



German Historical Museum, Berlin, Germany
Architect: I. M. Pei

A WIDE RANGE OF CURVED AND FLAT SAFETY GLASS WITH SUPERIOR QUALITY

Established in 1984, Tambest Glass Solutions is one of the leading suppliers of architectural glass products in Europe. Our innovative and versatile production machinery combined with decades of expertise in glass processing guarantee a first-class measurement accuracy and optical quality.

Internationally, the company is best known from its curved architectural glass. Our unique know-how is manifested in various challenging projects all over the world.

Our selection covers all types of safety glass products: a wide variety of curved architectural glass and flat safety glass.

Because of the company's independence from float glass manufacturers, the company can supply multifunctional glass products that combine the latest coatings from different glass manufacturers.

For more information please visit:

www.tambest.com

EVERYTHING UNDER ONE ROOF

Curved safety and architectural glass:

- Curved tempered glass
- Curved laminated glass
- Curved tempered laminated glass
- Curved insulating glass

Flat safety glass:

- Laminated safety glass
- Tempered safety glass
- Tempered laminated safety glass
- Other types of flat safety glass

Annex to Finnish Parliament House, Helsinki, Finland
Architect: Helin & Co.



Gira, Radewormwald, Germany
Architect: Ingenhoeven & Partner



Tower of Peace, St. Petersburg, Russia
Architect: Jean-Michel Wilmotte, Artist: Clara Halter





Winter Cover of Fountain, Tampere, Finland
Architect: KSOY Arkkitehtuuria



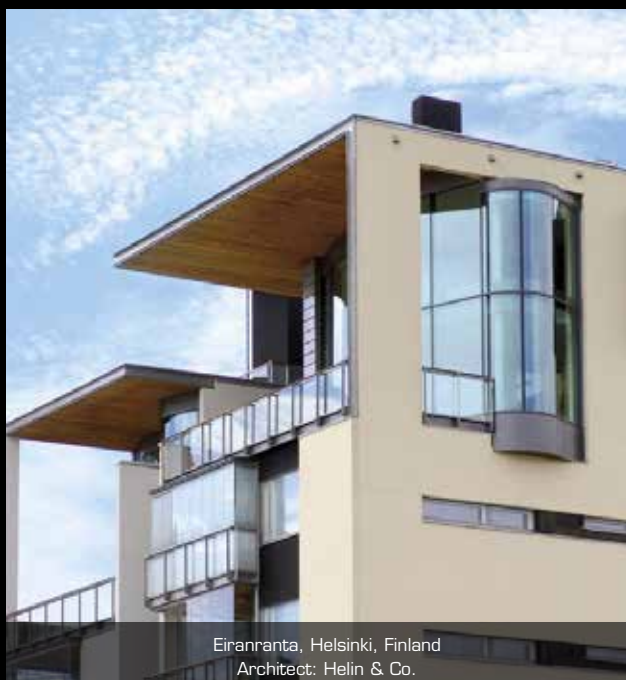
Hotel Oslo Plaza, Oslo, Norway



Sello Shopping Centre, Espoo, Finland
Architect: Helin & Co



KÖ18, Düsseldorf, Germany
Architect: JSK-Architekten



Eiranranta, Helsinki, Finland
Architect: Helin & Co.



Paulig Roastery and Headquarters, Helsinki, Finland
Architect: Tommila Ltd



Compaq Headquarters, Issy les Moulineaux, France
Architect: Studios Architecture J.Ory



Deutsche Messe AG, Hannover, Germany
Architect: Schultz & Partner



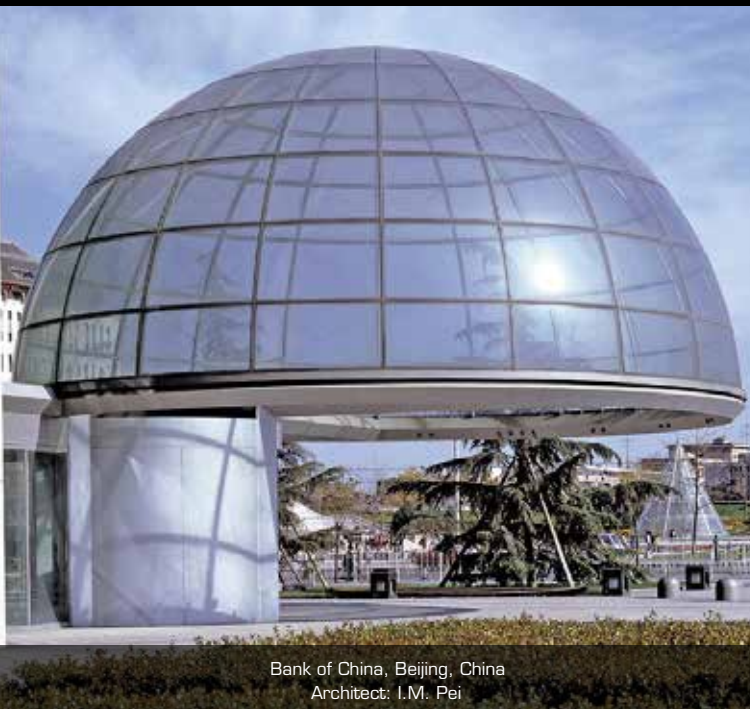
30 St Mary Axe , London, United Kingdom
Architect: Foster and Partners



