ACORN ARCHITECTURAL ALUMINIUM	Technical Submittal
Client:	Graham Construction
Project Name:	Cambridge Halls - MMU
Document Number:	CAM-AAL-ZZ-ZZ-TS-X-001002
Document Title:	Glass
Contract Number:	C8209

For Comment/Review

Revision Date	Revised By	Revision
02.10.2025	Andy Turner	P01
06/11/2025	Andy Turner	P02
03/03/2026	Andy Turner	P03

Recent Changes

P01 - First Issue
P02 - Data Sheets Updated
P03 - EN356 & EN 12600 information added

ACORN ARCHITECTURAL ALUMINIUM

SGG ECLAZ Product Brochure

ECLAZ series

LOW-E GLASS



GLASS EXPROVER

SAINT-GOBAIN

ECLAZ series

Source of light and well-being

BETTER PLACE FOR PEOPLE

ECLAZ, is the new generation of Saint-Gobain Low-E glass for high end Glazing Units. Aesthetic, thermal insulation, solar gains, natural light access, ECLAZ allows to reach the highest requirements in terms of energy efficiency and occupants' comfort, without any compromise.

EPD VERIFIED

The environmental impacts of this product have been assessed over its whole life cycle. Its Environmental Product Declaration has been verified by an independent third party.

- A KEY CONTRIBUTION IN SUSTAINABILITY
- TEMPERATURE CONTROL LOW-E
- DAYLIGHT COMFORT from 75% to 82% transparency
- ENERGY SAVINGS
- NEUTRAL AESTHETICS IN TRANSMISSION AND REFLECTION

PROCESSING

- Available in two versions: annealed or to be tempered
- To be assembled in insulating glazing unit
- Edge deletion is required
- Enameling not compatible

PERFORMANCES

Standard thicknesses : 4-6 mm (other on request) - Dimensions : Jumbos, split sizes

Average performance values of DGU (6+12+6 mm) with coating on surface #3[1], according to the standards ISO 9050 m1 /EN 673 and to the standards NFRC 100

Product	Norm	Light Trans-mittance LT (%)	Solar Factor g/SHGC	Shading Coefficient SC	External Light Reflectance LRe (%)	Internal Light Reflectance LRi (%)	U-Value W/(m².K)	
							12mm air	16mm argon
ECLAZ ONE II	ISO	78	0.55	0.63	15	17	1.5	1.0
	NFRC	78	0.55	0.64	15	17	1.6	1.4
ECLAZ II	ISO	82	0.66	0.76	11	11	1.6	1.1
	NFRC	82	0.67	0.77	11	11	1.7	1.5

SAINT-GOBAIN

Glass Exprover
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[1] DGU values calculated with PLANICLEAR as inner pane.

Design: Well Communications © February 2018

Please note when reading this glass specification(s).

Our proposed glass specification for the project is Glass Type 1.

Glass Type 2 is intending to be used where Glass Type 1 exceeds either 1300x2400 or 3000x900 in size.

Glass Type 3 is omitted

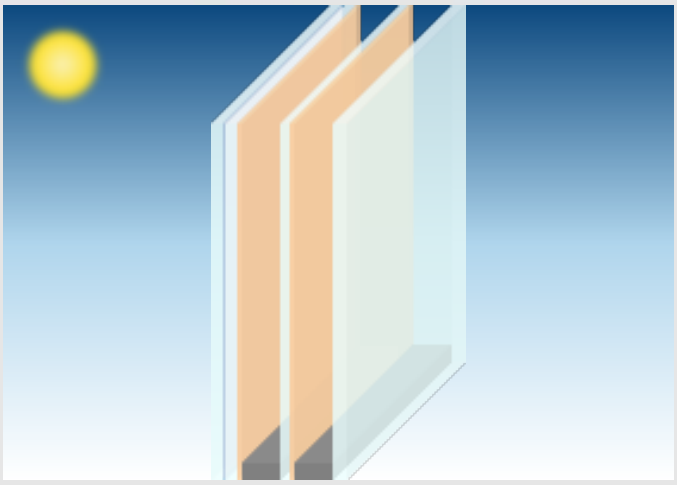
Below is comparison of the proposed Glass Specifications to the Acoustic Report - We would advise that it is very difficult to achieve the Octave Bands at the lower end.

Glazing Type		Minimum Recommnended S.R.Index (dB) at Octave Band Centre Frequency (Hz)								Rw(dB)
Glass Type	Glass Build Up	63	125	250	500	1K	2K	4k	8k	
Acoustic Report	High-spec PVB acoustic Laminated double glazing i.e 10/16/8.4 ac lam	31	28	30	39	44	49	56	56	42
G1 Proposal	11.5/16Cav/4/16Cav/6	26.1	25.9	32.3	40	46.5	50.3	62.4	NA	44
G2 Proposal	11.5/16Cav/6/16Cav/6	26	25.3	31.1	39.3	47.2	48.5	66.4	NA	43

Glass Type G1

ACORN ARCHITECTURAL ALUMINIUM

Photometric Data Sheet



Pane 1	PLANICLEAR (5 mm) Heat strengthened : Float PVB standard (4 x 0.38 mm) PLANICLEAR (5 mm) Heat strengthened : Float ECLAZ ONE II
Cavity 1	ARGON (90%) / AIR (10%) / 16 mm
Pane 2	PLANICLEAR (4 mm) Thermally toughened : Float ECLAZ II
Cavity 2	ARGON (90%) / AIR (10%) / 16 mm
Pane 3	PLANICLEAR (6 mm) Thermally toughened : Float

SGG UK
Sales & Techical Dept
Dave Hubbard
Weeland Road
DN14 0FD Eggborough
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LUMINOUS FACTORS

CIE015:2018

Light transmission (TL %)	70 %
Outdoor reflection (RLe %)	19 %
Indoor (RLi %)	18 %

