

# TempaGLAS<sup>TM</sup>

## TOUGHENED SAFETY GLASS



# AC YULE

*TempaGLAS TOUGHENED SAFETY GLASS*

**TempaGLAS** Toughened Safety Glass is manufactured to comply with BS 6206: 1981 (1994) Class A and can be used to satisfy the safety glazing requirements of BS 6262: Part 4: 1994.

### DESCRIPTION

**TempaGLAS** is four to five times stronger than ordinary glass of the same thickness and when broken, breaks safely into small relatively harmless pieces which are unlikely to cause severe injury. This principle is used in many car windscreens. AC Yule manufacturers **TempaGLAS** in its modern tempering facility and a very high quality product is assured. 4mm and 6mm clear and body tinted float glasses are manufactured to BS 6206 Class A under BSI Kitemark License No: KM 10948. Other types and thickness of **TempaGLAS** are manufactured in accordance with BS 6206 Class A.

### APPLICATION

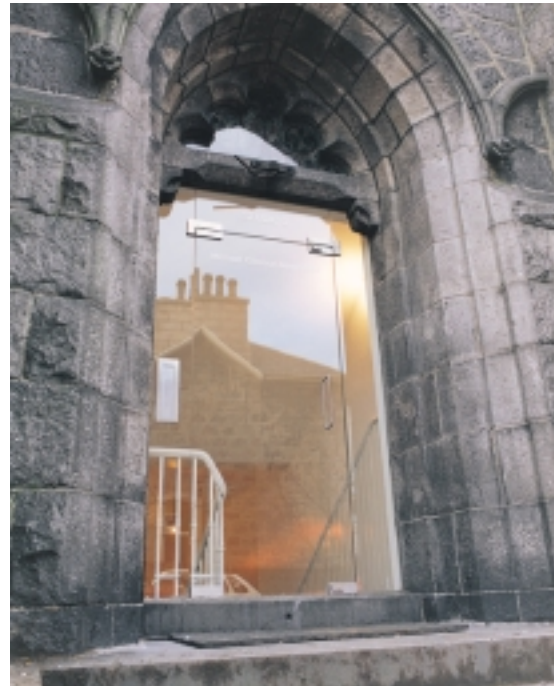
BS 6262: Part 4: 1994 recommends the use of safety glass in situations where a risk of human impact can result. Such situations include fully and half glazed doors and side lights, low level glazing below 800mm off floor level, balustrades, shower screens and bath panels.

It is also prudent to use safety glass in areas where a particular risk arises: e.g. schools, hospitals, squash courts and buildings where the general public have access: cinemas, theatres, airports, museums.

**TempaGLAS** meets the requirements of BS 6262: Part 4: 1994 and can be used in any of the above situations. **TempaGLAS** Toughened Safety Glass also satisfies safety glass characteristics required by Regulation 14 of the Workplace (Health, Safety and Welfare) Regulations 1992.

### MANUFACTURE

Most types of annealed glass can be toughened. Annealed glass is heated to approximately 630°C and then cooled rapidly with a controlled blast of air. This process creates a comprehensive stress on the surface of the glass which is balanced by a tensile stress in the centre of the glass.



### STANDARDS

The following British Standards are relevant to this product

BS 952: Part 1: 1995 Part 2: 1980	Glass for glazing Classification Terminology for work on glass.
BS 6206: 1981 (1984)	Specification for impact performance requirements for flat safety glass and safety plastics for use in buildings.
BS 3193: 1993	Specification for thermally toughened glass panels for use in domestic appliances.
BS 857: 1967 (1990)	Specification for safety glass for land transport.
BS 5516: 1991	Code of practice for design and installation of sloping and vertical patent glazing.
BS 6262: 1982	Glazing for buildings.
Part 4: 1994	Code of practice for safety, Human Impact.
BS 6180: 1995	Code of practice for barriers in and about buildings.

## WORK ON TOUGHENED GLASS

All edgework, drilling, surface decoration, notching and holes must be carried out prior to the toughening process. Any attempt to carry out work of this nature creates an imbalance of the stresses that give toughened glass its characteristics and breakage results. Normally the minimum finish for **TempaGLAS** is an arrissed edge, however, certain smaller panels may be toughened with clean cut edges. Polished edges and even bevelled edges within set criteria, can be supplied. (Small panels not arrissed).

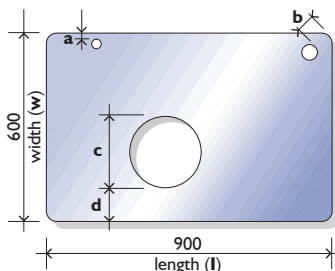
**Holes** - Holes may be drilled for fixings, handles or letter plates. All holes have a ground finish with an arriss on both faces. The minimum hole diameter is equal to the glass thickness and the maximum size is one third of the width of the sheet. The minimum distance between a hole and the edge of the glass is one and a half times the thickness of the glass for 8-19mm glass, and near a corner, four times the thickness of the glass. Tolerance on positioning of holes is  $\pm 1$ mm.

