

 **CHELSEA ARTISANS**

 **FUSION GLASS DESIGNS**

**ALL PRODUCTS**



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**ADVICE MANUAL**



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THIS ADVICE MANUAL IS DESIGNED TO ASSIST YOU IN SPECIFYING AND ORDERING GLASS FROM US. THE INFORMATION PROVIDED IS NOT EXHAUSTIVE DUE TO THE BESPOKE NATURE OF SELECT PRODUCT RANGES.

FLOAT GLASS

TOLERANCES

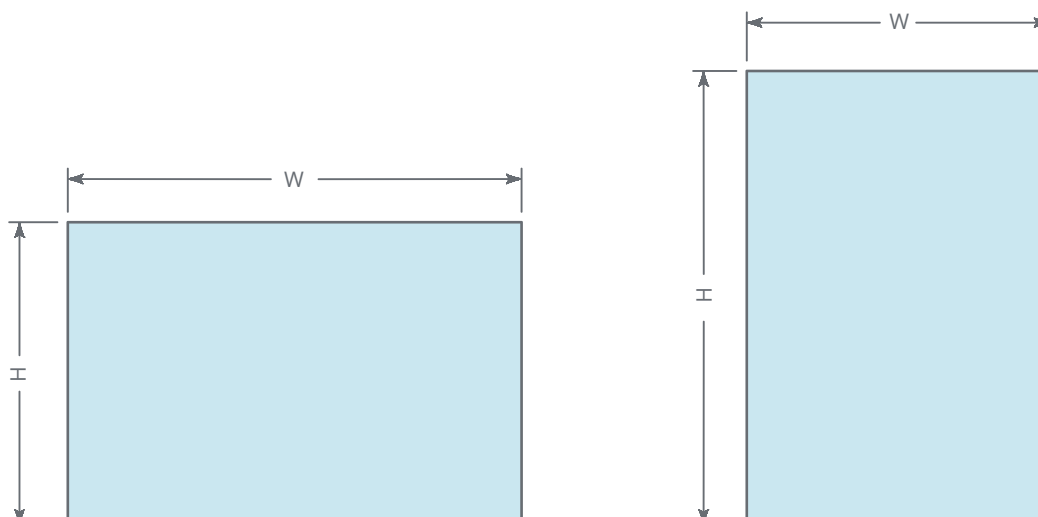
Please note that the tolerances detailed below in Table 1 are standard. Tighter tolerances are achievable but with added processing time and cost.

TABLE 1 - GLASS PANEL SIZE TOLERANCES IN RELATION TO THICKNESS		
GLASS THICKNESS	DIMENSIONS UP TO 1000mm	DIMENSION OVER 1000mm
6mm	+/- 2mm	+/- 2mm
8mm	+/- 2mm	+/- 2mm
10mm	+/- 2mm	+/- 2mm
12mm	+/- 3mm	+/- 3mm
15mm	+/- 4mm	+/- 5mm
19mm & over	+/- 5mm	+/- 7mm

LENGTH, WIDTH & SQUARENESS

When glass dimensions are quoted for rectangular panels, the first dimension shall be the width (W) and the second dimension the length (H) as shown in Figure 1. It shall be made clear which dimension is the width (W) and which is the length (H) when related to its installed position.

FIGURE 1 - EXAMPLES OF WIDTH (W) & LENGTH (H) RELATIVE TO PANEL SHAPE



The nominal dimensions for width and length being given, the finished panel shall not be larger than a prescribed rectangle resulting from the nominal dimensions increased by the tolerance (t) or smaller than a prescribed rectangle reduced by the tolerance (t). The sides of the prescribed rectangles are parallel to one another and these rectangles shall have a common centre. Limits are given in Table 2 and Table 3.

FIGURE 2 - TOLERANCE LIMITS FOR DIMENSIONS OF RECTANGULAR PANELS

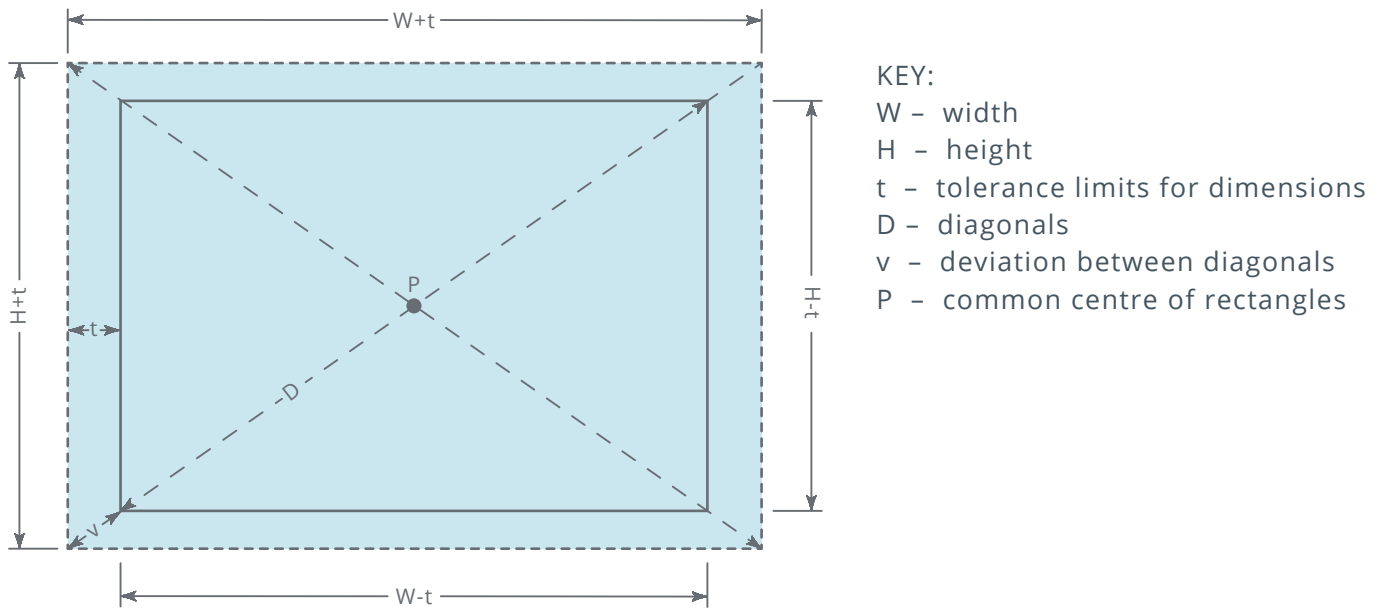


TABLE 2 - TOLERANCES ON WIDTH (W) AND LENGTH (H)		
NOMINAL DIMENSION OF SIDE W OR H	NOMINAL GLASS THICKNESS 8mm OR LESS	NOMINAL GLASS THICKNESS OVER 8mm
Less than 2000mm	+/- 2mm	+/- 3mm
2000mm - 3000mm	+/- 3mm	+/- 4mm
Over 3000mm	+/- 4mm	+/- 5mm

TABLE 3 - LIMIT DEVIATION (v) ON THE DIFFERENCE BETWEEN DIAGONALS		
NOMINAL DIMENSION OF SIDE W OR H	NOMINAL GLASS THICKNESS 8mm OR LESS	NOMINAL GLASS THICKNESS OVER 8mm
Less than 2000mm	4mm	6mm
2000mm - 3000mm	6mm	8mm
Over 3000mm	8mm	10mm



### TOUGHENED GLASS

Where specified glass is toughened to BS EN 12150 or required international standards. Glass will be stamped or marked to indicate that the glass meets this standard. If there is a requirement for the location of this stamp/mark on the glass (e.g. where it is least visible) this must be advised.

