

LAMINATED SAFETY GLASSES

AGC

GLASS UNLIMITED

— STRATOBEL® - STRATOPHONE®

AGC Flat Glass Europe,

A EUROPEAN FLAT GLASS LEADER

AGC Flat Glass Europe (formerly Glaverbel) produces, processes and sells flat glass for the construction industry (exterior glazing and interior decorative glass), for the automotive sector and for specialised industries. Based in Brussels, Belgium, it is the European branch of AGC Flat Glass, the world's leading producer of flat glass.

Ever keen to diversify its range, AGC Flat Glass Europe offers a range of laminated glasses that meet all safety levels, in line with the assembly used and prevailing standards.

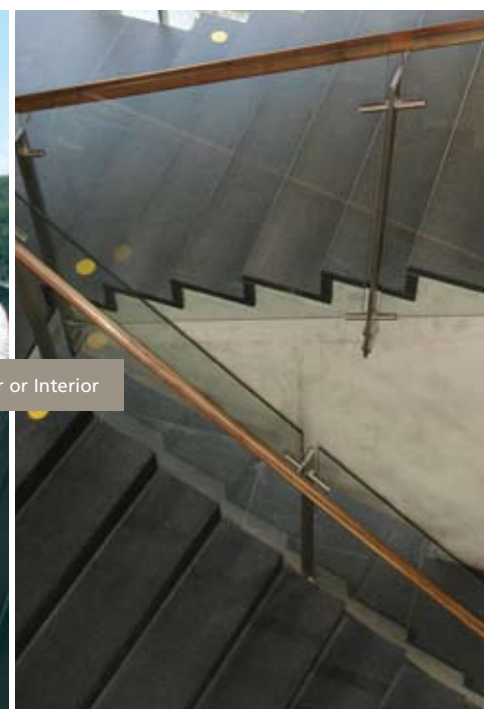
PRINCIPLE OF LAMINATED GLASS

Laminated glass consists of an assembly of two or more sheets of glass and one or more PVB (polyvinyl butyral) interlayers. If the glass is broken, most of the fragments remain stuck to the interlayer (in other words, the glazing stays in place).

The laminated assembly provides the glass product's mechanical strength. Depending on the structure in question (number of glass sheets and interlayers), the assembly also ensures varying levels of safety and insulation.

Laminated glass can be used in monolithic or insulating glazing.

Example of fragmentation of laminated glass



Exterior or Interior

MULTIPLE FUNCTIONS

The assembly of panes and interlayers encourages multiple applications.

By combining products from AGC Flat Glass Europe's vast range, it is possible to combine safety with other functions in a single glass product.



Safety

(Injury + Break-in/Theft + Firearm)



Acoustics

(Stratophone)



LOW-E

(Low-emissivity glasses)



Design

(Clear, Color, White)



Sun

(Solar control)



Complex transformations



On the ground, on the roof



SAFETY

STRATOBEL, THE GLASS SHIELD

It is the composition of the laminated glass that determines the level of safety provided. Safety standards define the testing methods that make it possible to classify glasses for various applications.

AGC's range of laminated glasses meets all prevailing safety levels and standards (see table on page 14).



PROTECTION FROM INJURIES AND FALLS

These products are classified according to EN 12600: Glass in building - Pendulum test – Impact test method and classification for flat glass



ANTI-BANDIT

Glass in building - Security glazing – Testing and classification of resistance against manual attack

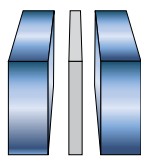


RESISTANT TO BULLET ATTACK

Glass in building - Security glazing – Testing and classification of resistance against bullet attack

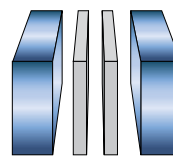
The technical information detailing the content of these standards is available at www.yourglass.com.