M/S Oasis of the Seas, Nassau, the Bahamas



Sokos Hotel Vaakuna, Helsinki, Finland
Architect: Johannes Schilling Architekten



Bank of China, Beijing, China
Architect: I.M. Pei



Stockholm Globe Arenas, Stockholm, Sweden

Hotel Sofitel, Paris, France



Hôpital Le Mans, Le Mans, France



Luhta Headquarters, Lahti, Finland
Architect: Arkaari Oy



CURVED GLASS

The glass bending expertise of Tambest Glass Solution is top class in the world. The innovative, modern and versatile production machinery combined with the staff's expertise of glass bending guarantee the first-glass shape and dimension accuracy of our products. Therefore, the company is internationally known as a supplier of extremely high quality and challenging curved glass solutions.

Thanks to our top-class expertise, Tambest

Glass Solutions is able to supply the highest optical quality. The aim is a distortion free appearance.

BENDING SHAPES

Several significant innovations of the field, such as bending methods applied to e.g. demanding spherical, conical and parabolic glasses have come into being as a result of the company's development work. This brochure introduces Tambest Glass Solution's comprehensive product range of curved

glass products whilst its technical possibilities and limitations.

Several interdependent factors affect the fact whether the requested glass is available as curved. These factors include e.g. glass quality, glass size, opening angle, radius and glass thickness. Therefore, the dimensions given in this brochure should be understood only as theoretical maximum dimensions to be specified case by case.

CYLINDRICAL



Cylindrical bending is possible in the following glass types and dimensions:

FLOAT GLASS

thickness 3–15 mm
b x l 3210 x 6000 mm or
b x l 6000 x 3210 mm
h max. 1100 mm

LAMINATED GLASS

thickness 6–36 mm
b x l 3210 x 6000 mm or
b x l 6000 x 3210 mm
h max. 1100 mm
lamination with a PVB-foil, min. 0.76 mm

TEMPERED GLASS

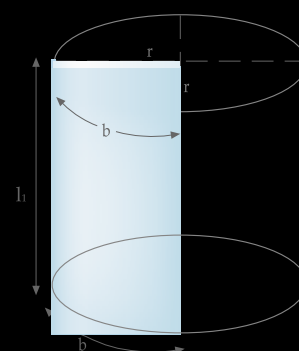
thickness 5–15 mm
b x l 2400 x 4200 mm or
b x l 4200 x 2400 mm
h max. 800 mm
a max. 90°

LAMINATED TEMPERED GLASS

thickness 10–30 mm
b x l on request
h max. on request
Ⓢ Laminated tempered safety glass combines the safety characteristics of tempered and laminated safety glass into the same product. The dimensions are defined case by case.

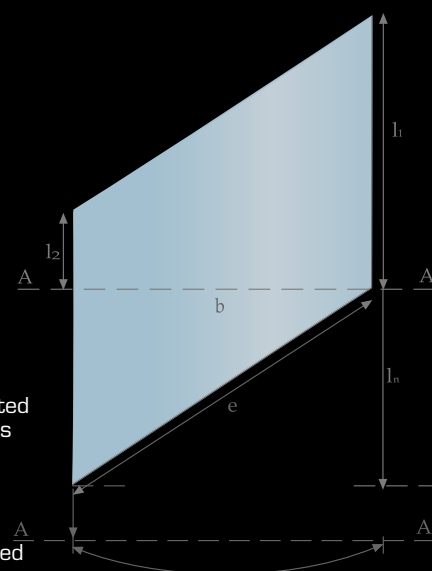
INSULATING GLASS

Dimensions of an insulating glass to be manufactured depend on the glass types preferred to be used for composing the insulating glass. The dimensions of an insulating glass are defined case by case.



r = bending radius
b = outer girth
l₁ = glass height
c = chord length
h = chord height
α = bending angle/opening angle