#### FLATNESS

Due to the toughening process, it is not possible to obtain a product as flat as annealed glass. This difference in flatness depends on the type of glass, e.g. coated etc., glass dimensions, i.e. the nominal thickness, and the dimensions and the ratio between the dimensions.

There are four kinds of distortion that can occur during the toughening process:

- 1) Overall bow
- 2) Roller wave distortion
- 3) Edge lift

NOTE: Overall bow, roller wave and edge lift can, in general, be accommodated by the framing system.

FIG. 3 - REPRESENTATION OF OVERALL BOW

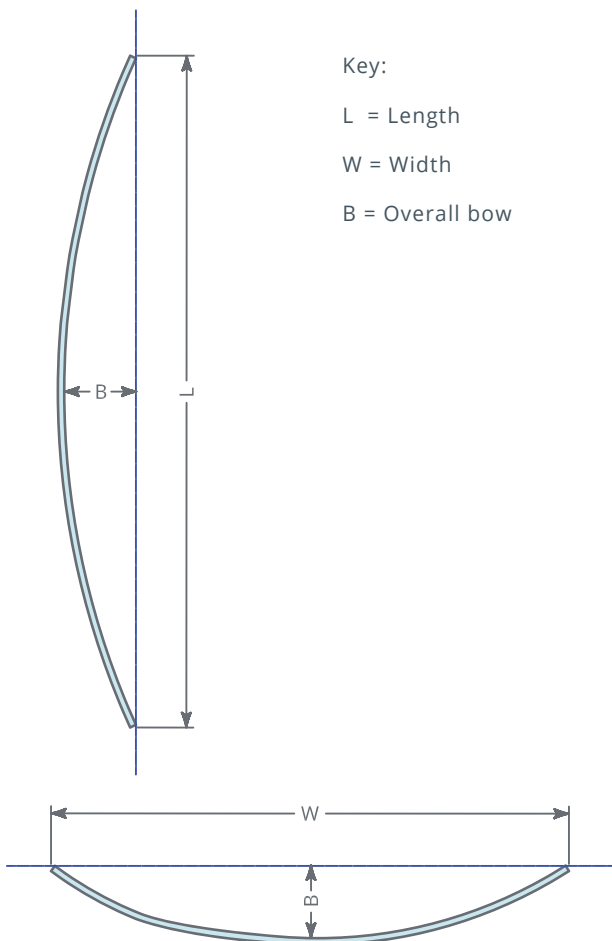
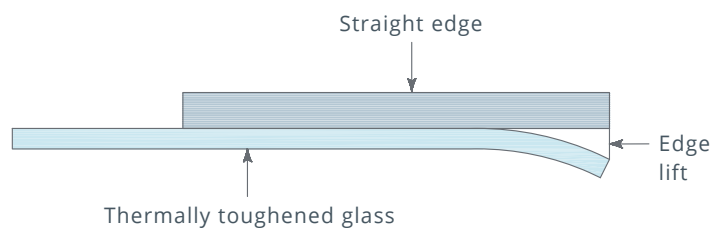


FIG. 4 - REPRESENTATION OF ROLLER WAVE DISTORTION



FIG. 5 - REPRESENTATION OF EDGE LIFT



The maximum allowable values for the overall bow, roller waves and edge lift are given in Tables 4 and 5. The values only apply to thermally toughened glass without holes and/or notches and/or cut-outs.

TABLE 4 - MAXIMUM VALUES OF OVERALL BOW & ROLLER WAVE DISTORTION FOR TOUGHENED GLASS		
GLASS TYPE	MAXIMUM OVERALL BOW DISTORTION/m	MAXIMUM ROLLER WAVE DISTORTION
Uncoated float glass in accordance with EN 572-1 and EN 572-2	3mm	0.3mm
Others	4mm	0.5mm

TABLE 5 - MAXIMUM VALUES OF EDGE LIFT FOR TOUGHENED GLASS		
GLASS TYPE	GLASS THICKNESS	MAXIMUM EDGE LIFT
Uncoated float glass in accordance with EN 572-1 and EN 572-2	3mm	0.5mm
	4mm to 5mm	0.4mm
	6mm to 25mm	0.3mm
Others	All	0.5mm

#### OTHER DISTORTIONS

The incorporation of holes and/or notches in a panel gives the possibility of distortions being produced during the toughening process as a result of the absence of glass and/or an increase in unsupported edges. The magnitude of these distortions will generally be less than edge lift.

#### STORAGE

Edges should be protected from contact with hard or uneven surfaces, and 'stacked' panels should only be stored in dry conditions.

#### HEAT SOAK TOUGHENED GLASS

Where specified, all glass shall be heat soaked for a minimum of 8 hours at 290°C in order to minimize the occurrence of nickel sulphide crystals in accordance with BS EN 14179. Glass will be stamped/marked to indicate that the glass meets this standard.

If there is a requirement for the location of this stamp/mark on the glass (e.g. where it is least visible) this must be advised.

## COLOUR COATED GLASS

THE FOLLOWING INFORMATION IS TO BE READ IN CONJUNCTION WITH THE DIAMOND DÉCOR® & DIAMOND DÉCOR® SATINOVO PRODUCT MANUALS & DATA SHEETS

### COLOUR REFERENCES

Ideally, we prefer to work with RAL colour references. We will work with BS, Pantone or Dulux references as we recognise that our customers will require us to work with these references.

### COLOUR MATCHING

We are able to colour match to specific requirements. Where this is not a straightforward process, we may have to charge for this service.

### OPTICAL QUALITY

Please note that different glass (low iron, clear float, coloured) and different thicknesses of glass will have different optical qualities. It is important to note that if all the glass on a project is not the same (i.e. some glass is 6mm thick and some is 15mm thick) then colours may appear different. It is advisable to have a sample made prior to full production.

### TRANSPARENT AND TRANSLUCENT PAINTS

Chelsea Artisans are able to supply glass with translucent paint. It is important to understand the effect of light through this type of painted glass. We again advise that a sample should be made prior to full production.

### SAMPLES

Please note that the majority of Chelsea Artisans standard painted samples are produced on low iron glass due to the superior optical quality. If a different type of glass is required, it will look different to the standard sample.

For bespoke colours, low iron glass will be used unless instructed otherwise.

## LAMINATED GLASS

All laminated glass products are not recommended for use in external or wet/damp environments unless fully framed and sealed. We advise that particular care must be taken to protect the edges of laminated panels against water ingress. Prolonged contact with water can cause the interlayers used in laminating to deteriorate, both in appearance and adhesion. Edges should also be protected from contact with compounds and products containing mineral or vegetable oils and unsuitable glazing compounds such as acid curing silicones.

All our laminated glass is compliant to BS EN 14449.

### TOLERANCES

Maximum step on any edge = 2mm

Overall thickness = +/- 1mm

Maximum bow between point supports = +/- 10mm

Maximum bow along panel short dimension = +/- 2mm

### COLOURED LAMINATES

THE FOLLOWING INFORMATION IS TO BE READ IN CONJUNCTION WITH THE  
FUSION GLASS : COLOUR LAMINATE PRODUCT MANUALS & DATA SHEETS

Colours may have slightly varying intensity or concentration across the glass depending on the processes used. This may be most evident with textured kiln formed glass, sandblasted glass, toughened or patterned glass. Variations in colour may occur between sample and a full sized panel due to the optical effect of light through the glass. The darker the laminate colour, the more likely it is that imperfections in the glass will be seen.

When manufacturing coloured laminate panels it is not always possible to prevent small airborne contaminants becoming trapped within the glass and laminate interlayers. Such contaminants may only become visible as small dark marks once the panel is fired in the laminating ovens, being most noticeable in light colours, most particularly white. Such features will not be cause for rejection of a panel. Chelsea Artisans have large size display panels which exhibit the features and customers are encouraged to view these panels to ensure they have an understanding of the nature and potential for such features to be present.

