those of the glazing.

Note: European test standards exist for defining the performance of frames with respect to these different applications.

2.5 SETTING BLOCK REQUIREMENTS

The glazing must never come into direct contact with the frame or any other hard material. This can be avoided by using a suitable setting and locations blocks and complying with the edge clearance requirements (see section 2.6).

2.5.1 DEFINITIONS

There are three types of block (Figure 2):

- **setting blocks (C1):** transfer the load of the glazing to the frame at specific points so as to protect the squaring of the frame and limit deformation of the supporting bar. With the exception of U-profiled gaskets, setting blocks must be used
- **location blocks (C2):** allow the glazing to be positioned and held correctly in relation to the rebate platform and guarantee the squaring of the frame. They are used each time there is a risk that the glazing could come into contact with the rebate platform, especially at closing or suspension points on opening sections
- **distance blocks (C3):** allow the glazing to be positioned and held in place correctly in relation to the rebate upstand on one side and the glazing bead on the other; they thus ensure that the thickness of the joint between the glass and the frame remains constant (in the parallel plane of the glazing). In practice, C3 blocks are used most frequently as a backer rod and continuous waterproof seal. For roof glazing, C3 blocks bear part of the glazing weight and must always be used as backer rods and continuous rubber profile.

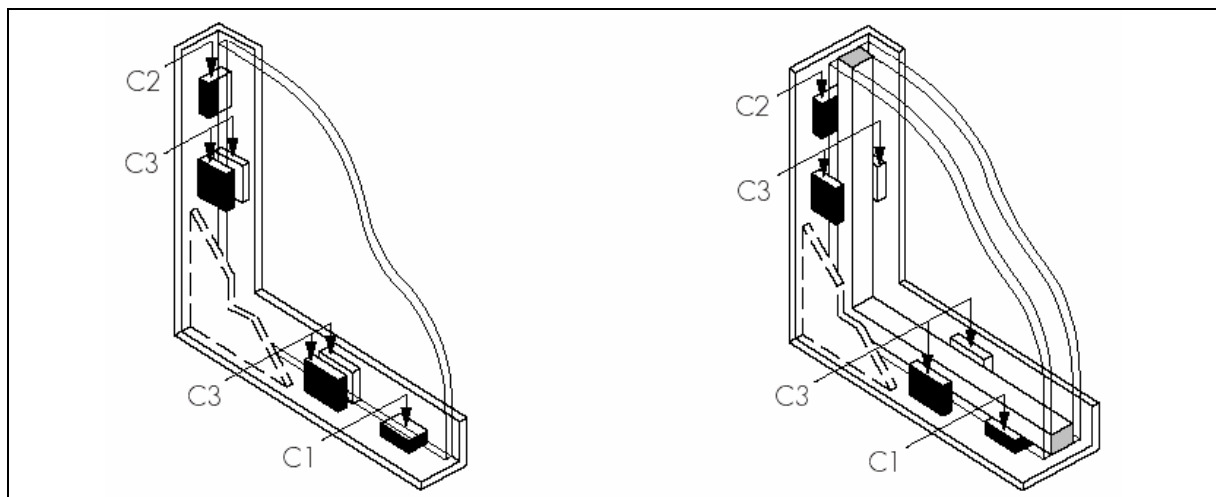


Figure 2 – Types of blocks

2.5.2 NATURE OF BLOCKS

Setting and location blocks may be made of:

- synthetic materials (e.g. polypropylene or polyamide) that have a hardness of 70-95 DIDC (Shore A in accordance with ISO 48) and a softening point above 80°C. Blocks made of EPDM and neoprene are not recommended because they could have some deformation
- treated, rot proof hardwood (volumic mass ≥ 650 kg/m³); the wood fibres must be parallel to the plane of the glazing. Wooden blocks must not be used with coated or laminated glass.

If blocks are used for distance, they must be made of elastomer materials that have a hardness of 50-70 DIDC (Shore A in accordance with ISO 40 and EN ISO 2039-1).

2.5.3 BLOCK DIMENSIONS

The width of the blocks must be at least equal to the width of the glazing.

The thickness of the blocks must be at least equal to the minimum edge clearance between the glazing and the rebate.

The blocks must be at least 50 mm long.

The actual length of the setting blocks is calculated using the following formula (prEN 12488):

$$l = \frac{25 \cdot S}{n \cdot \sigma} \cdot \sin \alpha$$

where

- l is the calculated length of the block (mm)
- 25 is the weight of the glazing expressed in N per m² and mm of thickness
- S is the surface area of the pane (m²)
- n is the number of setting blocks below the lower edge of the glazing ($n = 1$ or 2 depending on the type of frame, Figure 4)
- α is the angle of the glazing in relation to the horizontal
- σ is the permissible resistance of the block (N/mm²), limited to 1.5 N/mm²

Table 1 gives the minimum length of setting blocks depending on the surface of the glazing, the number of setting blocks in the rebate platform (i.e. the type of opening in the frame) for vertical glazing or for glazing that is at an angle of more than 75° to the horizontal.

Table 1 – Length of setting blocks for glazing that is vertical or at an angle greater than 75° to the horizontal (resistance 1.5 N/mm²)

Surface area S of glazing	Opening or tilt and turn sash frame (mm)	Other frames (mm)
≤ 1 m ²	50	50
1 m ² < S ≤ 2 m ²	50	50
2 m ² < S ≤ 4 m ²	67	50
4 m ² < S ≤ 8 m ²		67
8 m ² < S ≤ 12 m ²		100
12 m ² < S ≤ 16 m ²		133
16 m ² < S ≤ 20 m ²		167

Table 2 lists the minimum lengths for setting blocks for roof glazing depending on the angle α of the glazing in relation to the horizontal, glazing surface and material used for the block.

Table 2 – Length of setting blocks for roof glazing (resistance 1.5 N/mm²)

Surface area S of glazing	Angle α of glazing in relation to the horizontal			
	$75^\circ < \alpha \leq 60^\circ$	$60^\circ < \alpha \leq 45^\circ$	$45^\circ < \alpha \leq 30^\circ$	$30^\circ < \alpha \leq 10^\circ$
$\leq 1 \text{ m}^2$	50	50	50	50
$1 \text{ m}^2 < S \leq 2 \text{ m}^2$	50	50	50	50
$2 \text{ m}^2 < S \leq 4 \text{ m}^2$	54	50	50	50
$4 \text{ m}^2 < S \leq 6 \text{ m}^2$	80	72	59	50

The tolerance over the length of the blocks is approximately 2 mm.

Setting blocks are generally 50 mm long.

2.5.4 POSITIONING OF BLOCKS

Setting and location blocks must be positioned in accordance with the type of opening in the frame.

