

THERMAL SIMULATION REPORT

Report Number:	TCL2014-SWA-004
Prepared For:	Steel Window Association 42 Heath Street Tamworth Staffordshire B79 7HJ
Window System Identifier:	W30
Fixed Outer Frame Identifier:	WX7 (Fixed)
Transom Frame Identifier:	W7 (Fixed)
Vent Frame Identifier:	WX7 (Moving)
Glazing System:	4mm St Gobain Diamant – 10 mm 90% Krypton – 4 mm Guardian Climaguard A+ (2014)
Spacer Bar:	10mm Edgetech Super Spacer Standard
Notes:	

Results

Thermal Transmittance (U_{window})	2.0	W/(m ² K)
Solar Factor (g_{window})	0.59	
Air Leakage Factor (L_{factor})	0.00	W/(m ² K)
BFRC Energy Rating Index	-7	
BFRC Energy rating Band	B	

(Window Configuration as per GGF Document 2.2)
(1230mm wide x 1480mm high –vent next to fixed light)

Report Prepared By Dr Gary Morgan
Therm Consulting

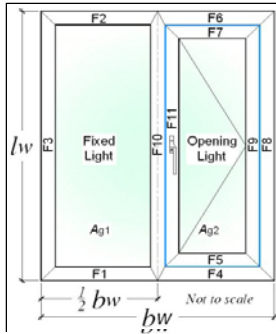
Signed: *G Morgan*

Date: 18th February 2014

The simulations in this report were performed using Therm 5.2.14
according to EN ISO 10077 – 2.
The Therm files generated are attached to this report as appendices



**BFRC Certified
Simulator 016**



Sample Style:
Casement
Fixed Light / Side Hung

Blue line illustrates opening light length (air leakage)

Frame offset: Yes

Nominal 4mm etc to 0DP , others 1DP			
Glazing dimensions and properties:			
Thickness of pane 1	4	mm	
Pane 1/2 distance	10	mm	
Gas fill (1/2)	Krypton 90%		
Thickness of pane 2	4	mm	
Complete next 3 cells for TG IGU			
Pane 2/3 distance		mm	
Gas fill (2/3)			
Thickness of pane 3		mm	
Glazing Trans. - 3DP	U_g	1.122	W/(m ² ·K)
g-value - 2DP	g	0.76	

Thermal transmittance of window from hot box test		
$U_w - 2DP$		W/(m ² ·K)

Window Dimensions:		Area		
Section	Length (m)	Width (m)	No gasket (m ²)	With gasket (m ²)
Fixed Light	1.4320	0.5725	0.8198	0.8118
Opening light	1.4040	0.5425	0.7617	0.7539
Total glazing, A_g			1.5815	1.5657
Frame	(m)	(m)	(m ²)	(m ²)
F1	0.6150	0.0240	0.0143	0.0154
F2	0.6150	0.0240	0.0143	0.0154
F3	1.4800	0.0240	0.0349	0.0378
F4	0.6150	0.0220	0.0131	0.0131
F5	0.5745	0.0160	0.0089	0.0100
F6	0.6150	0.0220	0.0131	0.0131
F7	0.5745	0.0160	0.0089	0.0100
F8	1.4800	0.0220	0.0321	0.0321
F9	1.4360	0.0160	0.0227	0.0255
F10	1.4800	0.0370	0.0539	0.0568
F11	1.4360	0.0160	0.0227	0.0255
Total Frame			0.2389	0.2547
Total Window, A_w			1.8204	1.8204
Percentage fixed light glass area			45.04%	44.60%
Percentage opening light glass area			41.84%	41.41%
Percentage glass area (total)			86.88%	86.01%

Solar Factor, g-value:	F_w	0.9
	g_w	0.59

U_{window}	No bars; or attached bars	1.99	W/(m ² ·K)
	Single cross bar in IGU	2.1	
	Multiple cross bar in IGU	2.2	
	Glazing bar (Georgian bar)	2.4	

BFRG Rating kWh/(m ² ·yr)	Label index	EWER Rating Scale	Window Rating
≥10		A+	B
0 to <10		A	
-10 to <0	←	B	
-20 to <-10		C	
-30 to <-20		D	
-50 to <-30		E	
-70 to <-50		F	

