smart
architectural aluminium

White Paper
A guide to the assessment of thermal performance of Aluminium Products

Building Regulations **Document L**

Conservation of Fuel and Power
March 2013

Smart Architectural Aluminium

CONTENTS

INTRODUCTION

Building regulations document L covers the energy efficiency of building. This document summarises the areas of relevance to the fenestration industry, from the most recent publications of standards.

Highlighting the various routes to prove compliance, with an overview of calculation methods and example calculations.

The thermal performances of various Smart Systems are summarised in the appendix.

Anthony Murray (MEng)
Smart Systems

Document Issue Date October 2010

Conservation of Fuel and Power

Recent changes in the building regulations are being driven by the commitment for the Government to continually improve thermal performance of buildings.

The building regulations part L are sub-divided into L1A (new dwellings), L1B (existing dwellings), L2A (new buildings other than dwellings) and L2B (existing buildings other than dwellings). Within each of these documents are different limiting U Values setting minimum performance requirements and the calculations methods to prove compliance.

Copies of the building regulations can be downloaded from:
www.planning portal.co.uk

Compliance Methods

Key Changes 2010

The limiting values have remained largely unchanged for the commercial market giving building designers flexibility to improve different building elements to achieve overall building targets.

The residential market has seen increases of 0.2W/m²K in the limiting value. Document L1b and L2b relate to both replacements and extensions to exiting buildings. The limiting value for refurbishment was previously lower then the value required for extension, this has been brought in line with the same value for replacement and extensions and all replacement windows should be installed with cavity closers where appropriate.

Domestic
New build reduced to 2.0W/m²K (from 2.2W/m²K).
Replacement Windows 1.6W/m²K (from 1.8W/m²K) or a Rated C
Replacement doors remain at 1.8W/m²K
Domestic Windows by 0.2W/m²K or 10kWhr/m²Year.

Commercial
New Build remains at 2.2W/m²K
Replacement windows and doors at remain 1.8 W/m²K
High usage entrance doors are now to be 3.5W/m²K from 6.0W/m²K.

Compliance Methods

Limiting Values

				Overall U Average	or	Energy Rating Band
Dwellings	**New Build**		Windows, roof windows, rooflights and doors	**2.0**		-
	Refurbishment Extensions		Windows, roof windows, rooflights and doors	**1.6**		C
			Doors	**1.8**		-
Non-Dwellings	**New Build**		Windows, roof windows, rooflights and doors	**2.2**		-
			High usage entrance doors	**3.5**		-
			Display windows	**N/A**		-
			Curtain walling	**2.2**		-
	Refurbishment Extensions		Windows, roof windows, rooflights and doors	**1.8**		C
			High usage entrance doors	**3.5**		-
			Display windows	**N/A**		-
			Curtain walling	**0.8 to 2.6**[1]		-

[1] Curtain walling U-Value should be no greater than :- $0.8 + 1.2\frac{A_{Glazed}}{A_{Total}} + 0.6\frac{A_{Openable}}{A_{Total}} \times \frac{A_{Glazed}}{A_{Total}}$

Calculation Methods

Key Changes 2010

The fenestration **calculation methods** to prove compliance have changed with the tightening of the rules for use of Indicative and Centre Pane methods. The calculated U Values can be calculated to BS EN 14351-1 permit CE Marking to prove compliance to the UK building regulations. For domestic windows ECO Labels combine the thermal parameters to creating a window energy rating, the methodology for window energy ratings is included in the 2010 regulations.

CE Marking is included in the regulations referencing SEN window to BS EN 14351-1 providing a system method for calculating the U Value. CE Marking can be used as bench mark to compare similar products for U Value g value and air permeability and as such reduces trade barriers.

ECO Labels simplifies the performance data to a single value, combined to provide an energy balance of losses and gains. This is based on a typical climate data to the UK and provides a comparison tool between different products.

Indicative U Value. The use of BRE's Standard Assessment Procedures are now restricted to mainly residential buildings, only applying to commercial buildings where the building is domestic in character, such as student accommodation.

Centre Pane of 1.2 provided compliance for all replacement windows in the 2006 regulations. This option is now restricted to where there is a need to maintain the external appearance of the building. In these circumstances the replacement windows should meet a centre pane of 1.2W/m²K alternatively single glaze windows should be supplemented with a low e secondary glazing.

Declaring Thermal Performance

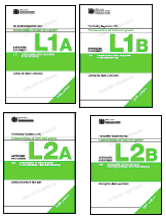
	Domestic		Commercial	
	New	Replacement	New	Replacement
Hot box testing BS EN ISO 12567-1				
CE Marking BS EN ISO 14351-1				
ECO Label Window Energy rating bands	 Replacement domestic windows only			
Glass centre pane Centre Pane < 1.2W/m²K			 Replacement window/doors when need to maintain existing appearance only	
Indicative Method SAP2009 Table6e		 Domestic windows/doors only		

Hot box testing and Simulations

BS EN ISO 12567-1 BS EN ISO 10077-1 & 2

The hot box test is a physical measurement of the actual heat transfer through a particular window configuration. Based on a standard design the heat transfer is measured in a libratory 'hot box'. Hot box testing to proving compliance can be prohibitively when considering design variations.

Applies to:
L1a L1b L2a and L2b



Hot Box test provides an accurate performance, however the results cannot be used for any other sample or variant i.e. change a sash or any other part of the window make-up and a new hot box test is required to assess the thermal performance each specification variation. Finite element simulations to BS EN 10077-2, can be used in the absence of Hot Box testing using numerical software packages to simulate the physical heat transfers of a test. A simulation in accordance with BR443 can also be used to prove compliance to the UK building regulations.

CE Marking

BS EN 14351-1

The Harmonised European standard allows general performance declarations for Windows and Doors to a common format throughout Europe. Providing commonality to the methodology and performance declarations from different countries allow free trade across Europe.

Applies to:
L1a L1b L2a and L2b

The thermal performance from the European standard can be from testing or simulation to a standard SEN Window configurations detailed BS EN14351-1. Thermal Simulation software uses finite elements to calculate the conduction and radiation of the framing sections and area weighted with the performance . U values calculated to BS EN 14351-1 can be used to prove compliance to UK building regulations L and provide compliance to building regulation 7 for energy performance.

BS EN 14351-1 applies to New build and replacement for commercial and domestic application.

Window Energy Rating

WER window energy rating bands (Domestic Windows Only)
The ratings are classified into bands A-G representing bands of WER Ratings kWh/m²/yr. Windows with a net heat loss have BFRC rating bands B-G windows with an A rating indicating a net inflow of heat, warming the property.
Window energy rating are based on the energy balance of the losses through the window offset against the solar heat gains through the window. The calculations are always on standard designs and based on typical climate data for the UK. Window energy ratings are intended as a comparator tool and the actual heat losses on the window will depend on the location design of window and climate.

