FACTORY STANDARD

SellGlass

FACTORY STANDARD (NZ)

§ 1
General provisions

The Factory Standard of SELL-GLASS spółka z ograniczoną odpowiedzialnością was established based on the following European Standards:

PN-EN 572-2 Glass in building - Basic soda lime silicate glass products

PN-EN 1036-1 Glass in building - Mirrors from silver-coated float glass for internal use.

PN-EN 12150-1 Thermally toughened soda lime silicate safety glass

PN-EN 12543-5 Glass in building - Laminated glass and laminated safety glass - Part 5: Dimensions and edge finishing

PN-EN 12543-6 Glass in building - Laminated glass and laminated safety glass - Part 6: Appearance

The Factory Standard sets out the basic parameters of SELL-GLASS products and their quality standards and possible deviations

§ 2
Definitions

safety building glass – a product made of at least one glass pane which minimizes the risk of human injury and cuts if broken.

d – nominal thickness of the glass

B, H - side dimensions

Φ – hole diameter

z – glass surface, i.e. the product of multiplication of width B and length H

point defects – non-transparent spots, bubbles and foreign matter.

linear defects – foreign matter and small or deep scratches.

non-transparent defects – noticeable defects in the glass (inclusions in the glass or in the interlayer).

bubbles – these are usually air bubbles which may appear in the glass or in the interlayer.

foreign matter – any undesirable inclusions in the glass caused in the process of production.

cracks – sharp cracks or serration running from the edge through the glass.

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§ 3

Performance tolerances for toughened glass

THICKNESS

Limiting thickness deviation of laminated products with foil and Float glass

maximum deviations of Float glass thickness			
thickness (mm)	tolerance	thickness (mm)	tolerance
2	+/- 0.2	10	+/- 0.3
3	+/- 0.2	12	+/- 0.3
4	+/- 0.2	15	+/- 0.5
5	+/- 0.2	19	+/- 1
6	+/- 0.2	25	+/- 1
8	+/- 0.3		

Thickness measurement

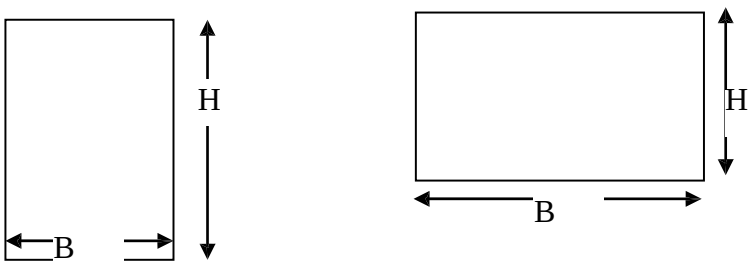
The thickness of the glass should be calculated as the average of the measurements taken at the centres of the four sides. Measurements should be made to the nearest 0.01 mm and their average should be rounded to 0.1 mm.

If individual measurements are rounded to about 0.1 mm, they should also be within the limits of maximum permissible deviations.

DIMENSIONS

Width B and length H

If the dimensions of laminated or toughened glass are given with reference to rectangular plates, the first dimension should be width B and the second dimension should be length H, as shown in the figure:



Dimensions should be given in millimetres. Each dimension should be within the specified maximum permissible deviations.

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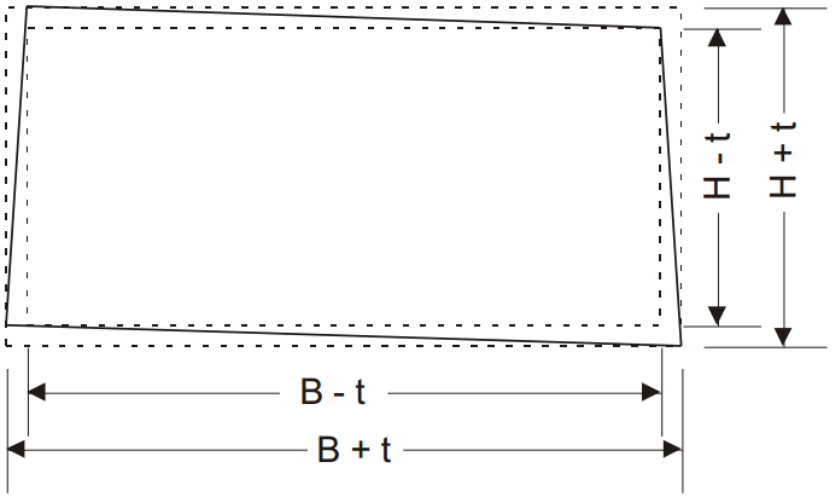
Checking dimensions and rectangularity