Report Number: **TCL2014-SWA-004** Issue No 22.1: 11/03/2013
 Report Date: **18 February 2014**
 Project Details: **4 10 4 St Gobain Diamant - 90% Krypton - Guardian Climaguard A+ (2014) with Edgtech Super Spacer Standard**

THIS SPREADSHEET IS THE PROPERTY OF THE BFRC AND CAN ONLY BE USED IN CONJUNCTION WITH A BFRC LICENCE APPLICATION

Input Values:
 Yellow input, green intermediary, blue finals X DP is no. of decimal places to enter

Parameter	Symbol	Units
Total window height 0DP	l_w	1480 mm
Total window width 0DP	b_w	1230 mm

Frame dimensions:	(b _i)	Frame width, b _r	Frame offset, b _{oF}	Gasket protrusion, b _{gF}	Frame & gasket widths	
		(mm)	(mm)	(mm)	(mm)	
All frame values round to nearest 1mm, gaskets to 1DP	F1 fixed sill	24	2	2.0	26.0	Total
	F2 fixed head	24	2	2.0	26.0	
	F3 fixed jamb	24	2	2.0	26.0	
F4 + F5 sash sill	F4 fixed sash sill	22	n/a	n/a	22.0	40.0
	F5 moving sash sill	16	2	2.0	18.0	
F6 + F7 sash head	F6 fixed sash head	22	n/a	n/a	22.0	40.0
	F7 moving sash head	16	2	2.0	18.0	
F8 + F9 sash jamb	F8 Fixed sash jamb	22	n/a	n/a	22.0	40.0
	F9 moving sash jamb	16	2	2.0	18.0	
F10 + F11 mullion	F10 fixed mullion	37	2	2.0	39.0	57.0
	F11 moving mullion	16	2	2.0	18.0	
Total gasket area				0.015772	m ²	

Where a U_w value from hot box testing is available, nd_r^{2D} or L_{ψ}^{2D} values need to be entered					
Frame conductance:	L_r^{2D}	All L values to 4DP . All b values to 0DP			
		W/(m·K)	b _p (mm)	W/(m·K)	b _g (mm)
F1 fixed sill	0.4191	190	0.3962	190	
F2 fixed head	0.4191	190	0.3962	190	
F3 fixed jamb	0.4191	190	0.3962	190	
F4 + F5 sash sill	0.5207	190	0.5000	190	
F6 + F7 sash head	0.5207	190	0.5000	190	
F8 + F9 sash jamb	0.5207	190	0.5000	190	
F10 + F11 mullion	0.9006	380	0.8581	380	

Frame:	Frame width, b _r	Frame U-value, U	Frame areas, A	Frame heat flow, HU	Linear trans, ψ	Linear length, l _s	Junction heat flow, H ψ
Section	(m)	(W/(m ² ·K))	(m ²)	(W/K)	(W/(m·K))	(m)	(W/K)
F1 fixed sill	0.0240	5.8933	0.0143	0.0840	0.0416	0.5765	0.0240
F2 fixed head	0.0240	5.8933	0.0143	0.0840	0.0416	0.5765	0.0240
F3 fixed jamb	0.0240	5.8933	0.0349	0.2059	0.0416	1.4360	0.0597
F4 + F5 sash sill	0.0380	6.3957	0.0220	0.1408	0.0438	0.5465	0.0239
F6 + F7 sash head	0.0380	6.3957	0.0220	0.1408	0.0438	0.5465	0.0239
F8 + F9 sash jamb	0.0380	6.3957	0.0548	0.3505	0.0438	1.4080	0.0616
F10 + F11 mullion	0.0530	6.5146	0.0766	0.4992	0.0865	1.4220	0.1230
Totals		0.2389	1.5052			Total	0.3401

Air Leakage loss:		
Air leakage at 50 Pa per hour & per unit length of opening light (BS 6375-1) 2DP		
Opening light length	4.0210 m	0.07 m ³ /(m·h)
L_{50}	0.15 m ³ /(m ² ·h)	Heat loss = 0.0165 L_{50}
Total air leakage		0.281 m ³ /h
Heat loss = 0.0165 L_{50}		0.00 W/(m ² ·K)