Only applies domestic buildings L1b refurbishment only.

WER may also apply to commercial refurbishment, if the building is domestic in character. For example, student accommodation, care homes and similar

Applies to:
Domestic Replacement Window Only

Standard Assessment Procedure

SAP2009 Table6e
The indicative method calculates typical thermal performance of windows, doors, and roof lights. This calculation takes into account the thermal performance of the frame based on the window material thermal break size combined with thermal performance of the glass.

The BRE's Standard Assessment Procedure is now only a valid calculation method for domestic buildings L1a and L1b.

SAP 2009 may also apply to commercial, if the building is domestic in character. For example, student accommodation, care homes and similar

Applies to:
Domestic Buildings

Glass centre pane

Centre Pane < 1.2W/m²K
For replacement windows only it was possible to claim compliance with Part L1B and L2B by simply certifying or proving that the window is glazed with glazing with a 'centre of glass' U value < 1.2 irrespective of frame type.

Only applies to replacement windows and doors where there is a need to maintain the external appearance of the building and replacement windows unable to meet the requirement.

Applies to:
Replacement and Extensions to Existing Buildings

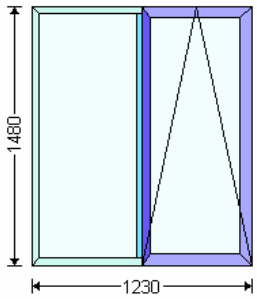
U Value Calculation

U Value of Window

The U value for a window can be calculated by summing the area weighted heat loss though the window.

- Frame
- Glass
- Glass Edge

For the purposes of UK Building regulation this is standard window defined in BR443 or in BS EN14351-1.



Specification:
Outerframe
ETC311
Vent
ETC320
Transom
ETC330

Frame

Heat loss through the frame is calculated by multiplying the areas by the U value of the individual parts of the window see table right.

Heat Loss Frame **1.031 W/K**

	U Value W/m²K	Area m²	Qf W/K
Outerframe	2.798	0.1026	0.2872
Mullion	2.509	0.0338	0.0848
Ventframe	2.912	0.1652	0.4809
Mullion +Vent	2.509	0.0712	0.1785
Frame Overall	2.767	0.3727	**1.031**

Glass

Heat loss though the glass, is calculated by the Centre Pane (U value) of the glass multiplied by the visible glazed area.

Heat Loss Glass **1.738 W/K**

	Centre Pane W/m²K	Area m²	Qg W/K
Glass Unit	1.2	1.449	**1.738**

Glass Edge

At the edge of the glass, the spacer bar has a different thermal performance to the centre of the glass. The edge spacer effect can be calculated by an edge effect coefficient ψ multiplied by the linear perimeter of the glass.

Heat Loss Glass Edge **0.292 W/K**

	Centre Pane W/m²K	Area m²	Qg W/K
Spacer Bar	0.039	7.508	**0.292**

Overall U Value

The overall U Value for the System can be calculated.

Overall U Value **1.7 W/m²K**

$$U_{Window} = \frac{\text{Total Heat Losses}}{\text{Window Area}}$$

$$= \frac{1.031 + 1.738 + 0.292}{1.230 \times 1.480}$$

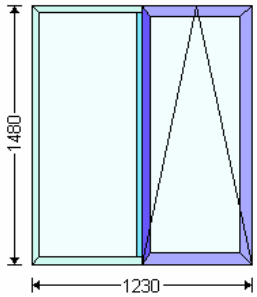
$$U_{Window} = \mathbf{1.681\ W/m^2K}$$

Window Energy Rating Calculation

Window Energy Rating

The Window Energy Rating WER is calculated from.

- U Value
- g Value
- Air Leakage



Heat Loss (U Value)

The heat lost through the window for a typical year in the UK.

68.5 x U_{Window}

	W/m²K	UK WER Factor	Heat Losses kWHr/m²Year
Heat Loss	1.681	68.5	115.148

Heat Loss (Air Leakage)

Where AL air leakage though the window in m³/h.m² at 50Pa pressure difference.

1.13025 x AL

	AL	UK WER Factor	Heat Losses kWHr/m²Year
Air Leakage	0	1.13025	0

Solar Gain (g Value)

The solar gain of the window is calculated from the g value of the glass multiplied by the visible area of glazing.

196.7 x (1-f)x g_{glass}
196.7 x (0.795)x 0.74

	g_{Window}	UK WER Factor	Solar Gains kWHr/m²Year
Solar Gains	0.5883	196.7	115.719

WER Value

The annual energy balance for the window can be calculated from the Solar Gains offset against the Heat Losses:
115.719 – 115.148

Window Energy Rating
+ 0.4kWh/m²Year.

The window energy band is assigned based on the typical heat balance.

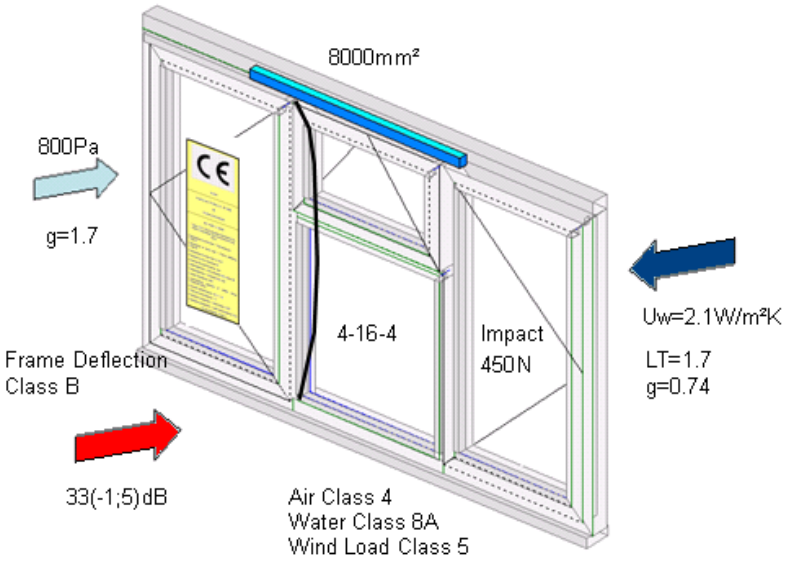
Window Energy Band
BAND A

WER Band	**WER** (kWh/m²Year)
A	0
B	0 to -10
C	-10 to -20
D	-20 to -30
E	-30 to -50
F	-50 to -70
G	-70 or more

CE Marking

Applies to L1a L1b L2a L2b

CE Marking cover varied construction products, the harmonised standard for windows and doors is implemented BS EN 14351-1, this cover many performance aspects including weather, impact and acoustics performance including calculations for the thermal characteristics.



