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**Glass in building — Curved glass —**

**Part 1:  
Terminology and definitions**

*Verre dans la construction — Verre bombé — Partie 1: Terminologie et définitions*



Reference number  
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## Foreword

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ISO 11485-1 was prepared by Technical Committee ISO/TC 160, *Glass in building*, Subcommittee SC 1, *Product considerations*.

ISO 11485 consists of the following parts, under the general title *Glass in building — Curved glass*:

- *Part 1: Terminology and definitions*
- *Part 2: Quality requirements*
- *Part 3: Requirements for tempered and laminated curved safety glass<sup>1)</sup>*

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1) Under preparation.



# Glass in building — Curved glass —

## Part 1: Terminology and definitions

### 1 Scope

This part of ISO 11458 specifies terminology and definitions for curved glass used in general building construction, furniture, display and various other non-automotive applications.

### 2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

#### 2.1

**curved glass****bent glass (US)**

sheet of annealed glass curved by a heating process

#### 2.2

**curved annealed glass**

glass that is curved and then cooled slowly so that it recovers its initial mechanical characteristics

#### 2.3

**curved patterned glass**

flat patterned glass that has been formed into a curved shape

#### 2.4

**curved wired glass**

flat wired glass that is formed into a curved shape

#### 2.5

**curved insulating glass**

two panes of curved glass that have been fabricated into an insulating glass unit

#### 2.6

**curved tempered glass**

flat glass that is formed into a curved shape by heating above a specified temperature and then subjected to a rapid and controlled cooling process in order to give it greatly increased resistance to thermal and mechanical stress

NOTE In this International Standard, the term “tempered” also means “thermally toughened”.

#### 2.7

**curved heat-soaked tempered glass**

tempered curved glass that has been post-processed using a specified heat-soak cycle with the intent of isolating possible nickel sulfide inclusions

#### 2.8

**curved tempered enamelled glass**

curved tempered glass which has a ceramic frit fired into the surface during the tempering process

NOTE 1 After tempering, the ceramic frit becomes an integral part of the glass.

NOTE 2 The application of the ceramic frit may be by a continuous or discontinuous application, e.g. screen printing.

**2.9**

**curved heat-strengthened glass**

flat glass that has been formed into a shape and heat-strengthened

NOTE The specifications of curved heat-strengthened glass are under consideration.

**2.10**

**curved chemically strengthened glass**

flat glass that has been formed into a shape and chemically strengthened

**2.11**

**curved laminated glass**

assembly consisting of curved glass sheets joined together with cast-in-place resins or films

**2.12**

**curved laminated tempered glass**

assembly consisting of curved tempered sheets joined together with cast-in-place resins or films

**2.13**

**curved safety glass**

curved glass that in the case of accidental breakage, reduces the risk of cutting or piercing injuries and/or offers residual resistance by retaining the glass fragments

NOTE 1 The curved glass can be tempered or laminated for example.

NOTE 2 Curved safety glass is classified according to ISO 11485-2.

**2.14**

**concave**

“hollow” face of curved glass

**2.15**

**convex**

“bulge” face of curved glass

**2.16**

**angle**

$\alpha$

angular measurement of a segment of a curve in degrees

NOTE See Figure 1.

**2.17**

**inner radius**

$R_i$

radius of concave face

NOTE See Figures 1 and 2.

**2.18**

**outer radius**

$R_e$

radius of convex face

NOTE See Figures 1 and 2.

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**2.19****arc***A*

length of the curved portion

NOTE 1 See Figure 1.

NOTE 2 An arc is described as either interior arc ( $A_i$ ) or exterior arc ( $A_e$ ).**2.20****chord of the arc** $C_a$ 

line segment that connects end points of an arc

NOTE 1 See Figure 1.

NOTE 2 A chord is described as either an interior chord ( $C_{ai}$ ) or an exterior chord ( $C_{ae}$ ). The interior chord ( $C_{ai}$ ) corresponds to the interior arc ( $A_i$ ) and the exterior chord ( $C_{ae}$ ) corresponds to the exterior arc ( $A_e$ ).**2.21****rise****depth***F*

segment between the middle of the arc of the circle and the middle of the chord that subtends the arc

NOTE See Figure 1.