Nominal dimensions of width B and length H should not be greater than the described rectangle which is a product of the increase of the nominal dimensions by the upper maximum permissible deviation t, or smaller than the described rectangle which is a product of the decrease of the dimensions by the lower maximum permissible deviation t. The sides of the described rectangles are parallel to each other and should have a common central point. The limits of the rectangularity should be the described rectangles.



graniczne odchylenia szerokości B i długości H

[limits of maximum permissible deviations of width B and length H]

Each offset (see below) should be within the limits of the following maximum permissible deviations.

limits of maximum permissible deviations t for the exact dimensions B and H (mm)			
nominal dimensions B or H	nominal thickness of ≤ 8 mm	8 mm nominal thickness of > 8 mm	
		each glass pane of nominal thickness < 10 mm	at least one glass pane of nominal thickness of ≥ 10 mm
< 1100 mm	+ 2.0 mm	+ 2.5 mm	+ 3.5 mm
	- 2.0 mm	- 2.0 mm	- 2.5 mm
< 1500 mm	+ 3.0 mm	+ 3.5 mm	+ 4.5 mm
	- 2.0 mm	- 2.0 mm	- 3.0 mm
< 2000 mm	+ 3.0 mm	+ 3.5 mm	+ 5.0 mm
	- 2.0 mm	- 2.0 mm	- 3.5 mm
< 2500 mm	+ 4.5 mm	+ 5.0 mm	+ 6.0 mm
	- 2.5 mm	- 3.0 mm	- 4.0 mm
> 2500 mm	+ 5.0 mm	+ 5.5 mm	+ 6.5 mm
	- 3.0 mm	- 3.5 mm	- 4.5 mm

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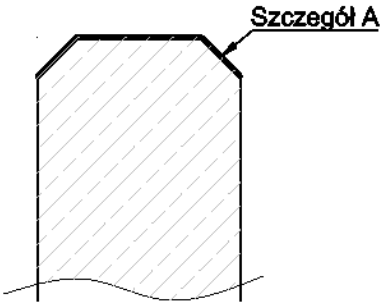
§ 4

GRINDING OF GLASS EDGES

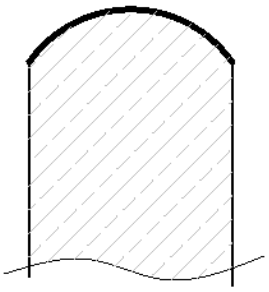
Grinding and polishing of glass edges

[Detail A]



Trapezoidal cut known as the pencil cut (f-edge) – made with the use of diamond discs on multi-head vertical or horizontal grinders, or made with the use of diamond peripheral discs on the numeric centre.

- ground edge - matt cut along the entire edge
- polished edge - shiny edge
- grinding and polishing angle for the pencil cut - detail A $\alpha = 45^{o}$ within the length range of 0.3-1.3mm



Round trapezoidal cut (c-edge) – made with the use of diamond peripheral discs.

- cut edge - matt
- polished edge - shiny edge

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§ 5

PUNCHING

Due to the glass properties and the course of the toughening process, there are some restrictions regarding the location and diameter of the holes in the glass, in relation to its edges, corners and other holes.