Standard bending: opening angle ≤90°
Special bending: opening angle 90°–180°



r = bending radius
(to the outer surface) (A-A)
b = outer girth: on the line A – A
l₁ = glass height
e = diagonal chord length
α = bending angle / opening angle
l_n = rise (mm)

Rule: l₂ min ≥ 1/3 x l₁

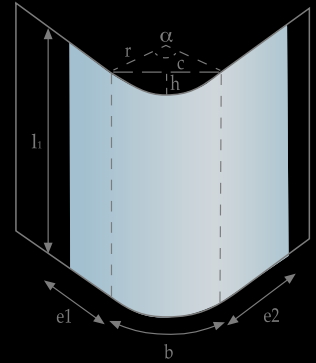
CYLINDRICAL BENDING WITH FLAT PARTS



As a continuation of cylindrical bending, the glass continues as flat either on both sides of the girth or only on one side. Cylindrical bending with flat sections is possible in float glass, laminated glass or insulating glass.

- Dimensions and thicknesses are defined case by case.

r = bending radius
 b = girth
 l_1 = glass height
 c = chord length
 h = chord height
 $e1$ = flat section 1
 $e2$ = flat section 2
 α = bending angle/
 opening angle



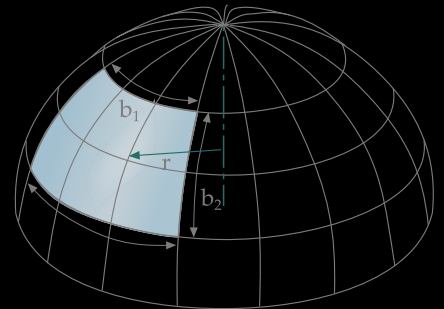
SPHERICAL BENDING



The bending radius is the same to the direction of both the x- and y-axis. Dimensions are defined on request. Spherical bending is possible in float glass, laminated glass or insulating glass.

- Max. bending angle 30°
- Dimensions and thicknesses are defined case by case.

r = radius of the sphere
 $b1$ = girth 1
 $b2$ = girth 2



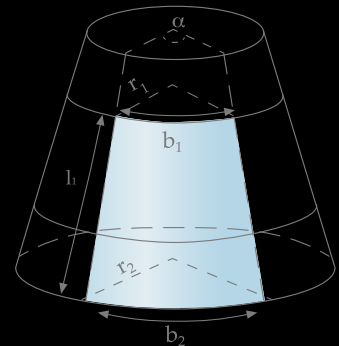
CONICAL BENDING



Even though the bending shape of the glass is cylindrical, the upper and lower radii of the glass differ. Conical bending is possible in float glass, laminated glass or insulating glass.

- Dimensions and thicknesses are defined case by case.

$r1$ = radius 1
 $r2$ = radius 2
 $b1$ = girth 1
 $b2$ = girth 2
 l_1 = glass height
 α = bending angle/
 opening angle



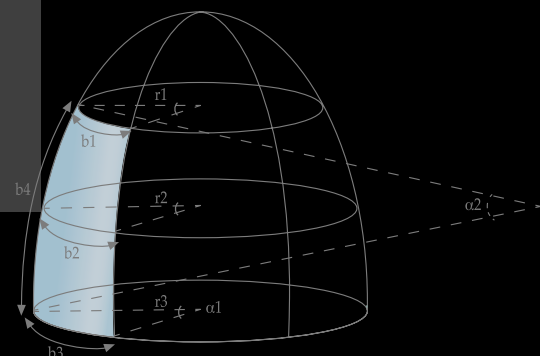
PARABOLIC BENDING



Parabolic bending is a shape based on spherical bending, with two bending directions as in case of spherical bending. The bending radii, however, change in accordance with the parabola function. Parabolic bending is possible in float glass, laminated glass or insulating glass.

- Dimensions and thicknesses are defined case by case.

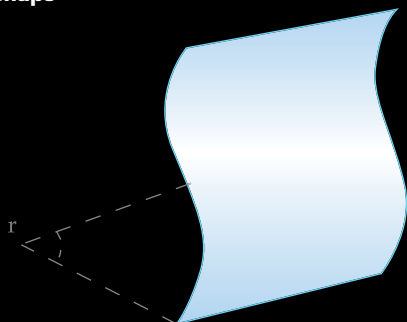
$b1$ = girth 1
 $b2$ = girth 2
 $b3$ = girth 3
 $b4$ = girth 4
 $\alpha1$ = opening angle 1
 $\alpha2$ = opening angle 2
 $r1$ = radius 1
 $r2$ = radius 2
 $r3$ = radius 3



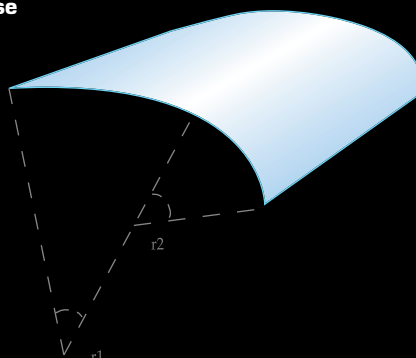
OTHER SHAPES

Dimensional data and information on glass types available for these shapes on request.