Other parameters needed for calculation, taken from simulations:			
$\lambda_p = 0.035$ W/(m·K)	$R_{se} = 0.04$ ·K /W	$d_p = d_g = 0.018$ m	$R_{se} = 0.13$ m ² ·K /W
$R_p = 0.5143$ m ² ·K /W	$R_{tot} = 0.6843$ ·K /W	$U_p = 1.4614$ W/(m ² ·K)	

BFRG Rating =	
218.6g window - 68.5 x (U_{window} + Effective L_{50}) =	-7.34
Climate zone is:	UK

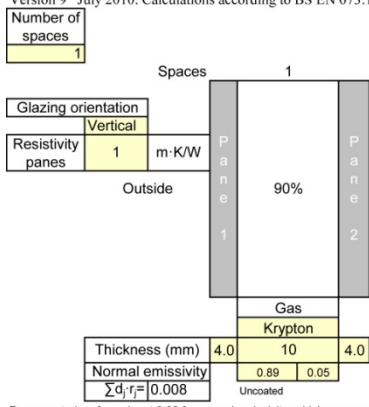
Thermal transmittance, W/(m ² ·K)	U_{window}	2
Solar factor	g_{window}	0.59
Window air leakage heat loss, W/(m ² ·K)	L_{factor}	0.00



Simulator Name: **DR Gary Morgan**

BFRC Certified Simulator **016**

Version 9 July 2010. Calculations according to BS EN 673:1998 (A1)



For uncoated surfaces input 0.89 for normal emissivity, which corresponds to a corrected emissivity of 0.837

Iteration number	U value		$\sum 1/h_s$		A_{eff}		ΔT
	W/(m ² ·K)	(m ² ·K)/W	W/(m ² ·K)	(m ² ·K)/W	W/(m ² ·K)	W/(m ² ·K)	
1	1.122	0.7147	0.0140	15	0.0140	15	
2	1.122	0.7147	0.0140	15	0.0140	15	

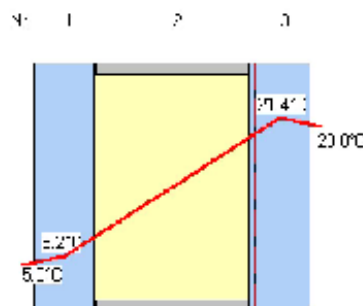


Calculation WinSLT

Position:

Layer composition (outside to inside)

Number	BE	Denomination	mm
1		Diamant	4,00
2		90% Krypton	10,00
3		Climaguard A+ (2014 Spec)	4,00
			18,00



Transmission, Reflexion, Absorbtion

$Q_v = 0,13$ (Light reflection factor outside)

$Q'_v = 0,13$ (Light reflection factor inside)

$Q_e = 0,21$ (direct radiation reflection factor)

$\alpha_e = 1 = 0,02; 2 = 0,11$ (direct radiation absorption factor)

$R_a = 99$ (general color rendering index)

$T_{UV} = 0,39$ (ultraviolet transmittance)

$T_v = 0,80$ (Light transmission factor)

$T_e = 0,66$ (direct radiation transmission factor)

EN 410

$SC = 0,95$ (Shading Coefficient = $g/0,80$)

$q_i = 0,09$ (secondary heat inside)

$g = 0,76$ (Total energy transmission)

EN 673 Installation angle = 90° vertikal

$U_g = 1,1$ W/m²K (Heat transfer coefficient)

EN 13363-2 $T_e = 5,00$ °C $T_i = 20,00$ °C

$E_s = 300,00$ W/m² System = 1,50 m

$g_{th} = 0,054$ (Thermal radiation factor)