Layout of holes

Variables which affect the limitations on the hole layout

d – nominal thickness of the glass

B, H - side dimensions Φ

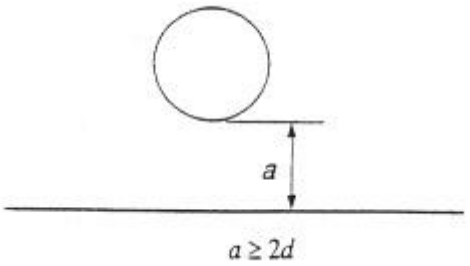
- hole diameter number

of holes

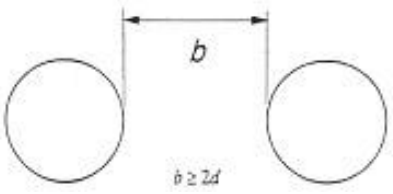
shape of glass

Round (drilled) holes

Distance **a** from the edge of the glass to the edge of the hole should not be less than double the nominal thickness of the glass **2d**



Distance **b** between the edges of the holes should not be less than **2d**.



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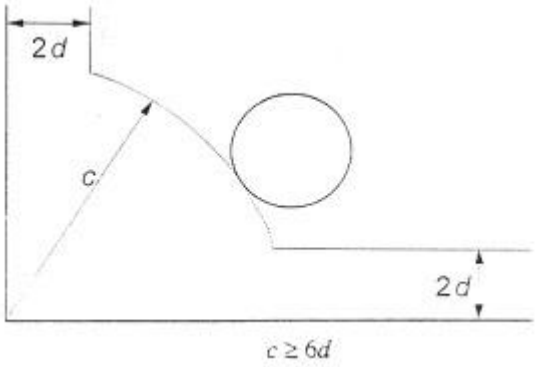
Distance **c** of the edge of the hole from the corner of the glass should not be less than **6d**.



Tolerance for drilled hole diameters

Tolerance for drilled hole diameters	
Nominal diameter of the hole Φ	Hole diameter tolerance
4 mm ≤ Φ ≤ 20 mm	± 1.0 mm
20 mm < Φ ≤ 100 mm	± 2.0 mm
Φ >100 mm	As agreed with the manufacturer

Tolerance of drilled hole layout

Measurements of the locations of placement of the holes are made in two directions, at the right angle (x, y) from the same reference point for all the holes, to the centre of the hole.

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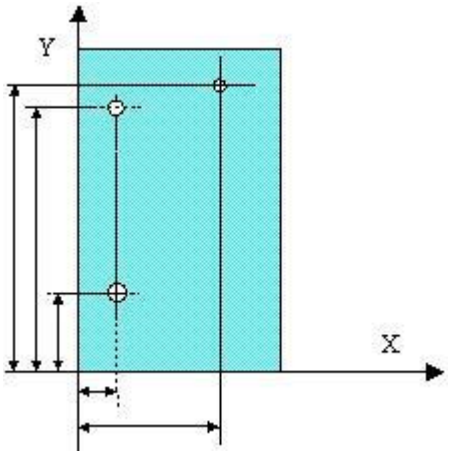

Glass dimension	Tolerance of drilled hole layout	
	Nominal thickness of the glass d ≤ 12 mm	Nominal thickness of the glass d > 12 mm
B or H ≤ 2000 mm	± 2.5 mm	± 3.0 mm
2000 mm <B or H ≤ 3000 mm	± 3.0 mm	± 4.0 mm
B or H > 3000 mm	± 4.0 mm	± 5.0 mm

Rectangular holes (cut)

The size of rectangular holes

The size of rectangular holes may not be greater than a third of, respectively, the width and height of the glass piece.

h ≤ H / 3 c

≤ B / 3

The layout of rectangular holes

The strip (a, b) between the rectangular hole and the edge of the glass must not be smaller than half of the hole size in a given direction.

a ≥ h / 2 b

≥ c / 2

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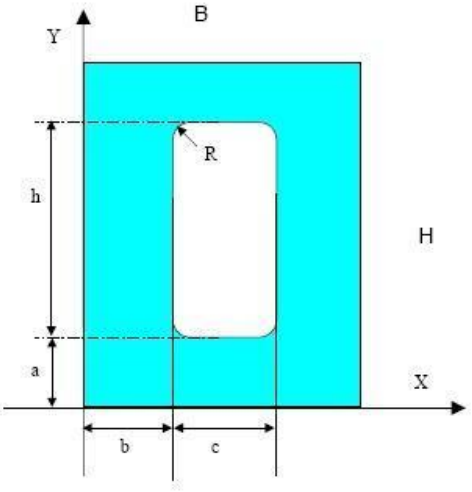
Corners of rectangular holes must be rounded. Minimum rounding radius R = 9 mm



