

Tempered/Toughened Glass

Meeting Your Aesthetics Needs

Tempered/Toughened safety glass®

Safety glass: protect yourself from injury for complete peace of mind

Description

Noval safety glass is a thermally toughened safety glass, the toughening process provides a significantly increased resistance to mechanical and thermal stresses than conventional annealed glass, if fragments safely into small pieces with dulled edges. Furniture



Appliance

- Doors: Noval safety glass can be used for various types of internal and external and glazed doors .
- Glass assemblies: the sheets of glass are joined together
- Using metal elements to create glass assemblies for the following applications:
- Doors
- Shop windows
- Commercial entrances
- Noval safety glass is required for use in table tops, shelving, furniture etc .in the home to reduce the risk of breakage and injury.
- Street furniture: telephone boxes, bus shelters, signs etc. can also be built using safety glass.
- Facades, overhead glazing, spandrel panels: some applications require the use of safety glass, Toughened glass for safety reasons or to provide resistance against thermal and mechanical stresses.



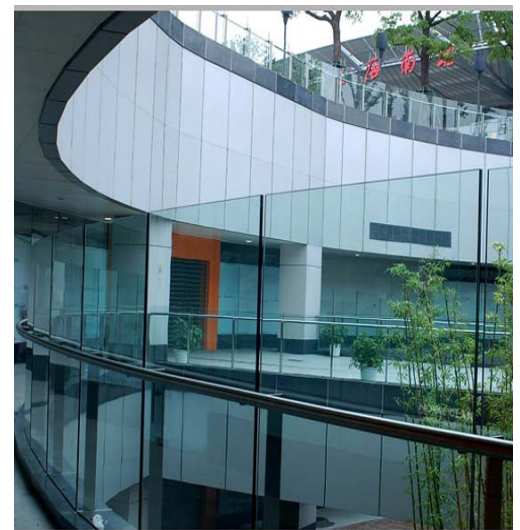
Advantage

- **Fragmentation:**
If the glass break, Noval safety glass considerably reduces the risk of injury as it fragments into small pieces with dulled edges.
- **Increased resistance to metrical**
Stresses: the impact resistance and bending strength of Noval safety glass is 5 times that of ordinary annealed glass of the same thickness.
- **Increased resistance to tresses:** Noval provides greeter resistance to thermal stresses than annealed glass.
- **Large glass assemblies:** Noval safety glass, joined together using metal elements, can be used for large glazed areas ,to minimize the appearance of support structures .
- **Transparency:** Noval safety doors help improve lighting in corridor or rooms that are far from external window.
- Noval has the same spectrophotometer prophetic as the base product of the same thickness, prior to undergoing heat treatment.

Range

If no information is given as to the tray of glass used for producing Noval safety glass, the base product is assumed to be Noval clear float glass. Otherwise the name of the base product is added after the name (for example: made using is called Noval safety glass, Most NOVAL GLASS products can be toughened or are available in a toughened version, except for:

- Blown glass or certain drawn glasses
- Certain references in the Noval decorative glass range
- Produces for which toughening intrinsically changes the characteristics and performance of the produce (e. g .the toughened versions of Noval safety glass have different levels of resistance to certain types of impact from the no toughened version).



Noval Heat-soak Testing

To reduce the risk of toughened glass spontaneously breaking due to the presence of critical nickel sulphide (NIS) inclusions in the sheets of glass, it is advisable to put the toughened glass through an additional heat treatment known as the Heat-soak Test (BSEN14179). This is a destructive test which eliminates the majority of glass that is at risk. However in its current state the technique cannot eliminate 100% of the glass which is at risk. The risk of spontaneous breakage is however considerably reduced. This treatment is recommended for all situations where the stability of the structure, the maintenance of the barrier and the safety of users may be at risk from breakage of the toughened glass.

Thickness (mm)	Maximum dimensions(mm)		Minimum dimensions(mm)		Maximum weight (kg)
	length	width	length	width	
4	2400	1200	350	100	29
5	3000	2000	350	100	75
6	3660	2440	350	100	134
8	3660	2440	350	100	179
10	4500	2440	350	100	275
12	4500	2440	350	100	324
15	4500	2440	350	100	324
19	4500	2440	350	100	324

There are typical possible dimensions available within Noval safety glass and may vary depending from one transformation site to another, Please contact us for further information.