The minimum distance between the corners of the frame and the edge closest to the block must be at least equal to the length of one setting or location block in order to avoid excessive stresses on the corners of the glazing (Figure 3).

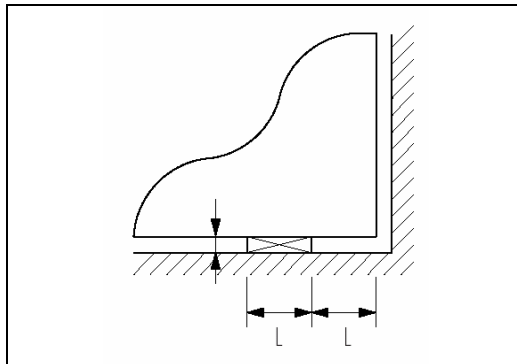
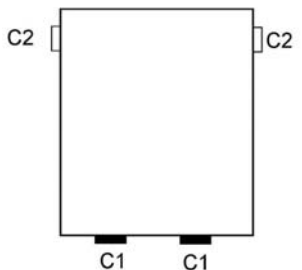
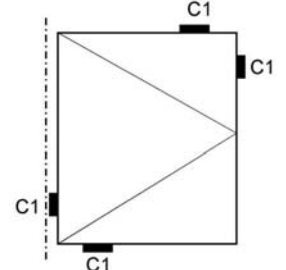
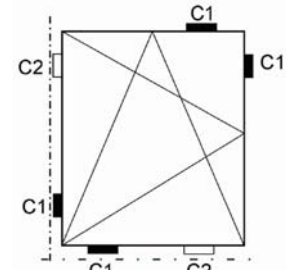
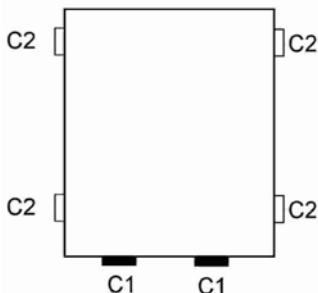
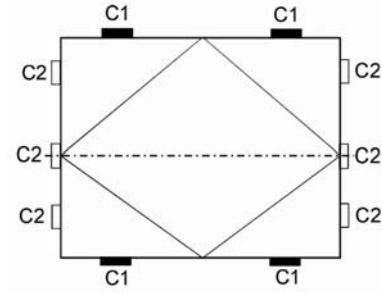
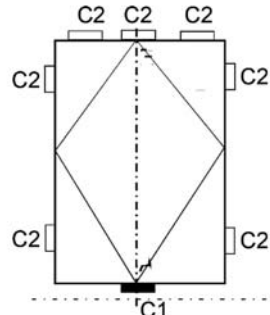
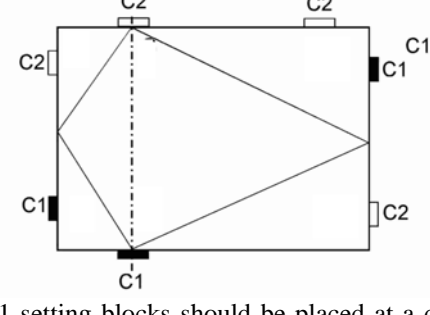


Figure 3 –Position of setting and location blocks in relation to the corners of the glazing

Figure 4 shows the position of the setting and location blocks depending on the type of opening in the frame.

<p style="text-align: center;">Fixed</p>  <p>C2 blocks are only required for frames glazed in a workshop that then need to be transported.</p>	<p style="text-align: center;">Opening (inwards or outwards)</p>  <p>The upper C1 block is adjusted to regulate the squaring of the frame and allow it to open easily.</p>	<p style="text-align: center;">Tilt and turn sash</p>  <p>The upper C1 block is adjusted to regulate the squaring of the frame and allow it to open easily.</p>
<p style="text-align: center;">Roofing glazing</p> 	<p style="text-align: center;">Horizontal pivot casement</p>  <p>The C1 blocks must be placed close to the corners of the frame (at a minimum distance of 50 mm) to limit bending of the lower transom. The C1 blocks on the upper transom bear the weight of the glazing when the frame pivots. They must be the same length as the C1 blocks on the lower transom. Depending on the design of the frame, one C2 block can be placed along each stile of the frame at the same level as the pivot or else two C2 blocks can be placed at the ends of the stiles.</p>	
<p style="text-align: center;">Centre vertical pivot casement</p>  <p>Two C1 setting blocks should be placed at a distance of 50 mm on either side of the frame rotation axis. For small volumes, C2 blocks at the bottom of the stiles are optional.</p>	<p style="text-align: center;">Off-centre vertical pivot casement</p>  <p>Two C1 setting blocks should be placed at a distance of 50 mm on either side of the frame rotation axis. For small volumes, C2 blocks at the bottom of the stiles are optional.</p>	

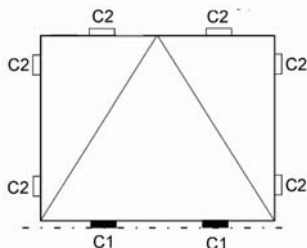
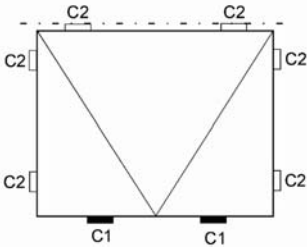
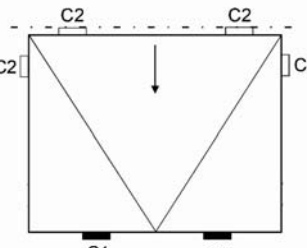
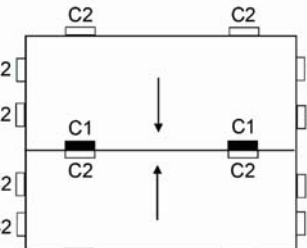
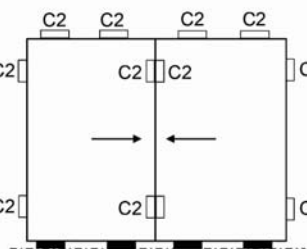
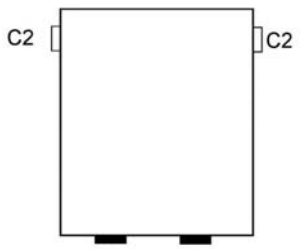
<p style="text-align: center;">Bottom hung</p>  <p>The C1 blocks should be placed at the level of the hinges. For small volumes, C2 blocks at the bottom of the stiles are optional.</p>	<p style="text-align: center;">Top hung casement</p>  <p>The C1 blocks must be placed close to the corners of the frame (at a minimum distance of 50 mm) to limit bending of the lower transom.</p>
<p style="text-align: center;">Projecting top hung</p>  <p>The C1 blocks must be placed close to the corners of the frame (at a minimum distance of 50 mm) to limit bending of the frame. The C2 blocks along the stiles are placed at the point where the support arms are fixed.</p>	<p style="text-align: center;">Guillotine</p>  <p>A single C2 block along the stiles is sufficient for small volumes.</p>
<p style="text-align: center;">Sliding</p>  <p>The C1 blocks must be placed in front of the runners.</p>	<p style="text-align: center;">Spandrel</p> 