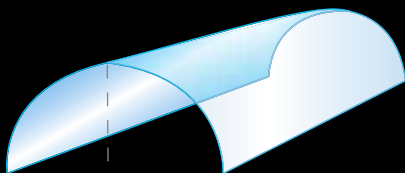
S-shape



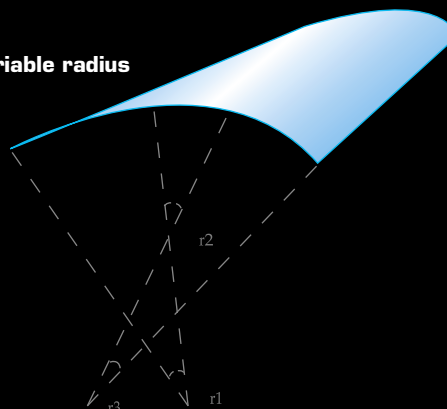
ellipse



semicircle 180



variable radius



CURVED INSULATING GLASS



Insulating glasses may be composed of different glass types, and this way, it is possible to achieve several protective qualities, such as solar protection, thermal insulation, sound insulation, safety or burglar resistance. The maximum dimensions of insulating glass to be manufactured depend on the requested bending shape and the glass types to be used. Dimensions and thicknesses are calculated on request.

Curved insulating glass is available in all the bending shapes mentioned in this brochure.

SPACER ALTERNATIVES

aluminium
warm-edge

SEALANT ALTERNATIVES

butyl / polysulphide
butyl / silicone

AIR SPACE

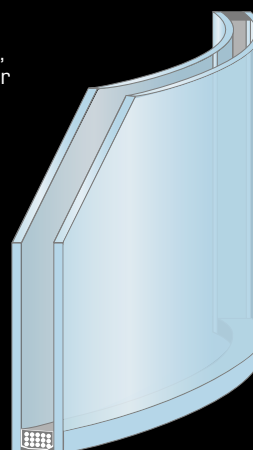
6-20 mm

► Bigger air space on request.

FILLING

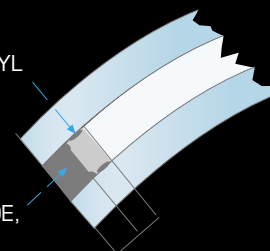
air
argon

► Dimensional tolerances for insulating glasses are defined on request.

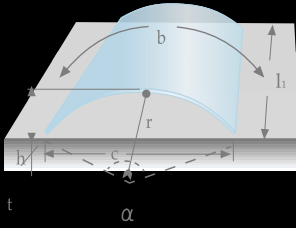


BUTYL

POLYSULPHIDE,
SILICON

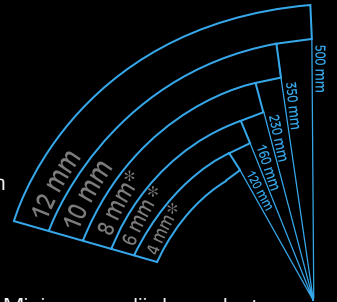


DIMENSIONING, MAXIMUM SIZES AND TOLERANCES



DIMENSIONING AND MAXIMUM SIZES

Several interdependent factors affect the fact whether the requested glass is available as curved. These factors include glass type, glass quality, glass size, opening angle, radius and glass thickness. For that reason, the dimensions given in this brochure should be understood as indicative maximum dimensions.



To bend the glass, the following dimensions are always required:

r = radius
b = girth
l₁ = glass height

or

c = chord length
h = chord height
l₁ = glass height

or

α = bending angle / opening angle
r = radius
l₁ = glass height

Minimum radii dependent on glass thicknesses and a bending angle of ≤ 90° in float glass.
Ⓢ Please check with the manufacturer in project phase.