Performance

- Impact resistance:** its enhanced impact resistance enables an 8mm sheet of Noval safety glass to withstand a 500g steel ball dropped from a height of 2m. For comparison, the same ball dropped from a height of 0.3 m would break 8mm annealed glass. Noval has been tested in accordance with BS EN12600
- Bending strength:** Noval safety glass is significantly more resistant to flexural stresses than conventional annealed glass. This resistance is characterized by a bending strength in the region of 120 MPa (BS EN 12150).
- Resistance to thermal stress:** Noval can withstand temperature differences of up to 200 °C . For comparison, this is around 30°C for ordinary annealed glass.



Processed product variations

Noval Safety Glass can be

- Sandblasted or acid etched (the maximum permitted stress will differ from that of non-treated products)
- Drilled and notched: these operations must be performed before toughening treatment (see below).
- Coated with a solar control coating, a low-emissive
- Coating or a self-cleaning coating
- Laminated
- Assembled into a double-glazed unit
- Enameled
- Screen-printed

Glass-to-metal contact is prohibited. Cylindrical parts and the edges of notches are not suitable to bear high stress. The toughening process of Noval safety glass can introduce a degree of optical imperfection into the glass in the

form of bow or roller wave distortion. These are inherent to the manufacturing principle and cannot be considered

as a defect (see BS EN12150).

NOVAL SAFETY Glass® Processing characteristics

- Tolerances on thicknesses are the same as for Noval Clear Float Glass.
- Tolerance on flatness :
Over bow = 0.003mm/mm, Local bow = 0.5mm/300mm

Edge worked

Noval Safety Glass edgeworked is carried out before toughening. This glass cannot be cut or edge worked after the toughening process. The following standard edgework can be performed:

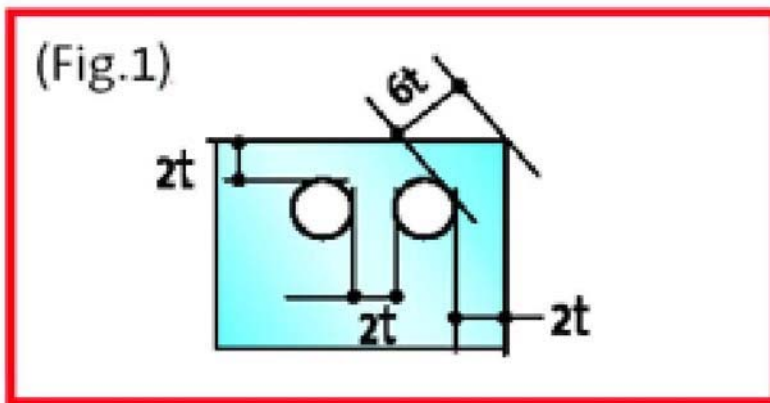
- Beveled edge or arrived edges
- Ground or smooth ground edge
- Smooth ground or flat
- Polished edge
- Beveled
- Drilled holes have a ground edge finish as standard. Larger apertures can be smoothed or polished.
- Other edge working is available on request.



Drilling

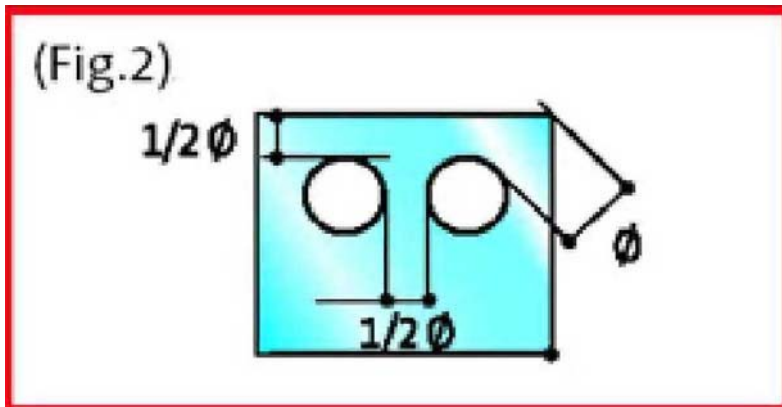
The minimum hole diameter must be equal to the glass thickness (t). in addition, the maximum diameter(Φ)(or the total of the Φ) must be :

- 1/4of the width of the sheet for Noval Safety Glass ≤ 6 mm
- 1/3of the width of the sheet for Noval Safety Glass =8,10and 12mm
- Rules for the positioning of holes
- Holes with $\Phi \leq 40$ mm Comply with minimum distance in the drawing below.