Figure 4 – Position of setting and location blocks depending on the type of frame

2.5.5 COMMENTS

- The blocks must not prevent drainage from the rebate platform or obstruct the drainage openings. Several options are available that will ensure good drainage (Figure 5)
- Metallic and synthetic frames presents generally different grooves in the rebate platform and need therefore an intermediary piece with a good plane surface on wiche the setting block can be isntalled (Figure 5 right).

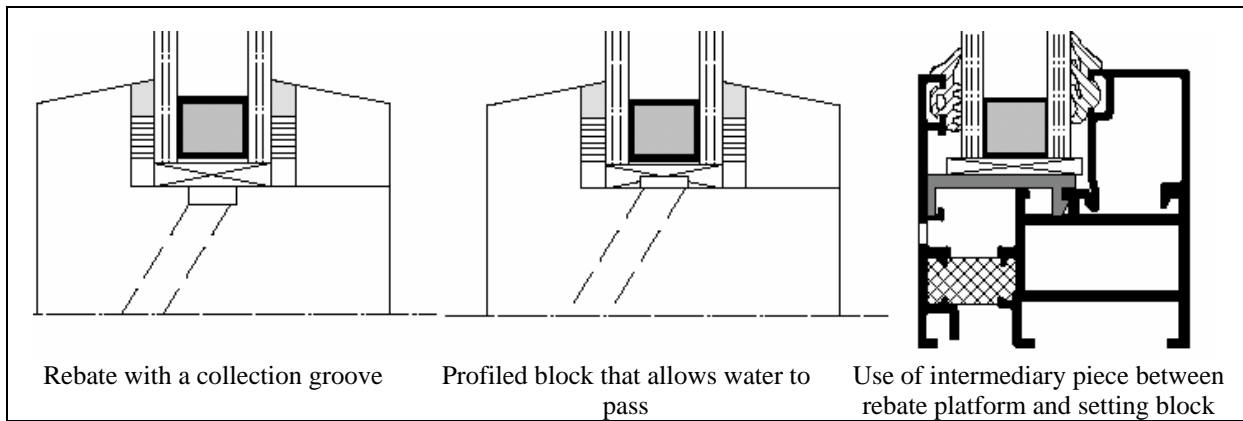


Figure 5 –Setting blocks may not interrupt the drainage

2.6 GLAZING CLEARANCE REQUIREMENTS

The glazing must never come into direct contact with the frame or any other hard material. This can be avoided by using a suitable setting block and complying with the edge clearance requirements (see section 2.5).

Figure 6 shows a rebate and the various key dimensions for setting glazing:

- height and width of the rebate
- mechanical edge covering (or height of support) i.e. the height at which the glazing is effectively held by the frame
- edge clearance (or rebate platform), i.e. the space between the glazing and the rebate platform
- lateral clearance, i.e. the space between the glazing and the rebate platform on the one hand and the glazing bead on the other.

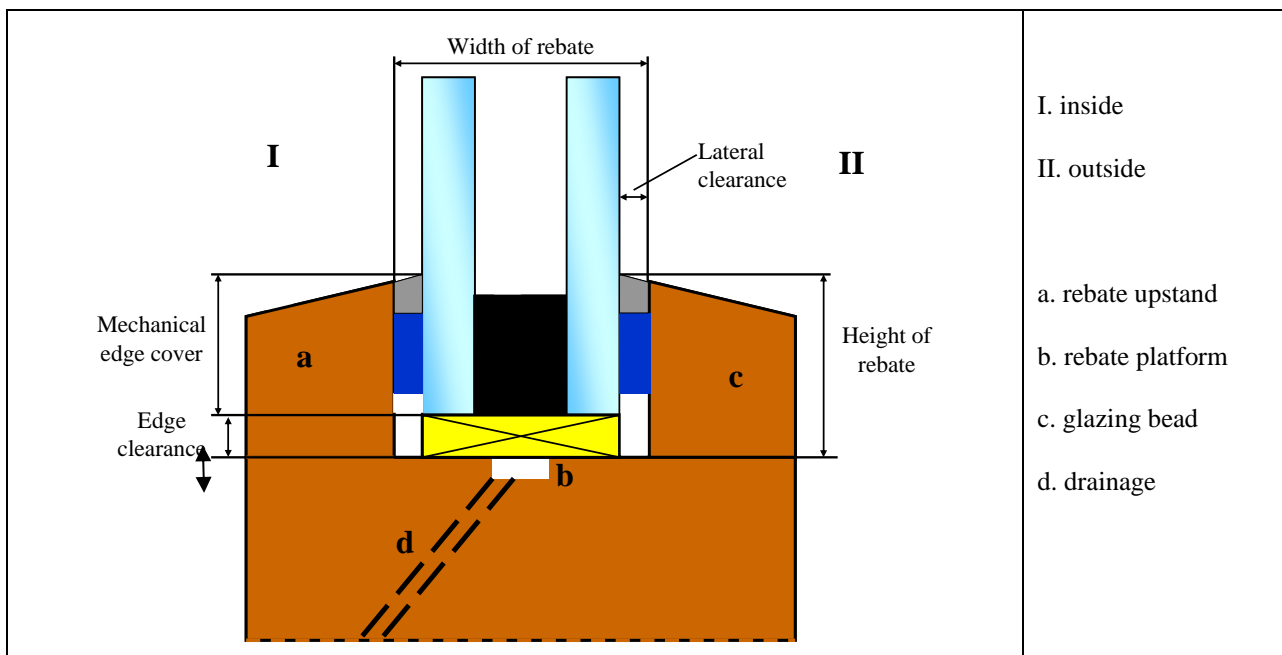


Figure 6 – Clearance

For frames with grooves in the rebate (metal, synthetic materials), the height and width of the rebate are measured from the top of the grooves.

The minimum clearance measurements are listed below.

Edge clearance

The minimum edge clearances are given in Table 3. They are required to ensure that there is not contact between the frame and the glazing ant to allow the ventilation of the frame (see also Chapter 5).