### FABRIC LAMINATES

THE FOLLOWING INFORMATION IS TO BE READ IN CONJUNCTION WITH THE  
FUSION GLASS : FABRIC LAMINATE PRODUCT MANUALS & DATA SHEETS

Fabrics are made of fibres which may have slight variations in weave. Every attempt will be made during laminate to maintain a consistent and even distribution. Some directional variations may occur which cannot be prevented.

Some directional variations may occur between panels. On large or complex projects we recommend prototype panels are produced for sign off and final approval.

A mirrored or opaque backing layer of glass will need to be combined with the fabric when the product is used as cladding or fixed back to a structural substrate.

Free issue materials are handled at your risk. We will always assume that adequate material, including spares for handling and installation risk, will be available and delivered to our works at no cost to ourselves.

When specifying this product please ensure that the end user is aware of material limitations as Chelsea Artisans cannot accept rejection on this basis as per our T&Cs.



## MESH LAMINATES

THE FOLLOWING INFORMATION IS TO BE READ IN CONJUNCTION WITH THE  
FUSION GLASS : MESH LAMINATE PRODUCT MANUALS & DATA SHEETS

All of our woven meshes may have marking from handling and weaving which are an unavoidable part of their manufacturing process. We will always do our best to minimise these as much as possible. All meshes when laminated must be viewed from a minimum distance of 5m.

On large or complex projects we recommend prototype panels are produced for sign off and final approval.

A mirrored or opaque backing layer of glass will need to be combined with the mesh when product is used as cladding or fixed back to a structural substrate.

When specifying this product please ensure that the end user is aware of material limitations as Chelsea Artisans Ltd cannot accept rejection on this basis as per our T&Cs.

## DIGITAL PRINT LAMINATES

THE FOLLOWING INFORMATION IS TO BE READ IN CONJUNCTION WITH THE  
FUSION GLASS : DIGITAL PRINT LAMINATE PRODUCT MANUALS & DATA SHEETS

When manufacturing coloured laminate panels it is not always possible to prevent small airborne contaminants becoming trapped within the glass and laminate interlayers. Such contaminants may only become visible as small dark marks once the panel is fired in the laminating ovens, being most noticeable in light colours, most particularly white. Such features will not be cause for rejection of a panel. Chelsea Artisans have large size display panels which exhibit the features and customers are encouraged to view these panels to ensure they have an understanding of the nature and potential for such features to be present.

Artwork: Images can be printed from most digital files. However, resolution must be appropriate for print quality and panel size required. For more information on file type, image size and resolution, please contact our Sales Team.

## SHATTERED LAMINATES

When shattering the centre panel of laminated glass, the break pattern of that glass is random and we are unable to control it. The shattering 'fans out' from the break point. If it is important to you, you can specify where you wish the break point to be although there may be reasons why a particular shatter point cannot be used. Where an exposed edge will be evident when installed, the shattered layer is slightly smaller than the outer layers and filled with clear silicone.

## TOUGHENED LAMINATES

Please note that the overall thickness of toughened laminate is generally thicker than that of the same thickness annealed glass. This is generally due to the need to have more interlayers with toughened glass.

## VISUAL APPROVAL CRITERIA

One bubble of 2-3mm diameter per linear meter is acceptable at the junction between the edge tape and the interlayer. In the body of the laminate, bubbles up to 3mm in diameter are acceptable if at least 1 metre apart. These inspections shall be carried out under normal daylight conditions, from a distance of 3 meters, and confined to the normal vision area defined as an oval with axes equal to the height and width of the laminate. Please note that the risk of trapped air bubbles increases from the above criteria when laminating materials such as fabrics, papers and meshes.



### INCLUSIONS

The laminating process does generate a small amount of static electricity. Every care is taken to ensure that small inclusions or particles do not get into the laminate. However, there is a small risk that some visible inclusions or particles will get into the laminated glass. This can be particularly evident on colour laminates.

### DE-LAMINATION

There is a slight risk that de-lamination may occur on more complex laminates such as kiln formed laminates or when fabrics or meshes are being laminated. This can also happen around the perimeter of standard laminates. This is highly unlikely to affect the structural integrity of the glass.

### POLISHED EDGES

It is possible to polish the edges of laminated glass to produce a clean edge. However, this is not possible when the glass has been toughened, or where the interlayer material will absorb moisture e.g. fabrics or papers.

### LAMINATING OVEN SIZES

Chelsea Artisans have ovens that can accommodate quite small to very large pieces of glass. We will advise if your requirements do not fit our ovens.

Maximum oven size: 2100mm x 4700mm subject to decorative insert.

### INSTALLATION

Care should be taken to ensure that the structural silcones or gaskets that are being used are compatible with the interlayer.

Ensure that, when the panel is installed, edges are ventilated to allow any moisture a free path away from the interlayer.

Avoid accumulation or moisture & contaminants on laminate edges, especially at the top lateral edge. Ensure that membranes intended to remove risk of moisture contact do not inadvertently lead to a build-up of moisture adjacent to the laminated panel edge.

**KILN FORMED GLASS**

THE FOLLOWING INFORMATION IS TO BE READ IN CONJUNCTION WITH THE FUSION GLASS : KILN FORMED PRODUCT MANUALS & DATA SHEETS

**TOLERANCES**

The heating and cooling involved in kiln forming glass means that the glass expands and contracts during the process. As a result, greater tolerances should be allowed for in overall size, thickness, warp and edge straightness when specifying/ordering kiln formed glass.

TABLE 7 - PANEL SIZE TOLERANCES IN RELATION TO THICKNESS FLAT GLASS (TOLERANCE SUBJECT TO TEXTURE)	
GLASS THICKNESS	TOLERANCE
10mm - 15mm	+/- 3mm
19mm & over	+/- 5mm

TABLE 8 - PANEL SIZE TOLERANCES IN RELATION TO THICKNESS CURVED GLASS (SINGLE LAYER TOUGHENED)	
GLASS THICKNESS	TOLERANCE
Up to 10mm	+/- 3mm
10.1mm - 15mm	+/- 4mm
15.1mm - 19mm	+/- 5mm

**EDGE STRAIGHTNESS**

+/- 3mm per 1000mm

**TORSION**

+/- 5mm per 1m measured along a straight edge. Torsion is measured with the glass laid flat on its straight edges and under its own weight.

**MOULDS**

The glass is formed over refractory moulds to create textures and patterns on the underside, leaving the top surface smooth and undulating.

## FLAT AREAS

Overall textures can be tailored to include flat areas for rebates, patch fittings, holes and cut-outs for use in most systems. Please ensure these are specified when placing an order.

## TEXTURES

Please note that there may be a difference in texture across a panel of glass as the weight of the glass compressing into the mould may differ. Also, where necessary, the texture may be less pronounced than shown on a sample to ensure the glass goes through the toughening or laminating processes successfully.

## TOUGHENING

Occasionally, when toughening kiln formed glass, faint 'roller' marks can appear on the surface of the glass. The likelihood of this will increase as the weight of the glass increases. Also, there will be a 'glazing border' of approximately 10mm around the edge of the glass (flat, minimal textured area).

Please note that some Fusion Glass : Kiln Formed standard products & bespoke patterns are unable to be toughened due to the nature of the toughening process.

## DEVITRIFICATION

There is a risk of devitrification when kiln forming glass. This appears in the form of a 'milky haze' or 'wrinkles' in small areas of the glass where it has been forced into an unforgiving shape. The risk is greater when using a softer glass such as low iron or coloured glass and devitrification is more evident where a dark background or dark laminate interlayer is used. Such imperfections would not be considered a justification for rejection.

## SILVERING

When kiln formed glass is silvered, there may be discolouration in small areas due to the silvering process.