Protection from injuries



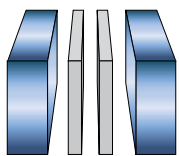
- For preventing cuts and injuries due to accidental impact
- 2 sheets of glass - at least 1 PVB interlayer
- Class: 2B2

Protection from falling



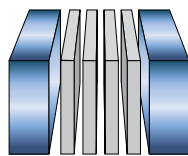
- For preventing individuals from falling through glass even when the glass is accidentally broken
- 2 glasses - at least 2 PVB interlayers
- Class: 1B1

Basic protection



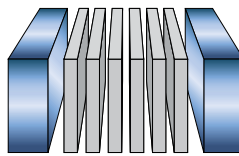
- Vandalism
- 2 glasses – at least 2 PVB interlayers
- Class: P1A-P2A

Medium protection



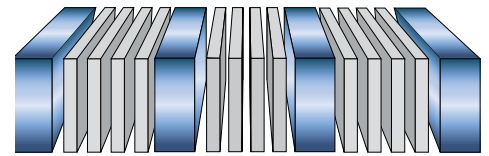
- Small-scale manual attack
- 2 glasses – at least 4 PVB interlayers
- Class: P3A-P4A

Enhanced protection



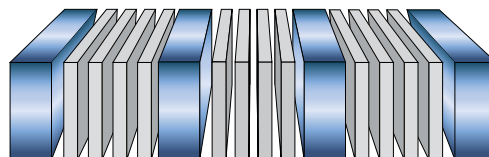
- Withstands premeditated attacks by attackers who have limited time to operate (deters break-ins and theft)
- 2 glasses – at least 6 PVB interlayers
- Class: P5A

Very high level of protection



- In case of repeated, premeditated manual attack by attackers who have significant resources at their disposal
- Laminated glass
- Class: P6B - P7B - P8B

Protection for individuals from armed attack



- Able to withstand bullet attack
- Multi-laminated assembly
- Class determined according to type of weapon and ammunition

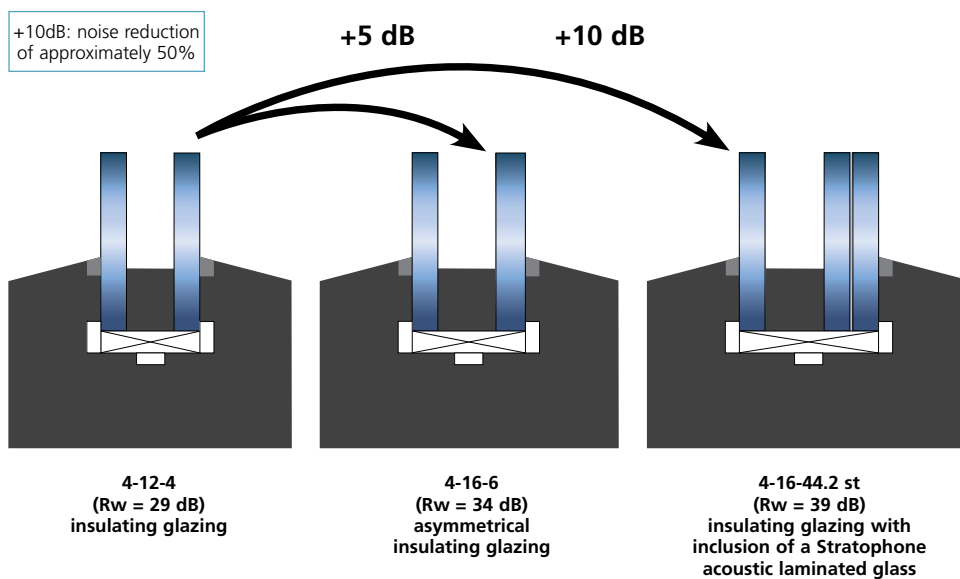


ACOUSTICS

STRATOPHONE, SILENCE IS GOLDEN

Some laminated glasses guarantee high-level acoustic performance while providing mechanical performance equivalent to normal PVB in terms of safety. By including at least one acoustic PVB interlayer, Stratophone significantly reduces noise, providing a quiet atmosphere day and night.

In the example below you can compare the acoustic performance of three kinds of structures. From a conventional insulating glazing to an insulating glazing with Stratophone, a few millimetres is all it takes to achieve high-quality acoustic comfort. For instance, improving a building's acoustic insulation by 10dB yields a 50% noise reduction.