Rectangular holes tolerance

Hole side dimension	Tolerance (h, c)
h or c	± 3.0 mm

Rectangular holes layout tolerance

The layout of rectangular holes is measured in two directions, at the right angles, to the X and Y axes which are axes (points) of reference to the nearest edge of the rectangular hole.

Glass dimension	Rectangular holes layout tolerance (a, b)	
	Nominal thickness of the glass d ≤ 12 mm	Nominal thickness of the glass d > 12 mm
B or H ≤ 2000 mm	± 2.5 mm	± 3.0 mm
2000 mm <B or H ≤ 3000 mm	± 3.0 mm	± 4.0 mm
B or H > 3000 mm	± 4.0 mm	± 5.0 mm

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§ 6

CUTS ON EDGES AND IN CORNERS

It is possible to make multiple cut and cut configurations. The following are general layout and tolerance rules.

The size of cuts on the edges

The size of cuts on the edge may not be greater than a third of, respectively, the width and height of the glass piece.

$c \leq B / 3$

$h \leq H / 3$

The layout of cuts on the edges

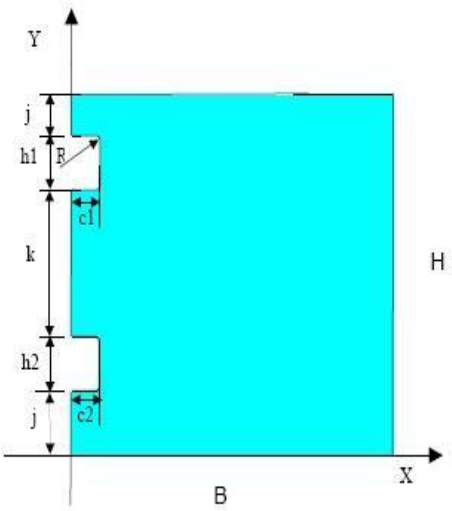
Distance between the two cuts on the edge (k) must be greater than or equal to half the width of the larger of them. The width of the cut on the edge is considered to be the dimension measured parallel to the edge on which the cut is made.

$k \geq h/2$

Distance between the cut on the edge and the edge of the glass pane (j) must be greater than or equal to half the cut width and not less than 100 mm.

$j \geq h/2$

Internal corners of the cuts must be rounded. Minimum rounding radius $R \geq 9mm$.



The tolerance of the layout of cuts on the edges

The measurements of the locations of the cuts on the edge are made in two directions, at the right angle, to the X and Y axes which are the axes (points) of reference to the nearest edge of the cut.

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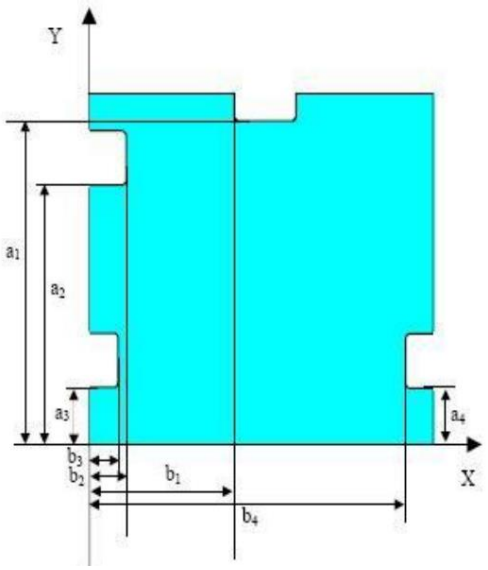
The tolerance of the layout of cuts on the edges is shown in the table and figure below

Glass dimension	Tolerance of placement of the cuts on the edge (a_1, a_2, a_3, a_4, b_1, b_2, b_3, b_4)	
	Nominal thickness of the glass d ≤ 12 mm	Nominal thickness of the glass d > 12 mm
B or H ≤ 2000 mm	± 2.5 mm	± 3.0 mm
2000 mm <B or H ≤ 3000 mm	± 3.0 mm	± 4.0 mm
B or H > 3000 mm	± 4.0 mm	± 5.0 mm



Size of cuts in the corner

The size of cuts in the corner may not be greater than a third of, respectively, the width and height of the glass piece c ≤ B / 3

h ≤ H / 3

Internal corners of the cuts must be rounded. Minimum rounding radius R ≥ 9mm.