Table 3 –Minimum edge clearance

Surface area S of the glazing (m ²)		< 0.25	0.25 ≤ S < 2	2 ≤ S < 6	S ≥ 6
Minimum edge clearance	Single pane/laminated glass	3 mm	3 mm	4 mm	5 mm
	Insulating glazing	4 mm*	4 mm*	4 mm*	5 mm
* Minimum 4 mm, preferably 5 mm					

Height of the rebate

Taking into account the edge clearances, dimensional tolerances on the glazing and the frame, and the minimum mechanical edge covers required to set the glazing correctly, Table 4 lists the minimum rebate heights for setting in a closed rebate. These heights are required to protect the seal against UV in the case of insulating glazing and to guarantee mechanical restraint of the glazing in the event of maximum stress.

Table 4 –Minimum height of rebate

Surface area S of glazing (m ²)		< 0.25	0.25 ≤ S < 2	2 ≤ S < 6	S ≥ 6
Minimum height of rebate	Single pane/laminated glass	10 mm	13 mm	18 mm	25 mm *
	Insulating glazing	18 mm*	18 mm*	18 mm*	25 mm *
* In practice, this corresponds to fixed frames and/or shop windows; a rebate height of 25 mm is required in this case given the tolerances on the glazing and to facilitate setting of glazing given their dimensions. ** Minimum 18 mm, preferably 20 mm					

Note: In all cases, the height of the rebate must be sufficient so as to ensure that the insulating glazing seal is not obvious.

Mechanical edge cover

The rebate heights and the edge clearances can be used to calculate the minimum mechanical edge cover (Table 5).

Table 5 –Minimum mechanical edge cover

Surface area S of glazing (m ²)		< 0.25	0.25 ≤ S < 2	2 ≤ S < 6	S ≥ 6
Minimum mechanical Edge cover	Single pane/laminated glass	7 mm	10mm	14 mm	20 mm
	Insulating glazing	14 mm*	14 mm*	14 mm*	20 mm
* Minimum 14 mm, preferably 15 mm					

Lateral clearance

The width of the rebate is measured between the rebate upstand and the glazing bead. The minimum width must be such that, taking into account the tolerances of thicknesses of glazing, the lateral clearances required by the seals, i.e. 3 mm for waterproof seals and 4 mm for mastics, are respected.

Width of the rebate

The width of the rebate is equal to the thickness of the glazing (given the tolerance) plus the lateral clearance on either side.

It should be noted that multifunctional insulating glazing (combination of thermal and/or acoustic insulation and/or safety and resistance to burglary) is significantly wider than 'traditional' insulating glazing. These thicknesses are not always compatible with standard frame width and a frame with a larger cross-section is therefore required.

By way of example, Table 6 lists the minimum rebate widths depending on the thickness of the glazing and the clearances required between the glazing and the frame. The actual thickness of the glazing must of course be calculated on an individual basis in accordance with the stresses (e.g. wind, own weight or snow).

Table 6 – Examples of minimum rebate widths depending on the type of glazing to be installed

Type of glazing	Minimum thickness of glazing	Minimum rebate width	
		Mastic	Rubber profile
Thermobel	4-12-4 = 20 mm	28 mm	26 mm
	4-15-4 = 23 mm	31 mm	29 mm
Thermobel with Stratobel	4-12-33.2 = 23 mm	31 mm	29 mm
	4-12-44.2 = 25 mm	33 mm	31 mm
Thermobel Phonibel	4-12-8 = 24 mm	32 mm	30 mm
Thermobel Phonibel S / Phonibel ST	6-15-44.2 = 30 mm	38 mm	36 mm
	44.2-20-66.2 = 42 mm	50 mm	48 mm

2.7 SEALS

2.7.1 MASTIC SEALS¹

1. **Linseed oil putty** and **acid silicones** can not be used to set AGC's insulating glazing, coated glasses and laminated glasses. For other sealants, the compatibility with the glazing, in function of the setting system, must be checked. The sealant supplier can deliver information's about the compatibility.

2. Four rules to follow:

¹ Sealing mastic is the general term used for silicones; this term should not be confused with linseed oil putty or glazing putty used in the past.

a) Compatibility: the glazier must check compatibility and adherence of mastics with different components (e.g. frame, spacers, glazing bead or glazing). Work must be carried out following the instructions issued by the sealing product manufacturer (e.g. working temperature and properties)

b) Cleanliness: the adhesion of the mastic with both the rebates and the glass depends on the state of the surface. The rebates must be dry, clean and treated accordingly (e.g. primer for treated or exotic wood, plastic). If necessary, grease will need to be removed from the surface of the glass. Cleanliness during work to lay the joint is vital, certain mastics can occasionally leave traces that are difficult to remove once they have polymerized

c) Tightness: the tightness of the mastics must be checked over time to find out if it is sufficient. If not, it will need to be touched up

d) Maintenance: mastics must be maintained in accordance with the manufacturer's instructions. We advise an inspection one year after the installation, and after this, an annual inspection of a representative part of the construction in order to determine if a detailed inspection, or maintenance, is necessary

Mastics must ideally be approved by a certifying body in the field where they are going to be used. This information must be provided with the mastic directions for use.

If an approved product is not used, the mastic manufacturer must provide evidence that the product is suitable, including proof of durability.

Mastics designed for glazing are classified in four categories in line with ISO 11600 instructions depending on their amplitude factor and secant modulus ² (Table 7). The type of mastic used depends on the type of application.

Table 7 –Types of glazing putty

Class of putty	Function of putty	Type of glass
25 LM	Tightness to be guaranteed	Coloured, opacified or solar control coated glasses
25 HM	Tightness to be guaranteed and stress transmission	
20 LM	Tightness to be guaranteed	Clear glasses
20 HM	Tightness to be guaranteed and stress transmission	

The mastic strips must be 4 mm wide (with a minimum width of 3 mm at all points) and 4 mm deep unless recommended otherwise by the mastic manufacturer.

A backer rod must be used to correctly delimit the depth of the joint (Figure 6) and prevent all contact with the seal for insulating glazing; this will prevent any problems of incompatibility of materials.

² See ISO 11600 for definitions of these concepts.

2.7.2 RUBBER PROFILE

If rubber profiles are used, they must be easy to replace.

Seals must be at least 3 mm wide. They cannot be drawn during the setting process; they must be continuous along the entire edge of the glazing and should ideally be welded into the corners.

The tightening pressure must not exceed 10 N/cm.

The gaskets must be compatible with the other materials used during setting and must be durable (e.g. resistance to UV).

2.8 THERMAL STRESSES

2.8.1 ORIGIN OF THERMAL STRESSES

Mechanical thermal stresses can be generated in glazing if there is a difference in temperature between two points in the glass that are sufficiently close to each other.