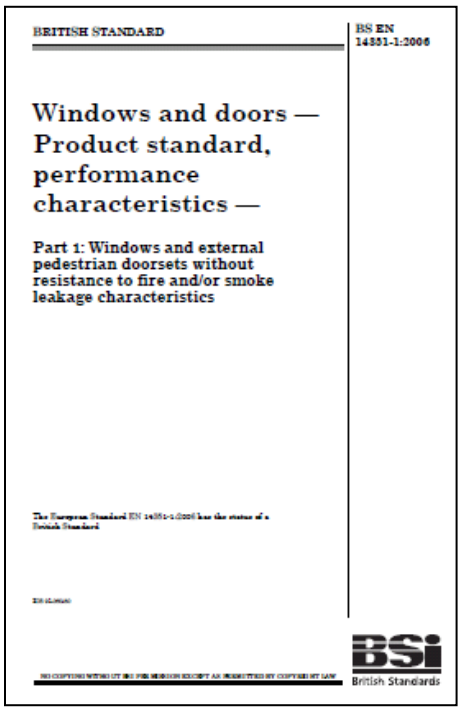
The motive to CE Marking is to create a single European market by removing the technical barriers to trade between member states through the use of harmonized standards and approvals. Ensuring consistency of declared values, CE Marking effectively provides a “passport” for a product ensuring a product is fair and legally placed on the market in any Member State. Harmonising standards ensures that the specification do not decimate against European Trade, helping to increase competition and performance.

CE marked product should be accepted on any market in the European Economic Area without requiring further testing and country specific tests or markings.

BS EN 14351 Harmonised European Standard

BS EN 14351-1 allows for clear comparisons between the performances from different suppliers allowing informed choices to be made on all characteristics and to select the highest performing products.

U Value calculation to BS EN 14351-1 is based on SEN windows and can be used to comply with the U Value requirements for commercial and domestic applications. WER are suited to refurbishment domestic CE Marking U Values are suited to new buildings and commercial buildings. This allows for the overall energy in new buildings to be calculated through SBEM or SAP calculations including allowances for overheating.

