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**Registered No.**  
NI 9272

# Terms & Conditions

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## of Tender and Sale



## Terms & Conditions of Tender and Sale

### 1. Prices and Invoicing

- 1.1. Goods will be invoiced at prices ruling on the date of order.
- 1.2. All prices are excluding VAT, unless otherwise stated.
- 1.3. Prices apply to glass upto 3200mm x 2200mm unless otherwise stated, with the following exceptions:
  - Vanceva laminated glass – prices apply to glass upto 3200mm x1500mm
  - Ballistic laminated glass – prices apply to glass upto 3200mm x1500mm
  - Fire resistant glass – maximum sizes dependent on manufacturers test evidence
- 1.4. All glass panes/units with an area less than 0.3m<sup>2</sup> shall be charged at 0.3m<sup>2</sup> unless otherwise stated.
- 1.5. For specialist triple glazing, shaped, stepped, painted glass, etc. a minimum area charge of 0.5m<sup>2</sup> shall apply unless otherwise stated.
- 1.6. All glass panes/units over 3.5m<sup>2</sup> in area will be subject to a surcharge of 40% unless otherwise stated.
- 1.7. All prices are quoted in Sterling, unless otherwise stated.
- 1.8. Unless otherwise stated, all prices are quoted ex-works. Delivery to customers' premises or to site may incur additional charge.
- 1.9. Where a price has been quoted for a specific job or contract, please state on your order our Quotation No. or the quoted prices. Failure to do so shall result in standard rates being charged.
- 1.10. Any order placed will only be accepted subject to the status of your account with GlasSeal at the time of receipt of order.
- 1.11. All orders should be placed/confirmed in writing, either by fax, post or e-mail.
- 1.12. In any case where there is a variation of quantity, size, processing requirements or delivery schedules, GlasSeal retains the right to amend the price accordingly. Price quotations based on approximate sizes or quantities only may be withdrawn if details come to light that at the time of order which significantly affect costs.
- 1.13. All customer supplied glass sent to GlasSeal for processing is done so entirely at the customer's own risk.
- 1.14. A contract of sale and purchase is constituted only when an order has been accepted by and fulfilled by GlasSeal AND goods have been supplied to and accepted by the buyer AND an invoice has been issued.
- 1.15. Acceptance of an order is not constituted by an order acknowledgement, or a pro-forma invoice, or an indication of delivery date verbal or written.

### 2. Energy Surcharge

- 2.1. Energy surcharges will apply to all invoices at published rates.

### 3. Settlement of Accounts

- 3.1. Payment must be made within the Credit Terms applicable to your account.
- 3.2. GlasSeal reserves the right to charge interest monthly at Bank Of England base rate +5% on all overdue accounts.

### 4. Delivery of Goods

- 4.1. Goods may be delivered loose or on stillages.
- 4.2. Off-loading is the responsibility of the customer.
- 4.3. Carriage charges in accordance with the rates applicable at the time of dispatch may be applied if special delivery requirements are required.

### 5. Transit Breakages and Claims

- 5.1. It is important that all units are examined on receipt or as soon as possible afterwards.
- 5.2. Any loss or damage must be reported to GlasSeal immediately and confirmed in writing no later than the end of the next working day.

## 6. Storage, Handling and Installation

- 6.1. Goods must be stored, handled and installed in accordance with supplier's instructions, i.e. as per Glass & Glazing Federation current literature (GGF Glazing Manual).
- 6.2. Fire resistant glass, such as Pilkington Pyrodur or Pyrostop, must be stored, handled and installed in accordance with manufacturer's instructions.
- 6.3. GlasSeal accepts no liability for loss or damage resulting from failure to adhere to instructions current at time of delivery.

## 7. Cancellations

- 7.1. Where cancellations can be made without loss they will be accepted, but it must be clearly understood that once an order has been started, such work must be paid for in full.
- 7.2. Where a substantial part of the order as a whole has been started or completed, cancellation may be refused.

## 8. Delivery Dates

- 8.1. GlasSeal will endeavour to adhere to arranged times, but shall not be liable for any loss or damage incurred by the buyer, his agents or clients by delay however caused.
- 8.2. Where an order is received by GlasSeal and insufficient materials are available to complete the order, or where GlasSeal must out-source part or all of the manufacture of the product, GlasSeal shall endeavour to keep the buyer informed of estimated delivery dates, but accepts no responsibility or liability for reliance upon these dates.
- 8.3. If the buyer requests postponement of delivery, GlasSeal will invoice completed goods on the date of the original delivery request. Normal payment terms will apply to such invoices.

## 9. Warranties

- 9.1. Terms of guarantee on EN1279 double glazing units published separately.
- 9.2. All other products subject to 1 year warranty against manufacturing defects, unless otherwise stated.
- 9.3. All glass is subject to Glass & Glazing Federation publication "VISUAL QUALITY STANDARD FOR INSTALLED INSULATING GLASS UNITS CONSTRUCTED FROM FLAT TRANSPARENT GLASS"

## 10. Buyer's Responsibilities

- 10.1. It is the buyer's responsibility to specify glass products which comply with all relevant local Building Regulations and national standards when glazed.
- 10.2. It is the buyer's responsibility to submit glazing (manufacturing) sizes compatible with the glazing system taking into consideration platform width, rebate depth and clearances.
- 10.3. It is the buyer's responsibility to carry out, or request, thermal safety checks to ensure suitability of the glass specification for intended use and location.
- 10.4. It is the buyer's responsibility to request reference samples for client approval prior to ordering, so that a representative sample of the glass may be viewed in its intended location.

## 11. Acceptance of Terms & Conditions

- 11.1. By placing an order with GlasSeal (NI) Ltd., the buyer confirms acceptance of these Terms & Conditions accepts the Technical Guidance provided herein also.