SOLAR FACTORS

EN410:2011

Solar factor (g)	0.44
Shading Coefficient (SC)	0.50

COLOR RENDERING

CIE015:2018

Transmission (Ra)	96.5
Reflection (Ra)	90.8

BURGLAR RESIST

EN356:1999

Result :	P4A/NPD/NPD

CARBON FOOTPRINT

EN15804:2012+A2:2019

Global warming potential 'GWP' 106 Kg(CO2)/m² (A1-A3)

ENERGY FACTORS

EN410:2011

Transmission (Te)	39 %
Reflection (Ree)	25 %
Indoor (Rei)	30 %
Absorption (AE1)	30 %
Absorption (AE2)	5 %
Absorption (AE3)	2 %

THERMAL TRANSMISSION

EN673:2011

Ug	0.5 W/m².K

0° related to vertical position

MANUFACTURING SIZES

Nominal thickness	53.5 mm
Weight	52 kg/m²

PENDULUM RESISTANCE

EN12600:2002

Result :	1B1/1C3/1C2

ACOUSTICS

EN12758:2019

Acoustic simulated values - v2.0	Rw(C;Ctr) = 44(-2;-6) dB
OITC (ASTM E1332)	35
STC (ASTM E413)	44

TÜVRheinland CERTIFIED
Verified Results EN 410 EN 673
www.tuv.com ID 0000036859

Calumen III calculates the photometric characteristics and thermal transmission of glass using calculation algorithms which comply with the following standards: the European standards EN 410 and EN 673, the international standard ISO9050, the Japanese standard JIS R 3106/3107 and the Korean standard KS L 2514/2525. The functional output and calculation rules of Calumen for standards EN 410 and EN 673 have been validated by TÜV Rheinland (report 89212153-01). The technical performances obtained according to these standards are provided for information only and are subject to amendment.
Only the values entered in the performance declaration available on the CE marking site of Saint-Gobain Glass are official.
The sound attenuation indices are measured under laboratory conditions according to the standards EN ISO 10140 and EN 12758. The calculated indices are provided for information only. The accuracy for Rw index lies within a range of +/-2dB.The glass thickness calculations comply with the 2012 version of the DTU39-P4 description. The USER is responsible for ensuring that the correct calculation hypotheses are entered and the DTU39 is applied appropriately for the project concerned.

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Acoustic Data Sheet

COMPUTAT OF THE SOUND TRANSMISSION LOSS

Modeling and computation done by Saint-Gobain Recherche Compiègne

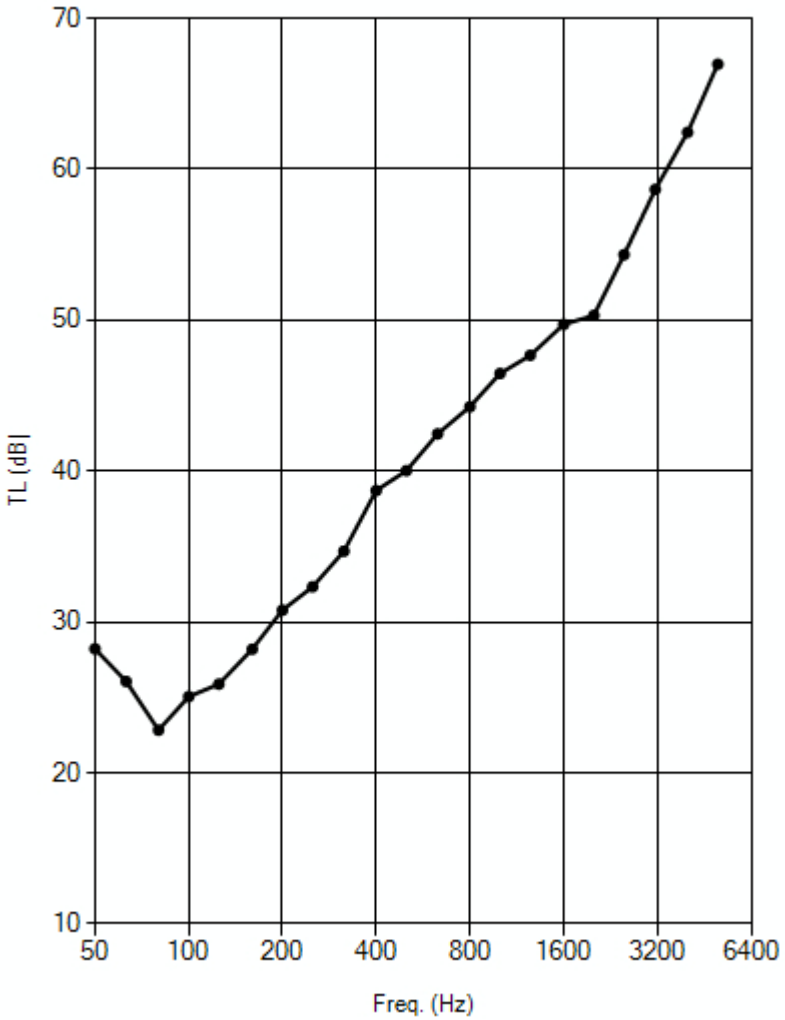
Computation hypothesis defined to model a measurement according to EN ISO 140

All the results, notices, measures, diagrams or charts and any other elements in this document have been obtained in Saint-Gobain's laboratories under specific circumstances. They are for information purposes only and have no contractual value. Saint-Gobain will not be liable for them in any circumstances.