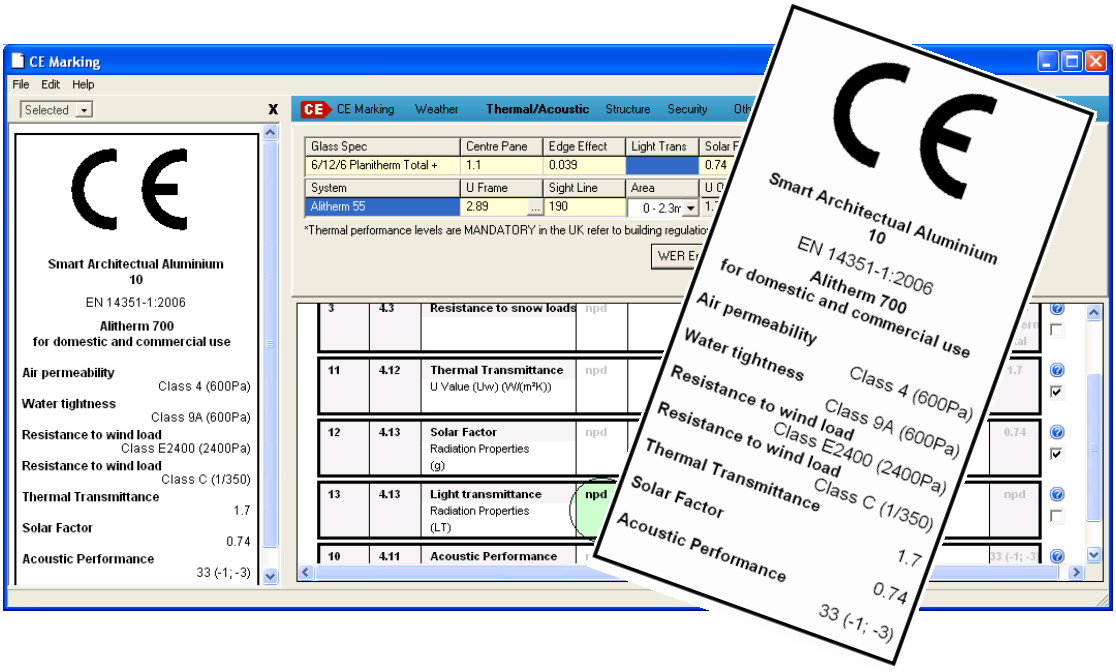

BRITISH STANDARD

BS EN 14351-1:2006

Windows and doors — Product standard, performance characteristics —

Part 1: Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics

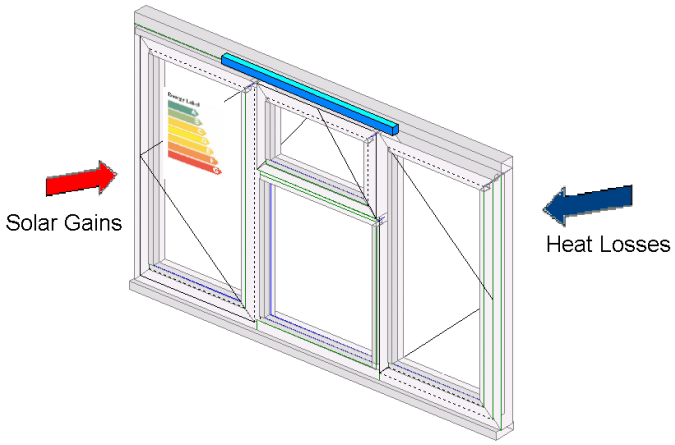
BSI British Standards



Window Energy Ratings

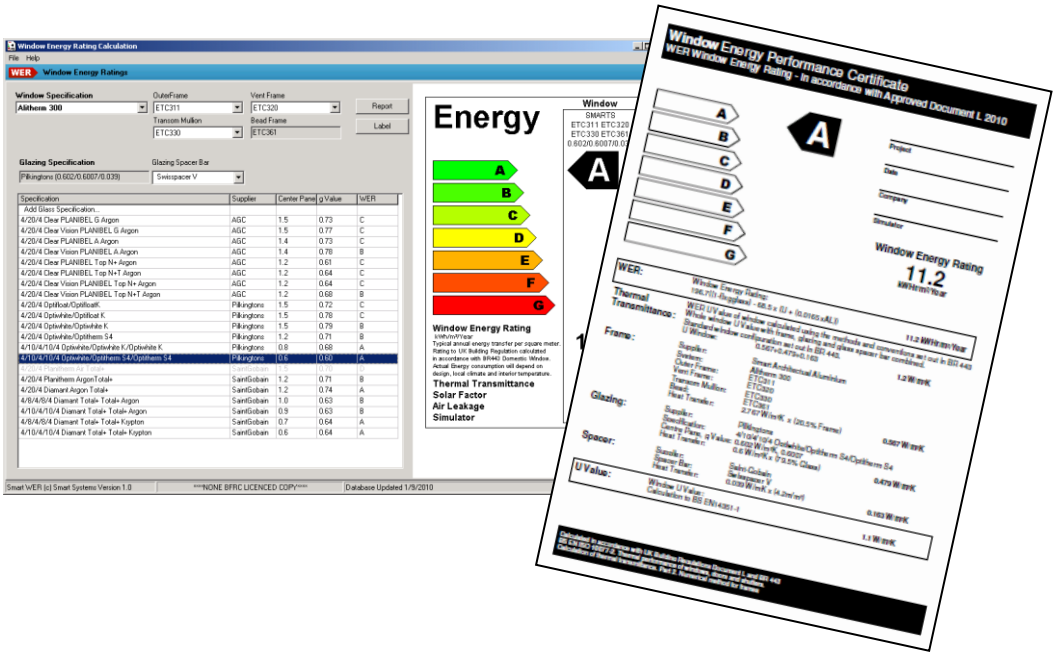
Applies to L1b

Window Energy Ratings calculate the "energy balance" of a typical window by combining the heat losses and offset against heat gains due to the sun.



The resulting energy balance, the difference between the gains and losses is the Window Energy Rating expressed in kWh/m² per Year. Window with high solar gains can completely offset the heat losses from the window resulting in a windows which is a net heat contributor to the property.

The values used to calculate the energy balance are based on typical values of sunshine and climate for the UK for a typical window. This actual window configuration including the glass specification can be modelled by a Smarts Dealer to provide a detailed energy report and WER label.



Understanding the ratings

The ratings are from A to G with A being most efficient and G rated windows losing the most amount of heat. Band A is a window where the solar gains are larger than the heat losses, band B to G the window will lose heat. The energy balance is calculated for a typical year in the UK and calculates the energy in kWh per square metre of window.

The effective cost for the typical window would depend on the cost of heating and number of windows. The following table shows typical annual savings based on the cost of gas heating for different sized properties.

Typical contribution of windows to annual heating bill						
WER (kWh/m²Year)	Rating	**Window** 1m x 1m	**Flat** 6.9m²	**Terraced** 12.7m²	**Semi** 16.9m²	**Detached** 23.7m²
0		£0	£0	£0	£0	£0
0 to -10		£0.40	£3	£5	£7	£9
-10 to -20		£0.80	£6	£10	£13	£19
-20 to -30		£1.20	£9	£15	£20	£28
-30 to -50		£2.00	£14	£25	£34	£47
-50 to -70		£2.80	£20	£36	£47	£66
-70 or more		£2.80+	£20+	£36+	£47+	£66+
Double Glazed PVCu Installed Windows in 2002		£4.23	£29	£54	£72	£100

[1]Source GGF Energy Saving Calculator Based on Gas Heating
Heating costs Gas 0.04£/KWh, Electric 0.083£/KWh, Oil 0.061£/KWh Oil, Solid Fuel 0.027£/KWh. Double Glazed PVCu in 2002 with DGU with 20mm spacer bar commercial domestic

Example
A detached house with PVCu window 8 years old replaced with C Rated Windows
Aluminium the heat losses would drop from £100 per year to £19 saving £81 per year.

Thermal Performance

Appendix A

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

A1	Alitherm 47
A2	Alitherm 47 Heritage
A3	Alitherm 55
A4	Alitherm 300
A5	Alitherm 600
A6	Alitherm 700
A7	Alitherm 700 Rev
A8	Alitherm 800
A9	Alitherm Door
A10	Intruder
A11	Duotherm
A12	Evolution
A13	Visoline
A14	Imperial
A15	Superial
A16	EcoFutural EFi+
A17	VS 600
A18	Visoglide Plus
A19	Smart Wall
A20	Shopline
A21	Visoglide
A22	UltraGlide
A23	Superglide
A24	Slide 2000
A25	Slide Mono
A26	Visofold 4000
A27	Visofold 3000
A28	Visofold 2000
A29	Visofold 1000

Thermal Performance
Alitherm 47

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech	DuraLite Tremco 0.025
	Centre Pane[1] W/m²K									
1.0										
1.1										
1.2									0.3	0.3
1.3		0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5
1.4	0.3	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6
1.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8
1.6	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9
1.7	0.7	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0
1.8	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.2
1.9	1.0	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.3
2.0	1.1	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4
2.1	1.3	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.6
2.2	1.4	1.5	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7
2.3	1.5	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8
2.4	1.7	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9	2.0
2.5	1.8	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1
2.6	1.9	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2

ADL 2010	Domestic		Commercial	
	L1A New Domestic	L1B Referb Domestic	L2A New Commercial	L2B Referb Commercial
1.0	●	●	●	●
1.1	●	●	●	●
1.2	●	●	●	●
1.3	●	●	●	●
1.4	●	●	●	●
1.5	●	●	●	●
1.6	●	●	●	●
1.7	●	①	●	●
1.8	●	①	●	●
1.9	●	①	●	○
2.0	○	①	●	○
2.1	○	①	●	○
2.2	○	○	●	○
2.3	○	○	○	○
2.4	○	○	○	○
2.5	○	○	○	○
2.6	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Alitherm 47 Heritage

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K										ADL 2010			
											Domestic		Commercial	
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025	**L1A** New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
1.0				0.3	0.3	0.3	0.4	0.4	0.4	0.4	●	●	●	●
1.1		0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	●	●	●	●
1.2	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.7	●	●	●	●
1.3	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	●	●	●	●
1.4	0.6	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	●	●	●	●
1.5	0.7	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	●	●	●	●
1.6	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	●	●	●	●
1.7	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.3	●	①	●	●
1.8	1.1	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4	●	①	●	●
1.9	1.2	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	●	①	●	○
2.0	1.3	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	○	①	●	○
2.1	1.5	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	○	①	●	○
2.2	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.9	○	○	●	○
2.3	1.7	1.8	1.8	1.9	1.9	1.9	1.9	1.9	2.0	2.0	○	○	○	○
2.4	1.8	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	○	○	○	○
2.5	1.9	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	○	○	○	○
2.6	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Alitherm 55

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech	DuraLite Tremco 0.025	ADL 2010: Domestic — L1A New Domestic	L1B Referb Domestic	Commercial — L2A New Commercial	L2B Referb Commercial
	Centre Pane[1] W/m²K													
1.0											●	●	●	●
1.1											●	●	●	●
1.2										0.3	●	●	●	●
1.3				0.3	0.4	0.4	0.4	0.4	0.4	0.4	●	●	●	●
1.4		0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	●	●	●	●
1.5	0.4	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	●	●	●	●
1.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	●	●	●	●
1.7	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.0	●	①	●	●
1.8	0.8	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	●	①	●	●
1.9	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.3	●	①	●	○
2.0	1.1	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.4	○	①	●	○
2.1	1.2	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	○	①	●	○
2.2	1.4	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.7	○	○	●	○
2.3	1.5	1.6	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	○	○	○	○
2.4	1.6	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	○	○	○	○
2.5	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1	○	○	○	○
2.6	1.9	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Alitherm 300