**2.22****girth***G*

distance around the concave or convex surface measured perpendicular to the height including any flats

NOTE See Figure 1.

**2.23****chord of the girth** $C_g$ 

line segment that connects end points of a girth

NOTE See Figure 1.

**2.24****depth** $P_r$ maximal distance between the upper part of the girth ( $G$ ) and the corresponding chord ( $C_d$ )

NOTE See Figure 1.

**2.25****flat***B*

flat segments forming a part of curved glass

NOTE See Figure 1.

**2.26****length***L*

dimension of the straight edge of the curved glass

NOTE See Figure 1.

**2.27**  
**thickness**

$T$

nominal thickness of the final product

NOTE 1 In a curved insulating glass, the thickness is the sum of the thicknesses of the inner glass ( $T_i$ ), the gas space ( $T_a$ ) and the outer glass ( $T_e$ ).

NOTE 2 See Figures 1 and 2.

**2.28**  
**plan**

document containing the geometry of the product to be made

**2.29**  
**drawing**

graphic details defining the geometry of the product to be made

**2.30**  
**lay out**

representation of scale 1:1 of the curvature profile

**2.31**  
**template**

three-dimensional reproduction at scale 1:1 to determine the dimensions and shape of the product to be made

**2.32**  
**cutting template**

form (pattern) that facilitates accuracy in the glass forming process by providing the proper curved glass information for size, shape and contour

**2.33**  
**model**

product in glass or other material at scale 1:1 that is an identical reproduction

**2.34**  
**curvature profile**

geometrical shape of the curved part of the curved glass

**2.35**  
**shape accuracy**

$P_C$

accuracy of the contoured form including curvature, arc(s), and even flats

**2.36**  
**cross-curve deviation**

**sag**

deviation from a straight line or reference curve perpendicular to the curvature measured on the concave side

**2.37**  
**edge straightness deviation**

**warp**

$R_B$

deviation from straightness of the straight edges of the glass

**2.38**  
**twist deviation**

$V$

one or more of the corners of the glass are not in the same plane



**2.39****optical distortion**

slight deformation of the images seen in reflection or in transmission, inherent to the process of bending glass

**2.40****displacement**

*d*

misalignment at any one edge of the constituent glass panes making up the curved laminated and/or insulating glass

NOTE 1  $d_1$ : displacement of one of the edges of the glass during the manufacture of laminated curved glass.

NOTE 2  $d_2$ : displacement of the edges of the glass during the manufacture of insulating glass.

**2.41****cold crack**

crack caused by a difference of temperature of the surface in the cooling process

NOTE 1 For example, around tong marks or ring marks.

NOTE 2 Cold cracks appear in a whisker-like or hair-like shape in the case of curved tempered glass and in a shell shape appearing around crossing points of wires in the case of annealed curved wired glass.

**2.42****pock marks**

process surface blemishes that consist of small, shallow areas, circular in shape, on the surface of the glass

**2.43****ring marks**

process surface blemishes that consist of shallow marks typically running along the perimeter of the glass surface