Tolerance of the cuts in the corner

Side of the cut in mm	Tolerance (h, c)
h or c	± 3.0 mm

Tolerance of the layout of cuts in the corner

The measurements of the locations of the cuts in the corner are made in two directions, at the right angle, to the X and Y axes which are the axes (points) of reference to the nearest edge of the cut.

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Glass dimension	Tolerance of the placement of cuts on the edge (a, b)	
	Nominal thickness of the glass d ≤ 12 mm	Nominal thickness of the glass d > 12 mm
B or H ≤ 2000 mm	± 2.5 mm	± 3.0 mm
2000 mm <B or H ≤ 3000 mm	± 3.0 mm	± 4.0 mm
B or H > 3000 mm	± 4.0 mm	± 5.0 mm

§ 7

LAMINATED GLASS

Dimensions and deviation limits

Permissible deviations of dimensions of single laminated glazed panes (according to EN ISO 12543-5) Nominal width and length dimensions should not be greater than or smaller than the limiting deviation (t) for the exact dimensions B and H (mm)

Tolerance of the dimensions of laminated glass, depending on the thickness of the glass pane

Nominal dimensions L and H (mm)	Nominal thickness ≤ 8 mm	Nominal thickness of laminated glass > 8 mm	
		Each glass pane with nominal thickness of <10 mm	At least one glass pane with nominal thickness of ≥ 10 mm
≤ 2000	+3.0 -2.0	+3.5 -2.0	+5.0 -3.5
≤ 3000	+4.5 -2.5	+5.0 -3.0	+6.0 -4.0
> 3000	+5.0 -3.0	+6.0 -4.0	+7.0 -5.0

Maximum permissible thickness deviations of cast interlayers should be in accordance with the table below

Interlayer thickness	**Maximum permissible deviation**
< 1	± 0.4
≥ 1 to < 2	± 0.5
≥ 2 to < 3	± 0.6
≥ 3	± 0.7

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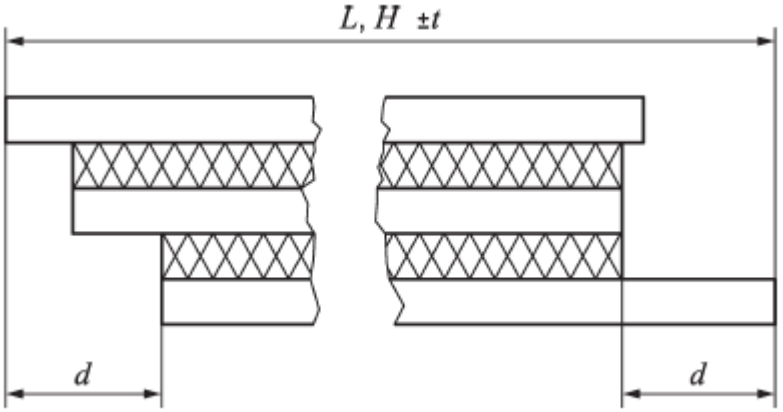
Maximum permissible deviations of the difference between diagonals

Dimensions in millimetres

Nominal dimension L or H	**Nominal thickness of laminated glass ≤ 8 mm**	**Nominal thickness of laminated glass > 8 At least one glass pane**	
		Each glass pane of nominal thickness of < 10	**At least one glass pane of nominal thickness of ≥ 10 mm**
< 2000	6	7	9
< 3000	8	9	11
< 3000	10	11	13

Displacement



Maximum displacement, d , should be as specified in the following table. Width, L, and length, H, should be considered separately.