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K										ADL 2010			
											Domestic		Commercial	
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025	**L1A** New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
1.0											●	●	●	●
1.1							0.3	0.3	0.4	0.4	●	●	●	●
1.2		0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	●	●	●	●
1.3	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	●	●	●	●
1.4	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	●	●	●	●
1.5	0.6	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	●	●	●	●
1.6	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.1	●	●	●	●
1.7	0.9	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	●	①	●	●
1.8	1.0	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	●	①	●	●
1.9	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5	●	①	●	○
2.0	1.3	1.4	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	○	①	●	○
2.1	1.4	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	○	①	●	○
2.2	1.6	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.9	○	○	●	○
2.3	1.7	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	○	○	○	○
2.4	1.8	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	○	○	○	○
2.5	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.3	○	○	○	○
2.6	2.1	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Alitherm 600

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K									
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025
1.0										
1.1							0.3	0.3	0.3	0.4
1.2		0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5
1.3	0.3	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6
1.4	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8
1.5	0.6	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9
1.6	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.1
1.7	0.9	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.2
1.8	1.0	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3
1.9	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5
2.0	1.3	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6
2.1	1.4	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7
2.2	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.9
2.3	1.7	1.8	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0
2.4	1.8	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1
2.5	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3
2.6	2.1	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4

ADL 2010			
Domestic		Commercial	
L1A New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
●	①	●	●
●	①	●	●
●	①	●	●
●	①	●	○
○	①	●	○
○	①	●	○
○	○	●	○
○	○	○	○
○	○	○	○
○	○	○	○
○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Alitherm 700

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech	DuraLite Tremco 0.025	ADL 2010: Domestic — L1A New Domestic	L1B Referb Domestic	Commercial — L2A New Commercial	L2B Referb Commercial
	Centre Pane[1] W/m²K													
1.0											●	●	●	●
1.1							0.3	0.3	0.3	0.4	●	●	●	●
1.2		0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	●	●	●	●
1.3	0.3	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	●	●	●	●
1.4	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	●	●	●	●
1.5	0.6	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	●	●	●	●
1.6	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.1	●	●	●	●
1.7	0.9	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.2	●	①	●	●
1.8	1.0	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	●	①	●	●
1.9	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5	●	①	●	○
2.0	1.3	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	○	①	●	○
2.1	1.4	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	○	①	●	○
2.2	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.9	○	○	●	○
2.3	1.7	1.8	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	○	○	○	○
2.4	1.8	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	○	○	○	○
2.5	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	○	○	○	○
2.6	2.1	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Alitherm 700 Rev

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K										ADL 2010			
											Domestic		Commercial	
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025	**L1A** New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
1.0					0.3	0.3	0.3	0.3	0.4	0.4	●	●	●	●
1.1		0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	●	●	●	●
1.2	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	●	●	●	●
1.3	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	●	●	●	●
1.4	0.6	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	●	●	●	●
1.5	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.1	●	●	●	●
1.6	0.9	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	●	●	●	●
1.7	1.0	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	●	①	●	●
1.8	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5	●	①	●	●
1.9	1.3	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	●	①	●	○
2.0	1.4	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	○	①	●	○
2.1	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.9	○	①	●	○
2.2	1.7	1.8	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	○	○	●	○
2.3	1.8	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	○	○	○	○
2.4	2.0	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3	○	○	○	○
2.5	2.1	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	○	○	○	○
2.6	2.2	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Alitherm 800

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech	DuraLite Tremco 0.025
	Centre Pane[1] W/m²K									
1.0							0.3	0.3	0.3	0.4
1.1		0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5
1.2	0.3	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6
1.3	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8
1.4	0.6	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9
1.5	0.7	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0
1.6	0.9	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.2
1.7	1.0	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3
1.8	1.1	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4
1.9	1.3	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.6	1.6
2.0	1.4	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7
2.1	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.9
2.2	1.7	1.8	1.8	1.9	1.9	1.9	1.9	1.9	2.0	2.0
2.3	1.8	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1
2.4	2.0	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3
2.5	2.1	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4
2.6	2.2	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5

ADL 2010	Domestic		Commercial	
	L1A New Domestic	L1B Referb Domestic	L2A New Commercial	L2B Referb Commercial
1.0	●	●	●	●
1.1	●	●	●	●
1.2	●	●	●	●
1.3	●	●	●	●
1.4	●	●	●	●
1.5	●	●	●	●
1.6	●	●	●	●
1.7	●	①	●	●
1.8	●	①	●	●
1.9	●	①	●	○
2.0	○	①	●	○
2.1	○	①	●	○
2.2	○	○	●	○
2.3	○	○	○	○
2.4	○	○	○	○
2.5	○	○	○	○
2.6	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Alitherm Door

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K									
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025
1.0										
1.1										
1.2										
1.3				0.3	0.3	0.3	0.4	0.4	0.4	0.4
1.4		0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6
1.5	0.4	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7
1.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8
1.7	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1.0
1.8	0.8	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1
1.9	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2
2.0	1.1	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4
2.1	1.3	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5
2.2	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.7
2.3	1.5	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8
2.4	1.7	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9
2.5	1.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1
2.6	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2

ADL 2010			
Domestic		Commercial	
L1A New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
●	①	●	●
●	①	●	●
●	①	●	○
○	①	●	○
○	①	●	○
○	○	●	○
○	○	○	○
○	○	○	○
○	○	○	○
○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Intruder

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech	DuraLite Tremco 0.025	ADL 2010: Domestic — L1A New Domestic	L1B Referb Domestic	Commercial — L2A New Commercial	L2B Referb Commercial
	Centre Pane[1] W/m²K													
1.0											●	●	●	●
1.1											●	●	●	●
1.2											●	●	●	●
1.3											●	●	●	●
1.4				0.3	0.3	0.3	0.4	0.4	0.4	0.4	●	●	●	●
1.5		0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	●	●	●	●
1.6	0.4	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	●	●	●	●
1.7	0.5	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	●	①	●	●
1.8	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1.0	●	①	●	●
1.9	0.8	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	●	①	●	○
2.0	0.9	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	○	①	●	○
2.1	1.1	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.4	○	①	●	○
2.2	1.2	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	○	○	●	○
2.3	1.4	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.7	○	○	○	○
2.4	1.5	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.8	1.8	○	○	○	○
2.5	1.6	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	○	○	○	○
2.6	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Duotherm

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech	DuraLite Tremco 0.025	ADL 2010: Domestic — L1A New Domestic	L1B Referb Domestic	Commercial — L2A New Commercial	L2B Referb Commercial
	Centre Pane[1] W/m²K													
1.0											●	●	●	●
1.1											●	●	●	●
1.2											●	●	●	●
1.3							0.3	0.3	0.4	0.4	●	●	●	●
1.4		0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	●	●	●	●
1.5	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	●	●	●	●
1.6	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	●	●	●	●
1.7	0.6	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	●	①	●	●
1.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.1	●	①	●	●
1.9	0.9	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	●	①	●	○
2.0	1.0	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	○	①	●	○
2.1	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5	○	①	●	○
2.2	1.3	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	○	○	●	○
2.3	1.4	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	○	○	○	○
2.4	1.6	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.9	○	○	○	○
2.5	1.7	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	○	○	○	○
2.6	1.8	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2

[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.