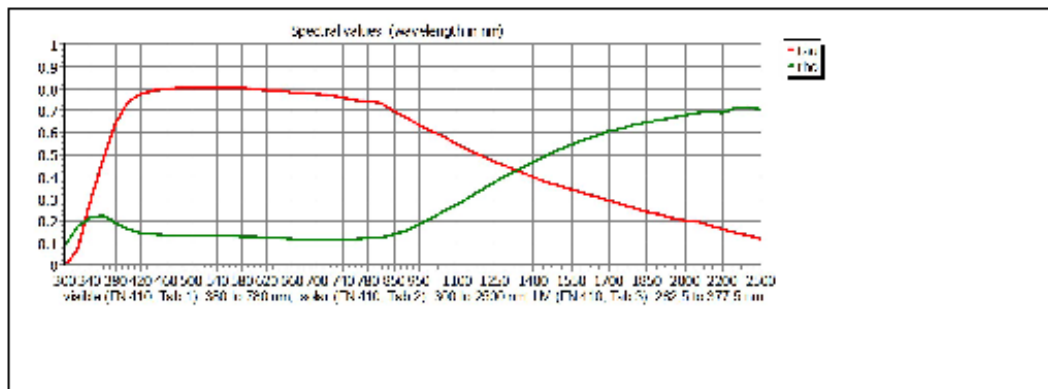
$h_{c,e} = 18$ W/m²K $h_{c,i} = 3,6$ W/m²K

$g_c = 0,041$ (Convection factor)

$q_i = 0,096$ (secondary heat inside)

$g_v = 0,000$ (Ventilation)

$g = 0,76$ (Total energy transmission)



Fluctuations of light and radiation technical values for the chemical composition of glass and manufacturing process possible. Function values take into account the permitted tolerances according to the product standards. The calculation-result don't gives information about the technical practicability of this construction.

Registered for: Therm Consulting - Therm Consulting
 IfT-certified according to the Validation Report No. 410 42167

WinSLT 5.1186

Copyright Sommer Informatik GmbH, Rosenheim

18/02/2014 - 11:00:01



Certificate of Test: Chilt/P10036

Steel Window Association
42 Heath Street
Tamworth
Staffordshire
B79 7HJ

This document confirms that performance testing was conducted on 8 April 2010. Testing was conducted to the following standard:-

- BS 6375 Part 1:2009 Performance of windows and doors - Part 1: Classification for weathertightness and guidance on selection and specification. The following results were achieved.

Product tested	W-30 Side Hung Casement Window		
Summary of testing and classification			
	Test Standard	Classification standard	Result
Air permeability	BS EN 1026: 2000	BS EN 12207: 2000	600Pa (Class 4)
Watertightness	BS EN 1027: 2000	BS EN 12208: 2000	750Pa (E750)
Wind resistance	BS EN 12211: 2000	BS EN 12210: 2000	1600Pa (Class A4)
Exposure category	BS 6375: Part 1: 2009		1600

Air leakage at 50pa was 0.2m³/h positive pressure and 0.3m³/h negative pressure. The perimeter length of opening light was 3.42m

The results relate only to the specimen tested, as detailed in technical specification document number Chilt/P10036/tec1

Paul Andrews –
Head of Section Mechanical Testing
Date:

Vincent Kerrigan -
Technical Manager
Date: 19-07-2010

Chiltern Dynamics

Chiltern House, Stocking Lane, Hughenden Valley, High Wycombe, HP14 4ND, United Kingdom

Tel: 01494 569800 Fax: 01494 564895

Web: www.chilternfire.co.uk

Email: cif@chilternfire.co.uk

This document is confidential and remains the property of Chiltern International Fire Ltd



1762

Page 1 of 11

Air leakage calculation

Chiltern Dynamics report number Chilt /P10036 gives the positive and negative airflows at 50 Pa as 0.2 m³/h and 0.3 m³/h respectively. The opening light length is given as 3.42 m

Thus the average air infiltration rate per m opening light length is given by:

$$((0.2 + 0.3) / 2) / 3.42 = 0.07 \text{ m}^3/(\text{m}\cdot\text{h})$$

Material	Conductivity (W/mK)	Emissivity
Mild Steel	50	0.9
Aluminium	160	0.9
Glass	1.0	0.9
EPDM	0.25	0.9
Butyl (Hot Melt)	0.24	0.9
Super Spacer Standard	0.13	0.9
PVC / PU Foam Elastomer	0.05	0.9
Glazing Gas Space Effective	0.014	0.9
CEN Insulation Panel	0.035	0.9