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# Technical

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# Guidance



## 1. Glass Handling & Storage

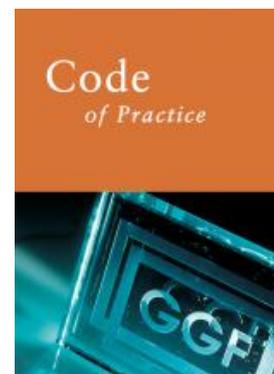
- 1.1. Upon delivery of the glass check markings and/or labels on the crate, rack or glass to ensure compliance with your specification and be aware of any special handling, storage or installation instructions.
- 1.2. The edges and corners of glass are especially vulnerable during handling, storage and installation. Do not turn or rest glass on its corner.
- 1.3. Inspect the cut edges of the glass for excessive flaws such as shells or feathers that can compromise the strength and mechanical performance of the glass.
- 1.4. Check all surfaces for any signs of mechanical damage or etching.
- 1.5. Particular care is necessary as edge or surface damage may cause subsequent unexpected failure.
- 1.6. Glass that is not stored safely can present considerable risk of injury.
- 1.7. Never stack glass panels horizontally.
- 1.8. Store panels on edge at an angle of 3° to 6° from the vertical, with sufficient lateral support to prevent bowing, in a clean dry, ventilated place, avoiding direct sunshine and other sources of heat.
- 1.9. Set the glass panes on strips of wood, felt, rubber, plastic or other soft material, to avoid contact with hard materials such as metal, stone or concrete.
- 1.10. Avoid contact with alkaline materials such as lime and cement; or with solvents, fuel or acids.
- 1.11. Delivery, handling and site storage methods must be agreed for each site.
- 1.12. The recipient is responsible for ensuring safe unloading operations. The glass delivery driver will refuse to offload glass if it is unsafe to do so.
- 1.13. In determining a suitable area for site storage of glass several factors must be considered: exposure to wind and rain; exposure to accidental damage by other trades; type of racking; space and access to racking; weight of glass load; weight distribution and floor or platform loadings; will the glass itself pose a hazard to site workers?
- 1.14. Glass should always be handled by staff that have been properly trained and equipped with appropriate handling and safety equipment.
- 1.15. When moving glass and glass products around a site or a factory by whatever means always bear in mind that glass remains fragile and can be broken by rough handling.
- 1.16. When the packaging has been removed, the glass must be covered to prevent the ingress of dust and grit that may cause subsequent scratching.
- 1.17. Any form of factory applied protection, such as transit pads or film, must not be removed until the glass is ready for installation.
- 1.18. Glass is not normally considered corrodible by contact with water providing it is allowed to dry properly.
- 1.19. However, if water is allowed to remain in contact with the glass for extended periods it can become alkaline and will attack the glass surface.
- 1.20. If not stored properly (i.e. if not separated by transit pads and covered) water can penetrate between panes of stacked glass by capillary action; this moisture is then trapped between the panes and will tend not to dry naturally, eventually "welding" the glass sheets together.
- 1.21. If any moisture or condensation is apparent between the panes of stacked glass, separate immediately and dry thoroughly, otherwise permanent staining may result. Re-stack in a more suitable location in accordance with the advice provided above and the recommendations of BS 6262: 1982 Code of practice for glazing for buildings.
- 1.22. Carefully inspect all glass before installation.

Recommended reading:

**GGF Glass Handling, Storage and Transport Code of Practice**

Can be downloaded from the Glass & Glazing Federation website:

[http://www.ggf.org.uk/publication/a\\_code\\_of\\_good\\_practice\\_for\\_the\\_glass\\_handling\\_and\\_storage](http://www.ggf.org.uk/publication/a_code_of_good_practice_for_the_glass_handling_and_storage)



## 2. Glass Cleaning & Maintenance

- 2.1. Regular cleaning of glass is important to ensure that there is no discolouration or deterioration at the glass surface.
- 2.2. It may be necessary according to the atmospheric conditions prevailing in the area to determine the frequency for regular cleaning, particularly where infrequent cleaning could result in obstinate dirt or staining having to be removed by manual, labour intensive methods, incurring additional time and cost.
- 2.3. The usual effect of dirt on glass is to dull the surface appearance and reduce the light transmittance.
- 2.4. Glass installed in new buildings should be cleaned frequently, as alkaline (lime) leaching from the mortar or from concrete lintels onto the glass can cause permanent staining if it is allowed to remain in contact with glass for prolonged periods.
- 2.5. Generally, cleaning of glass as a routine operation is by the use of warm water with soap or mild liquid detergent, followed by rinsing with clean water. Washleather or cloth is suitable to use for transparent glass, but certain types of washleather or imitation washleather have been known to cause streaking if the glass is not also then polished with a cloth.
- 2.6. For glass having a textured surface into which it may not be possible to clean with a cloth, a stiff plastic or bristle brush is effective. Obstinate dirt in such cases can usually be removed by using either whiting in water or methylated spirits. Glass must then be rinsed thoroughly with clean warm water.
- 2.7. If dirt, contamination, staining and the like are not overcome by these normal methods, then other means may be adopted.
- 2.8. Before choosing a particular form of treatment it is advisable to determine wherever possible the actual cause of the trouble.
- 2.9. If the cause is known to be an on-going one, the first step should be to prevent further trouble at source.
- 2.10. The remedy perhaps could be in the sealing of concrete lintels or the provision of drip channels so that rain water will not run down the glass surface.
- 2.11. However where obstinate staining is present, the answer may be in the use of a slurry of pumice powder, cloth applied, and followed by polishing with ceri-rouge if necessary, or in the use of solvents for splashings of tar, paint and grease.
- 2.12. Solvents need care in use because of possible fire risk and health hazards. Glass should always be cleaned down with water after the use of solvents.
- 2.13. Certain solvents can be used in moderate amounts, including isopropyl alcohol, acetone, toluene or mineral spirits. Follow up with a thorough water rinse, and wipe dry with a soft cloth.
- 2.14. Used with extreme caution, steel wool is acceptable, but only in the finest grades (0000) and saturated with one of the cleaning solutions listed above.
- 2.15. For best results, always clean glass when it's cool and shaded; not when it is hot or in direct sunlight.
- 2.16. The use of any acid, however dilute, is not recommended.
- 2.17. If unsure about a cleaning agent or method, test it on a small area first.

**NB:** Above advice does not apply to coated glass surfaces, such as self-cleaning glass, ceramic, painted, mirrored or laquered surfaces. Seek advice from manufacturer's web-site/literature for product specific cleaning and maintenance instructions.