[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows

[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.

•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Evolution

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech	DuraLite Tremco 0.025
	Centre Pane[1] W/m²K									
1.0				0.3	0.3	0.3	0.4	0.4	0.4	0.4
1.1		0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
1.2	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.7
1.3	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8
1.4	0.6	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9
1.5	0.7	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0
1.6	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1
1.7	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.3
1.8	1.1	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.4
1.9	1.2	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5
2.0	1.3	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6
2.1	1.5	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7
2.2	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.9
2.3	1.7	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9	2.0
2.4	1.8	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1
2.5	1.9	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2
2.6	2.0	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3

ADL 2010				
Domestic		Commercial		
L1A New Domestic	L1B Referb Domestic	L2A New Commercial	L2B Referb Commercial	
●	●	●	●	
●	●	●	●	
●	●	●	●	
●	●	●	●	
●	●	●	●	
●	●	●	●	
●	●	●	●	
●	①	●	●	
●	①	●	●	
●	①	●	○	
○	①	●	○	
○	①	●	○	
○	○	●	○	
○	○	○	○	
○	○	○	○	
○	○	○	○	
○	○	○	○	

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Visoline

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech	DuraLite Tremco 0.025	ADL 2010: Domestic — L1A New Domestic	L1B Referb Domestic	Commercial — L2A New Commercial	L2B Referb Commercial
	Centre Pane[1] W/m²K													
1.0											●	●	●	●
1.1											●	●	●	●
1.2											●	●	●	●
1.3									0.3	0.3	●	●	●	●
1.4		0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	●	●	●	●
1.5	0.3	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	●	●	●	●
1.6	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	●	●	●	●
1.7	0.6	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	●	①	●	●
1.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.1	●	①	●	●
1.9	0.9	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	●	①	●	○
2.0	1.0	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4	○	①	●	○
2.1	1.2	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5	1.5	○	①	●	○
2.2	1.3	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	○	○	●	○
2.3	1.5	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.8	1.8	○	○	○	○
2.4	1.6	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	○	○	○	○
2.5	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1	○	○	○	○
2.6	1.9	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Imperial

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech	DuraLite Tremco 0.025	ADL 2010: Domestic — L1A New Domestic	L1B Referb Domestic	Commercial — L2A New Commercial	L2B Referb Commercial
	Centre Pane[1] W/m²K													
1.0											●	●	●	●
1.1											●	●	●	●
1.2					0.3	0.3	0.4	0.4	0.4	0.4	●	●	●	●
1.3		0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	●	●	●	●
1.4	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	●	●	●	●
1.5	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	●	●	●	●
1.6	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.0	●	●	●	●
1.7	0.8	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	●	①	●	●
1.8	1.0	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.3	●	①	●	●
1.9	1.1	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4	●	①	●	○
2.0	1.3	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.6	○	①	●	○
2.1	1.4	1.5	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	○	①	●	○
2.2	1.5	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8	○	○	●	○
2.3	1.7	1.8	1.8	1.9	1.9	1.9	1.9	1.9	2.0	2.0	○	○	○	○
2.4	1.8	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	○	○	○	○
2.5	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	○	○	○	○
2.6	2.1	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Superial

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech	DuraLite Tremco 0.025	ADL 2010: Domestic — L1A New Domestic	L1B Referb Domestic	Commercial — L2A New Commercial	L2B Referb Commercial
	Centre Pane[1] W/m²K													
1.0		0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	●	●	●	●
1.1		0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	●	●	●	●
1.2	0.4	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	●	●	●	●
1.3	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	●	●	●	●
1.4	0.7	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	●	●	●	●
1.5	0.9	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.2	●	●	●	●
1.6	1.0	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	●	●	●	●
1.7	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5	●	①	●	●
1.8	1.3	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	●	①	●	●
1.9	1.4	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.8	●	①	●	○
2.0	1.6	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.9	1.9	○	①	●	○
2.1	1.7	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	○	①	●	○
2.2	1.9	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.2	○	○	●	○
2.3	2.0	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	○	○	○	○
2.4	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.5	○	○	○	○
2.5	2.3	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.6	○	○	○	○
2.6	2.4	2.6	2.6	2.6	2.7	2.7	2.7	2.7	2.7	2.8	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
EcoFutural EFi+

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K										ADL 2010			
											Domestic		Commercial	
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025	**L1A** New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
1.0		0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	●	●	●	●
1.1	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.7	●	●	●	●
1.2	0.5	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	●	●	●	●
1.3	0.7	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	1.0	●	●	●	●
1.4	0.8	0.9	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	●	●	●	●
1.5	0.9	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	●	●	●	●
1.6	1.1	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.4	●	●	●	●
1.7	1.2	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	●	①	●	●
1.8	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.7	●	①	●	●
1.9	1.5	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	●	①	●	○
2.0	1.7	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9	2.0	○	①	●	○
2.1	1.8	1.9	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	○	①	●	○
2.2	1.9	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	○	○	●	○
2.3	2.1	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.4	2.4	○	○	○	○
2.4	2.2	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5	○	○	○	○
2.5	2.4	2.5	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.7	○	○	○	○
2.6	2.5	2.7	2.7	2.7	2.7	2.7	2.8	2.8	2.8	2.8	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
VS 600

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K										ADL 2010 — Domestic		Commercial	
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025	**L1A** New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
1.0											●	●	●	●
1.1				0.3	0.3	0.3	0.4	0.4	0.4	0.4	●	●	●	●
1.2		0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	●	●	●	●
1.3	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	●	●	●	●
1.4	0.5	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	●	●	●	●
1.5	0.7	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	1.0	●	●	●	●
1.6	0.8	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.1	1.1	●	●	●	●
1.7	0.9	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	●	①	●	●
1.8	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4	●	①	●	●
1.9	1.2	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5	1.5	●	①	●	○
2.0	1.3	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	○	①	●	○
2.1	1.5	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.8	○	①	●	○
2.2	1.6	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.9	1.9	○	○	●	○
2.3	1.7	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	○	○	○	○
2.4	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2	○	○	○	○
2.5	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.3	○	○	○	○
2.6	2.1	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Visoglide Plus