Nominal dimension L or H	**Maximum permissible displacement** d
L, H ≤ 1000	2.0
1000 < L, H ≤ 2000	3.0
2000 < L, H ≤ 4000	4.0
L,H > 4000	6.0

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Point defects within the visible area

Defect dimension d mm		0.5 < d ≤ 1.0	1.0 < d ≤ 3.0			
Glass pane dimension		For each measurement	A ≤ 1	1 < A ≤ 2	2 < A ≤ 8	A > 8
Number or density of permissible defects	2 panes 3 panes 4 panes ≥ 5 panes	No limit; But without accumulation of defects	1 2 3 4	2 3 4 5	1/m2 1.5/m2 2/m2 2.5/m2	1.2/m2 1.8/m2 2.4/m2 3/m2
NOTE Accumulation of defects occurs when at least four defects are < 200 mm apart. This distance is reduced to 180 mm for laminated glass consisting of three panes, to 150 mm for laminated glass consisting of four panes and to 100 mm for laminated glass consisting of five or more panes.						

The number of acceptable defects according to the Table should be increased by one for each individual interlayer thicker than 2 mm

Linear defects within the visible area

Linear defects within the visible area for unframed edges

Pane surface m2	**Number of acceptable defects with the length of > 30 mm ***
≤ 5	Impermissible
5 to 8	1
> 8	2
*Linear defects with the length of less than 30 mm are permissible	

Layered glass is usually fitted in frames. However, if laminated glass is not framed, its edges may be as specified below, according to ISO 12543-5

- cut edges

- polished edges

- oblique edges

Chips and bubbles, checked according to the test method specified in this chapter, are acceptable if they are not obvious. Defects in the interlayer, i.e. extrusion and recess, are acceptable.

§ 8

MARKING OF TOUGHENED GLASS

According to the PN-EN 12150-1 standard, toughened glass should be marked in a legible and permanent manner.

The label should specify:

- the name or trade mark of the manufacturer

- PN-EN 12150-1 standard number

Missing glass marking is acceptable only if this results from the information contained in the order or previous arrangements with the client!

Standard marking at the SELL-GLASS plant is “PN-EN 12150”.

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§ 9

Permissible defects

Conditions for observation and assessment of defects

The glass should be viewed by placing it vertically and parallel to a matt screen, in diffused daylight or equivalent. The observer should be at a distance of 2 m from the glass, looking at it perpendicularly (the matt screen should be on the other side of the glass) with the naked eye.

PERMISSIBLE DEFECTS IN TOUGHENED GLASS

No.	Type of defect	Glass surface (z)		
		$z \leq 1.0\ m^2$	$1.0\ m^2 < z \leq 2.0\ m^2$	$z > 2.0\ m^2$
1	Point defects in the form of inclusions of foreign	non-permissible	non-permissible	non-permissible
2	Open (bursting) bubbles	non-permissible	non-permissible	non-permissible
3	Closed bubbles	Permissible 2 bubbles within max dimensions of 2mm	Permissible 3 bubbles within max dimensions of 2mm	Permissible 5 bubbles within max dimensions of 2mm
4	Linear defects in the form of cracks	Permissible if their total length is 40 mm and max thickness up to 0.1 mm and max length of the individual crack is up to 15mm In the marginal strip, single scratches of up to 20 mm in length are permissible	Permissible if their total length is 45 mm and max thickness up to 0.1 mm and max length of the individual crack is up to 15mm In the marginal strip, single scratches of up to 20 mm in length are permissible	Permissible if their total length is 50mm and max thickness up to 0.1 mm and max length of the individual crack is up to 15mm In the marginal strip, single scratches of up to 20 mm in length are permissible
5	Defects of the edge	Dulled edge - slight chips are allowed on the edge, provided they are dulled Ground edge (matt) - chipping, grinding defects (shiny spots) - not allowed Polished (shiny) edge - matt spots, chips - not allowed		
6	Stains, smudges	Permissible if they are not visible in daylight from the distance specified by the standard applicable to the type of glass		
7	Enamel colour	Enamel colour is determined on the basis of a baked enamel sample on a specific type of glass (glass thickness, glass manufacturer) confirmed by the client.		