This phenomenon can be caused by various factors such as:

- solar radiation³
- heating and air conditioning devices inside the building
- type of glass
- shade
- ...

Table 8 provides an overview of common thermal stresses.

³ The impact of the sun varies depending on the orientation. The sun reaches its highest point in the south in the northern hemisphere (therefore, it has little impact on the northern façade).

Table 8 – Thermal stresses in glazing

Origin	Factors influencing stresses	Extent of thermal stresses	Recommendation to reduce impact
Sunshine	Frame material	Rising stress depending on: <ul style="list-style-type: none"> ➤ clear pvc or wood ➤ dark aluminium with thermal break ➤ dark heavy metal ➤ light aluminium with thermal break ➤ light aluminium ➤ concrete 	Insulate the frame from masonry
	Type of frame	<ul style="list-style-type: none"> ➤ fixed without pressure gasket ➤ hanging, opening lights ➤ horizontal pivoting frame ➤ sliding ➤ fixed or opening frames with pressure gasket 	Allow mechanical edge cover less than or up to a maximum of 45 mm.
	Shadows on the outside caused by the façade itself	Rising if: <ul style="list-style-type: none"> ➤ vertical overhang ➤ horizontal overhang ➤ external blinds 	Maintain at least 2 cm lateral ventilation on either side of blind's whole height. Under no circumstances may there be any contact between the glass and the blinds.
	Paper or plastic screen (inside or outside)	Heightened	Avoid.
	Interior curtain	Heightened if opaque and no ventilation	The space between the glazing and the curtains must be connected with air on the inside of the building.
	Objects against the glazing	Significantly heightened	Avoid.
Heating and air conditioning devices	Radiators	<ul style="list-style-type: none"> ➤ Increases if the distance between the radiator and glazing decreases. ➤ Increases if the temperature of the radiator rises 	Radiators and heating pipes must be placed at a minimum distance of 20 cm from the glazing. The temperature of the heating fluid must not exceed 65°C.
	Induction units	<ul style="list-style-type: none"> ➤ Certain if the air is forced directly onto the glazing. ➤ Increases if the distance between the blower vent and radiator, even parallel to the glazing, decreases. 	Air should be forced parallel to the glazing or, ideally, towards the inside of the building. Vents must be placed at least 20 cm away from the glazing.
	Anti-condensation unit (heating device, mobile blower)	Some	Ensure that they are placed at a distance of at least 30 cm or more depending on the power and potential reflection.
	Fireplace	Some	Place a screen between the fire and the glass.

2.8.2 EVALUATION OF THERMAL STRESSES

The temperature differences discussed above cause mechanical stresses in glazing.

These stresses can be calculated in relation to the direction in which the building faces (Figure 7), the latitude of the site and other factors discussed above (e.g. frame, shadows or curtains).

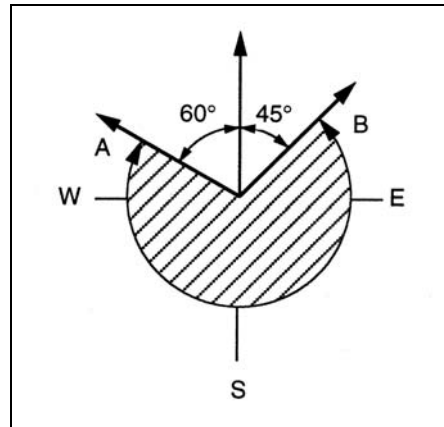


Figure 7 –Directions to be taken into account when evaluating thermal stresses: vision glazing in the northern hemisphere is subject to sunlight if it is facing at an angle covered by the hatched area (the opposite is the case for glazing in the southern hemisphere).

If the thermal stresses are estimated to be too high, the glass must be **toughened** or hardened (depending on whether an additional safety function to protect against injury is required or not).

We have drawn up an information form entitled "Risk of thermal shock" to help us estimate this risk. All you need to do is complete it and send to AGC's Technical Advisory Service. This form will be used to evaluate the resulting thermal stresses in the glass and whether or not the glass subject to sunlight needs to be hardened or toughened.

This sheet is available from AGC upon request or at www.YourGlass.com.

3 VERTICAL GLAZING IN A REBATE

3.1 GENERAL INFORMATION

The various instructions provided in Chapter 2 must be followed.

The two setting principles, with sealant (generally for wooden frames) or a rubber profile (generally for frames made from aluminium or plastic materials), are shown in Figure 8.

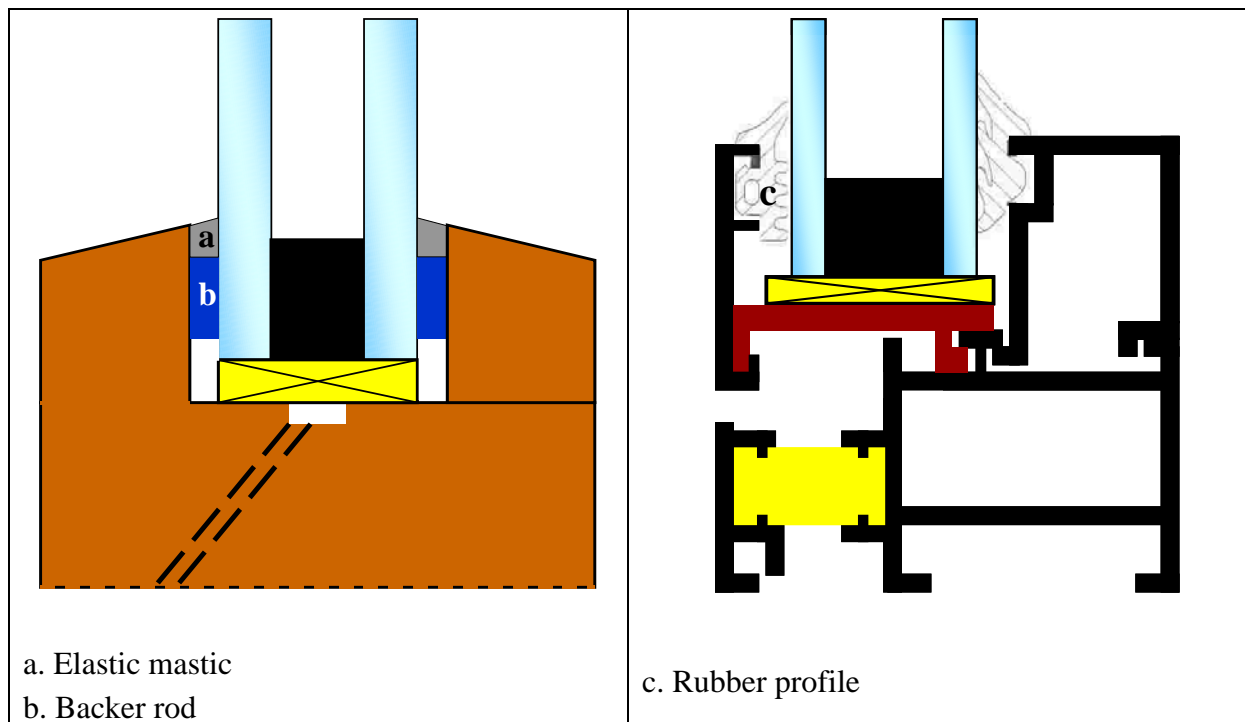


Figure 8 –Setting with mastic and rubber profile

3.2 ADDITIONAL RECOMMENDATIONS

3.2.1 STRATOBEL/STRATOPHONE GLASSES

This type of glazing is made of two or more panes of glass stuck to each other by an interlayer which must not be damaged during setting.