## KILN BEDS

Kiln moulds are laid down by hand and it is important to recognise the hand made nature of our product. There are different substrates that we use to obtain different results. When a sand substrate is used, there is a small risk of sand granules being fired into the textured face of the glass. When a board substrate is used, there is a limitation on the board size which is 1200mm wide. We have not yet found a manufacturer that can supply wider board than this.

There is also a risk that as the glass expands and contracts during firing, the mold will move with it producing a faint line in the finished glass if it is wider than 1200mm. Any line will be more apparent with a dark background. It is advisable to design this into the texture in the panel.

## KILN SIZES

Chelsea Artisans have kilns that can accommodate most size requirements. We will advise if your requirements do not fit our kilns.

## SURFACE DECORATED GLASS

THE FOLLOWING INFORMATION IS TO BE READ IN CONJUNCTION WITH THE FUSION GLASS : SURFACE DECORATED PRODUCT MANUALS & DATA SHEETS

Chelsea Artisans use 100 grade abrasive grit when sandblasting. We can, and do, use other grades when required but 100 grade is our standard product and will be used unless otherwise specified in writing. An additional charge may be applied if a non-standard grade finish is required.

### FLAT TONE SANDBLAST

Standard 100 grade abrasive grit sandblast across the whole sandblasted area.

### HALF TONE SANDBLAST

We are able to achieve a half tone effect. However, there is a risk that there will not be precise continuity of the degree of the half tone across the whole sandblasted area.

### DEEP SANDBLAST

Chelsea Artisans aim to achieve a consistent depth across a sandblasted area. Please note that this is a hand finished process and therefore may be slight variation dependant on design or pattern.

### PEPPERING

When deep sandblasting glass, any non-sandblasted area is protected by vinyl. The process is carried out by hand and under pressure. There is a risk that the vinyl may be penetrated by the sand if it is blasted for slightly too long. This may result in slight peppering of non-sandblasted areas.

### PROTECTIVE COATING

Once glass has been sandblasted, a protective coating will be applied. This coating bonds to the porous sandblasted surface and creates a durable protective barrier so that dirt, scuff marks and finger marks can be easily wiped off with a damp cloth. There may be subtle variations in tone and whiteness when the coating is applied.

### CLEANING

Sandblasted glass with a protective coating can be wiped clean using a damp, soft cloth. Please DO NOT use detergents or cleaning products other than those recommended by the manufacturer. Further information is available on request.

### TOUGHENED GLASS

It is possible to sandblast glass after it has been toughened. However, this would only be to a light depth. Deep etched glass will be sandblasted prior to toughening. Again, it is advisable to have a sample made prior to full production.



### SCREENPRINTED GLASS

THE FOLLOWING INFORMATION IS TO BE READ IN CONJUNCTION WITH THE  
FUSION GLASS : SCREEN PRINT PRODUCT MANUALS & DATA SHEETS

#### PRINT QUALITY

The screen print quality is very reliant upon the quality of artwork. The ideal format for artwork would be film positive. We can accept a digital image which we would turn into a film positive. However, this would be chargeable.

#### COLOUR MATCHING

Colour matching service to RAL and Pantone colours available.

#### SCREEN PRINT BED SIZE

Chelsea Artisans' screen print bed can accommodate quite small to very large pieces of glass. We will advise if your requirements do not fit our bed. More details available on the Screenprint Data Sheet downloadable from our website.

## CURVED GLASS

### TOLERANCES

Different tolerances apply to curved glass than for flat glass. The tolerance on the radius is half the thickness of the glass. For example, if the glass is 10mm thick, the tolerance is +/-5mm. If the glass is 10mm+10mm laminate i.e. 20mm nominal total thickness, the tolerance is +/-10mm.

### SIZE TOLERANCE

The tolerance on size is +/-4mm on glass up to 15mm thick and +/-5mm above that thickness.

### EDGE STRAIGHTNESS

It should be noted that in some circumstances, depending on glass curvature and thickness, there could be flat areas to the profile of the curvature.

### LAMINATED & CURVED GLASS

Curving and laminating will produce a greater 'edge step' between the panels than on flat laminated glass. This is particularly relevant where holes or notches are provided as these may need to be slightly oversized.

## UV BONDED GLASS

### TOLERANCES

Please note that tolerances on UV bonded glass are necessarily much tighter than standard tolerances. This is particularly relevant regarding edge straightness, warp and dimensions. Your requirements should be discussed in detail.

### WET AREAS AND MOISTURE

Chelsea Artisans use a standard UV adhesive when bonding glass. If you are specifying/ ordering UV bonded glass for a wet or high moisture area, please advise at the earliest opportunity as a specific adhesive will need to be used for these areas.

EDGE WORK, HOLES, CUT-OUTS & NOTCHES - DIAMOND SYSTEM

When cut outs are formed in glass, e.g. for socket outlets, light switches or plumbing fixtures, stresses are put onto the glass which can cause it to break without obvious reason. However, when cut outs are unavoidable please ensure the following points are considered:

- Any electrical switch plate/lift call button or fitting which is mounted over the face of the glass must be installed in a manner that does not exert any pressure on to the face of the glass. This can be achieved by ‘sleeving’ the fastenings so that any tightening pressure is carried through to the back box or substrate. The sleeves should ideally be tubular and sized to a length that is just proud of the face of the glass by approximately 1mm.
- Mounting screws are sometimes located in the vertical or horizontal centre line of the fixture, and can cause the plate to rock. Where this occurs, it is recommended that supports are provided at each corner. This can be achieved simply by the use of self-tapping or machine screws set and adjusted to project 1mm in front of the face of the glass, preventing closure of the plate under pressure against the glass.

These measures will reduce the risk of breakage, but not entirely eliminate it, as any impact could trigger a stress that could break the glass.

PLEASE NOTE THAT DIAMOND DÉCOR® AND DIAMOND MIRROR® GLASS PRODUCTS HAVE BEEN DESIGNED TO BREAK SAFELY, AND REMAIN IN PLACE UNTIL REPLACEMENT CAN BE CARRIED OUT.

FIGURE 6 - MIN. DISTANCE BETWEEN HOLE & EDGE OF PANEL

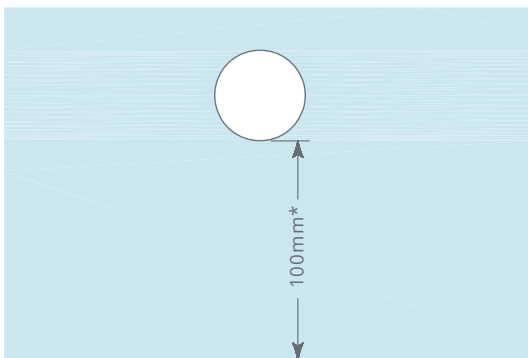


FIGURE 7 - MIN. DISTANCE BETWEEN TWO HOLES

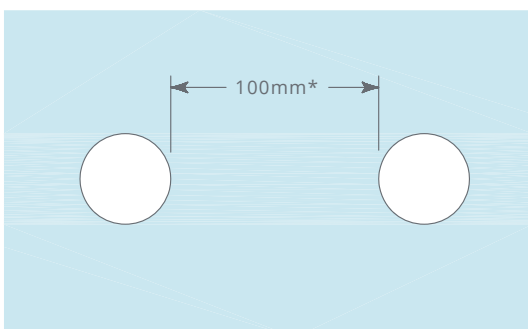
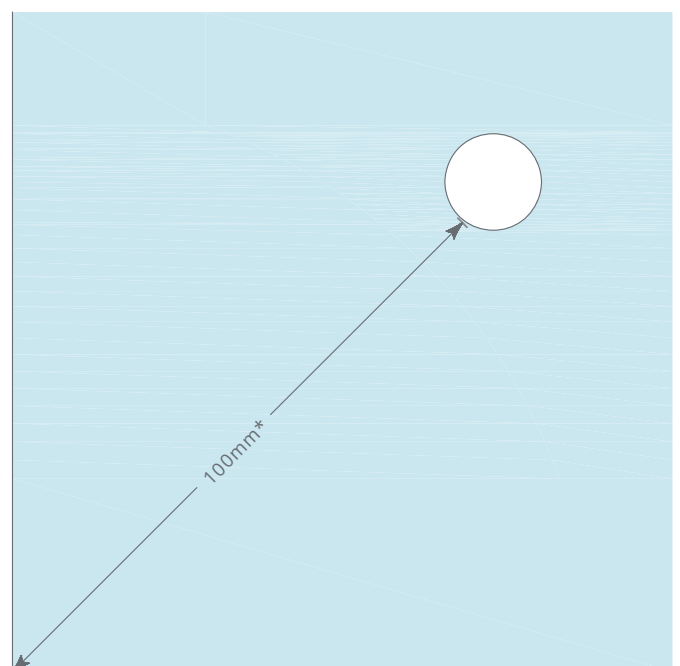