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K										ADL 2010			
											Domestic		Commercial	
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025	**L1A** New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
1.0											●	●	●	●
1.1					0.3	0.3	0.3	0.3	0.3	0.3	●	●	●	●
1.2		0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	●	●	●	●
1.3	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	●	●	●	●
1.4	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	●	●	●	●
1.5	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	●	●	●	●
1.6	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	●	●	●	●
1.7	0.9	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.2	●	①	●	●
1.8	1.0	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	●	①	●	●
1.9	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	●	①	●	○
2.0	1.3	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	○	①	●	○
2.1	1.5	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	○	①	●	○
2.2	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8	○	○	●	○
2.3	1.7	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0	○	○	○	○
2.4	1.9	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	○	○	○	○
2.5	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	○	○	○	○
2.6	2.1	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2

[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.

[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows

[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.

•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Smart Wall

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech	DuraLite Tremco 0.025	ADL 2010: Domestic — L1A New Domestic	L1B Referb Domestic	Commercial — L2A New Commercial	L2B Referb Commercial
	Centre Pane[1] W/m²K													
1.0											●	●	●	●
1.1											●	●	●	●
1.2											●	●	●	●
1.3											●	●	●	●
1.4							0.3	0.3	0.3	0.4	●	●	●	●
1.5		0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	●	●	●	●
1.6	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.7	●	●	●	●
1.7	0.5	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	●	●	●	●
1.8	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.0	●	●	●	●
1.9	0.9	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	●	○	●	○
2.0	1.0	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.3	○	○	●	○
2.1	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	○	○	●	○
2.2	1.3	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	○	○	●	○
2.3	1.5	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	○	○	○	○
2.4	1.6	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	○	○	○	○
2.5	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1	○	○	○	○
2.6	1.9	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Shopline

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech 0.025	DuraLite Tremco 0.025	ADL 2010: Domestic — L1A New Domestic	L1B Referb Domestic	Commercial — L2A New Commercial	L2B Referb Commercial
	Centre Pane[1] W/m²K													
2.5											○	○	○	○
2.6											○	○	○	○
2.7											○	○	○	○
2.8											○	○	○	○
2.9				0.3	0.3	0.3	0.4	0.4	0.4	0.4	○	○	○	○
3.0	0.3	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	○	○	○	○
3.1	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	○	○	○	○
3.2	0.6	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	○	○	○	○
3.3	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	○	○	○	○
3.4	0.9	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	○	○	○	○
3.5	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	○	○	○	○
3.6	1.2	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	○	○	○	○
3.7	1.4	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.7	○	○	○	○
3.8	1.5	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	○	○	○	○
3.9	1.7	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9	2.0	○	○	○	○
4.0	1.8	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	○	○	○	○
4.1	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2

[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.

[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows

[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.

•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Visoglide

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech	DuraLite Tremco 0.025
	Centre Pane[1] W/m²K									
1.0										
1.1										
1.2										
1.3							0.3	0.3	0.3	0.4
1.4		0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5
1.5	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6
1.6	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8
1.7	0.6	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9
1.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0
1.9	0.9	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2
2.0	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3
2.1	1.2	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.5
2.2	1.3	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6
2.3	1.5	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7
2.4	1.6	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.9
2.5	1.7	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0
2.6	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1

ADL 2010	Domestic		Commercial	
	L1A New Domestic	L1B Referb Domestic	L2A New Commercial	L2B Referb Commercial
1.0	●	●	●	●
1.1	●	●	●	●
1.2	●	●	●	●
1.3	●	●	●	●
1.4	●	●	●	●
1.5	●	●	●	●
1.6	●	●	●	●
1.7	●	●	●	●
1.8	●	●	●	●
1.9	●	○	●	○
2.0	○	○	●	○
2.1	○	○	●	○
2.2	○	○	●	○
2.3	○	○	○	○
2.4	○	○	○	○
2.5	○	○	○	○
2.6	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
UltraGlide

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K										ADL 2010			
											Domestic		Commercial	
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025	**L1A** New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
1.0											●	●	●	●
1.1											●	●	●	●
1.2											●	●	●	●
1.3							0.3	0.3	0.3	0.4	●	●	●	●
1.4		0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	●	●	●	●
1.5	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	●	●	●	●
1.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	●	●	●	●
1.7	0.7	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	●	●	●	●
1.8	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	●	●	●	●
1.9	1.0	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	●	○	●	○
2.0	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5	○	○	●	○
2.1	1.3	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	○	○	●	○
2.2	1.5	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.8	○	○	●	○
2.3	1.6	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	○	○	○	○
2.4	1.8	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1	2.1	○	○	○	○
2.5	2.0	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	○	○	○	○
2.6	2.1	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Superglide

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K										ADL 2010			
											Domestic		Commercial	
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025	**L1A** New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
1.0											●	●	●	●
1.1											●	●	●	●
1.2											●	●	●	●
1.3											●	●	●	●
1.4											●	●	●	●
1.5											●	●	●	●
1.6											●	●	●	●
1.7					0.3	0.3	0.4	0.4	0.4	0.4	●	●	●	●
1.8		0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	●	●	●	●
1.9	0.4	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	●	○	●	○
2.0	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	○	○	●	○
2.1	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1.0	○	○	●	○
2.2	0.8	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	○	○	●	○
2.3	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.3	○	○	○	○
2.4	1.1	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4	○	○	○	○
2.5	1.3	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	○	○	○	○
2.6	1.4	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Slide 2000

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K										ADL 2010			
											Domestic		Commercial	
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025	**L1A** New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
1.0											●	●	●	●
1.1										0.3	●	●	●	●
1.2		0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	●	●	●	●
1.3	0.3	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	●	●	●	●
1.4	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	●	●	●	●
1.5	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	●	●	●	●
1.6	0.7	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	●	●	●	●
1.7	0.9	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	●	●	●	●
1.8	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.3	●	●	●	●
1.9	1.1	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4	●	○	●	○
2.0	1.3	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	○	○	●	○
2.1	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.7	○	○	●	○
2.2	1.5	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	○	○	●	○
2.3	1.7	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9	○	○	○	○
2.4	1.8	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	○	○	○	○
2.5	1.9	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	○	○	○	○
2.6	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Slide Mono