Glazing : 6 (16AR) 4 (16AR) 55.4PRO

Ratings : According to ISO 717-1 100Hz - 3150Hz / ASTM E413 125Hz - 4000Hz / ASTM E1332 80Hz - 4000Hz

R_W ($C;C_{tr}$) = 44(-2 ;-6) dB R_A = 42 dB $R_{A,tr}$ = 38 dB STC = 44 dB OITC = 35 dB



Frequency Hz	R 1/3 oct. dB	R 1/1 oct. dB
50	28.2	25.1
63	26.1	
80	22.8	
100	25.1	26.2
125	25.9	
160	28.2	
200	30.8	32.3
250	32.3	
315	34.7	
400	38.7	40.1
500	40	
630	42.5	
800	44.3	45.9
1000	46.5	
1250	47.7	
1600	49.7	51
2000	50.3	
2500	54.3	
3150	58.7	61.5
4000	62.4	
5000	67	

<u>Computation details:</u> Composition n°21738 calculated on 03/04/2021 - ISACO 2.0.0

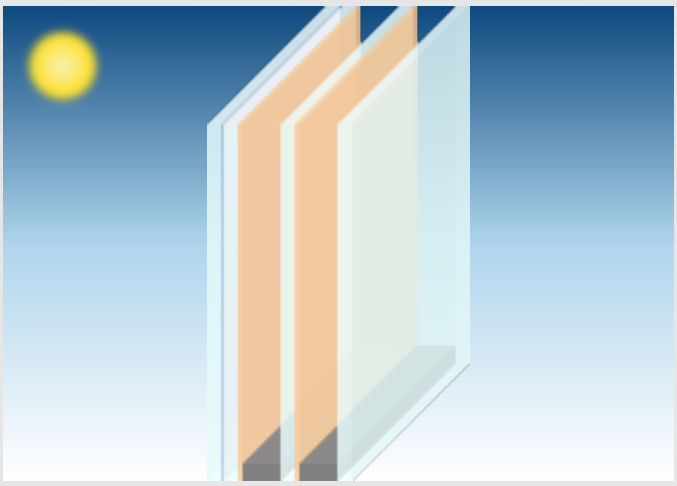
- Overall dimensions: 1480 mm x 1230 mm
- Composition:
  - Glass 1: SGG GLASS 6
  - Gas 1: AR 16
  - Glass 2: SGG GLASS 4
  - Gas 2: AR 16
  - Glass 3: SGG STADIP PROTECT 55.4

SAINT-GOBAIN GLASS FRANCE
Saint-Gobain Reseach Compiègne – BP 40103 – 60777 Thourotte – Tél 03 44 92 36 00 – Fax 03 44 92 36 99
Saint-Gobain Glass France – Société Anonyme au capital de 219.001.680 € – R.C.S. Nanterre B 998 269 211 – N° T.V.A. CEE FR 6099 8269 211
Siège Social : Les Miroirs – 18 avenue d'Alsace – 92400 Courbevoie – Tél : 01 47 62 34 00 – Adresse Postale : Les Miroirs – 92096 La Défense Cedex
www.saint-gobain-glass.com

Glass Type G2

ACORN ARCHITECTURAL ALUMINIUM

Photometrics Data Sheet



Pane 1	PLANICLEAR (6 mm) Heat strengthened : Float PVB standard (4 x 0.38 mm) PLANICLEAR (6 mm) Heat strengthened : Float ECLAZ ONE II
Cavity 1	ARGON (90%) / AIR (10%) / 16 mm
Pane 2	PLANICLEAR (6 mm) Thermally toughened : Float ECLAZ II
Cavity 2	ARGON (90%) / AIR (10%) / 16 mm
Pane 3	PLANICLEAR (6 mm) Thermally toughened : Float

SGG Glass UK and Ireland

James O Donoghue

james.o'donoghue@saint-gobain.com

LUMINOUS FACTORS

CIE015:2018

Light transmission (TL %)	69 %
Outdoor reflection (RLe %)	19 %
Indoor (RLi %)	17 %

SOLAR FACTORS

EN410:2011

Solar factor (g)	0.43
Shading Coefficient (SC)	0.49

COLOR RENDERING

CIE015:2018

Transmission (Ra)	95.9
Reflection (Ra)	90.3

BURGLAR RESIST

EN356:1999

Result :	P4A/NPD/NPD

CARBON FOOTPRINT

EN15804:2012+A2:2019

Global warming potential 'GWP' 119 Kg(CO2)/m² (A1-A3)

ENERGY FACTORS

EN410:2011

Transmission (Te)	38 %
Reflection (Ree)	23 %
Indoor (Rei)	29 %
Absorption (AE1)	32 %
Absorption (AE2)	5 %
Absorption (AE3)	2 %

THERMAL TRANSMISSION

EN673:2011

Ug	0.5 W/m².K

0° related to vertical position

MANUFACTURING SIZES

Nominal thickness	57.5 mm
Weight	62 kg/m²

PENDULUM RESISTANCE

EN12600:2002

Result :	1B1/1C2/1C2

ACOUSTICS

EN12758:2019

Acoustic simulated values - v2.0	Rw(C;Ctr) = 43(-1;-6) dB
OITC (ASTM E1332)	34
STC (ASTM E413)	44

TÜVRheinland CERTIFIED
Verified Results EN 410 EN 673
www.tuv.com ID 0000036859

Calumen III calculates the photometric characteristics and thermal transmission of glass using calculation algorithms which comply with the following standards: the European standards EN 410 and EN 673, the international standard ISO9050, the Japanese standard JIS R 3106/3107 and the Korean standard KS L 2514/2525. The functional output and calculation rules of Calumen for standards EN 410 and EN 673 have been validated by TÜV Rheinland (report 89212153-01). The technical performances obtained according to these standards are provided for information only and are subject to amendment.
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The sound attenuation indices are measured under laboratory conditions according to the standards EN ISO 10140 and EN 12758. The calculated indices are provided for information only. The accuracy for Rw index lies within a range of +/-2dB.The glass thickness calculations comply with the 2012 version of the DTU39-P4 description. The USER is responsible for ensuring that the correct calculation hypotheses are entered and the DTU39 is applied appropriately for the project concerned.