FIGURE 8 - RELATIONSHIP BETWEEN HOLE & CORNER OF PANEL



\* Chelsea Artisans to be consulted if distance to hole is less than 100mm



**EDGE WORK, HOLES, CUT-OUTS & NOTCHES**

**EDGE WORKING OF GLASS TO BE THERMALLY TOUGHENED**

The simplest type of edge working is the arrised edge (see Figure 9). Common types of edge working on thermally toughened glass are shown in Figures 10 & 11. Common types of edge work on kiln formed glass are shown in Figures 12-14.

For specialist edge work, such as ‘water jet cutting’, Chelsea Artisans should be consulted.

FIGURE 9 - CLEAN CUT & HAND ARRISED EDGE

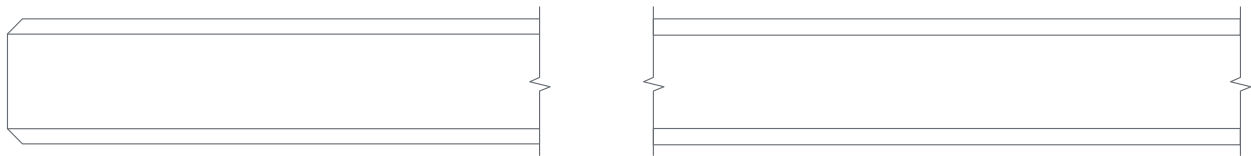


FIGURE 10 - GROUND ALL ROUND (GAR) EDGE

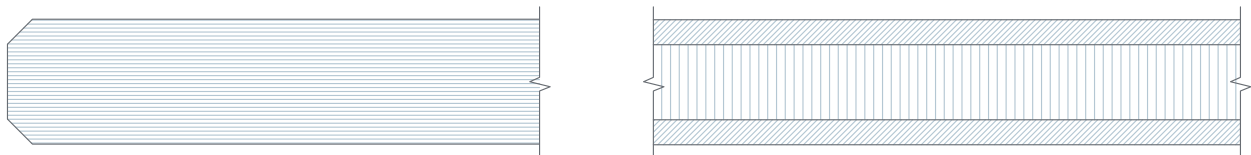
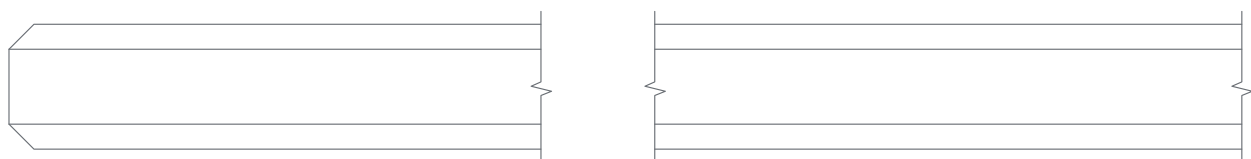


FIGURE 11 - POLISHED ALL ROUND (PAR) EDGE



**EDGE WORKING OF KILN FORMED GLASS**

FIGURE 12 - BOUND EDGE

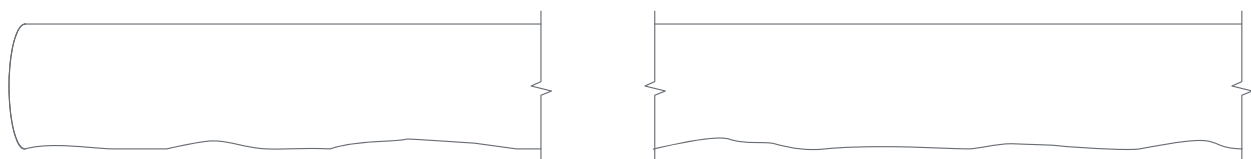


FIGURE 13 - FIRE POLISHED EDGE

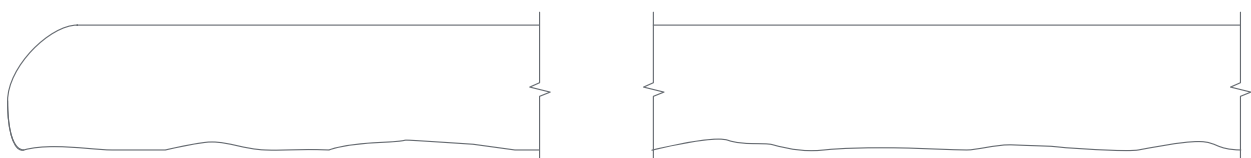
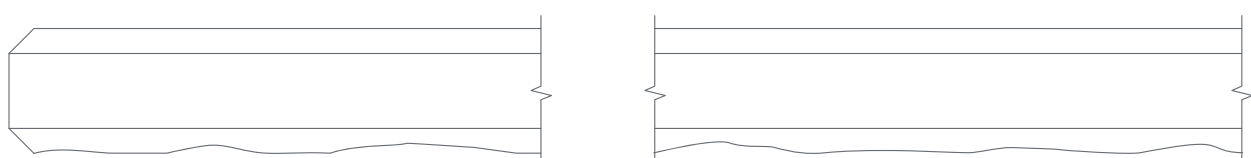


FIGURE 14 - POLISHED ALL ROUND (PAR) EDGE



**PROFILED EDGES**

Various other edge profiles can be manufactured with different types of edgework. Chelsea artisans to be consulted.

ROUND HOLES

This standard considers only round holes in glass that is not less than 4mm nominal thickness. Chelsea Artisans should be consulted about edge working of holes.

The diameter of holes,  $\emptyset$ , shall not, in general, be less than the nominal thickness of the glass. For smaller holes, Chelsea Artisans should be consulted.

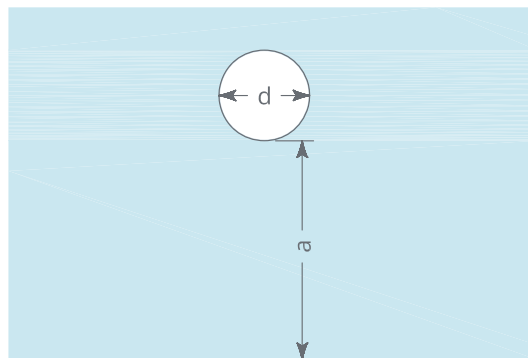
In general, the limitations on the positions of holes either relative to the edges of the glass panel, the corners of the glass panel or to each other depends on:

- the nominal glass thickness (d)
- the dimensions of the panel (W, H)
- the hole diameter ( $\emptyset$ )
- the shape of the panel
- the number of holes

The recommendations given below are those which are normally available and are limited to panels with a maximum of 4 holes.

1) The distance, a, of the edge of a hole to the glass edge should be not less than 2d.