## 3. Guidance Specific to Pilkington Pyrodur & Pyrostop

### 3.1. General

- 3.1.1. General guidance and good practices provided under **2. Glass Cleaning & Maintenance** are applicable to Pilkington Pyrodur and Pyrostop.
- 3.1.2. In addition it is important to note specific requirements for this type of product.
- 3.1.3. Pilkington Pyrodur and Pyrostop are clear multi-laminated fire-resistant glasses, composed of alternate sheets of annealed glass and intumescent interlayers.
- 3.1.4. All fire resistant glass products should be installed only in compatible fire-rated framing systems, such as hardwood or steel.
- 3.1.5. Adequate drainage should be provided within the system to prevent prolonged exposure of the glass edges to moisture.
- 3.1.6. Glazing pressure on the glass should be low and uniform. There should be no point loading.

### 3.2. Edge Protection Tape

- 3.2.1. Pyrodur and Pyrostop are supplied with a special edge protection tape which provides protection from moisture and water vapour. The intumescent interlayers in these products are highly sensitive to water.
- 3.2.2. The edge tape is an integral part of the product as supplied and must not be removed or tampered with either temporarily or permanently.
- 3.2.3. If the edge tape is damaged this should be reported to GlasSeal and remedial action agreed.
- 3.2.4. Damage to edge tape will permit exposure of the interlayers to moisture and result in softening of the interlayer. If this occurs, the intumescent interlayer will run out of the edge of the pane and may be seen as a white stain on adjacent surfaces. Over time enough interlayer may run out to leave a void, which will manifest itself as a bubble or bubbles inside the laminate.

### 3.3. Special Situations

- 3.3.1. If the potential application is one where conditions of high humidity (such as swimming baths) or direct exposure to high intensity sunlight (such as directly below a glazed roof or close to a glazed façade) are possible, then advice should be sought from GlasSeal or Pilkington at the design stage.

### 3.4. Storage

- 3.4.1. Pilkington Pyrostop and Pyrodur must be kept dry and not be exposed to temperatures outside the range -40 degree C to +50 degree C. This applies at all times, including storage, handling, transport, temporary storage on site during construction, installation and normal use after installation, otherwise there may be some slight visible change in appearance. Considerations in this respect, for example, may include the likelihood of direct exposure to localised heating or intense lighting sources inside a building which could cause the temperature of the glazing to stay above 50 degree C during use. This consideration also applies to applications in a facade, including the use of surface film, if prolonged exposure to direct solar heating is likely to keep the temperature of the glass above 50 degree C. Such cases need to be considered individually. In these cases seek the advice of GlasSeal or Pilkington at the design stage.
- 3.4.2. Pilkington Pyrostop and Pyrodur must be stored in dry conditions, stacked upright – at an absolute maximum 6 degree declination from the vertical – fully supported on suitable racks in a manner, and on a firm surface, that prevents the glass from sagging. The bottom of the glass or units must be evenly in contact with the support surface along the entire length. Stacked glasses or insulating glass units should be separated by soft pads, such as cork.
- 3.4.3. Under no circumstances must Pilkington Pyrostop and Pyrodur be left exposed to direct sunlight and local weather. The glasses must not be left temporarily held in frames without fixing of the glazing beads and completion of the capping silicone sealant. If installed before the external facades have been fully completed, then Pilkington Pyrostop and Pyrodur must be fully protected temporarily until the facade is complete. It is also not acceptable practice to install the Pilkington Pyrostop and Pyrodur monolithic glasses or insulating glass units in frames that have been left exposed to weather. The installation conditions and the frames must be dry throughout the entire glazing. The sawing or modification of delivered Pilkington Pyrostop and Pyrodur glasses is not permitted.

## 4. Glass Inspection & Visual Quality

### 4.1. Inspection of Glass

- 4.1.1. Inspection of glass products for external scratches must be carried out immediately upon receipt of glass.
- 4.1.2. External scratches, chips, shells, surface damage, staining or cracks are most likely to occur as a result of inappropriate handling or storage of glass on site.
- 4.1.3. Installed glass should be cleaned carefully (see 2. Glass Cleaning and Maintenance guidance), immediately upon completion of installation, and examined for defects before any rendering, plastering or other works adjacent to the glazing takes place.
- 4.1.4. Defects which appear to be inside the product, not on the surface, should be viewed in accordance with the GGF Visual Quality Standard, relevant EN standards and guidance outlined below:

### 4.2. Insulating Glass Units

- 4.2.1. Transparent glass used in the manufacture of insulating glass units is identical to that used traditionally for single glass and will, therefore, have a similar level of quality.
- 4.2.2. Panes of the sealed unit shall be viewed at right angles to the glass from the room side standing at a distance of not less than 2 metres but for toughened, laminated or coated glasses (not less than a distance of 3 metres) in natural daylight and not in direct sunlight with no visible moisture on the surface of the glass.
- 4.2.3. The area to be viewed is the normal vision area with the exception of a 50mm wide band around the perimeter of the unit.
- 4.2.4. Flat transparent glass, including laminated or toughened (tempered) glass, shall be deemed acceptable if the following phenomena are neither obtrusive nor bunched: totally enclosed seeds, bubbles or blisters; hairlines or blobs; fine scratches not more than 25mm long, minute embedded particles.
- 4.2.5. Obtrusiveness of blemishes shall be judged by looking through the glass, not at it, under lighting conditions as described above.
- 4.2.6. When thermally toughened glass is viewed by reflection, the effect of the toughening process may be seen under certain lighting conditions. The visibility of surface colouration or patterns does not indicate deterioration in the physical performance of the toughened glass. Because of the nature of the toughening process, distortion will be accentuated when the glass is viewed in reflection or incorporated in insulating glass units.
- 4.2.7. Visible multiple reflection can occur under certain lighting aspect conditions, especially when viewed from an angle. This is an optical phenomenon arising from multiple surface reflections in sealed units.
- 4.2.8. The manufacture of flat laminated glass does not usually affect the visual quality of the glass incorporated in insulating glass units. However, the faults generally accepted in 4.2.4. may be increased in number if several glasses and interlayers are used in the production of laminated glass.
- 4.2.9. When viewed under certain light conditions, insulating glass units incorporating clear or tinted flat laminated glass may show a distortion effect caused by reflection on the multiple surfaces of the components of the laminated glass.

### 4.3. Patterned Glass

- 4.3.1. The above criteria do not apply to patterned glass, as due to the method of manufacture and its function as a privacy glass, imperfections such as seeds and bubbles are deemed to be acceptable.