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Acoustic Data Sheet

COMPUTAT OF THE SOUND TRANSMISSION LOSS

Modeling and computation done by Saint-Gobain Recherche Compiègne

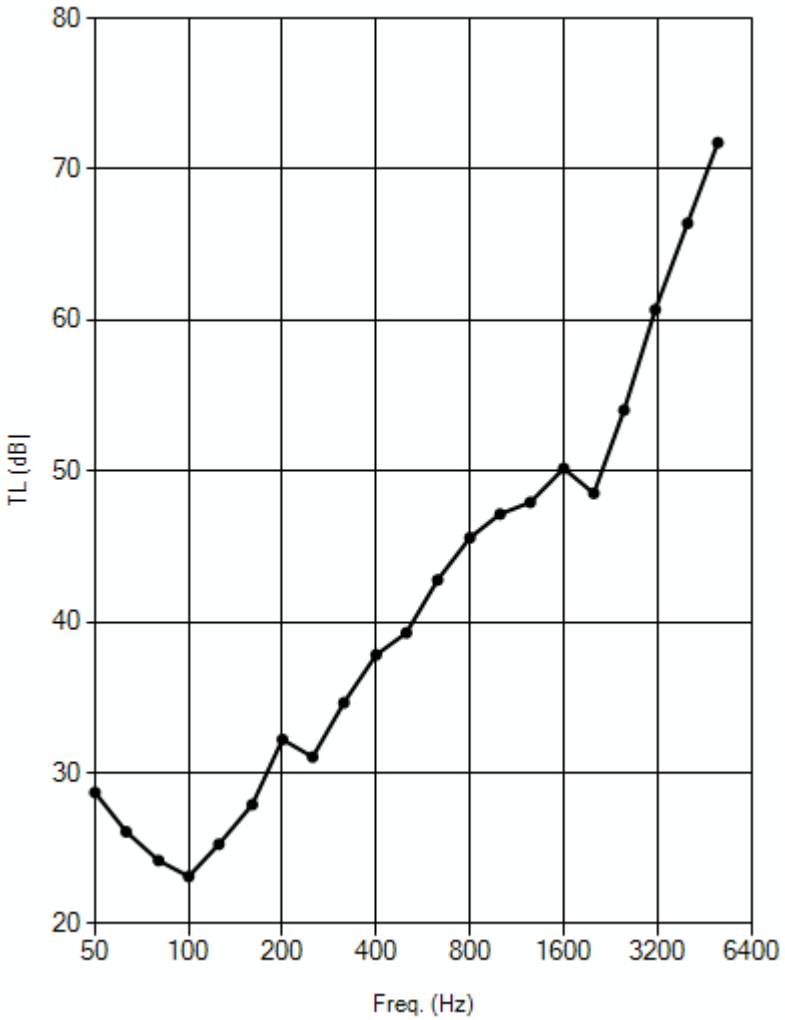
Computation hypothesis defined to model a measurement according to EN ISO 140

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Glazing : 66.4PRO (16AR) 6 (16AR) 6

Ratings : According to ISO 717-1 100Hz - 3150Hz / ASTM E413 125Hz - 4000Hz / ASTM E1332 80Hz - 4000Hz

R_W ($C;C_{tr}$) = 43(-1 ;-6) dB R_A = 42 dB $R_{A,tr}$ = 37 dB STC = 44 dB OITC = 34 dB



Frequency Hz	R 1/3 oct. dB	R 1/1 oct. dB
50	28.7	26
63	26.1	
80	24.2	
100	23.1	25
125	25.3	
160	27.9	
200	32.2	32.4
250	31.1	
315	34.7	
400	37.8	39.5
500	39.3	
630	42.8	
800	45.6	46.8
1000	47.2	
1250	47.9	
1600	50.2	50.4
2000	48.5	
2500	54	
3150	60.7	64.2
4000	66.4	
5000	71.8	

<u>Computation details:</u> Composition n°11364 calculated on 20/10/2023 - ISACO 2.0.0

- Overall dimensions: 1480 mm x 1230 mm
- Composition:
  - Glass 1: SGG STADIP PROTECT 66.4
  - Gas 1: AR 16
  - Glass 2: SGG GLASS 6
  - Gas 2: AR 16
  - Glass 3: SGG GLASS 6

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Siège Social : Les Miroirs – 18 avenue d'Alsace – 92400 Courbevoie – Tél : 01 47 62 34 00 – Adresse Postale : Les Miroirs – 92096 La Défense Cedex
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Glass Spacer Data Sheet

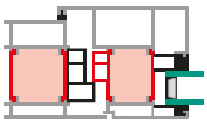
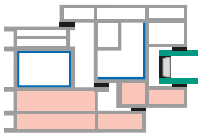
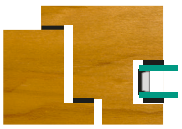
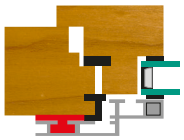
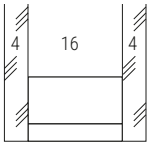
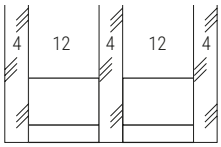
Data sheet Psi values for windows

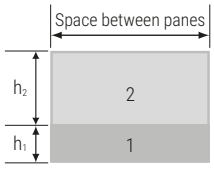
based on determination of the equivalent thermal conductivity of spacers by measurement

swisspacer SAINT-GOBAIN

SWISSPACER
Vetrotech Saint-Gobain (International) AG
Industriestrasse 8
CH-8574 Lengwil

	Product name	Spacer height in mm	Material	Thickness d in mm
Profile description	ULTIMATE 	6.5 Spacer category C	Metalized multilayer polyester film "High Tech Gas Barrier Foil"/ SAN-GF	~ 0.05 1.0