Rw is the benchmark index for measuring the desired level of acoustic insulation. It is an average, supplemented with two adaptation terms (C and Ctr) that take account of the types of frequencies involved (high and low, respectively).

■ GLASS ■ PVB





THERMAL INSULATION & SOLAR CONTROL

(STRATOBEL LOW-E)
(STRATOBEL SUN)

Stratobel, a solution for all climates!

AGC Flat Glass Europe is a leader in low-emissivity and solar control coatings. The different types of coated glazings are also available in laminated assemblies: Stratobel LOW-E and Stratobel Sun. The AGC range features multiple solutions depending on the look, performance and processing required.



STRATOBEL SUN FOR SOLAR CONTROL

The coated glasses in this range absorb and reflect part of the sun's heat and light. Depending on the look required, certain products are either reflective (Stopsol) or neutral (Sunergy, Stopray).

STRATOBEL LOW-E FOR THERMAL INSULATION

Coated glasses reduce the heat loss coefficient, keeping more heat inside the building.





DESIGN

STRATOBEL AND DESIGN

Glass is ubiquitous in contemporary architecture and design.

Stratobel laminated glass offers many creative options, specifically in terms of colour, light and texture.

Depending on the technique selected, the appearance will be transparent, coloured or translucent/opaque. It may even include original design elements.

TRANSPARENCY – STRATOBEL CLEAR

The glasses in the Planibel Clear range are suitable for all processing options used in the construction industry. The transparency offered by Planibel Clear is highly prized by contemporary architectural designers.

The Stratobel Clear range comprises:

- Planibel Clear
- Planibel Clearvision: since it is extra-clear, it has a neutral appearance that is ideal for use in decorative applications.
- Planibel Linea Azzura: its blue reflection gives it an original touch that makes it stand out from its rivals.
- The PVB is always clear.



COLOURS – STRATOBEL COLOR

Stratobel Color encourages the expression of subtle nuances in the most flamboyant architectural and interior design projects.



The coloured appearance is achieved by the glass and PVB used.

- Type of glass: clear or coloured Float Planibel, Matelux on clear or coloured glass
- AGC is well known for its range of blue tinted glasses that inspire architects and designers in both the construction industry and interior fit out trade.
- PVB: clear or coloured in the various ranges

INTIMATE VISUAL COMFORT – STRATOBEL WHITE

Walls and partitions made of Stratobel let in light while keeping out prying eyes. The simple white provides an atmosphere of undisturbed calm.

This kind of comfort can be created with:

- Stratobel White PVB: assembly with PVB Mat (Mat 80, Mat 65, Mat 07), whose light transmission performance provides an ascending level of privacy. Planibel Clearvision enhances the white sheen.
- Stratobel White Matelux: assembly with clear or matt glass (Matelux on Clear, Clearvision or Antislip).

Please contact us for information on availability and technical recommendation. You can also visit our site at www.yourglass.com.



■ PROTECTION FROM ULTRAVIOLET RADIATION

Stratobel and Stratophone laminated glasses provide especially high levels of protection from UV radiation (more than 99% when two 0.38 mm PVB interlayers are used). Despite this, any objects, materials and wallpaper behind the laminated glass may still be subject to some degree of discolouration or bleaching.

Discolouration is not caused solely by UV radiation. Blue light, infrared light, heat, moisture, artificial lighting and the quality of the materials and pigments used also play a role in the discolouration process.



INSTALLATION

INSTRUCTIONS

When installing Stratobel or Stratophone laminated glass, care must be taken to ensure compliance with the following three key requirements:

- no water must be allowed to stagnate in the rebate
- the glazing must be correctly blocked
- sealants must be used that are compatible with PVB (and with any coatings used in the laminated assembly). It is up to the person applying the sealant to check it for compatibility.

Asymmetrical laminated glasses (able to withstand break-ins and firearms) and/or insulating glazings that include one or more laminated glasses must be installed in a certain direction so that they can achieve the required performance levels. Stringent rules must be respected for flooring and steps.

For more information, please consult the Glazing Instructions brochure, available on request and on our website at www.yourglass.com.