The following precautions must therefore be taken:

- the edges of laminated glasses must not be in contact with organic solvents or water
- the mastics used must be compatible with the interlayer.

3.2.2 STRATOBEL/STRATOPHONE GLASSES - PROTECTION AGAINST INJURY

Assembled in insulating glazing, Stratobel/Stratophone laminated glass must be placed on the side from which the impact and injury could occur. If necessary, both parts of the insulating glazing should be made of Stratobel/Stratophone safety glass.

The glazing is only one safety element. A suitable safety frame should also be used. A standard exist for classifying impact on frames.

3.2.3 STRATOBEL/STRATOPHONE GLASS – BURGLAR RESITANT GLASS

This glazing is designed to protect individuals and goods. Police investigations identify two types of intrusion:

- The first involves breaking the window. However, depending on the thickness of the PVB used, laminated glass is an obstacle that is becoming ever more difficult to break through.
- The second involves attacking the frame. This can be done in three ways:
 - ✓ Removing the glazing from the frame: this problem is avoided by embedding the glazing in deep rebates. A system that makes the glazing an integral part of the frame, preferably using a silicone joint or similar product, should also be used.
 - ✓ Dismantling the glazing: to prevent this type of attack, glazing beads should be used on the internal side of the building. If the glazing beads are on the outside, the tightening of the space between the frame and the glass should be realized by a silicone joint put on a backer rod.
 - ✓ Taking the frame out: this type of attack can be prevented by using suitable rotation and closing accessories. Anchoring the frame into the masonry would be particularly cautious.

For burglar resistant glass assembled in insulating glazing, the performance of the insulating glazing is equivalent to that of laminated glass as long as the laminated glass is installed on the side opposite to the side of attack (Figure 9).

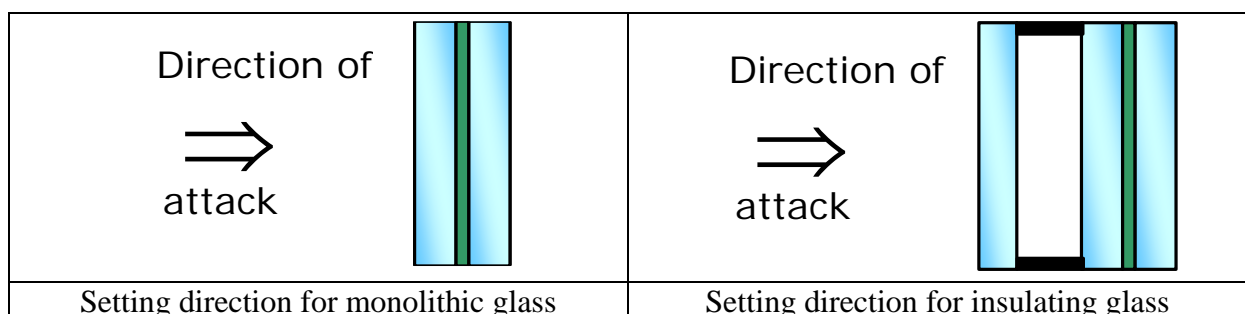


Figure 9 –Burglar resistant glass in insulating glazing

The glazing is only one safety element. A suitable safety frame should also be used. Standard exists for classifying the burglary resistance of frames.

3.2.4 LAMINATED GLASS WITH POLYCARBONATE STRATOBEL PC

Refer to the special instructions for this type of glazing.

3.2.5 STRATOBEL BULLET-PROOF GLASS

Bullet-proof glasses are usually asymmetrical laminated glasses. The glass must be set in the same direction as the direction in which it was tested in order to obtain the desired performance.

In the case of bullet-proof glass assembled in insulating glazing, the performance of the insulating glazing is equivalent to that of laminated glass as long as the laminated glass is installed in the opposite direction the direction of attack (Figure 10).

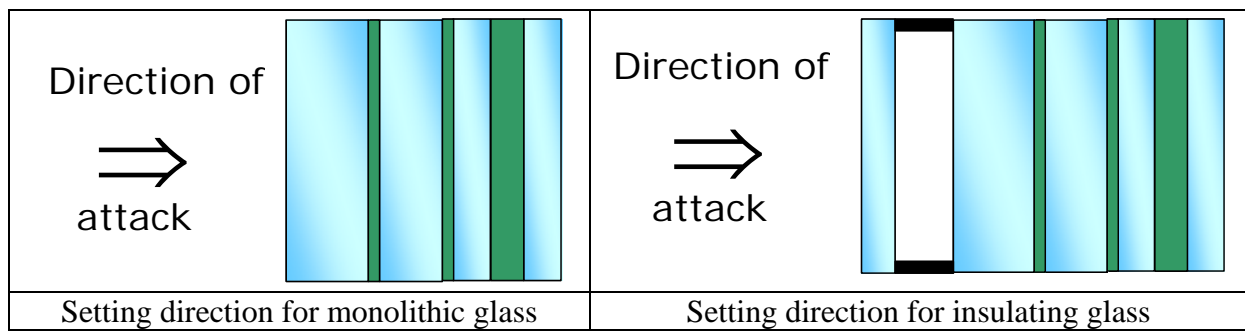


Figure 10 –Bullet-proof glass in insulating glazing

In certain special cases, bullet-proof glazing is composed of two panes of laminated glass assembled in insulating glazing, each of the laminated components having been studied specially to meet the bullet-proof classification requirements. The setting direction must also correspond with the direction in which the glazing was tested.

Several sections of glazing must not be set "edge-to-edge".

This type of glazing must not be set in a full putty bed.

The glazing is only one safety element. A suitable safety frame offering the same performance should also be used. Standard exists for classifying the bullet resistance of frames.