### 4.4. Brewster's Fringes

- 4.4.1. The appearance of the optical phenomenon known as Brewster's Fringes is not a defect of the glass, and can occur with any glass of high optical and surface quality.
- 4.4.2. This phenomenon is a result of the high quality now being achieved world wide by modern methods of glass manufacture. Brewster's Fringes occur if wavelengths of light meet up with each other when they are exactly 180° out of phase – an example of the phenomenon known to physicists as the interference of light.
- 4.4.3. Brewster's Fringes occur when the surfaces of the glass are flat and the two panes of glass are parallel to each other, i.e. when the light transmission properties of the installation are of a very high order.

## 4.5. Thermally Toughened Glass

- 4.5.1. The toughening process will inevitably result in a product whose optical quality is not as high as that of glass from which it is produced. The phenomena outlined below should not be considered as defects in toughened glass, rather the inherent results of its production.
- 4.5.2. Surface distortion can be seen particularly in reflection; this is exacerbated when the glass is body tinted, surface coated or incorporated into insulating glass units.
- 4.5.3. Where aesthetic considerations are primary, the design professional and/or installer should consider the appropriateness of specifying, recommending and using thermally toughened glass.
- 4.5.4. 'Rollerwave' may be seen as regularly spaced vertical or horizontal bands and is an unavoidable result of taking glass to a temperature near its softening point in the toughening process.
- 4.5.5. Toughened glass may also exhibit 'bow', i.e. slight bending or curvature of the pane. The degree of bow will vary depending on glass thickness, aspect ratio, presence of low-emissivity coatings and other factors.
- 4.5.6. Minor 'pitting' may occur in thick or tinted glass as a result of the long duration such glass types must be subjected to heat in order to achieve fully tempered glass with acceptable breakage patterns.
- 4.5.7. 'Strain pattern' or 'quench pattern' may appear as faint spots, blotches or lines. This is the result of air quenching (cooling) of the glass in the toughening process.
- 4.5.8. The intensity of the quench or strain pattern is influenced by the viewing angle and lighting conditions. It may be accentuated if two panes of tempered glass are using in an insulating glass unit.
- 4.5.9. The quench or strain pattern is most apparent when viewed under polarized light and at an oblique angle.

## 4.6. Tinted, Coloured & Spandrel Glass

- 4.6.1. Any inherent defects mentioned above may be accentuated in coloured or tinted glass.
- 4.6.2. Allowances should be made for shading differences between different batches of raw material (glass, PVB, paint, etc).
- 4.6.3. Allowances should be made for shading differences arising where availability of materials is limited and have to be sourced from more than one supplier.
- 4.6.4. Thicker panes of 'clear' glass may appear 'greener' than thinner panes of the same material.
- 4.6.5. Thicker panes of body-tinted glass will appear darker than thinner panes of the same tint. Commonly green, grey, bronze and blue are available.
- 4.6.6. Differences in appearance between different thicknesses of glass should be taken into consideration if there is a requirement for thicker glass in some areas of a building to provide adequate strength or resistance to wind-loading or barrier-loading.
- 4.6.7. Colours may appear duller or 'greener' viewed through thicker glass. This is not normally an issue with shades of green, grey or brown, however it is strongly recommended that low-iron glass is specified in conjunction with pale colours to minimise this effect.
- 4.6.8. Conventional spandrel type glass (also known as Armaclad) may exhibit 'pin-holes' in the enamelled surface. These are an unavoidable consequence of small specs of dust getting between the glass surface and the enamel thereby preventing fusion of the enamel to the glass surface during the tempering process. These 'pin-holes' are not normally visible when this product is used as intended to clad blockwork or hide floorslabs, but may be clearly visible when the panel is backlit, including when viewed from inside a building where daylight provides the backlighting. For this reason, enamelled spandrel glass should not be used where any form of backlighting is present.
- 4.6.9. Painted toughened glass (where a 'two-pack' paint is applied in several layers to already toughened glass) is generally 'pin-hole' free. However, as the paint is not fused to the glass surface there is always a possibility that rough treatment in service may result in damage to the paint.
- 4.6.10. Variation in perceived colour may occur with both enamelled and painted toughened glass. Such variations however will be more apparent with white or light colours because of unavoidable light transmittance. Further due to inherent variations in the paint or enamel thickness, lighter colours may be more influenced by the colours of materials installed behind the glass.
- 4.6.11. Where any of the inherent limitations of enamelled or painted glass may be a potential concern it is recommended that a solid-colour laminated-toughened glass product is specified. In such products the colour is provided by a combination of coloured PVB interlayers encapsulated between two panes of toughened glass. Very close equivalents to RAL or BS colours are available.

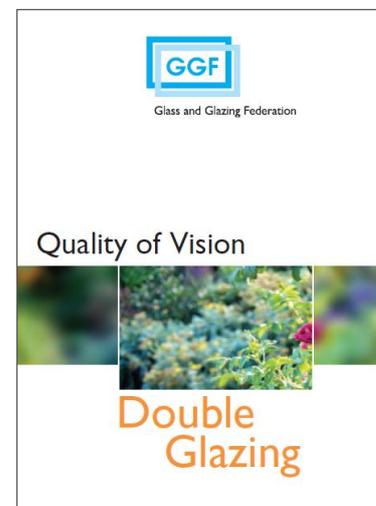
- 4.6.12. Any light coloured glass, may exhibit some shadows depending on lighting conditions. Incident light may reflect off or refract through glass surfaces or edges.
- 4.6.13. For all types of coloured glass it is recommended that representative sized samples are viewed on-site, in the proposed framing/fixing system and approved by the client prior to ordering/manufacturing glass for a project.
- 4.6.14. As is the case with paint, all coloured glass for a project should be ordered and manufactured in one batch to minimise the risk of colour variation.
- 4.6.15. In particular, solid white laminated glass, such as that incorporating Vanceva Polar White PVB interlayer, will exaggerate any variation in iron-content present in the float glass, or differences in low-emissivity coatings.
- 4.6.16. It is not possible to guarantee that any replacement panes will exactly match the original batch.