**Notches** - Various shapes can be cut to accept fittings and locks. Edges are ground with an arriss. Internal corners are rounded to a radius of not less than the glass thickness and external corners are dubbed. Tolerance on notch dimensions is  $0 + 2$ mm and on position relative to the edge of the glass is  $\pm 2$ mm.

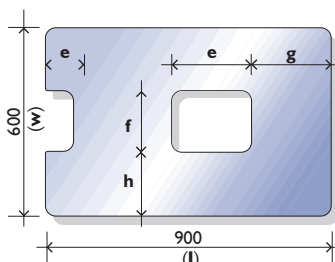
**Cut-outs** - All cut-outs have a ground finish with an arriss on both faces. The maximum dimensions of a cut-out are one third of the width of the sheet and one third of the length. The minimum distance between a cut-out and the edge of the glass is a half of the dimension of the cut-out on the same axis. Cut-outs must have a rounded, internal corner with a diameter not less than the thickness of the glass. The minimum rectangular shaped cut-out is twice the glass thickness.

**Surface decoration** - Designs and lettering which are silk screened prior to the toughening process and are fired

## MAXIMUM AND MINIMUM SIZES



- a - min. from any edge of glass to edge of hole = 4.5 or 6.0mm = 1.5 x thickness of glass  
8-19mm = 2 x thickness of glass.
- b - min. from corner to edge of hole 4 x thickness of glass.
- c - min. diameter = thickness of glass  
max. diameter =  $w \div 3$   
example  $600 \div 3 = 2$
- d - min. = diameter of hole  $\div 2$   
example  $200 \div 2 = 100$
- e - min. size = 2 x thickness of glass  
max. size =  $l \div 3$   
example  $900 \div 3 = 300$
- f - min. size = 2 x thickness of glass  
max. size =  $w \div 3$   
example  $600 \div 3 = 200$
- g - min. size =  $e \div 2$   
example  $300 \div 2 = 150$
- h - min. size =  $f \div 2$   
example  $200 \div 2 = 100$



**Note:** Edges are ground with an arriss. Internal corners are rounded to a radius of not less than the thickness of the glass and external corners are dubbed.

into the surface of the glass during the process can be used for company names, logos, decorative designs, advertising features, or to provide obscurity for privacy. It is often the case that a glass panel is not readily noticeable and some type of design may be needed to draw attention to its presence to reduce the risk of accidental impact.

## PRODUCT RANGE MAXIMUM SIZES

GLASS TYPE	NOMINAL THICKNESS mm	MAXIMUM SHEET SIZE mm
<b>TempaGLAS 'K'</b> Low Emissivity Float	4	2080 x 3000
	6	2080 x 4200
<b>TempaGLAS Clear Float</b>	4	2080 x 3000
	5	2080 x 4200
	6	2080 x 4200
	8	2080 x 4200
	10	2080 x 4200
	12	2080 x 4200
	15	2080 x 3180
19	2080 x 3180	
<b>*TempaGLAS white patterns</b> Arctic, Autumn, †Brisa, Chantilly, Cotswold, Driftwood, Everglade, Flemish, Florielle, Linkon, Mayflower, Minster, Pelerine, Reeded, Stippolyte, Sycamore, Taffeta, Warwick	4	†Brisa 1800 x 3000
	4	1320 x 2140
	6	1320 x 2140
<b>Pilkington's "Oriol" Collection</b> Brocade, Canterbury, Laurel, Ravenna	4, 6	1320 x 2140
<b>TempaGLAS Solar Control Float</b> Antisun Bronze 61/70 Antisun Bronze 50/62 Antisun Bronze 33/51 Antisun Bronze 27/47 Antisun Grey 54/69 Antisun Grey 41/61 Antisun Grey 24/50 Antisun Grey 18/46 Reflectafloat (Silver) 33/53	4	2080 x 3000
	6	2080 x 4200
	10	2080 x 4200
	12	2080 x 4200
	4	2080 x 3000
	6	2080 x 4200
	10	2080 x 4200
	12	2080 x 4200
	6	2080 x 4200

**Large sizes** - It is possible to supply panels up to 4500mm in length. All enquiries regarding glass of greater length than the normal maximum i.e. 4200mm should be submitted to our head office for approval.

**Minimum size** - The smallest glass size available is 100 x 250mm.

**Circular shapes** - Clear float glass, of all thickness can be toughened up to 2080mm in diameter. The minimum diameter for circular shapes is 250mm. Most other types of glass can be toughened within these size limitations.

**Irregular shapes** - Irregular shapes can usually be toughened provided their dimensions fall within the maximum sizes tabulated for rectangular shapes and the outline is not too complex. A hard template must be submitted for approval prior to placement of an order.

**Decorated glass** - Enquiries must be submitted for all silk-screened, mitred, bevelled, embossed or sandblasted toughened glass.

