

Window Energy Rating (WER)

Report in Accordance with BFRC Guidelines and Regulations

Report reference: SWER156
Issue date: 15th July 2010
Prepared for: Profile Systems
System: Dualframe 75mm
Prepared by: Ms Becky Hewlett
BFRC certified simulator No. 038



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Introduction

Frame Properties

The thermal performance calculations of the window configurations detailed are provided by computer simulation using LBNL THERM Finite element simulator software program THERM 5.2 and validated against proofs in Annex D (D1 to D10) of BS EN ISO 10077-2:2003.

Glazing Properties

The glazing gas space effective conductivity (Keff) and centre pane U value are calculated using the BFRC BS EN 673 spreadsheet, (Version 9.0 - July 2010)

The g value of the glazing is calculated using Saint-Gobain Calumen II software, (Version 1.0.0)

Note - insulating glass units must comply with BS EN 1279-5:2005

Air Leakage properties

Air leakage data is provided from a UKAS accredited air permeability test report by Exova Warringtonapt (Report No 190968)

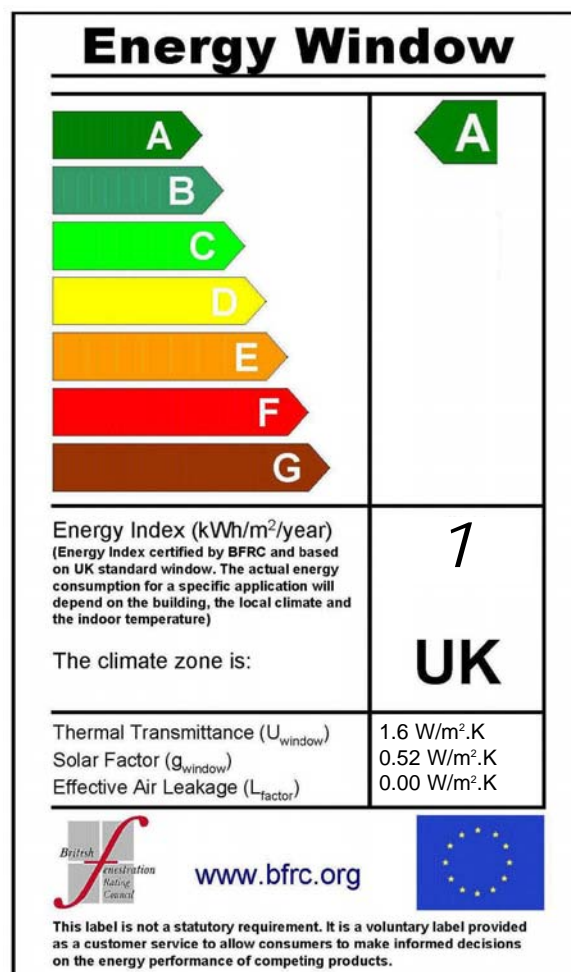
Whole Window Properties

The overall window U value, g value, L factor and energy rating index, are calculated using BFRC spreadsheet (Issue 21 - 4.3.2009)

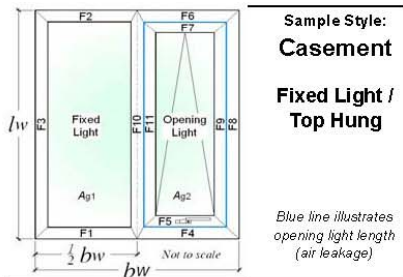
Window Specification

<i>Window System:</i>	Dualframe 75mm Casement
<i>Outerframe:</i>	DF316
<i>Ventframe:</i>	DF331
<i>Transom/Mullion:</i>	DF327
<i>Beading:</i>	DF216
<i>Glazing:</i>	4/20/4 Saint-Gobain Double glaze unit Diamant, 90% Argon, Planitherm Total+, Planilux
<i>Spacer:</i>	Swiss Spacer-V (Total depth 12mm) Dessicant - Molecular Sieve (0.10 W/m-K) Primary seal - Polyisobutylene (PIB) (0.20 W/m-K) Secondary seal - Polyurethane (0.25 W/m-K)

Window Rating Label



BFRC Window Energy Rating Spreadsheet



Report Number: **SWER156** Issue No.21: 04/03/2009
 Report Date: **15.7.10**
 Project Details: **Dualframe 75mm Casement - Profiles DF316, 331, 327, 216 SG (4/20/4) Diamant / 90% Argon / Planitherm Total+, SWS-V**

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

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

Nominal 4mm etc to **ODP**, others **1DP**

Glazing dimensions and properties:

Thickness of pane 1	4	mm
Pane 1/2 distance	20	mm
Gas fill (1/2)	Argon 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	1.221 W/(m ² K)
g-value - 2DP	g_a	0.74

Frame dimensions:

	(b_f)	Without gasket	Gasket protrusion	With gasket	
		(mm)	(mm)	(mm)	
All frame values to nearest 0.5mm, gaskets to 1DP	F1 fixed sill	34.5	3.0	37.5	Total
	F2 fixed head	34.5	3.0	37.5	
	F3 fixed jamb	34.5	3.0	37.5	
F4 + F5 sash sill	F4 fixed sash sill	34.5	n/a	34.5	66
	F5 moving sash sill	28.5	3.0	31.5	
F6 + F7 sash head	F6 fixed sash head	34.5	n/a	34.5	66
	F7 moving sash head	28.5	3.0	31.5	
F8 + F9 sash jamb	F8 Fixed sash jamb	34.5	n/a	34.5	66
	F9 moving sash jamb	28.5	3.0	31.5	
F10 + F11 mullion	F10 fixed mullion	66	3.0	69	100.5
	F11 moving mullion	28.5	3.0	31.5	
Total gasket area		0.022746		m ²	