Processed Product Variations

Holes with $\Phi > 40$ mm (fig 2) Comply with the minimum distances in the drawing below.



Φ = diameter of the hole

Tolerances on the hole position

Normal Φ of the hole	Tolerance in mm
5 to 50 mm	± 1.00
51 to 100 mm	± 2.00
> 100 mm	Please contact us

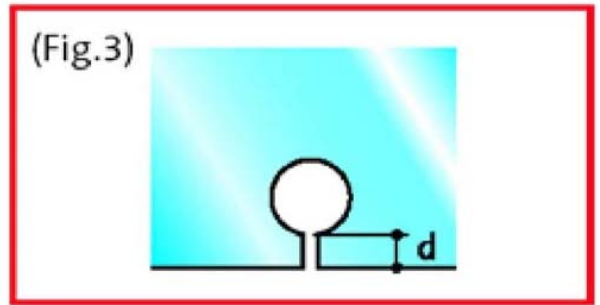
- **Tolerances on hole position** side less than 1m: $\pm 2\text{mm}$

Sawn holes

Holes linked to the edge by a cutting line.

$5\text{mm} \leq d \leq 2t$

Tolerance on the hole position



Processed product variations

Tolerance on the holes position

Rectangular or square holes

$X \geq A/2$ and $y \geq B/2$

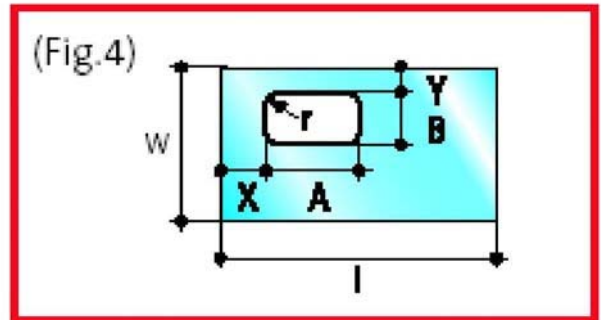
For Noval Safety Glass 6mm

$A \leq 1/3$ and $B \leq w/4$

For Noval Safety Glass

$8\text{mm} A \leq 1/3$ and $\leq w/3$,

$r \geq 10\text{mm}$



- **Tolerance on sizes**

Side 5 to 50mm $\pm 1\text{mm}$

Side 51 to 100: $\pm 2\text{mm}$

Tolerance on the hole position

Tolerance on positing: $\pm 1.5\text{mm}$

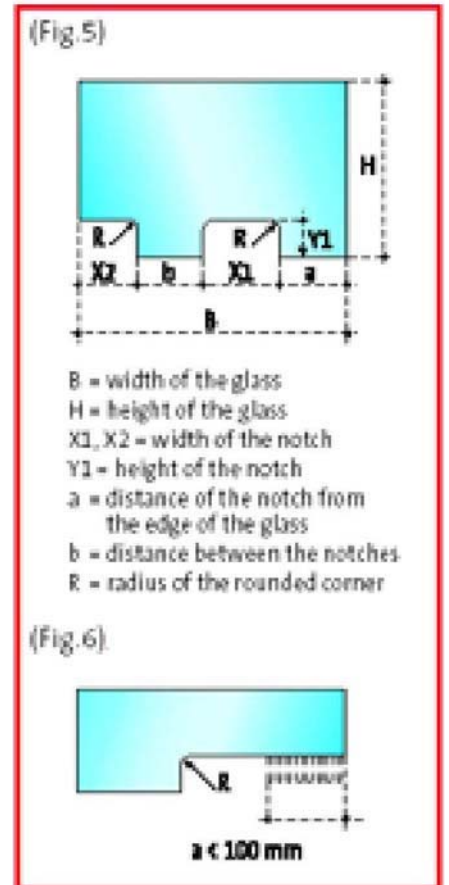
Notches

When the outer edges of the accessory are aligned with the edges of the glass, the clearance between the inner part of the accessory and the glass must always be between 4mm(maximum) and 1mm (minimum)

- **Rules for position of notices (see fig.5)**

$Y1 \leq X1$ and $Y1 \leq X2$:the height of a notch must not exceed its width. $B \geq X1/2$: the distance between two notches must be at least half the width of the largest notch.