\*Due to the varying thickness of some patterned glass, they may not demonstrate break characteristics which comply with the requirements of BS 6206.

If patterned glass that complies with BS 6206 is required this must be clearly specified at time of order.

All types of patterned glass will be appropriately marked i.e with or without a reference to BS 6206, whichever case applies.

## PROCESSING TOLERANCES

Dimensional Tolerances (Thickness overall dimensions and weight)

<i>TempaGLAS</i> Toughened Safety Glass				
TOLERANCES THICKNESS MM	NOMINAL THICKNESS MM	PATTERNED MM	SIZE ARRISSED MM	WEIGHT KG/M <sup>2</sup>
4	3.8 - 4.2	3.5 - 4.5	-2 + 1	10.0
5	4.8 - 5.2		-2 + 1	12.5
6	5.8 - 6.2	5.5 - 6.5	-2 + 1	15.0
8	7.7 - 8.3		-2 + 1	20.0
10	9.7 - 10.3		-2 + 1	25.0
12	11.7 - 12.3		*	30.0
15	14.5 - 15.5		*	37.5
19	18.0 - 20.0		*	47.5

\* Toughened glass in thicknesses greater than 10mm requires a higher standard of edge finish. Dimensional tolerances for such thicknesses depend on the final application.

## FLATNESS TOLERANCE

A degree of bow may be introduced to a glass panel owing to nature of the toughening process, but generally this is kept to a minimum by utilising the type of plant that produces **TempaGLAS** Toughened Safety Glass. Bow is measured as the maximum difference between the true vertical line and the concave surface of the glass held in a vertical position at quarter points.

The maximum bow is 1mm per metre up to 1 metre dimension and 2mm per metre for dimensions greater than 1 metre.

## APPEARANCE

**TempaGLAS** Toughened Safety Glass is virtually indistinguishable from ordinary annealed glass of the same type and thickness when viewed under normal conditions. Some slight distortion of images in reflection may occur however.

**TempaGLAS** is branded indelibly with the standard relevant to it, namely, BS 6206: Class A when intended for building work. Any special positioning of the brand mark must be specified to order. As stated above, some types of patterned glass do not comply with the break characteristics of BS 6206 and are marked accordingly. Please contact Glass & Glazing Division for patterned glass types that do comply if this is a requirement.

## PERFORMANCE

### STRENGTH

**Tempaglas** is four to five times stronger than ordinary annealed glass of the same thickness and consequently a reduction in the thickness of the tempered glass compared with that necessary for annealed glass may be possible.

## WIND LOADING

Reference to BS 6262 should be made prior to specification of glass types and sizes that are to be subject to wind loading. The design of glazing subject to such loadings is usually calculated to restrict deflection to a visually acceptable degree rather than strength.



## IMPACT STRENGTH

All **TempaGLAS** Toughened Safety Glass is manufactured to comply with BS 6206: Class A. The test in BS 6206 stipulates that a 45kg leather bag filled with lead shot swung against a test panel from a height of 1219mm must either not break or break safely. For a test panel to break safely, the granules resulting from breakage must be less than a certain size and have sufficiently dulled edges so as to greatly reduce the risk of serious injury.

## FRACTURE

**TempaGLAS** will break when the static or impact load bends the glass sufficiently to overcome the compressive stress and put the surface into tension and exceed its breaking stress. It can also break when the severe impact of a sharp object penetrates the compressive stresses in the surface. Deep scratches may have this effect and cause fracture when glass is subsequently loaded.

## THERMAL STABILITY

**TempaGLAS** can be used in all climates. It can withstand heat up to 295°C and extreme cold for long periods. It can also resist large, sudden temperature changes. This characteristic is particularly advantageous where solar control glasses are subject to large thermal stresses imparted by solar radiant heat being absorbed in the thickness of the glass, and the edge of the pane being kept cool behind the glazing beads. In this situation it is likely that ordinary annealed glass would fracture, but this risk is eliminated using **TempaGLAS** Solar Control Glasses.



## SITework

**TempaGLAS** Toughened Safety Glass panels must be carefully inspected prior to installation to ensure no surface or edge damage has occurred.

Once tempered, panels cannot be worked or cut in any way.

## HANDLING

Edges and corners are vulnerable during handling and storage, and care must be taken to ensure necessary protection is provided during installation.

## STORAGE

**TempaGLAS** Toughened Safety Glass should be stored at an angle of between 3° and 6° from the vertical with sufficient lateral support to prevent bowing, in a clean, dry ventilated space. The panels should be set on strips of wood or other soft material and contact with hard materials should be avoided.

## GLAZING

Glazing and fixing techniques should comply with the recommendations of BS 6262: 1982.

## MAINTENANCE

As with ordinary annealed glass, **TempaGLAS** should be washed down with clean water upon installation to remove abrasive dust. Normal cleaning solvents may be used to remove glazing compound grease and finger marks.

Thereafter a mild liquid detergent should be used to keep the glass surface clean.

**TempaGLAS**<sup>®</sup> Toughened Safety Glass



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