	Representative glass constructions	Metal with thermal break	Plastic	Wood	Wood/Metal
Representative frame profiles					
Representative psi value double-sheet thermally insulating glass W/mK	 Double-sheet insulating glass U_g=1.1 W/m²K	0.036	0.032	0.031	0.032
Representative psi value triple-sheet thermally insulating glass W/mK	 Triple-sheet insulating glass U_g=0.7 W/m²K	0.031	0.030	0.029	0.030

Two Box model Characteristic values	Space between panes in mm	$\lambda_{eq,2B}$ in W/mK	
		Box 1 · h_1 = 3 mm	Box 2 · h_2 = 6.5 mm
	Can be used for all spacer widths	0.40	0.14

Explanations

The equivalent thermal conductivity has been determined in accordance with the ift guideline WA-17engl/1 "Thermally improved spacers – Determination of the equivalent thermal conductivity by measurement". The representative linear heat transfer coefficients calculated in this way (representative psi values) apply to typical frame profiles and glazing for the determination of the heat transfer coefficient U_W of windows. They have been determined under the boundary conditions (frame profiles, glazing, glass mounting depth, back covering, primary and secondary sealant) defined in the ift guideline WA-08engl/3 "Thermally improved spacers – Part 1: Determination of the representative Psi value for window frame profiles". This guideline also governs the area of validity and application of the representative psi values. In order to avoid rounding errors, the psi values in the data sheet have been given at 0.001 W/mK. The method for the arithmetical determination of the psi values has an accuracy of ± 0.003 W/mK. Differences of less than 0.005 W/mK are not significant. For further information, refer to the Bulletin 004/2008 "Guide to Warm Edge" of Bundesverband Flachglas.

Characteristic values determined by:

ift ROSENHEIM

May 2016 – No. CW19 – Revision index 7– 06/2025 – valid until June 30th, 2027

'WARM EDGE' WORKING PARTY

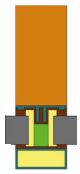
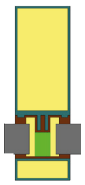
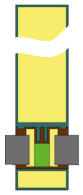
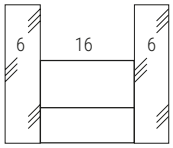
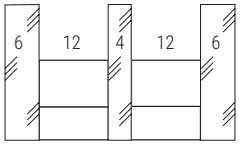
Data sheet Psi values for facade profiles

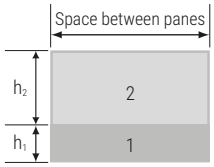
based on determination of the equivalent thermal conductivity of spacers by measurement

swisspacer SAINT-GOBAIN

SWISSPACER
Vetrotech Saint-Gobain (International) AG
Industriestrasse 8
CH-8574 Lengwil

	Product name	Spacer height in mm	Material	Thickness d in mm
Profile description		6.5	Metalized multilayer polyester film "High Tech Gas Barrier Foil" / SAN-GF	~0.05
		Spacer category C		1.0

	Representative glass constructions	Wood/metal	Metal with thermal break (d_i = 100 mm)	Metal with thermal break (d_i = 200 mm)
Representative facade profiles				
Representative psi value double-sheet thermally insulating glass W/mK	 Double-sheet insulating glass U_g=1.1 W/m²K	0.055	0.074	0.078
Representative psi value triple-sheet thermally insulating glass W/mK	 Triple-sheet insulating glass U_g=0.7 W/m²K	0.050	0.062	0.064

Two Box model Characteristic values		Space between panes in mm	$\lambda_{eq,2B}$ in W/mK	
			Box 1 · h_1 = 6 mm	Box 2 · h_2 = 6.5 mm
		Can be used for all spacer widths	0.40	0.14

Explanations

The equivalent thermal conductivity has been determined in accordance with ift guideline WA-17engl/1 "Thermally improved spacers – Determination of the equivalent thermal conductivity by measurement". The representative linear heat transfer coefficients (representative psi values) determined thereby apply to typical facade profiles and glazing for determination of the coefficients of thermal conductivity U_{CW} of curtain walls. They have been determined under the framework conditions (frame profiles, glazing, glass mounting depth, back covering, primary and secondary sealant) defined in ift guideline WA-22engl/1 "Thermally improved spacers – Part 3: Determination of the representative psi value for facade profiles". This guideline also governs the area of validity and application of the representative psi values. In order to avoid rounding errors, the psi values in the data sheet have been specified to the nearest 0.001 W/mK. The calculation method for determining the psi values has an accuracy of ± 0.003 W/mK. Differences of less than 0.005 W/mK are not significant. Further information can be found in the bulletin 004/2008 "Guide to Warm Edge" published by Bundesverband Flachglas.

Characteristic values determined by:

ift ROSENHEIM

ACORN ARCHITECTURAL ALUMINIUM

Security (EN356)

With reference to the security rating of the glass please refer to the rating as stated on the data sheets earlier on in the Tech sub.

For Example:



BURGLAR RESIST EN356:1999

Result : P4A/NPD/NPD

The following pages explain the understanding of the EN356 and what tests have been carried out in compliance with this regulation

Under the EN356 testing procedure the thinnest glass is tested, please refer to the attached DOP.



The security of dwellings and commercial premises is becoming more of a consideration in design, and with glass typically considered as an obvious weak point, ensuring the correct glazing is specified is critical where requirements exist.

REGULATIONS

In the UK and Ireland, regulatory requirements for security are limited. There exists only one Building Regulation in England and Wales for security, Approved Document Q, and one section within the Scottish Domestic Handbook, as below;

Table 1 - Regulatory Requirements in the UK & Ireland

Country	Building Regulations	Section
England & Wales	Approved Document Q [1]	Section 1 – Doors Section 2 - Windows
Scotland	Domestic Handbook [1]	Section 4.13 – Security

It should be noted that Document Q is only applicable to new build dwellings, and so the scope is limited, and the basic requirement is as follows; "*Reasonable provision must be made to resist unauthorised access to any dwelling, and any part of a building from which access can be gained to a flat within a building.*"

CODES & GUIDANCE

References to several documents are made by both Approved Document Q and the Domestic Handbook. Whilst most refer to doorsets and windows as a complete system, the requirements for glass are also provided by some.