$a \geq X1/2$ and $a \geq 100\text{mm}$; the distance between the notch and the edge of the glass must be at least half the width of the notch, and this distance must be greater than 100mm (see fig.6) $R \geq r$: the radius of the notch must be at least equal to the thickness of the glass.



• **Rules for position of angled notches (see fig.7)**

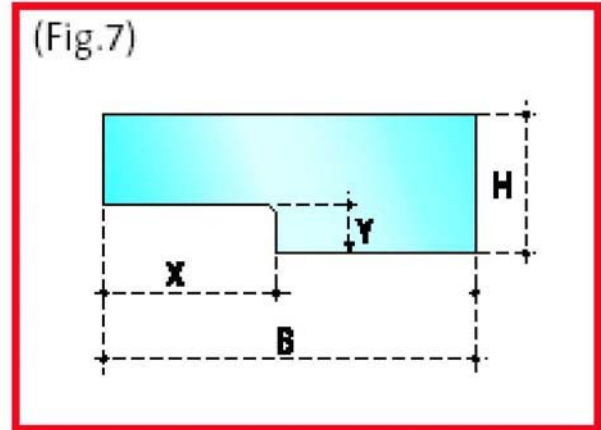
$X \leq B/3$ and $X \leq 200\text{mm}$

$Y \leq H/3$ and $Y \leq 200\text{mm}$

The width of the notch must not exceed 1/3 the width of the sheet of glass, for flat tempered, the width or height of the notch must not exceed 200mm

Tolerance on notch position

Tolerance on positioning: $\pm 2\text{mm}$



Processed product Variations....

Special cases

Trapezoidal sheets

Do not exceed the length/width ratio < 8

Where width = $(A+B)/2$ and B must be at least 250mm

Acute angle sheets

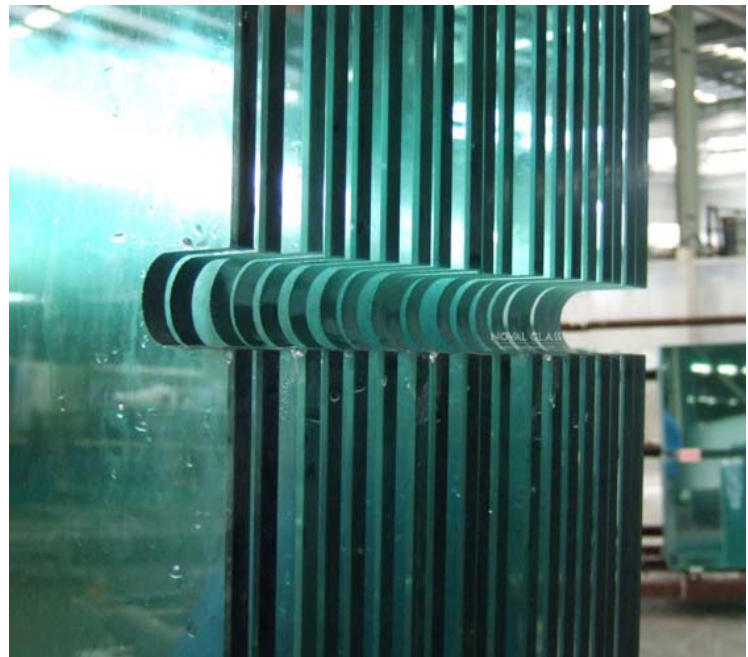
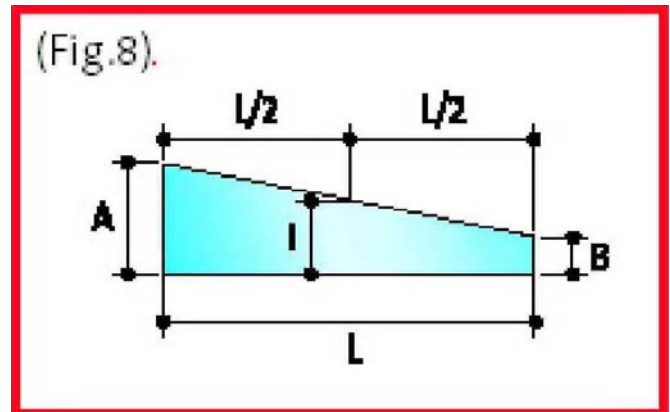
The same rules as for trapezoidal sheets apply. Section B (above) cannot be notched, sometimes known as "shortened corner", and is measure in the following way (in mm):

IF U = the acute angle, (expressed in degrees)

$Y \leq 65^\circ$: $B_{\text{min}} = 18 - 0.2 \times Y$

$Y \geq 65^\circ$: $B \geq 5\text{mm}$

The guidance given above is indicative and final manufacturing confirmation should be sought from the supplying branch.