NB: In all cases, the thicknesses corresponding to a safety class are the minimum for the test in question. The actual thicknesses to be used must be determined on a case-by-case basis in line with the dimensions and stresses to which the glazing will be subjected, and to the installation itself.

STORAGE, HANDLING AND PROCESSING

Detailed brochures are available with information on the precautions to taken when storing, handling and processing Stratobel laminated glass, and more specifically when a coated glass is included in the assembly.



PERFORMANCE & AVAILABILITY

STRATOBEL SAFETY, CAPABLE OF WITHSTANDING ACCIDENTS AND BREAK-INS

	Light properties		Energy properties		Acoustics	Safety			Thickness	Weight
	TL	LR	EA	Ug	Rw (C, Ctr)	Impact	Break-in	Bullets		
	%	%	%	W/(m².K)	dB	EN 12600	EN 356	EN 1063		
33.1	89	8	17	5,7	32 (-1; -3)	2B2	NPD	NPD	6	15
44.1	88	8	20	5,6	34 (-1;-2)	2B2	NPD	NPD	9	21
55.1	87	8	23	5,6	35 (-1; -3)	1B1	NPD	NPD	10	26
66.1	86	8	25	5,5	NPD	1B1	NPD	NPD	12	31
33.2	89	8	19	5,6	33 (-1;-4)	1B1	P1A-P2A	NPD	7	16
44.2	88	8	21	5,6	35 (-1;-3)	1B1	P1A-P2A	NPD	9	21
55.2	87	8	24	5,5	NPD	1B1	P1A-P2A	NPD	11	26
66.2	86	8	27	5,4	36 (-1;-3)	1B1	P1A-P2A	NPD	13	31
88.2	84	8	32	5,3	39 (-1;-3)	1B1	P1A-P2A	NPD	17	41
1010.2	82	7	36	5,2	40 (-1;-3)	1B1	P1A-P2A	NPD	21	51
1212.2	80	7	40	5,1	42 (-0;-3)	1B1	P1A-P2A	NPD	25	61
33.4	89	8	21	5,5	NPD	1B1	P3A-P4A	NPD	8	17
44.4	88	8	23	5,5	NPD	1B1	P3A-P4A	NPD	10	22
55.4	87	8	26	5,4	36 (-1;-4)	1B1	P3A-P4A	NPD	11	24
66.4	86	8	29	5,3	37 (-1;-4)	1B1	P3A-P4A	BR1-S	14	31
44.6	88	8	24	5,4	35 (-1;-3)	1B1	P5A	NPD	10	22
66.6	86	8	30	5,2	NPD	1B1	P5A	NPD	14	33
502-1	86	8	31	5,1	NPD	1B1	P6B	NPD	15	33
502-2	86	8	31	5,1	NPD	1B1	P6B	NPD	15	33
802-2	84	8	34	5,1	NPD	1B1	P6B	NPD	18	42
303-3	82	7	39	5	NPD	1B1	P7B	NPD	23	53
103-3	84	8	36	4,9	NPD	1B1	P6B	NPD	21	45
504-4	78	7	48	4,5	NPD	1B1	P8B	BR5-S/SG2-S	35	31
803-5	80	7	43	4,8	NPD	1B1	P8B	NPD	28	64

STRATOPHONE

	Light properties		Energy properties				Acoustics	Safety			Thickness	Weight
	TL	RL	EA	SF	SC	Ug	Rw (C; Ctr)	Impact	Break-in	Bullets		
	%	%	%	%		W/(m²·K)	dB	EN 12600	EN 360	EN 1063		
33.1	89	8	17	80	0,92	5,7	35 (-1; -3)	2B2	NPD	NPD	6	15
44.1	88	8	20	78	0,90	5,6	37 (0; -2)	2B2	NPD	NPD	9	21
55.1	87	8	23	76	0,87	5,6	38 (-1; -3)	1B1	NPD	NPD	10	26
66.1	86	8	25	74	0,85	5,5	40 (-1; -3)	1B1	NPD	NPD	12	31
33.2	89	8	19	79	0,91	5,6	36 (0; -3)	1B1	P1A-P2A	NPD	7	16
44.2	89	8	21	77	0,89	5,6	37 (0; -2)	1B1	P1A-P2A	NPD	9	21
55.2	87	8	24	75	0,86	5,5	39 (-1; -3)	1B1	P1A-P2A	NPD	11	26
66.2	86	8	27	73	0,84	5,4	40 (-1; -3)	1B1	P1A-P2A	NPD	13	31
88.2	84	8	32	70	0,80	5,3	41 (-1; -3)	1B1	P1A-P2A	NPD	17	41
33.4	89	8	21	78	0,90	5,5	NPD	1B1	P3A-P4A	NPD	8	17
44.4	88	8	23	76	0,87	5,5	NPD	1B1	P3A-P4A	NPD	10	22