3.2.6 FIRE-RESISTANT GLASSES

Certain glasses (e.g. Pyrobelite, Pyrobel, Pyrostar or polished wired glass) offer protection against fire.

In all cases, fire resistance test reports do not simply cover glass alone but rather all construction components. The installation must comply with all points covered in the test report. Components may only be modified after an extension, site opinion or similar report from an official laboratory has been obtained.

The desired classification can only be attained if the maximum dimensions and usage instructions given in the reports and other official documents are respected

3.2.7 THERMOBEL INSULATING GLAZING FOR SWIMMING POOLS

When insulating glazing is to be used in a swimming pool, this must be stated in the order because the height of the interlayer seal needs to be increased. In this case, the section of the glazing going into the glazing rebate must be at least 18 mm (including the tightness joint) and the edge clearance 6 mm. The only type of tightness mastic that can be used for insulating glazing in these applications is a silicon mastic.

The glazing rebates must be ventilated towards the outside through holes with measurements of 8 mm x 25 mm spaced at a maximum distance of 25 cm.

3.2.8 SPANDREL GLAZING

Spandrels can be either ventilated (Figure 11) or non-ventilated. We only recommend the ventilated type for insulating glazing used in spandrels.

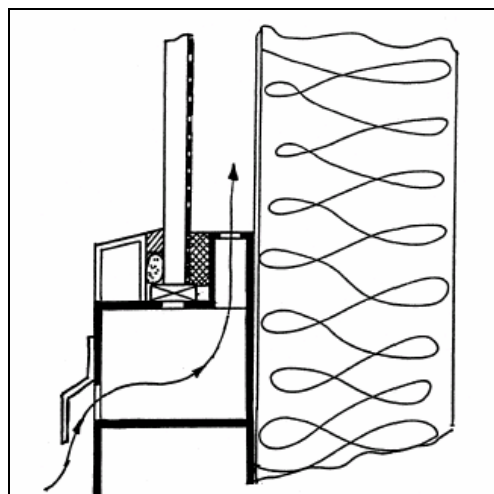


Figure 11 –Use of spandrel with ventilation

For ventilation, AGC recommends openings of at least 8 mm x 25 mm placed at 25 cm intervals in the upper and lower sections of the frame.

Insulation on the rear side must not be stuck onto the glazing.

Additional recommendations for insulating glazing spandrels

The thickness of the external pane must be at least 6 mm for Planibel, Stopsol, Stopray or Sunergy (both only in position 2). The internal pane is generally made of Blackpearl (coating directed in position 4) or Colorbel (enamel directed in position 4).

Unless prior studies show the contrary, the two panes of glass are always toughened or hardened to increase resistance to thermal shock. The thermal behaviour of the IGU must be checked.

Only a silicone tightness mastic for insulating glazing is permitted for these applications.

3.2.9 THERMOBEL PHONIBEL ACOUSTIC INSULATING GLAZING

With regard to Thermobel Phonibel, in addition to general setting recommendations, particular attention must also be paid to:

- the tightness of the joints between the glazing and the frame: the joints should ideally be made with flexible materials; if rubber profiles are used, they should ideally be welded at the corners
- tightness between the opening and fixed window of the frame: this must be ideally ensured using permanent elasticity joints. For opening frames, dual joints should ideally be used
- tightness between the frame and masonry: for good acoustic insulation, the interstices and joints around openings, windows etc. need to be carefully plugged to create an effective acoustic barrier; mineral wool materials are recommended in preference to foam
- a ventilation system adapted to the frame.

3.2.10 SOLAR CONTROL AND ENHANCED THERMAL INSULATION GLAZING

To achieve the performance desired, solar control glazing must be installed in the direction indicated on the label attached to the glass.

In the case of enhanced thermal insulation coatings (Top N+/Top N+T), the setting direction does not affect performance but changes the appearance of the glazing slightly; care should be taken therefore to ensure that all glazing placed side-by-side is set in the same direction.

3.2.11 USE OF PYROLYTIC COATING GLASSES IN SINGLE GLAZING OR IN A DOUBLE SKIN FAÇADE

If a pyrolytic coating such as Planibel G or Sunergy is used in single glazing or in a double skin façade, the coating is not protected on the inside of insulating glazing.

Care should be taken to ensure that no products run onto the coating or evaporate under the effect of heat and then condense on the coating. This is the case in particular for lubricants used on EPDM joints. This aspect is all the more important in double skin façades given the difficulty or even impossibility of maintaining the interior surfaces in this type of frame.

4 ROOF GLAZING IN A REBATE

In addition to the rules listed in Section 2, particular attention must be paid to the following points for glazing used in roofs.

4.1 SAFETY

Laminated glass must be used in roofing. The inner pane of insulating glazing must be laminated to prevent glass shards from falling onto occupants if the glass breaks.

4.2 ANGLE

The angle of the glazing must not be less than 10° due to tightness and cleaning of the roof.

4.3 THERMAL STRESSES

To limit thermal stresses on the glazing:

- the glazing must not straddle two different ambient temperatures (Figure 12) because it is then subject to a significant difference in temperature
- the plaster filling or rebate covering at the edges of the glazing must not exceed 50 mm
- heating or air conditioning systems must be designed so that they do not blow directly against the glazing
- glazing including an absorbent or reflective external glass must be tested for thermal shock risk.

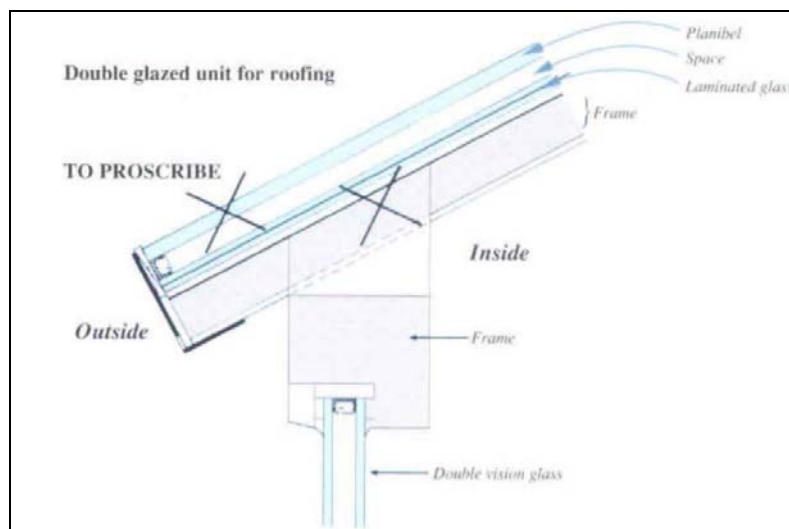


Figure 12 - Roof glazing straddling 2 atmospheric temperatures

4.4 UV PROTECTION

Thermobel joints must be protected from ultraviolet rays. A glazing edge can be exposed to UV rays in certain setting systems used for roofing. A silicone seal must be used in such cases.