Installation Guidelines

Noval Safety Glass must always be installed in accordance with current national standard and regulations.

The design of an Noval Safety Glass assembly must comply with the following guidelines

- Attach Noval safety tempered glass to the structure and ensure the assembly is rigid using wind bracing, or if necessary metal tie rods
- Ensure the sheets of glass are fully joined together. The installation must withstand all the stresses in the various planes
- Provides sufficiently strong hinges and cross bars to support the glass
- Check the thickness of ceilings or floors for installation of closers, anchoring flanges etc...

Breaking one sheet must not result in all or part of the rest of the installation falling if the height of the installation is less than 3m, For installations higher than 3m, the simultaneous breaking 2 sheets must not resulting in all or part of the rest of the installation falling.

The interfaces, support conditions and installation conditions all have a major influence on the maintenance of the mechanical properties of Noval safety glass. For this reason, NOVAL GLASS has a wide range of parts and accessories for creating combinations and to ensure that the assembly is long- lasting.

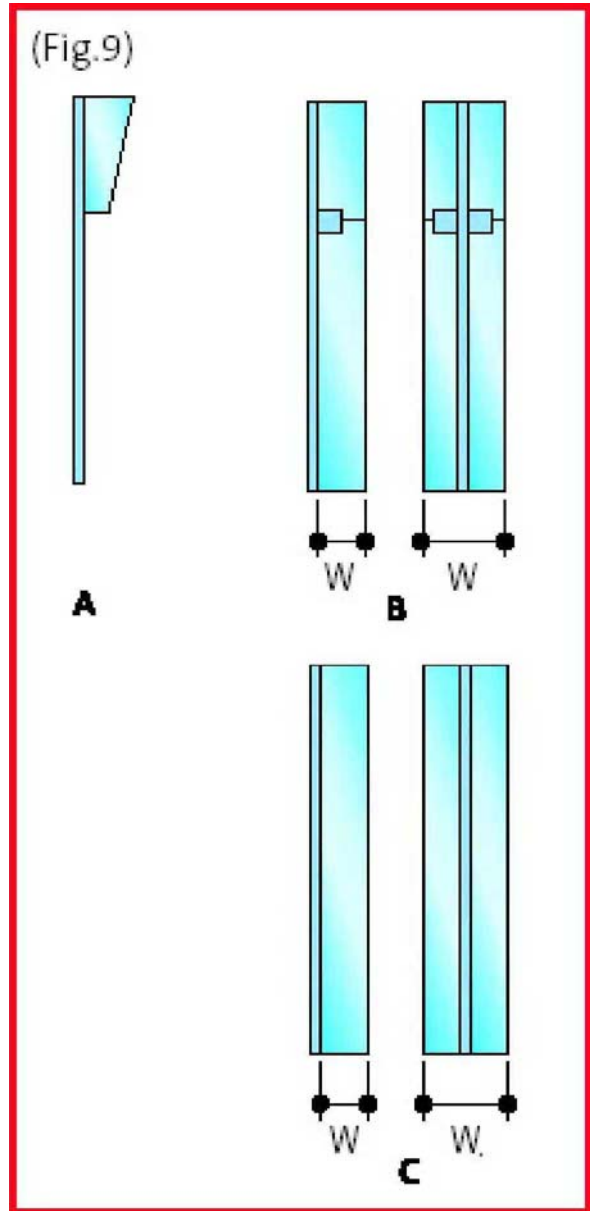
Wind bracing

Noval safety glass assemblies frequently require wind bracing. This ensures the resistance, rigidity and stability of structures and only bears the forces exerted in their plane of inertia. (see fig 9)

A- high(or low) wind bracing in one sheet.

B- Wind bracing across the whole height in two sheets (or more) on one side or overlapping. Minimum width: 30cm,

C- Wind bracing across the whole the whole height in one sheet on one side or overlapping. Minimum width: 30cm



Installation Guidelines

In all case, the parameters in the table for the range and the manufacturing instructions regarding edgework must be complied with Noval safety glass assemblies must be fitted with wind bracing in the following cases. If one side of the dimensions AR or BR are $< 30\text{cm}$, wind bracing will not be necessary, regardless of the other dimensions.