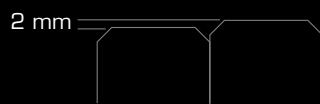
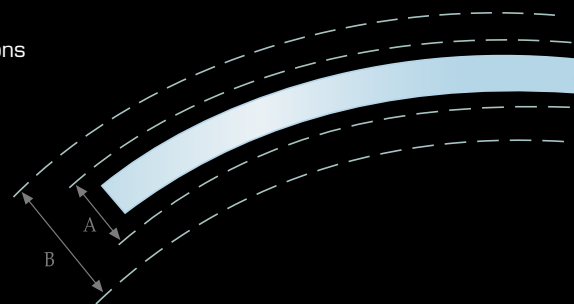
Ⓢ Dimensions should always be given as measured to the same surface (preferably to the outer surface of the glass, i.e. the convex surface).

MAXIMUM SIZES

	Girth (b)	Height (l ₁)	Max. bending angle	Bending shape
Float glass	3210 mm or 6000 mm	6000 mm or 3210 mm	180 °	all
Laminated glass	3210 mm or 6000 mm	6000 mm or 3210 mm	180 °	all
Tempered glass	2400 mm or 4200 mm	4200 mm or 2400 mm	90 °	cylindrical
Heat-strengthened glass	2400 mm or 4200 mm	4200 mm or 2400 mm	90 °	cylindrical
Laminated and tempered glass	4200 mm or 2400 mm	2400 mm or 4200 mm	90 °	cylindrical
Laminated and heat-strengthened glass	4200 mm or 2400 mm	2400 mm or 4200 mm	90 °	cylindrical
Insulating glass	Depend on the requested bending shapes and the glass types to be used.			

MANUFACTURING TOLERANCES

Manufacturing tolerances refer to deviations in the glass dimensions that may come into being between the theoretical dimensions of a glass and those of the manufacturing measurements of a finished glass. The values in the following tables have been calculated for a rectangular glass plate that is bent into a cylindrical shape – bending angle ≤ 90°. Dimensional tolerances for other shapes are defined case by case.



The stepping tolerance on curved laminated glass is max. 2 mm.

A = tolerance field = glass thickness + 6 mm
B = depth of glazing field

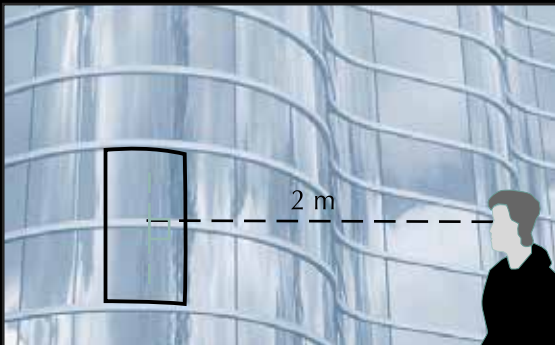
Manufacturing tolerance or deviation of the form must be taken into account when defining the depth of the glazing.

INSTALLATION TOLERANCES

Installation tolerance refers to the space between the glass and the frame in case of measurement differences. This must be defined already in the planning phase. Possible tolerance field must be taken into consideration when defining the depth of a rabbet space.

OTHER INFORMATION

Holes, notches and edge work must be done before the bending. Arrissed edges are standard in curved glass; polished edges etc. are also available on request.



Optical quality is checked visually. The aim is a distortion free appearance.

TEMPERED GLASS

	max. 2 m	max. 4.2 m
Girth (b)	± 2	± 3
Height (l ₁)	± 2	± 3
Straightness of edge	on request	on request
Twisting	on request	on request
Chord height	± 3	± 3

LAMINATED TEMPERED GLASS

	max. 2 m	max. 4.2 m
Girth (b)	± 2	± 3
Height (l ₁)	± 2	± 3
Straightness of edge	on request	on request
Twisting	on request	on request
Chord height	± 3	± 3

INSULATING GLASS

- ⦿ Dimensional tolerances for insulating glasses are defined on request.

FLOAT GLASS

	max. 2 m	max. 4 m	max. 6 m
Girth (b)	± 2	± 3	± 3
Height (l ₁)	± 2	± 3	± 3
Straightness of edge	2 mm/m	2 mm/m	on request
Twisting	3 mm/m	3 mm/m	on request
Chord height	± 3	± 3	± 3

LAMINATED GLASS

	max. 2 m	max. 4 m	max. 6 m
Girth (b)	± 2	± 4	± 4
Height (l ₁)	± 2	± 4	± 4
Straightness of edge	2 mm/m	2 mm/m	on request
Twisting	3 mm/m	3 mm/m	on request
Chord height	± 3	± 3	± 3

- ⦿ max. thickness 24 mm

Turning Torso, Malmö, Sweden
Architect: Santiago Calatrava



www.tambest.com

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