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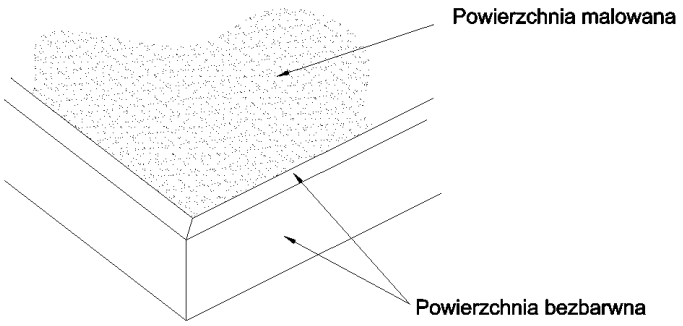
§ 10

PAINTING OF TOUGHENED GLASS

[Painted surface]



[Colourless surface]

Permissible defects of glass painted in one of the RAL colours

The colour of the coatings applied to the glass surface depends on the thickness of the glass, the process of its manufacture, and the composition of the mixture of glass raw materials. Depending on the angle at which the glass is viewed, the colour may be noticeably variable. Glass manufacturers try to ensure the best possible repeatability of process parameters, and thus the colour and shade of the glass. Nevertheless, each of these processes has certain tolerance limits of repeatability, within which there may be slight differences in the observed shade and colour.

For this reason, it is recommended to order glass for the entire room at the same time. The most commonly used glass is Float, but you should take into account its own colour (slightly greenish) which becomes more intense as the thickness of the glass increases, and it changes the shade of the applied paint.

Due to the above deviations, we recommend assessing the colour based on a sample of the same thickness as the ordered glass. Enamel colour is determined on the basis of a baked enamel sample on a specific type of glass (glass thickness, glass manufacturer) confirmed by the client.

Permissible defects of glass painted in one of the RAL colours		
Type of defect	Edge zone (a 15 mm wide strip along the perimeter of the glass)	The main zone (the remaining part of the glass)
Point defects less or equal to 0.5 mm *	Permissible	Permissible
Point defects greater than 0.5 mm.	Permissible with max width of 3mm and any length	Max 3 defects with a surface area of no more than 25 mm^2
Paint residues on the edges	Permissible for panes intended for frames or glass units, not permissible if the edge of the finished product is visible.	Not applicable

* defects ≤ 0.5 mm (starry sky, spot holes in the enamel) are acceptable and are generally not considered as defects

Places where defects have been corrected are acceptable. Repaired defects may not be seen from a distance of more than 3m.

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§ 11

Storage and transport of glass

Packing

Glass should be packed in boxes, cages or it should be placed on racks. Boxes and cages should be made of sawn timber, while the racks should be made of metal. All metal parts of the rack which are in direct contact with the glass should be lined with rubber or other cushioning material, each glass pane should be separated with flexible spacers. Windows placed on racks should be secured against sliding. A different packing method is allowed if it protects the glass to the same extent as the above method.

Storage

Glass should be stored in roofed, dry, well-ventilated rooms and protected against atmospheric precipitation, in the temperature not exceeding 40°C, each glass pane should be separated with a flexible spacer. Glass must be protected against contact with silicones, oils and oily or greasy substances. Avoid leaving the stained or wet glass for a long time. During assembly and operation, the glass should not come into contact with chemicals which aggressively affect the glass or film used for lamination, such as: silicones, greases, oily chemicals, alcohols, solvents, etc.

Transport

It is recommended to transport the glass in a specialized vehicle. When unloading the glass from the supplier's car is carried out by the client, the client is responsible for the correct unloading and any caused damage. If the client collects the glass from the production plant, this takes place at the risk of the client.

Cleaning of the surface and the glass

Chemically-treated glass (Satin) and sandblasted glass - dirt should be removed only with water, no chemicals should be used.

The manufacturer is not responsible for the use of chemicals or tools which cause damage to the surface of the glass, sandblasting coating, adhesive decorations or Teflon coating on the mirror.

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