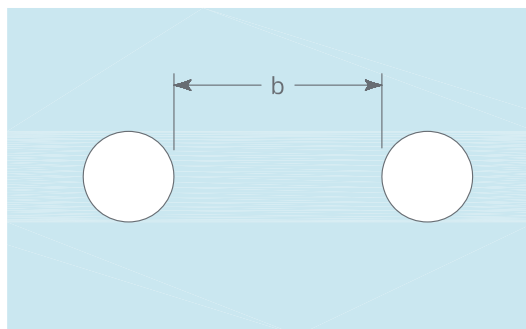
FIGURE 15 - RELATIONSHIP BETWEEN HOLE & EDGE OF PANEL



$$a \geq 2d$$

2) The distance, b, between the edges of two holes should be not less than 2d.

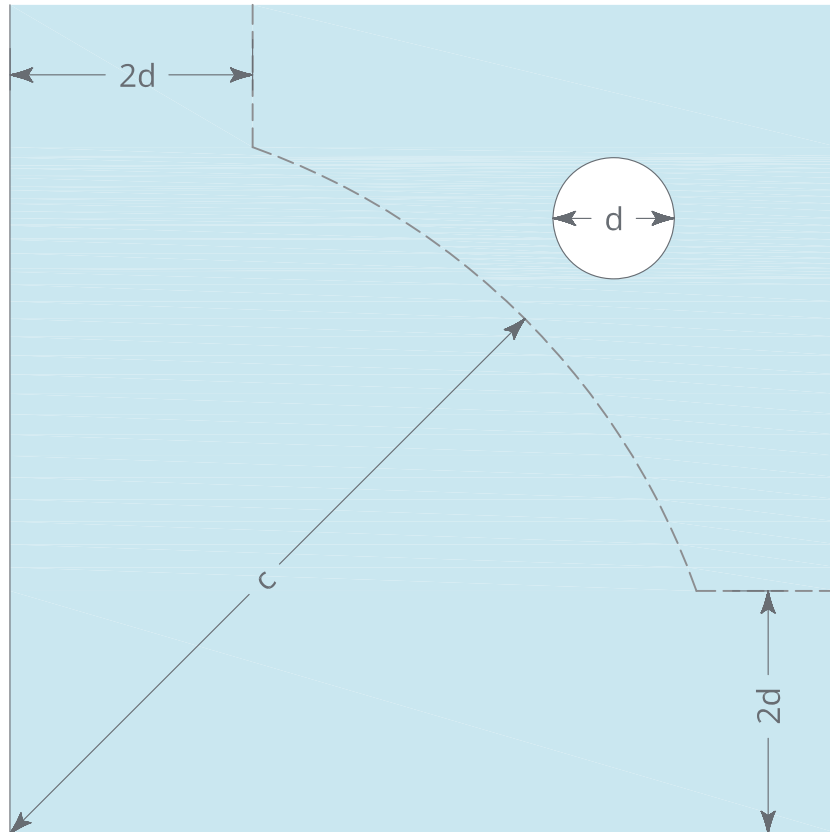
FIGURE 16 - RELATIONSHIP BETWEEN TWO HOLES



$$b \geq 2d$$

3) The distance,  $c$ , of the edge of a hole to the corner of the glass should be no less than  $6d$ .

FIGURE 17 - RELATIONSHIP BETWEEN HOLE & CORNER OF PANEL



$c \geq 6d$

NOTE: If one of the distances from the edge of the hole to the edge of the glass is less than 35 mm, it can be necessary to position the hole asymmetrically with respect to the corner. Chelsea Artisans should be consulted.

TOLERANCES ON HOLE DIAMETERS

The tolerances on diameters of holes are given in Table 9.

TABLE 9 - TOLERANCE ON HOLE DIAMETERS

NOMINAL HOLE DIAMETER (Ø)	TOLERANCE
Ø4mm to Ø20mm	+/- 1mm
Ø20mm to Ø100mm	+/- 2mm
Over Ø100mm	Consult Chelsea Artisans

**TOLERANCES ON POSITION OF HOLES**

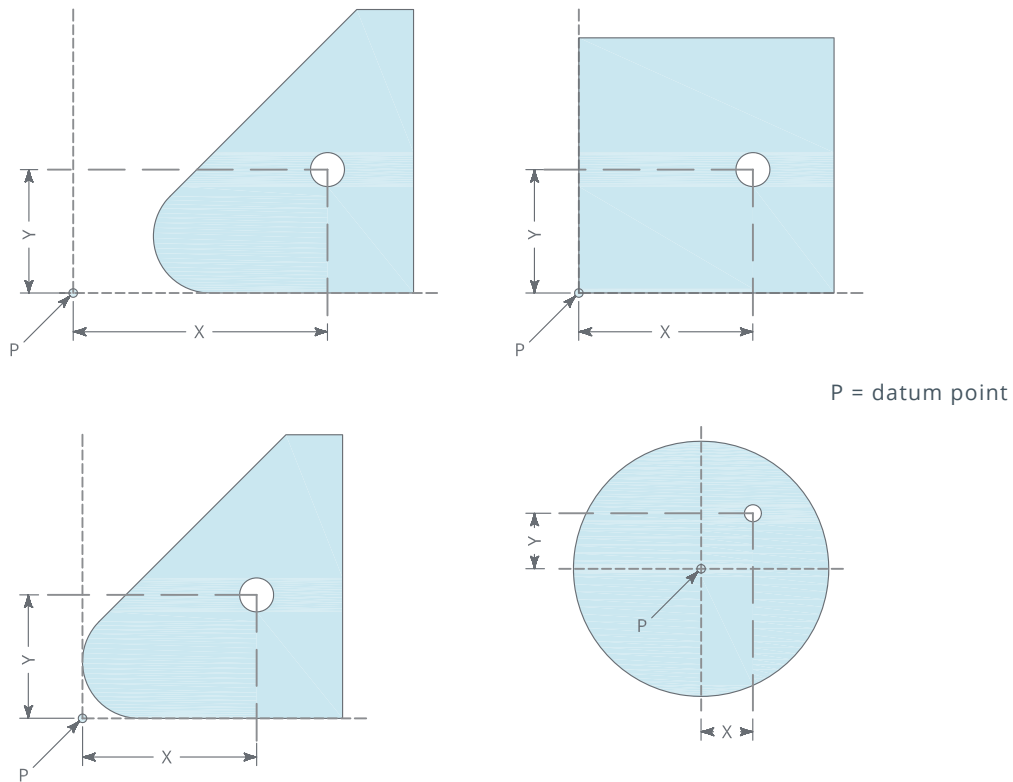
The tolerances on positions of holes are the same as the tolerances on the width (W) and the length (H) - see Table 2.

The positions of holes are measured in two directions at right angles (x- and y- axes) from a datum point to the centre of the holes. The datum point is generally chosen as a real or virtual corner of the panel (see Figure 18 for examples).

The position of a hole (X,Y) is  $(x \pm t, y \pm t)$ , where x and y are the required dimensions and t is the tolerance from Table 2.

NOTE: Chelsea Artisans should be consulted if tighter tolerances on hole positions are required.

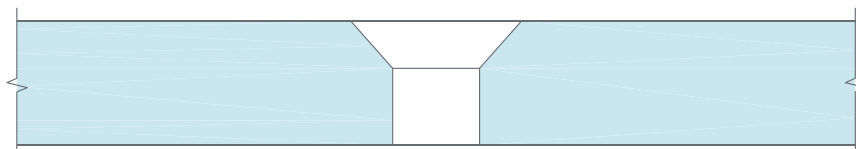
FIGURE 18 - EXAMPLES OF THE POSITIONING OF HOLES RELATIVE TO THE DATUM POINT



**HOLES/OTHERS**

There are available countersunk holes, see Figure 19. Chelsea Artisans to be consulted for the tolerances on hole position, hole shape/dimensions and edge work.