Table 2 – Codes & Guidance within the UK & Ireland

Codes & Guidance	Test Standards
PAS 24:2012 [2] STS 201/202/204 [3] LPS 1175 Issue 7.3 (Security Rating 1) [4] LPS 2081 Issue 1.1 (Security Rating A) [5] Secured By Design [6]	EN 356:2000 [7] LPS 1270 Issue 1.1 [8]

The requirements for each document are specific, and so each document should be fully understood where applicable. Essentially, for most of the above, an EN 356 or LPS classification for the glass is required, and the following classifications need to be achieved;

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Table 3 – Codes & Guidance Performance Requirements

Standard	EN 356 Classification	Notes
PAS 24:2012	EN 356:2000 Class P1A	Minimum Requirement
STS 204 Issue 3:2012	PAS 24 & BS 6375	---
LPS 1175 Issue 7:2010	Security Rating (LPS 1270)	Can be rated between 1-8
LPS 2081 Issue 1:2015	Security Rating (LPS 1270)	Can be rated between 1-8
Secured By Design	EN 356:2000 Class P1A	Minimum Requirement

The basic requirement is for a P1A classification for glass. LPS classifies based on time to penetrate and toolsets used. LPS is more onerous, and with regards LPS 1270, this standard considers that EN 356 does not suitably classify glass in a way which has relevance for LPS 1175. Therefore, the LPS 1270 tests were developed to classifying glazing based on levels of attack, and so make the classifications more compatible with the requirements of LPS 1175.

TEST METHODS

As above, EN 356 and LPS 1270 can be used to classify glass, with the tests summarised below;

EN 356

EN 356 involves testing the glass only, with no consideration is given to the surround or the method of securing the glass. EN356 testing has two distinct sections;

- A ball drop test
- An axe test

Table 4 - EN 356 Test Summary

Test	Class	Drop Height (mm)	No. Of Impacts
Ball Drop	P1A	1500	3 in a Triangle
	P2A	3000	
	P3A	6000	
	P4A	9000	
	P5A	9000	3 x 3 in a Triangle
Axe Impact	P6B	---	30 – 50
	P7B	---	51 – 70
	P8B	---	> 70

Performance must be determined through testing, and applied to a CE marking Declaration of Performance.

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Table 5 - Glass Types for EN 356 Classifications

Class	SGG STADIP PROTECT
P1A	6.8 mm (33.2)
P2A	8.8 mm (44.2)
P3A	9.1 mm (44.3)
P4A	7.5 mm (33.4)
P5A	10.3 mm (44.6)
P6B	15.0 mm (66.8)
P7B	---
P8B	---

LPS 1270

As with EN 356, LPS 1270 involves testing the glass only, not its performance in being removed from the surround. Testing can achieve 8 distinct classifications.

Table 6 – LPS 1270 Classifications

Classification	Tool Category	Maximum Working Time (minutes)	Maximum Test Duration (minutes)
0		Fails to Achieve a Rating of 1	
1	A	1	10
2	B	3	15
3	C	5	20
4	D	10	30
5	D+	10	30
6	E	10	30
7	F	10	30
8	G	20	60

Tool categories are detailed within the LPS standard. Classification is based on toolsets used, and time to penetrate. Specific to the glazing construction and attack face.

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REFERENCES

[1] HM Government, *The Building Regulations 2010 - Approved Document Q - Security - Dwellings,* 2015.

[2] British Standards Institute, *PAS 24:2016 - Enhanced security performance requirements for doorsets and windows in the UK. External doorsets and windows intended to offer a level of security suitable for dwellings and other buildings exposed to comparable risk,* BSI, 2016.

[3] Warrington Certification, *STS 201 - Enhanced security requirements for doorsets,* Warrington Certification, 2010.

[4] LPCB, *LPS 1175 Issue 7.3 - Requirements and testing procedures for the LPCB approval and listing of intruder resistant building components, strongpoints, security enclosures and free-standing barriers,* BRE Global, 2015.

[5] LPCB, *LPS 2081; Issue 1.1 - Requirements and testing procedures for the LPCB approval and listing of intruder resistant building components, strongpoints, security enclosures and free-standing barriers,* BRE Global, 2016.

[6] Secured by Design, *New Homes 2014,* 2014.

[7] European Committee for Standardization, *EN 356:2000 - Glass in building. Security glazing. Testing and classification of resistance against manual attack,* CEN, 2000.

[8] LPCB, *LPS 1270; Issue 1.1 - Requirements and testing procedures for the LPCB,* BRE Global, 2014.

[9] Riaghaltas na h-Alba, *Technical Handbook 2015 - Domestic,* Riaghaltas na h-Alba, 2015.

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ACORN
ARCHITECTURAL
ALUMINIUM

D.O.P

System 3 Ltd. Denton Hall Farm Road, Denton, Manchester, M34 2SY Tel: 0161 337 3000 Email: Sales@sys3.co.uk

Declaration of Performance

System 3 Ltd declare that the Laminated Safety Glass / Security Glass (LAM) supplied is intended for use in buildings and construction works.

It is not for use as Bullet or Explosion Proof Glass or

Fire Glazing Specifications unless stated otherwise.

The Laminated Safety glass conforms to system 3 - EN356: 1999 annex ZA.

Glazing for resistance against manual attack

Type testing to EN356 has been performed by

TÜV Rheinland Nederland, Arnhem, the Netherlands.