**2.44****tong marks**

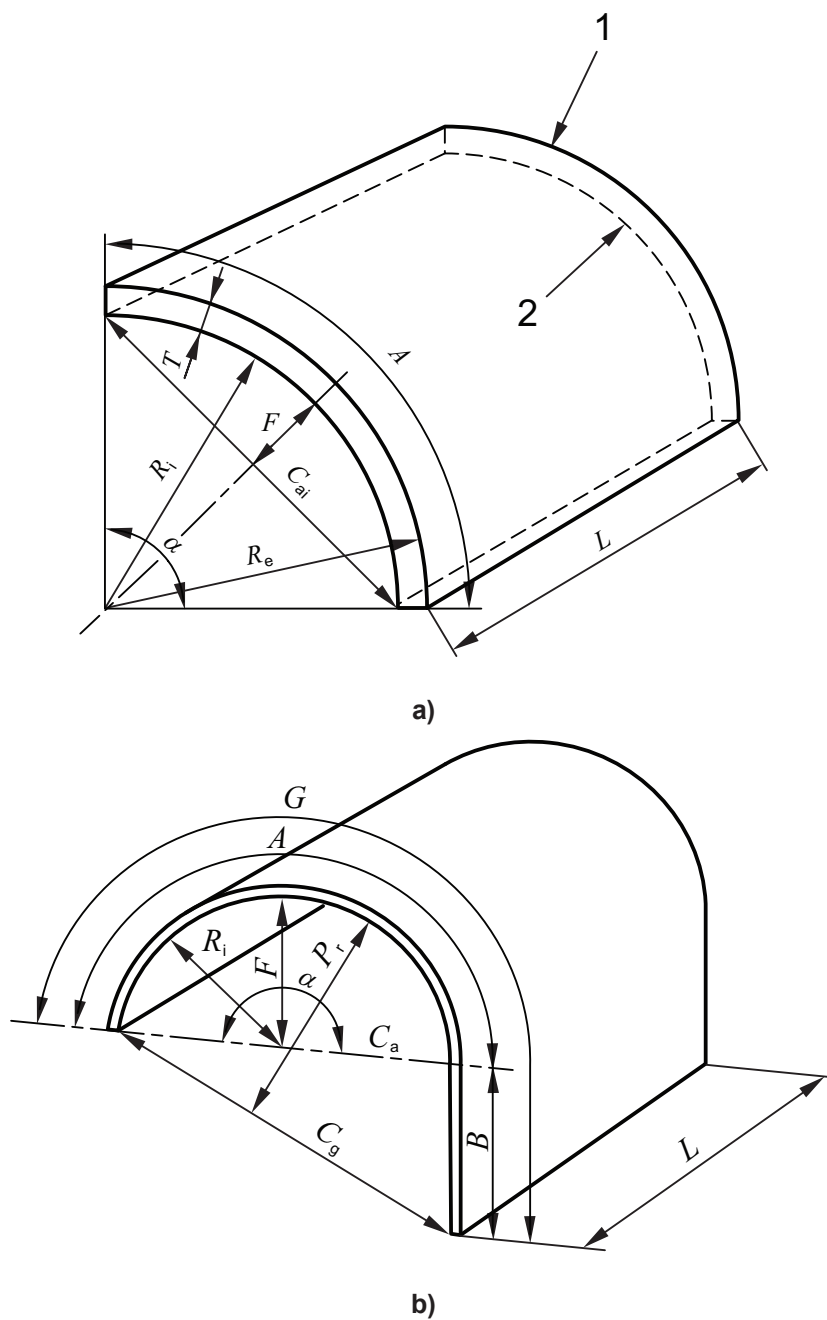
slight indentations along the top edge of vertically curved glass, resulting from the method of holding or supporting the glass with tongs in vertical form

**2.45****tools**

elements particular to an order which allow the fabrication of curved glass

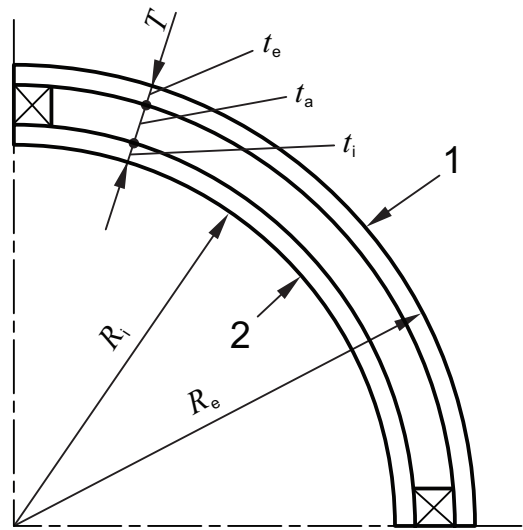
**2.46****gauge**

measurement tool for manufacturing and checking the curvature profile of the finished product



- Key**
- 1 bulge outer face (convex)
  - 2 hollow inner face (concave)

**Figure 1 — Examples of terms and dimensions**

**Key**

- 1 convex part
- 2 concave part

Figure 2 — Thicknesses and radius of an insulating glass

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## Bibliography

- [1] ISO 11485-2, *Glass in building — Curved glass — Part 2: Quality requirements*
- [2] ISO 12543 (all parts), *Glass in building — Laminated glass and laminated safety glass*
- [3] ASTM C1464-06, *Standard Specification for Bent Glass*



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