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K										ADL 2010			
											Domestic		Commercial	
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025	**L1A** New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
1.0							0.3	0.3	0.3	0.4	●	●	●	●
1.1		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	●	●	●	●
1.2	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	●	●	●	●
1.3	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	●	●	●	●
1.4	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	●	●	●	●
1.5	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1.0	●	●	●	●
1.6	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	●	●	●	●
1.7	1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	●	●	●	●
1.8	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	●	●	●	●
1.9	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	●	○	●	○
2.0	1.3	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.6	○	○	●	○
2.1	1.4	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	○	○	●	○
2.2	1.6	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	○	○	●	○
2.3	1.7	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	○	○	○	○
2.4	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	○	○	○	○
2.5	1.9	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.2	○	○	○	○
2.6	2.0	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Visofold 4000

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K										ADL 2010			
											Domestic		Commercial	
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025	**L1A** New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
1.0											●	●	●	●
1.1										0.3	●	●	●	●
1.2		0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	●	●	●	●
1.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.6	●	●	●	●
1.4	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	●	●	●	●
1.5	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	●	●	●	●
1.6	0.7	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	●	●	●	●
1.7	0.9	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	●	●	●	●
1.8	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	●	●	●	●
1.9	1.1	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4	●	○	●	○
2.0	1.3	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	○	○	●	○
2.1	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.7	○	○	●	○
2.2	1.5	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	○	○	●	○
2.3	1.7	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	○	○	○	○
2.4	1.8	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	○	○	○	○
2.5	1.9	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	○	○	○	○
2.6	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Visofold 3000

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K										ADL 2010			
											Domestic		Commercial	
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025	**L1A** New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
1.0											●	●	●	●
1.1					0.3	0.3	0.3	0.3	0.4	0.4	●	●	●	●
1.2		0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	●	●	●	●
1.3	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.7	●	●	●	●
1.4	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	●	●	●	●
1.5	0.7	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	●	●	●	●
1.6	0.8	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.1	●	●	●	●
1.7	0.9	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	●	●	●	●
1.8	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	●	●	●	●
1.9	1.2	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	●	○	●	○
2.0	1.4	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	○	○	●	○
2.1	1.5	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	○	○	●	○
2.2	1.6	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9	○	○	●	○
2.3	1.8	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	○	○	○	○
2.4	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2	○	○	○	○
2.5	2.0	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	○	○	○	○
2.6	2.2	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Visofold 2000

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification: Typical Spacer Bar Performances[2] W/m — Aluminium Typical 0.111	Stainl Steel Typical 0.069	Nirotec 015 Helmut Lingemann 0.066	Swisspacer Saint-Gobain 0.060	TGI Spacer TechnoForm 0.051	Thermix TX.N Ensinger 0.051	Super Spacer TriSeal Edgetech 0.041	Swisspacer V Saint-Gobain 0.039	Super Spacer Standard Edgetech	DuraLite Tremco 0.025
	Centre Pane[1] W/m²K									
1.0										
1.1					0.3	0.3	0.3	0.3	0.4	0.4
1.2		0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5
1.3	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.7
1.4	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8
1.5	0.7	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9
1.6	0.8	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.1
1.7	0.9	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2
1.8	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3
1.9	1.2	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5
2.0	1.4	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6
2.1	1.5	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7
2.2	1.6	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9
2.3	1.8	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0
2.4	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2
2.5	2.0	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3
2.6	2.2	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4

ADL 2010			
Domestic		Commercial	
L1A New Domestic	L1B Referb Domestic	L2A New Commercial	L2B Referb Commercial
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
●	○	●	○
○	○	●	○
○	○	●	○
○	○	●	○
○	○	○	○
○	○	○	○
○	○	○	○
○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

Thermal Performance
Visofold 1000

Thermal Simulation BS EN IS0 10077-2
BS EN 14351-1

smart
architectural aluminium

U Value W/m²K	Glazing Specification — Typical Spacer Bar Performances[2] W/m — Centre Pane[1] W/m²K										ADL 2010			
											Domestic		Commercial	
	Aluminium Typical 0.111	**Stainl Steel** Typical 0.069	**Nirotec 015** Helmut Lingemann 0.066	**Swisspacer** Saint-Gobain 0.060	**TGI Spacer** TechnoForm 0.051	**Thermix TX.N** Ensinger 0.051	**Super Spacer TriSeal** Edgetech 0.041	**Swisspacer V** Saint-Gobain 0.039	**Super Spacer Standard** Edgetech	**DuraLite** Tremco 0.025	**L1A** New Domestic	**L1B** Referb Domestic	**L2A** New Commercial	**L2B** Referb Commercial
1.0							0.3	0.3	0.3	0.4	●	●	●	●
1.1		0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	●	●	●	●
1.2	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	●	●	●	●
1.3	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	●	●	●	●
1.4	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	●	●	●	●
1.5	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	●	●	●	●
1.6	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	●	●	●	●
1.7	1.0	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.3	●	●	●	●
1.8	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4	●	●	●	●
1.9	1.3	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	●	○	●	○
2.0	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.7	○	○	●	○
2.1	1.5	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	○	○	●	○
2.2	1.7	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	○	○	●	○
2.3	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1	○	○	○	○
2.4	1.9	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	○	○	○	○
2.5	2.1	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	○	○	○	○
2.6	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.4	○	○	○	○

System Thermal Performance.
Calculation in accordance with BR443, Thermal transmittance of system from numerical method of simulations, BS EN IS0 10077-2
[1] Thermal Transmittance of glazing (Centre Pane) to be determined in accordance with EN 673, EN 674 or EN675.
[2] Spacer Bar Data to be Calculated in accordance with ift-Guidelines WA-08 'Determination of representative values for profile sections of windows
[3] Calculated overall thermal performance to BS EN ISO 1007-1 configuration to EN 14351-1 Annex E as per UK 2010 Building Regulations.
•①L1B dependent on g value of glazing windows may also be compliant with energy rating calculation

References

[1] The Building Regulations 2010 (as amended): Approved Documents L1A, L1B, L2A and L2B, 2006 Edition, obtainable from www.planningportal.gov.uk
[2] *SAP 2009: The BRE's Standard Assessment Procedure for Energy Rating of Dwellings*, obtainable from www.bre.co.uk/sap2009/
[3] Conventions for U Value Calculations, BRE443 obtainable from www.bre.co.uk

Calculation Methods

BS EN ISO 6946* Thermal performance of buildings and building components – Thermal resistance and thermal transmittance – Calculation method
BS EN ISO 10077-1* Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 1: Simplified methods
BS EN ISO 10077-2 Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 2: Numerical methods for frames
EN 13947 Thermal performance of curtain walling – Calculation of thermal transmittance

Measurement methods

BS EN ISO 12567-1 Thermal performance of windows and doors – Determination of thermal transmittance by hot box method – Part 1: Complete windows and doors
BS EN ISO 12567-2 Thermal performance of windows and doors – Determination of thermal transmittance by hot box method – Part 2: Roof windows and other projecting Windows

ADM	ALM	March 2013	V1

White Paper
Building Regulations Approved Document L

smart
architectural aluminium