Approved Body 0336

Essential Characteristics	Performance	Essential Characteristics	Performance
Resistance to Fire	NPD	Reaction to Fire	A1
External Fire Performance	NPD	Bullet Resistance	NPD
Explosion Resistance	NPD	Burglar Resistance	P4A
Pendulum Body Impact Resistance	1(B)1	Resistance Against Sudden Temperature Change & Temperature Differentials	40 K
Wind, Snow Permanent & Increased Load Resistance	8mm	Direct Airborne Sound Insulation	32 dB
Thermal Properties	5.6 W/m2K		
Radiation Properties			
Light Transmission & Reflection	0.88/0.08/0.08	Solar Energy Characteristics	0.71/0.07/0.07

The performance of the product identified above is in conformity with the set of detailed performance(s). This declaration of performance is issued, in accordance with Construction Product Regulations 305/2011, under the sole responsibility of the manufacturer identified above as it has effect in the United Kingdom in respect of Great Britain.

9.5mm (4.4.4) [redacted] aminated Single Glass), others available upon request

Signed by: [redacted]

Allan Brown - Director

Date: 19th May 2025

Impact Resistant (EN12600)

With reference to the Impact rating of the glass please refer to the rating as stated on the data sheets earlier on in the Tech sub.

For Example:



PENDULUM RESISTANCE EN12600:2002

Result : 1B1/1C3/1C2

The 1B1/1C3/1C2 gives the indvidual rating for each glass pane that is constructed within the make up of the unit.

See next page for the EN12600 meaning.

BS EN 12600:2002 is the European safety standard for impact resistance of flat glass, employing a pendulum test to classify glass based on how it breaks (breakage mode) and the height from which a 50kg, twin-tyre impactor is dropped
. It superseded the older BS 6206 standard and is used to minimize cutting and piercing injuries in high-risk areas. The classification is expressed as **α(β)φ** (e.g., 1B1), where:

- **α** = Highest class of drop height passed (1, 2, or 3).
- **β** = Type of breakage (A, B, or C).
- **φ** = Highest class of drop height passed (1, 2, or 3 - usually same as α).

1. Classification by Drop Height (Performance)
The standard classifies glass by the maximum height from which it did not break or broke safely:

- **Class 1 (Highest Safety):** Withstands a 1200mm drop. Suitable for critical applications like balustrades, low-level glazing, and public areas.
- **Class 2 (Medium Safety):** Withstands a 450mm drop. Equivalent to an adult walking into a glass door.
- **Class 3 (Lowest Safety):** Withstands a 190mm drop. Equivalent to a child running into glass or an adult pushing firmly.

2. Classification by Type of Breakage (Mode)
The breakage mode indicates the safety level of the shards:

- **Type A:** Numerous cracks form, creating large, sharp-edged fragments (e.g., annealed float glass).
- **Type B:** Numerous cracks form, but the fragments hold together, minimizing risk (e.g., laminated glass, safety film).
- **Type C:** Disintegration occurs, breaking into small, relatively harmless granules (e.g., thermally toughened glass).

Summary of Common Classifications (1B1, 2B2, 3B3)

- **1B1 (Best):** Suitable for high-risk, critical, and public areas.
- **2B2 (Typical):** Common for residential windows, doors, and general glazing.
- **3B3 (Minimum):** Used for minimal risk areas or out-of-reach windows.

Typical Applications (Critical Locations)

- **1B1:** Low-level, doors, side panels, and bath areas (where 1200mm is needed).
- **2B2:** Residential doors and windows.
- **3B3:** High-level glass.

The standard is a test method only, and it does not define specific application requirements, which are typically found in national building regulations (e.g., Part K in the UK).

Test Report

BSI
Product Services

Report No	262/4739116 This Report consists of 3 pages
Licence/Certificate No	KM 33596
Client	Systems 3 Limited Denton Hall Farm Road Denton Manchester Lancashire M34 2SY
Authority & date	BSI Product Services: Service Management Order No 4739116 dated 31 July 2006 - Equipment Record No 10072413
Items tested	4mm Low-E toughened glass
Specification	BS EN 12600:2002 - Glass in Building - Pendulum test type testing for product certification
Results	Pass
Prepared by	[redacted] (Senior Technician)
Authorized by	[redacted] (Senior Engineer)
Issue Date	[redacted]
Conditions of issue	This Test Report is issued subject to the conditions stated in current issue of *PS082* 'General conditions relating to acceptance of testing'. The results contained herein apply only to the particular sample/s tested and to the specific tests carried out, as detailed in this Test Report. The issuing of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by BSI of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of the Managing Director, BSI Product Services, who reserves the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought.

UKAS TESTING
0135

TEST AND EXAMINATION OF GLASS IN BUILDING - PENDULUM TEST

INTRODUCTION

At the request of BSI Product Services the glass samples, detailed below and submitted by System 3 Limited, were tested and assessed to the requirements of BS EN 12600:2002, as indicated on the following pages of this Report. This request was made on BSI Product Services: Service Management Order No 4739116 dated 31 July 2006 - Equipment Record No 10072413. It is emphasized that assessments were not made against other clauses of the Specification.

Date tested: 15 August 2006

Date samples received: 31 July 2006

Date of the last calibration of the test rig: 25 October 2005

TEST ITEMS

A) 24 off 4mm Asymmetric Low-E toughened glass 1938 x 876mm

SUMMARY OF RESULTS

The test samples were tested to the method described in BS EN12600:2002.

The results of which are as follows:

TEST ITEMS	CLASS	ASSESSMENT
A)	3 (190mm)	Pass
A)	2 (450mm)	Pass
A)	1 (1200mm)	Pass

TEST ITEMS	PERFORMANCE CLASSIFICATION	
	Modified	Unmodified
A)	1(C)1	1(C)1 +

\+ 1 is the highest drop height class at which the product either did not break or broke in accordance with a) or b) of Clause 4.