- **Transom in several parts**

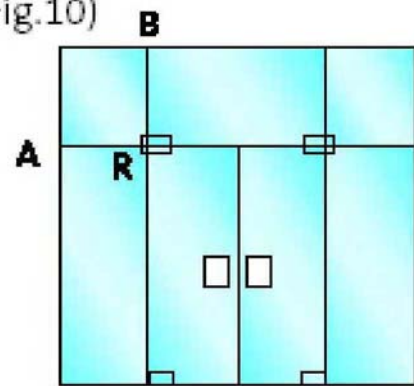
Add wind bracing if :

Metal glazing bead $AR + BR > 140\text{cm}$

Exposed anchors

Cement housing $AR + BR > 160\text{cm}$

(Fig.10)



-piece transom

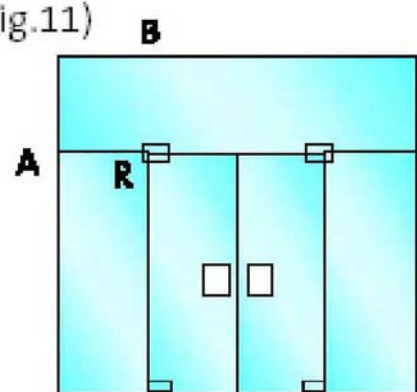
Add wind bracing if :

Metal glazing bead $AR + BR > 160\text{cm}$

Exposed anchors

Cement housing $AR + BR > 180\text{cm}$

(Fig.11)



Installation Guidelines.../...

Installation without doors

Add wind bracing if:

$AP + BP > 350\text{cm}$

Installation extended with non-toughened glass

-Wind bracing must be used:

- Clearance in the base of channels: $\leq 5\text{mm}$

- Clearance between sheets of glass:

-Fixed: $\leq 3\text{mm}$

-Moveable: 2mm

- Door clearance

-Laterally: 2mm

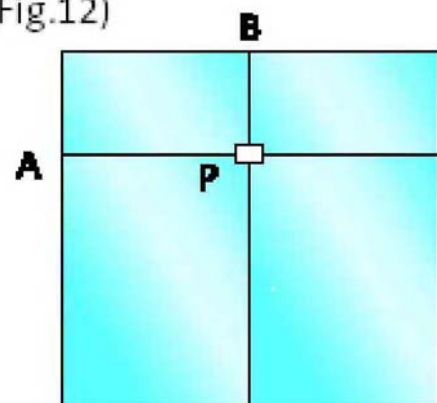
-At the bottom: 7mm

-At the top

-Ordinary door: 3mm

-Folding door: 7mm

(Fig.12)



Standards and Regulations

For sizing complying with current national regulations, see “Determining the thickness of glass”. For Noval safety glass, Noval decorative glass and patterned glass, the size and choice of thickness must consider the depth of the pattern on the chosen reference. In some cases, the presence of a deep design will require a thicker glass.

Noval safety glass complies with the requirements of standard BS EN 12150. Noval safety glass bears permanent marking the processing site and the relative EN standard BS EN 12150, Noval safety glass carries the relevant CE marking as required

Do you know ?

- Toughened glass cannot be drilled or edgeworked in any manner. Sandblasting or other surface treatments should be carried out prior to toughening as per AS1288 - 1994. Deep sandblasted patterns greater than 1mm are not permissible;
- Toughened glass ordered to templates must be accompanied with a full scale template made to the correct dimensions. These must be made from a rigid material. Orders submitted with complex drawings and sizes to avoid template construction will either be rejected or executed at the customer's risk;
- Minimum edgework finish on toughened glass up to 12mm is a standard arrissed edge. Minimum edgework on greater thicknesses should be a flat ground edge;
- Slight distortion or bowing may occur after toughening but is largely controllable. It will vary with substance, tint, surface treatment, size and shape of the glass. Ceramic painted, sandblasted or reflective coated glass has a greater tendency to bow and special tolerances would be advised. Flatness will be measured when the glass is standing on edge with a straight edge placed along the full length of the panel and a wedge measurement taken at the centre position. Refer to our technical department for more information.

For more information, pls contact service@novalglass.com or refer to www.novalglass.com