Recommended reading:

**GGF Quality of Vision – Double Glazing**

Can be downloaded from the Glass & Glazing Federation website:

<http://www.ggf.co.uk/assets/GGF%20Quality%20of%20Vision%20update%20Dec%2009-4d4c11274577f.pdf>



## 5. Safety

### 5.1. Impact Safety

- 5.1.1. It is the responsibility of the installer to ensure that all glass installed is compliant with current local Building Regulations and Health & Safety legislation.
- 5.1.2. All laminated and toughened glass supplied by GlasSeal will be safety glass unless otherwise stated.
- 5.1.3. Note that not all wired glass is classified as safety glass.
- 5.1.4. All safety glass impact performance is classified under BS6206 or BS EN 12600.
- 5.1.5. Reference should be made to The Building Regulations (Northern Ireland) Technical Booklet V : Glazing, or an equivalent document for the relevant jurisdiction.
- 5.1.6. It is not the responsibility of GlasSeal to identify where safety glass is required in a building or which parts of a customer's order require safety glass.

### 5.2. Glass As Guarding

- 5.2.1. Where, under current local building regulations, glass is required to act as guarding, advice should be sought from GlasSeal on the suitability of the proposed glass type for this application.
- 5.2.2. Suitability will be dependent on opening size, fixing/framing method, design loads and building use.
- 5.2.3. Reference should be made to The Building Regulations (Northern Ireland) Technical Booklet H : Stairs, Ramps and Guarding, or an equivalent document for the relevant jurisdiction.
- 5.2.4. It is not the responsibility of GlasSeal to identify where glass must act as guarding in a building.
- 5.2.5. It is the responsibility of the design professional to determine safety and loading requirements.

### 5.3. Sloped Overhead Glazing

- 5.3.1. Safety glass must be installed in sloped overhead glazing.
- 5.3.2. Where the glazing is less than 3 metres from finished floor level, toughened safety glass may be used.
- 5.3.3. Where the glazing is more than 3 metres from finished floor level, laminated glass should be used. In double glazing units, it is permissible (and for thermal safety and loading reasons, advisable) to incorporate toughened glass in the upper (outer) pane, as long as laminated glass is incorporated in the lower (inner) pane.
- 5.3.4. Sloped glazing may also be subject to snow loads. Advice should be sought from GlasSeal on the suitability of the proposed glass type to withstand snow loads.
- 5.3.5. Suitability will be dependent on pane size, glazing pitch, fixing/framing method, and design loads.
- 5.3.6. It is the responsibility of the design professional to determine safety and loading requirements.

### 5.4. Wind Loading

- 5.4.1. Consideration should be given to wind loading on glass. In particular, larger pane sizes may require thicker glass than adjacent smaller panes to meet design wind loads.
- 5.4.2. The design wind load is derived from the basic wind speed and factors that affect the way wind imparts load to the building. The load can be wind pressure or more often suction.
- 5.4.3. Advice should be sought from GlasSeal on the suitability of the proposed glass type to withstand design wind loads.
- 5.4.4. Suitability will be dependent on pane size, fixing/framing method, and design loads.
- 5.4.5. It is the responsibility of the design professional to determine safety and loading requirements.



## 5.5. Spontaneous Fracture Caused by Nickel Sulphide Inclusions

- 5.5.1. In some situations toughened glass may break for no apparent reason. One factor which is known to cause such spontaneous breakages is nickel sulphide inclusions.
- 5.5.2. Nickel sulphide (NiS) inclusion occurs during the manufacturing process for float glass. It does not cause any weakness in annealed glass. However, when float glass is heated during the toughening process, the NiS crystal changes structure. During the rapid cooling cycle of the toughening process the NiS particle cannot revert immediately back to its low temperature structure. Eventually, though, the NiS will slowly convert back to its low temperature phase, with an increase in volume of approximately 2-4%. This expansion results in spontaneous fracture of the pane of toughened glass.
- 5.5.3. Heat soak testing is a method of forcing this 'spontaneous' fracture in affected panes. All panes which survive heat soak testing should be free of any NiS inclusions.
- 5.5.4. GlasSeal provides no guarantee against Nickel Sulphide inclusion or fracture resulting from it.

## 5.6. Spontaneous Fracture Caused by Thermal Stress

- 5.6.1. Annealed glass (including laminated glass comprising annealed glass panes) can fracture as a result of thermal stress.
- 5.6.2. Thermal stress is created when one area of a glass pane becomes hotter than an adjacent area. If the stress is too great then the glass will crack.
- 5.6.3. Toughened glass is not prone to failure due to thermal stress.
- 5.6.4. Thermal stress can occur where
  - part of the glass is exposed to heat and part is shaded
  - there is an object close behind the glass which creates heat build up
  - glass is thick or tinted, but not toughened
- 5.6.5. Thermal fractures are distinctive in appearance. The crack begins at the edge of the glass and travels at right angles from this edge towards the centre. The crack will meander until eventually it reaches another edge.
- 5.6.6. GlasSeal can request on behalf of the installer/specifier a Thermal Safety Check from Guardian, St.Gobain or another glass manufacturer. This should take place during the design stage. The following information will be required to carry out this check:
  - Location of the building
  - Orientation
  - Type of glass being used including details of the insulating glass units
  - Size of building overhang if present
  - Size of mullion and transom caps if present
  - Details of any internal or external blind/louvres
  - Details of any back up - i.e where a panel makes up a level to a floor or ceiling behind the glass allowing hot air to be trapped and reflecting back at the glass.
  - The framing material including thermal breaks and frame colour.
  - The window size and if it opens - i.e. changes the angle to the sun.
  - Details of internal heating systems.
  - Any other details like other buildings or trees casting a shadow onto the glass.
- 5.6.7. If the above information is not available, but thermal fracture is a concern, toughened glass should be specified.
- 5.6.8. GlasSeal provides no guarantee against thermal fracture.