C is the mode of breakage

1 is the highest drop height class at which the product either did not break or when broke, broke in accordance with a) clause

TESTING AND EXAMINATION

CLAUSE **ITEM A**

5 IMPACT

5.3 Impact test

Type	-	Asymmetric Low-E toughened glass 1938 x 876mm
Thickness	-	4.00mm Nominal
Weight equivalent to 6500mm^2	-	61.8g
Tyre pressure	-	50.75±2.9psi

Sample No	Impact No	Side Impacted	Result of Impact	Particle Wt (g)	Assessment
		Drop Height 190mm			
1	1	Modified	No breakage	-	Pass
2	4	Modified	No breakage	-	Pass
3	7	Modified	No breakage	-	Pass
4	10	Modified	No breakage	-	Pass
5	13	Unmodified	No breakage	-	Pass
6	16	Unmodified	No breakage	-	Pass
7	19	Unmodified	No breakage	-	Pass
8	22	Unmodified	No breakage	-	Pass
		Drop Height 450mm			
1	2	Modified	No breakage	-	Pass
2	5	Modified	No breakage	-	Pass
3	8	Modified	No breakage	-	Pass
4	11	Modified	No breakage	-	Pass
5	14	Unmodified	No breakage	-	Pass
6	17	Unmodified	No breakage	-	Pass
7	20	Unmodified	No breakage	-	Pass
8	23	Unmodified	No breakage	-	Pass
		Drop Height 1200mm			
1	3	Modified	No breakage	-	Pass
2	6	Modified	No breakage	-	Pass
3	9	Modified	No breakage	-	Pass
4	12	Modified	No breakage	-	Pass
5	15	Unmodified	No breakage	-	Pass
6	18	Unmodified	No breakage	-	Pass
7	21	Unmodified	No breakage	-	Pass
8	24	Unmodified	No breakage	-	Pass

Test Report

BSI
Product Services

Report No	262/4654746 This Report consists of 3 pages
Licence/Certificate No	KM 33596
Client	System 3 Limited Denton Hall Farm Road Denton Manchester Lancashire M34 2SY
Authority & date	BSI Product Services: Service Management Order No 4654746 dated 7 November 2006 - Equipment Record No 10064647
Items tested	6mm Ceramic White toughened glass
Specification	BS EN 12600:2002 - Glass in Building - Pendulum test type testing for product certification
Results	Pass
Prepared by	M T [redacted] echnician)
Authorized by	G W [redacted] ngineer)
Issue Date	
Conditions of issue	This Test Report is issued subject to the conditions stated in current issue of *PS082* 'General conditions relating to acceptance of testing'. The results contained herein apply only to the particular sample/s tested and to the specific tests carried out, as detailed in this Test Report. The issuing of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by BSI of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of the Managing Director, BSI Product Services, who reserves the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought.

UKAS TESTING
0135

TEST AND EXAMINATION OF GLASS IN BUILDING - PENDULUM TEST

INTRODUCTION

At the request of BSI Product Services the glass samples, detailed below and submitted by System 3 Limited, were tested and assessed to the requirements of BS EN 12600:2002, as indicated on the following pages of this Report. This request was made on BSI Product Services: Service Management Order No 4654746 dated 7 November 2006 - Equipment Record No 10064647. It is emphasized that assessments were not made against other clauses of the Specification.

Date tested: 22 - 23 November 2006

Date samples received: 6 November 2006

Date of the last calibration of the test rig: 25 October 2005

TEST ITEMS

A) 24 off 6mm Asymmetric Ceramic White toughened glass 1938 x 877mm

SUMMARY OF RESULTS

The test samples were tested to the method described in BS EN12600:2002.

The results of which are as follows:

TEST ITEMS	CLASS	ASSESSMENT
A	3 (190mm)	Pass
A	2 (450mm)	Pass
A	1 (1200mm)	Pass

TEST ITEMS	PERFORMANCE CLASSIFICATION	
	Modified	Unmodified
A)	1(C)1	1(C)0 +

\+ 1 is the highest drop height class at which the product either did not break or broke in accordance with a) or b) of Clause 4.

C is the mode of breakage

0/1 is the highest drop height class at which the product either did not break or when broke, broke in accordance with a) clause

TESTING AND EXAMINATION

CLAUSE **ITEM A**

5 IMPACT

5.3 Impact test

Type - Asymmetric Ceramic White toughened glass 1938 x 877mm
Thickness - 6.00mm Nominal
Weight equivalent to 6500mm^2 - 95.2g
Tyre pressure - 50.75±2.9psi

Sample No	Impact No	Side Impacted	Result of Impact	Particle Wt (g)	Assessment
		Drop Height 190mm			
1	1	Modified	No breakage	-	Pass
2	4	Modified	No breakage	-	Pass
3	7	Modified	No breakage	-	Pass
4	10	Modified	No breakage	-	Pass
5	13	Unmodified	Broken safely	3.5	Pass
6	14	Unmodified	Broken safely	3.7	Pass
7	15	Unmodified	Broken safely	5.6	Pass
8	16	Unmodified	Broken safely	4.6	Pass
		Drop Height 450mm			
1	2	Modified	No breakage	-	Pass
2	5	Modified	No breakage	-	Pass
3	8	Modified	No breakage	-	Pass
4	11	Modified	No breakage	-	Pass
9	17	Unmodified	Broken safely	5.1	Pass
10	18	Unmodified	Broken safely	4.9	Pass
11	19	Unmodified	Broken safely	4.8	Pass
12	20	Unmodified	Broken safely	6.3	Pass
		Drop Height 1200mm			
1	3	Modified	No breakage	-	Pass
2	6	Modified	No breakage	-	Pass
3	9	Modified	No breakage	-	Pass
4	12	Modified	No breakage	-	Pass
13	21	Unmodified	Broken safely	5.5	Pass
14	22	Unmodified	Broken safely	7.0	Pass
15	23	Unmodified	Broken safely	4.6	Pass
16	24	Unmodified	Broken safely	5.4	Pass