STRATOBEL, CAPABLE OF WITHSTANDING BULLET ATTACKS

	Light properties		Energy properties				Acoustics	Safety			Thickness	Weight
	TL	RL	EA	SF	SC	Ug	Rw (C; Ctr)	Impact	Break-in	Bullets		
	%	%	%	%		W/(m²·K)	dB	EN 12600	EN 360	EN 1063		
BR1-S 402-1	86	8	29	72	0,83	5,3	NPD	1B1	P4A	BR1-S	14	32
BR1-NS 802-5	84	6	34	69	0,79	5,2	NPD	1B1	P2A	BR1-NS	18	42
BR2-S 003-1	83	8	36	67	0,77	5,1	NPD	1B1	P2A	BR2-S	20	47
BR2-NS 104-1	78	7	45	60	0,69	4,8	NPD	1B1	P6B	BR2-NS	31	73
BR3-S 603-1	80	7	42	63	0,72	4,9	NPD	1B1	P6B	BR3-S	26	63
BR3-NS 704-3	75	7	52	56	0,64	4,6	NPD	1B1	P6B	BR3-NS	37	89
BR4-S 304-6	78	7	46	60	0,69	4,6	NPD	1B1	P6B	BR4-S	33	80
BR4-NS 1207-1	65	12	58	49	0,56	2,6	NPD	1B1/1B1	P4A	BR4-NS	61	125
BR5-S 504-4	78	7	48	59	0,68	4,5	NPD	1B1	P8B	BR5-S/SG2-NS	35	81
BR5-NS 806-2	69	7	59	51	0,59	4,3	NPD	1B1	P7B	BR5-NS	58	141
BR5-NS 4207-1	65	12	59	45	0,57	2,5	NPD	1B1/1B1	P2A	BR5-NS	64	127
BR6-S 1207-1	65	12	58	49	0,56	2,6	NPD	1B1/1B1	P4A	BR6-S	61	125
BR6-NS 408-1	61	8	67	45	0,52	3,9	NPD	1B1	P8B	BR6-NS	74	179
BR6-NS 3209-1	58	11	66	43	0,49	2,4	NPD	1B1/1B1	P6B	BR6-NS	83	176
BR7-NS 8209-1	57	11	68	40	0,56	2,3	NPD	1B1/1B1	P8B	BR7-NS	88	188
BR7-S 6208-1	61	11	63	46	0,53	2,4	NPD	1B1/1B1	P7B	BR7-S	76	157
BR7-NS 009-1	62	6	68	45	0,52	3,6	NPD	1B1	P8B	BR7-NS	80	188
SG1-S 304-6	78	7	46	60	0,69	4,6	NPD	1B1	P6B	SG1-S	33	76
SG1-NS 9207-1	62	12	61	46	0,53	2,5	NPD	1B1/1B1	P4A	SG1-NS	69	145
SG2-S 504-4	78	7	48	59	0,68	4,5	NPD	1B1	P8B	SG2-S	35	81
SG2-NS 9208-1	61	11	65	44	0,51	2,3	NPD	1B1/1B1	P8B	SG2-NS/BR5-S	79	162

5-figure code: insulating glazing

4-figure code: laminated monolithic glazing. May be assembled in insulating glazing if necessary
(In such cases, laminated glass of at least 6 mm with 9 or 10 mm spacer)

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