## 6. Ordering Glass

### 6.1. General Information Required

- 6.1.1. Before ordering glass, consideration should be given to the type of glass required for the intended application.
- 6.1.2. When ordering glass, sufficient information should be provided to ensure that GlasSeal can supply an appropriate product for the intended application. Recommended information to be provided at time of ordering is listed below.
- 6.1.3. Quantity of each item
- 6.1.4. Pane width and height in millimetres
- 6.1.5. Single, double or triple glazing
- 6.1.6. Glass pane thickness(es): 2mm - 25mm; 4.4mm - 55mm for laminated glass
- 6.1.7. Glass pane type(s): annealed, laminated, toughened, wired
- 6.1.8. Glass pane description(s) – can be generic or a brand (brand names in brackets below):
  - Clear (e.g. Optifloat, Planilux)
  - Low-Iron (e.g. Optiwhite, Diamant)
  - Low-E (e.g. Climaguard, K Glass, Planitherm Total+)
  - Tinted (e.g. Optifloat Tint, Parsol)
  - Solar Control (e.g. Sunguard, Suncool, Coolite)
  - Self Cleaning (e.g. Bioclean, Activ)
  - Fire-Resistant (e.g. Pyrodur, Pyrostop, Pyroshield, Pyran)
  - Coloured (e.g. Vanceva, Lacobel)
  - Acoustic
  - Ballistic
- 6.1.9. Glass colour, tint or performance code (e.g. Vanceva 0232, RAL 7024, 70/40)
- 6.1.10. Requirement to meet specific standards or classifications (e.g. BS6206 Class A, EN1063 BR2)

### 6.2. Information for Insulating Glass Units

- 6.2.1. For IG units (double or triple glazing), further information should include the following where applicable.
- 6.2.2. Cavity width(s) in millimetres
- 6.2.3. Spacer bar colour (e.g. Silver, Bronze, Black, White, Gold, Grey)
- 6.2.4. Requirement for warm edge spacer bar (e.g. TGI, Swisspacer V)
- 6.2.5. Requirement for Argon or Krypton gas
- 6.2.6. Special requirements such as:
  - Georgian Bar
  - Duplex Bar
  - Leaded Design
  - Shaped
  - Stepped
  - Silicone Seal
  - Screen printed frit border
- 6.2.7. Any further dimensional information relevant to above and information on colour, design or finish.

### 6.3. Missing or Contradictory Information

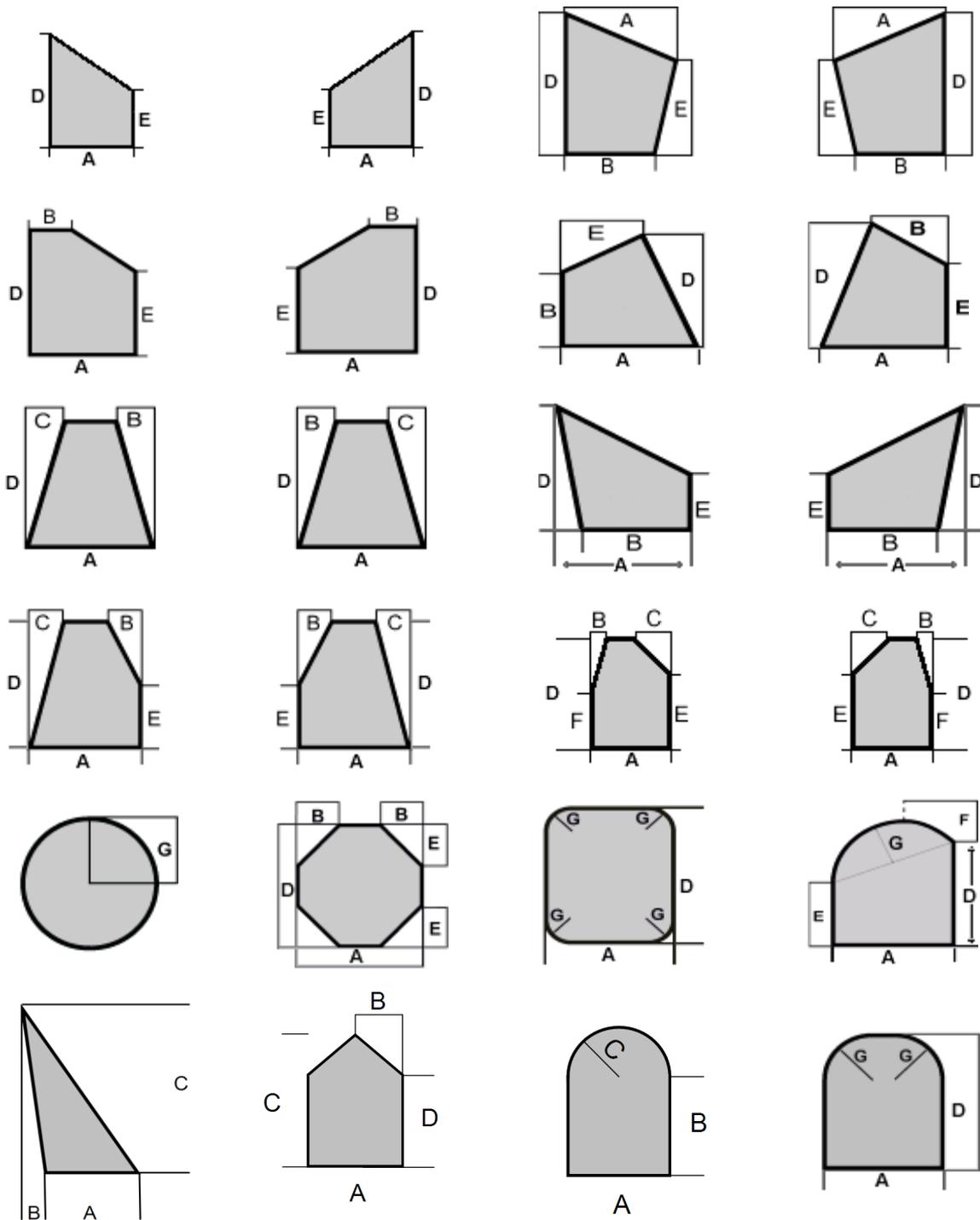
- 6.3.1. GlasSeal accepts no responsibility for any loss or inconvenience caused where an order has been accepted and fulfilled in good faith, but is not suitable because information provided on the order or accompanying documents was incomplete, incorrect or contradictory.

## 7. Shaped Glass

### 7.1. Regular Geometric Shapes

7.1.1. When ordering glass products which can be described by a dimensioned drawing, please supply adequate dimensional information such as that shown below.