FIGURE 19 - COUNTERSUNK HOLE



NOTCHES AND CUT-OUTS

Many configurations of notches and cut-outs can be manufactured, for examples see Figures 20a and 20b.

FIGURE 20a - EXAMPLES OF NOTCHES

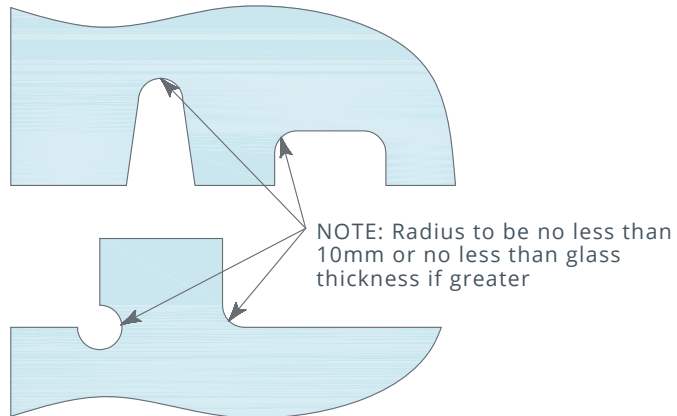
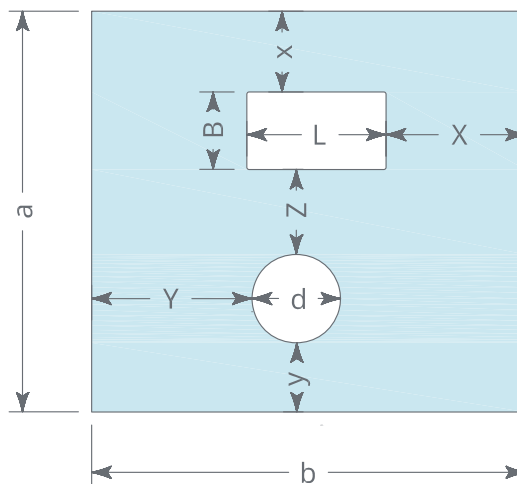


FIGURE 20b - EXAMPLES OF CUT-OUTS



Limitations on cut-outs as shown in figure 20b:

- $B, L$  and  $D < a/3$  or  $b/3$  whichever is the smaller
- $X$  and  $x$  no less than the smaller of  $L/2$  or  $B/2$
- $Y$  and  $y$  no less than  $D$
- $Z$  no less than the larger of  $B/2$ , or  $L/2$  and  $D/2$

Chelsea Artisans should be consulted about edge working of notches and cut-outs.

SHAPED PANES

Many non-rectangular shapes can be manufactured and Chelsea Artisans should be consulted.

## OPTICAL QUALITY & COLOUR

Chelsea Artisans purchase glass from reputable and recognised glass suppliers with excellent quality records. However, we are unable to control or guarantee any slight differences in the colour, tone or optical quality of any glass that is supplied to us. This may be more pronounced between different batches of glass.

The nature of the processes that we employ (sandblasting, kilnforming, laminating, painting, screen printing, uv bonding) does influence the optical quality of glass. This should be discussed with us when specifying our products.

NOTE: It is always very important to consider the effect that lighting will have on the product.

This section covers optical quality i.e. distortion of the glass which is visible in reflection; visual quality, i.e. defects on or within the glass which can be seen in transmission; and colour consistency, i.e. changes in hue, which can be seen in either transmission and/or reflection.

The toughening process will inevitably result in a product with lower optical quality than that of the glass from which it was produced.

### **DISTORTION**

Surface distortion is produced by a reduction in the surface flatness, which can be seen particularly in reflection. This can be exacerbated when the glass used is body tinted, surface coated (including post-toughening coating) or enamelled and/or incorporated into insulating glass units.

#### **ROLLER WAVE**

While the hot glass is in contact with the rollers during the toughening process (horizontal only), a surface distortion is produced by a reduction in surface flatness, known as roller wave. Roller wave is generally noticed in reflection.

#### **ROLLER PICK-UP / PLUCK**

Thermally toughened glass may show signs of small imprints in the surface (roller pick-up/pluck). This is a result of the length of time the glass spends in the furnace and therefore the thicker the glass the more pronounced this could be.

#### **ANISOTROPY (IRIDESCENCE)**

The thermal toughening process produces areas of different stress in the cross section of the glass. These areas of stress produce a bi-refracting effect in the glass, which is visible in polarised light.

The viewing of thermally toughened under polarized light results in areas of stress showing up as coloured zones. These zones are, known as "leopard spots". Polarised light occurs in normal daylight. The amount of polarized light depends on the weather and the angle of the sun. The bi-refracting effect is more noticeable either at a glancing angle or through polarized spectacles.

## BODY FAULTS

The number, size and distribution of seeds, bubbles, etc. are defined for the glass under consideration in the appropriate parts of BS EN 572. No change will occur as a result of the toughening process. Assessment of body faults should be undertaken using the method/criteria given for the basic glasses in the appropriate parts of BS EN 572.

## SURFACE FAULTS

Toughened safety glass shall be deemed acceptable if the following phenomena are neither obtrusive nor bunched: hairlines or blobs; fine scratches not more than 25mm long; minute imbedded particles. Obtrusiveness of blemishes shall be judged by looking through the glass, not at it, when standing at right angles to it on the room side at a distance of not less than 3m in natural daylight and not in direct sunlight. The area to be viewed is the normal vision area with the exception of a 50mm wide band around the perimeter of the glass. Pattern ghosting can occur on glasses with a textured finish.

## COLOUR

### CLEAR GLASS

Clear glass from different manufacturers may show differences in hue.

### BODY TINTED GLASS

Toughening will not produce any significant variation in colour. However, if a piece of toughened body tinted glass is placed next to a piece of annealed body tinted glass there may be a discernible difference.

A far larger problem will occur if different thicknesses of body-tinted glass are placed side by side as the colour is throughout the glass thickness. This can occur in those areas where toughened safety glass is required and an attempt is made to use the increased strength of the toughened safety glass by reducing the thickness of the glass. Body tinted glass from different manufacturers, or from different batches from the same source manufacturer can show different shades.

### SURFACE COATED GLASS

As a general rule those surface coated glasses which can be toughened may exhibit different visual characteristics or a slight colour variation as a result of toughening. Care should be taken to ensure that the coated surface is not contaminated before toughening by, for example oil, grease, sweat, etc, as these materials may be burnt in during the toughening process. This could produce patches on the coating where there is a significant colour variation.

Glass, which is coated after toughening, will be within the same manufacturers colour tolerance as coated annealed glass.

### SCREEN PRINTED GLASS

With this product the 'colour' results from the firing in of a ceramic frit. No colour variation will result from the toughening process itself.

### SHADE VARIATION / REPLACEMENT PANELS

When supplying replacement or additional panels there may be a colour shade variation as the material to be supplied will be from a current product batch. Although due care and attention will be taken when replacing the panels, we cannot be held responsible for any damage to adjacent panels/surfaces. Any additional panels required will be chargeable.

## ARTWORK

### SCANNED IMAGES

These should ideally be 300 dpi or higher if possible. Please make sure that de-screening has been applied and that any necessary adjustments to the image(s) have been made prior to sending to our Design Team. Should you require us to perform any scanning or digital manipulation of the images, please specify in advance.

### ORIGINAL ARTWORK

Any hand-drawn illustrations or technical drawings can be supplied. It is suggested that copies are made for your reference in the event that we cannot return the original artwork.

### POSITION OF ARTWORK ON GLASS

Artwork is always laid down by hand. The tolerance for the position of the artwork on the glass is +/-5mm.