4.5 MAINTENANCE

The cleaning system must be designed to ensure the glazing is not walked on. If this is not possible, the glazing must be designeg accordingly.

5 PHENOMENA SPECIFIC TO GLAZING

5.1 COLOURING OF 'CLEAR' GLASS

'Clear' glass always has a slight colour when light is transmitted through it. This is inherent to its basic composition.

The thicker the glass, the more pronounced the colour. Slight variations between different runs of glass production are normal and acceptable.

This phenomenon can be avoided by using special extra clear glass Planibel Clearvision.

5.2 VARIATION IN TINT OF COLOURED AND/OR COATED GLASSES

Coloured and/or coated glasses also have their own colouring. This is visible when light is transmitted or reflected. Slight variations in the colouring of the coating and the glass are inherent to the manufacturing system.

5.3 ASPECT

AGC advises against using different combinations or types of glazing in the same façade in order to avoid slight differences in colours.

5.4 EXTERIOR CONDENSATION

When using low-e insulating glazing, condensation may appear on the exterior of the glass. Given the insulating glazing's high level of thermal insulation performance, the outside sheet cools down so much that condensation forms on the outside. Such condensation is temporary and disappears during the day. It is simply evidence of how well the glazing insulates.

5.5 ANISOTROPY

Glass is a dull material in its ordinary **isotropic** state, i.e. it has identical optical (refraction index) and mechanical properties in all directions. Thermal treatment of the glass (toughened or hardened) creates a surface compression area on the pane of glass and, as a result, the glass becomes **anisotropic**.

Consequently, toughened or hardened glass can appear to have 'stains', that vary in terms of darkness or colour, which are visible to varying extents depending on the observation conditions and the polarization of the ambient light.

5.6 OPTICAL DISTORTIONS

Optical distortions in glazing are caused by three main factors:

- Thermal treatment of the glass (toughened, hardened): This treatment causes deformations in the surface of the glass. They are inherent to the process and cannot be avoided.
- Setting systems: If the edges of the glazing are too tight or if the frame is not flat (plane), this can cause distortions.
- Variation in the barometric pressure and temperature in the space in insulating glazing: The two panes in insulating glazing are separated by a space of dry air or gas, **vacuum closed**, sealed in the factory at the barometric pressure and temperature of the manufacturing workshop. Then, following atmospheric variations (pressure and temperature), the volume of air enclosed in the insulating glazing will:
 - ✓ expand (atmospheric pressure falls, temperature increases);
 - ✓ compress (atmospheric pressure increases, temperature decreases).The glass panes will then deform depending on this expansion (convex volume) or compression (concave volume).

Optical distortions connected with these phenomenon are inevitable. Their perception may be influenced by the environment of the building and by observation conditions.

5.7 INTERFERENCE

Insulating glazing has four surfaces that reflect light.

Under certain lighting conditions, optical phenomena can occur due to a combination of reflected rays and cause coloured fringes on the surface of the glass called **interference fringes**. This phenomenon is due to the flatness of the glass surfaces.

The interference fringes move when pressure is applied to the centre of insulating glazing. Interference fringes cannot be considered to be a fault in the glazing.

The risk of apparition decreases when using two glass of different thickness in insulating glass.

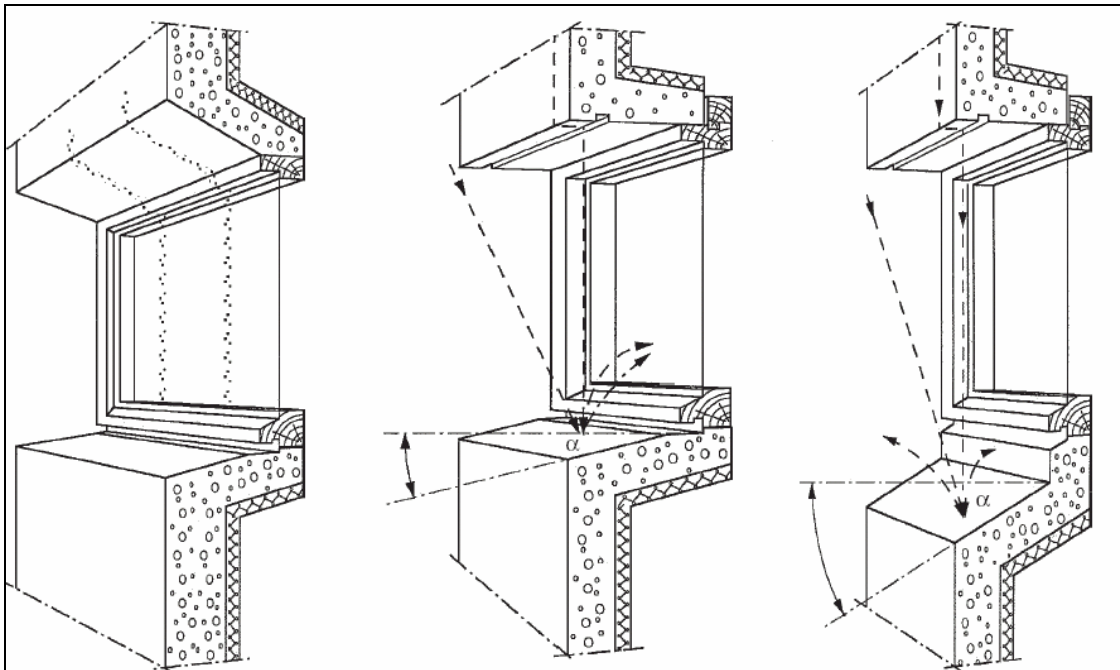
5.8 IRIDESCENCE

If glazing that remains in storage in humid and warm conditions for a prolonged period, the surface of the glass may become corroded. This corrosion appears as a white milkiness or as

coloured fringes. It is often irreversible. Glass must therefore be stored in suitable conditions (dry and correct spacers between the glazing).

5.9 CONCRETE RUNOFFS ON GLAZING

Water trickling down a façade can contain alkaline elements which then dry onto the glazing. These residues can be very difficult or even impossible to clean. This should be taken into account when choosing façade materials and care should be taken to use suitable devices to avoid runoffs or splashes onto the glazing.



6 STORAGE, HANDLING AND CLEANING OF GLAZING

Detailed guides listing the precautions that must be taken during storage, handling and cleaning of glazing are available at www.YourGlass.com.

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