7.1.2. If possible please supply CAD drawings in a DXF format.



## 7.2. Irregular Shapes

7.2.1. Where a shape is irregular and cannot be described by a geometric drawing, it may be necessary to supply a template from which the shape of the glass can be taken. Templates should be of a robust lightweight material, such as thin plywood. A charge will apply for template handling.

## 7.3. Glass with holes or notches

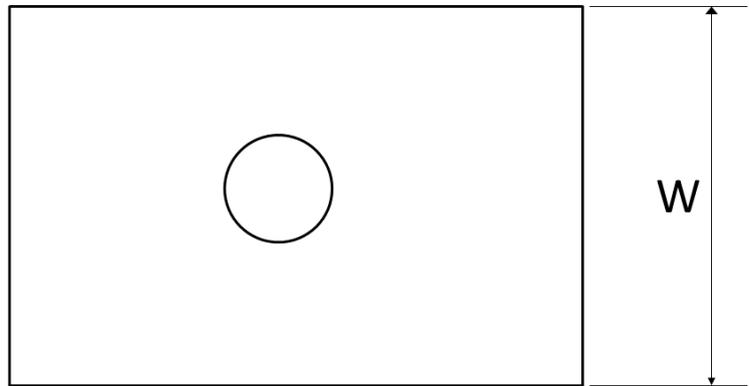
- 7.3.1. All glass panes with holes or notches machined into them should be toughened for mechanical strength.
- 7.3.2. There are limitations to the size, shape and proximity of holes or notches to the glass edge which must be considered before toughening the glass.

## 7.4. Minimum pane size for glass with holes

7.4.1. For glass panes with round holes, the pane width, **W** (i.e. the shorter edge) should be at least 8 x the glass thickness, **d**.

$$W \geq 8 \times d$$

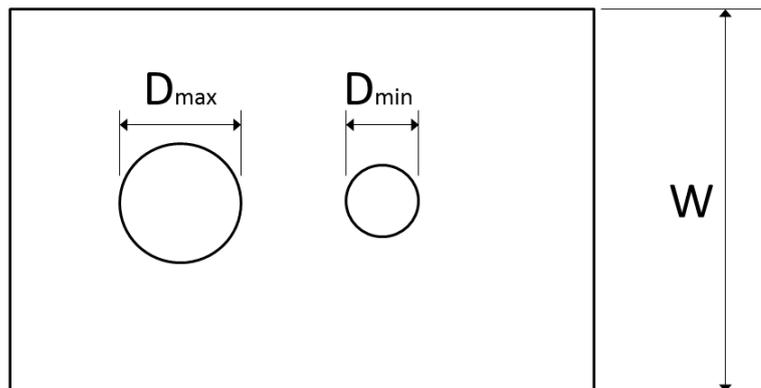
(where **W** = pane width  
and **d** = glass thickness)



## 7.5. Diameter of holes

- 7.5.1. Minimum diameter of holes (**D<sub>min</sub>**) is not recommended to be less than the nominal thickness (**d**) of the glass.
- 7.5.2. Maximum diameter of holes (**D<sub>max</sub>**) should not be more than a third of the narrowest point of the glass.

$$D_{\min} \geq d$$
$$D_{\max} \leq 1/3 \times W_{\min}$$



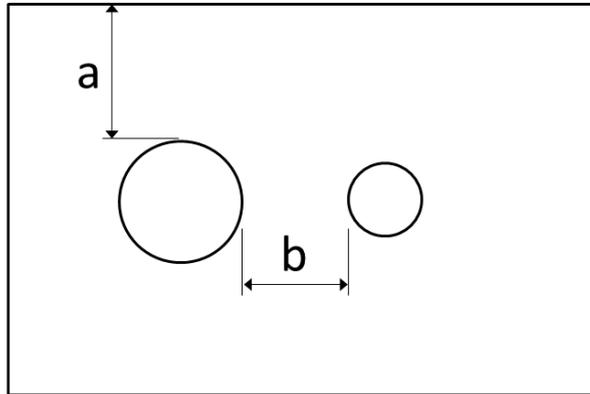
## 7.6. Position of holes

7.6.1. The distance (**a**) from the edge of the hole to the edge of the glass should be not less than 2 x glass thickness (**d**).

7.6.2. The distance (**b**) between the edges of the two holes should be not less than 2 x glass thickness (**d**).

$$a \geq 2 \times d$$

$$b \geq 2 \times d$$



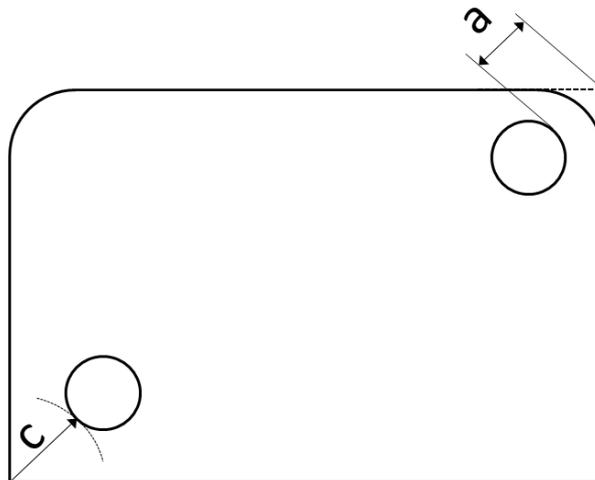
## 7.7. Holes in corners

7.7.1. For rounded corners, the distance (**a**) from the datum point of the projected corner to the edge of the hole must be at least 4 x the glass thickness (**d**).

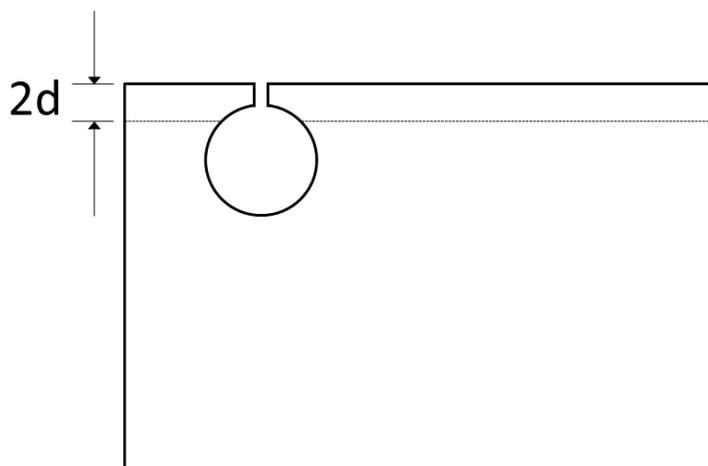
7.7.2. For square corners, the distance (**c**) from the edge of the corner to the edge of the hole should not be less than 6 x the glass thickness (**d**).

$$a \geq 4 \times d$$

$$c \geq 6 \times d$$



7.7.3. If the hole is placed in a corner nearer to the edge than recommended, the risk of breakage during toughening increases substantially. The risk can be minimised by making a cut from the hole to the edge.