### COLOUR PROOFS

We recommend that you supply a printed proof of your artwork. Please specify any sizes and Pantone or CMYK colour references, if applicable, on the proof.

### RECOMMENDED FILE FORMATS FOR ELECTRONIC DATA

Photoshop CS6: PSD, EPS, TIFF

Illustrator CS6: AI, EPS (with embedded fonts & any linked images)

AutoCAD 2015 (PC only): DWG, DXF

Quark Xpress 4: QXD, EPS (With fonts & images)

#### Ideal File Format

Vector artwork is the most suitable file format, such as Illustrator or Freehand and at 1:1 scale if possible. Bitmap files are acceptable, however you must allow a reasonable period of time for the artwork to be translated into vector format.

### ACCEPTED FILE MEDIA

CD-ROM (Mac/PC)

DVD-ROM (PC only)

Email (Up to 10mb)

Online file storage/delivery system (an FTP site or [www.dropsend.com](http://www.dropsend.com) for example)

Removable device (Memory stick)



**VISUAL INSPECTION**

**GENERAL GLASS INSPECTION METHODS**

Chelsea Artisans shall, in principle, adopt 'The Glass and Glazing Federation Recommended Standards' for inspection as follows:

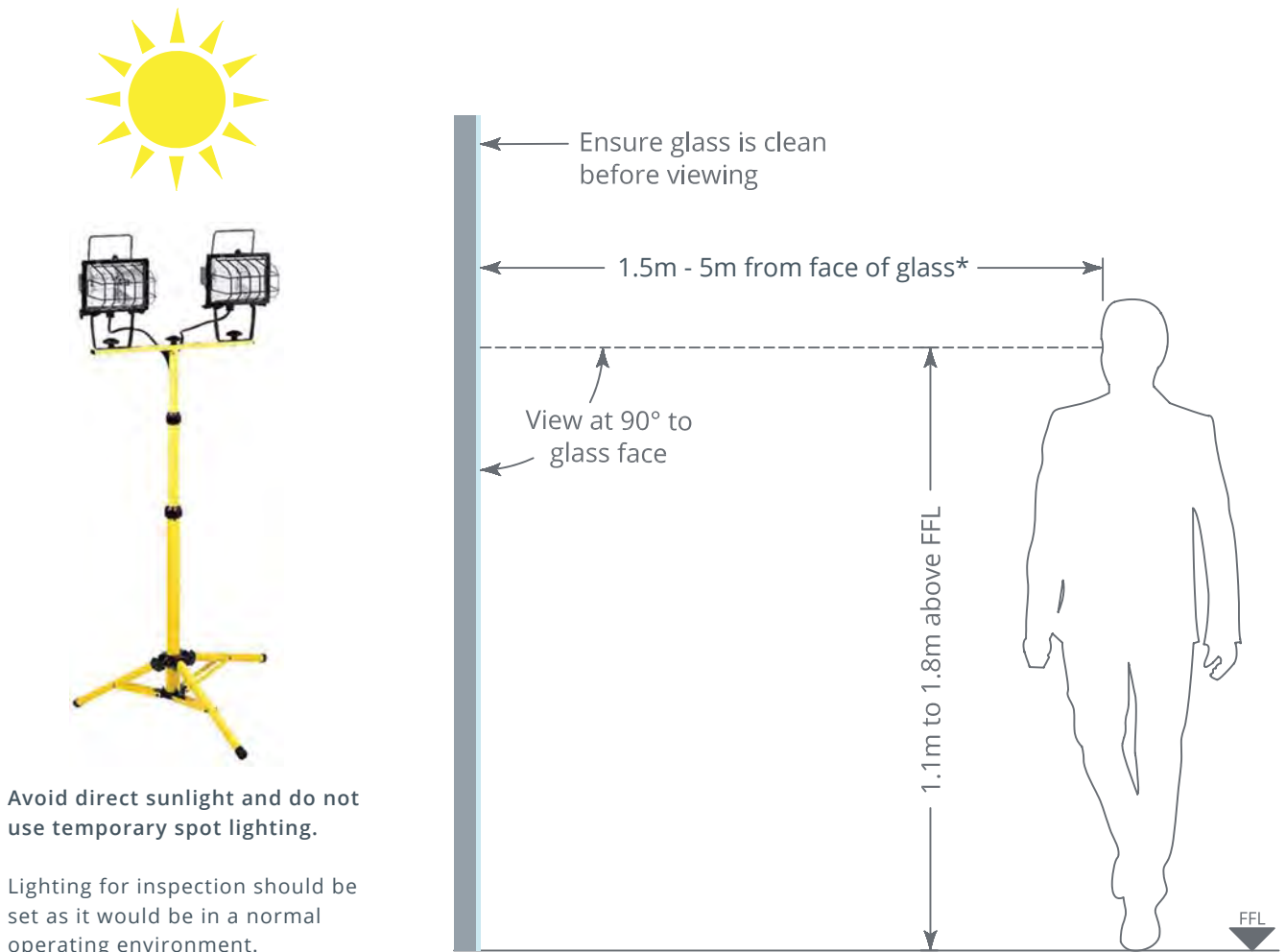
When assessing surface faults the panel is to be observed from a distance of 1.5m under normal daylight conditions. The angle of observation is to be 90° to the glass surface, i.e. normal incidence; the pane is to be vertical.

If the panel is back lit by artificial lighting this lighting should be set as it would be in a normal operating environment, i.e. task lighting and site spot lighting will not be an acceptable substitute. The glass should also be observed from the public side, i.e. for example the corridor side and should have been previously cleaned in accordance with the manufacturer's instructions. Where possible the viewing angle should be taken from head height of 1.8m from finished floor level.

The pane of glass is deemed to be acceptable if the faults described alone are not readily viewed when seen in transmission. Small faults whether singularly or in groups should be viewed depending upon the glass type and difficulty of installation and its processing.

It is Chelsea Artisans' intention that the regulations will be applied fairly and across the board.

FIGURE 21 - VISUAL INSPECTION METHOD



Avoid direct sunlight and do not use temporary spot lighting.

Lighting for inspection should be set as it would be in a normal operating environment.

\* Viewing distances vary - please see p.08 for Mesh Laminate viewing distance

## GENERAL MASTIC INSPECTION METHODS

In general the surface of the mastic will be smooth and free from contamination and mechanical defects. The specified mastic shall be inserted to form a monolithic joint, containing none of the faults shown in the diagram on this page.

The joint should, within reason, be contained within the arrises of the sheets of glass. No surface contaminations to the glass or manifestation with overspill of mastic will be acceptable. The mastic joint should not be applied over cracks or deformities i.e. shells in the glass. It is the specialist's duty to inspect the glass before applying the mastic.

Where practical, no ties or toggles will be inserted within the 'Eye Zone' i.e. 1.1m to 1.8m above floor level. All mechanical toggle holes shall be cut back and filled with an identical mastic from the same batch, if possible. All 'best endeavors' shall be used to infill the void so as to minimize differential to the bulk of the joint.

The recognized industry standards shall be adopted for inspections as follows:

When assessing mastic joints the glass is to be observed from a distance of 1.5m under normal daylight conditions. The angle of observation is to be within a 150° arc centred at 90° to the glass surface, the panel is to be vertical.

The lighting levels should be set as it would be in a normal operating environment, i.e. task lighting and site spot lighting will not be an acceptable substitute. The mastic joined glass should have been previously cleaned in accordance with the manufacturers' instructions. Where possible the viewing angle should be taken from head height of 1.8m from finished floor level.

The mastic joint is deemed to be acceptable if the faults described below are not readily viewed when seen face on and in transmission through the edges of the glass. Small faults whether singularly or in groups should be viewed depending upon the difficulty of installations.

It is Chelsea Artisans' intention that the regulations will be applied fairly and across the board.