## 7.8. Rectangular holes or cut-outs

7.8.1. The maximum size (**X x Y**) of the rectangular cut-out depends on the dimensions of the glass.

7.8.2. The length of the cut-out (**X**) should not be more than 1/3 of the glass length (**L**) and the width of the cut-out (**Y**) should not be more than 1/3 of the glass width (**W**).

$$X \leq 1/3 \times L$$

$$Y \leq 1/3 \times W$$

7.8.3. The distance (**a**) from the edge of the glass to the edge of the cut-out should be at least 1/2 of the length of the cut-out (**X**).

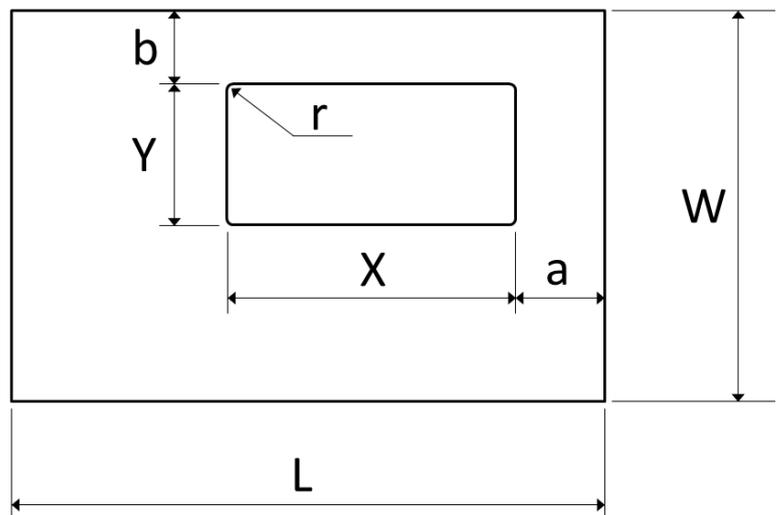
7.8.4. The distance (**b**) from the edge of the glass to the edge of the cut-out should be at least 1/2 of the width of the cut-out (**Y**).

$$a \geq 1/2 \times X$$

$$b \geq 1/2 \times Y$$

7.8.5. The internal radius of the corner (**r**) should be not less than the glass thickness (**d**).

$$r \geq d$$

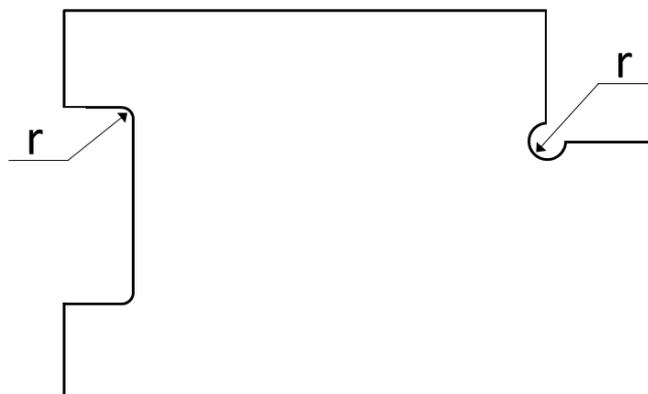


## 7.9. Notches and internal corners

7.9.1. Any internal corner must be rounded.

7.9.2. The internal radius of the corner (**r**) should be not less than the glass thickness (**d**).

$$r \geq d$$



## 8. Edgework of finished glass

8.1. Below is a guide to edgework types for finished glass .

8.2. Unless otherwise specified, float glass, laminated glass and wired glass will be supplied as-cut; toughened glass up to 10mm thick will be supplied with seamed (arrised) edges; toughened glass 12mm and thicker will be supplied with flat ground edges or flat polished edges.

8.3. The condition of the edge of finished glass products can impact the long term structural performance of the glass system. When selecting the appropriate edgework, consideration should be given to the intended use of the glass and the method of fixing or framing.

Edge Diagram	Description
	<b>FLAT POLISH</b> Standard polished edge
	<b>FLAT GROUND</b> Matt ground edge
	<b>POLISHED PENCIL-EDGE</b> Rounded polished edge
	<b>GROUND PENCIL-EDGE</b> Rounded matt edge
	<b>POLISHED MITRE</b> Polished mitre at 45 degree angle (or other angle if <u>specified</u> )
	<b>GROUND MITRE</b> Ground (matt) mitre at 45 degree angle (or other angle if <u>specified</u> )
	<b>ARRISED</b> Sharpness ground off the edges, commonly for toughened glass

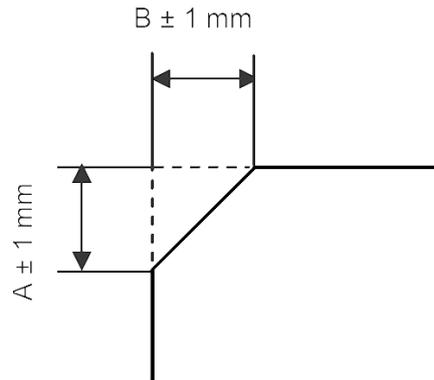
## 9. Corners

### 9.1. Dubbed corners

9.1.1. The sharp point of a 90° corner is removed using an arising belt to make handling of the glass pane safer. A very small radius with a slightly dull finish is formed.

### 9.2. Oblique (faceted) corners

9.2.1. The sharp point of a square corner is machined across typically forming a 45° angle, although other angles can be created on request.



### 9.3. Radius corners

9.3.1. Corners are CNC machined to a true radius corner. Minimum radius is 4mm.