Thermal transmittance of window from hot box test

$U_w - 2DP$		W/(m ² K)
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Window Dimensions:

Section	Length		Width		Area	
	(m)	(m)	No gasket (m ²)	With gasket (m ²)		
Fixed Light	1.4110	0.5475	0.7725	0.7608		
Opening light	1.3540	0.4905	0.6641	0.6531		
Total glazing, A_g			1.4367	1.4139		
Frame	(m)	(m)	(m ²)	(m ²)		
F1	0.6150	0.0345	0.0201	0.0217		
F2	0.6150	0.0345	0.0201	0.0217		
F3	1.4800	0.0345	0.0499	0.0541		
F4	0.6150	0.0345	0.0201	0.0201		
F5	0.5475	0.0285	0.0148	0.0163		
F6	0.6150	0.0345	0.0201	0.0201		
F7	0.5475	0.0285	0.0148	0.0163		
F8	1.4800	0.0345	0.0499	0.0499		
F9	1.4110	0.0285	0.0394	0.0435		
F10	1.4800	0.0660	0.0954	0.0996		
F11	1.4110	0.0285	0.0394	0.0435		
Total Frame	0.3837		0.4065			
Total Window, A_w	1.8204		1.8204			
Percentage fixed light glass area	42.44%		41.79%			
Percentage opening light glass area	36.48%		35.88%			
Percentage glass area (total)	78.92%		77.67%			

Where a U_g value from hot box testing is available, no L_f^{2D} or L_w^{2D} values need to be entered

Frame conductance:

Section	L_f^{2D}	All L values to 4DP . All b values to ODP		L_w^{2D}
		W/(m ² K)	b_f (mm)	
F1 fixed sill		0.2694	190	0.3356
F2 fixed head		0.2694	190	0.3356
F3 fixed jamb		0.2694	190	0.3356
F4 + F5 sash sill		0.3742	190	0.4376
F6 + F7 sash head		0.3766	190	0.4397
F8 + F9 sash jamb		0.3766	190	0.4397
F10 + F11 mullion		0.6488	380	0.7767

Frame:

Section	b_f (no gaskets)	U_f	Frame areas (no gaskets)	Heat flow	ψ	l_g	Heat flow
	(m)	W/(m ² K)	(m ²)	W/K	W/(m ² K)	(m)	W/K
F1 fixed sill	0.0345	2.1311	0.0201	0.0427	0.0301	0.5475	0.1655
F2 fixed head	0.0345	2.1311	0.0201	0.0427	0.0301	0.5475	0.1655
F3 fixed jamb	0.0345	2.1311	0.0499	0.1063	0.0301	1.4110	0.0425
F4 + F5 sash sill	0.0630	2.8305	0.0348	0.0986	0.0273	0.4905	0.1334
F6 + F7 sash head	0.0630	2.8686	0.0348	0.1000	0.0270	0.4905	0.1332
F8 + F9 sash jamb	0.0630	2.8686	0.0893	0.2561	0.0270	1.3540	0.0365
F10 + F11 mullion	0.0945	2.7201	0.1348	0.3667	0.0557	1.3825	0.0770
Totals	0.3837	1.0131				Total	0.2155

Solar Factor, g-value:

F_w	0.9
g_w	0.52

Air Leakage loss:

Air leakage at 50 Pa per hour & per unit length of opening light (BS 6375-1) - 2DP	0.13	m ³ /(m ² h)
Opening light length	3.9170	m
Total air leakage	0.509	m ³ /h
L_{50}	0.28	m ³ /(m ² 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/(mK)	$R_{se} = 0.04$ m ² K/W	$R_{sw} = 0.13$ m ² K/W
Panel thickness, $\alpha_p = \alpha_g = 0.028$ m	$R_p = 0.8000$ m ² K/W	$R_{tot} = 0.9700$ m ² K/W
		$U_p = 1.0309$ W/(m ² K)

BFRC Rating	Label index	EWER Rating Scale	Window Rating
> 0	A	A	A
-10 to <0	B	B	
-20 to <-10	C	C	
-30 to <-20	D	D	
-50 to <-30	E	E	
-70 to <-50	F	F	
< -70	G	G	

BFRC Rating =

218.6g $_{window} - 68.5 \times (U_{window} + \text{Effective } L_{50}) =$ **1.33**

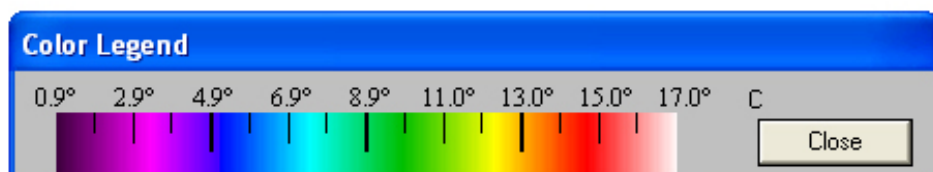
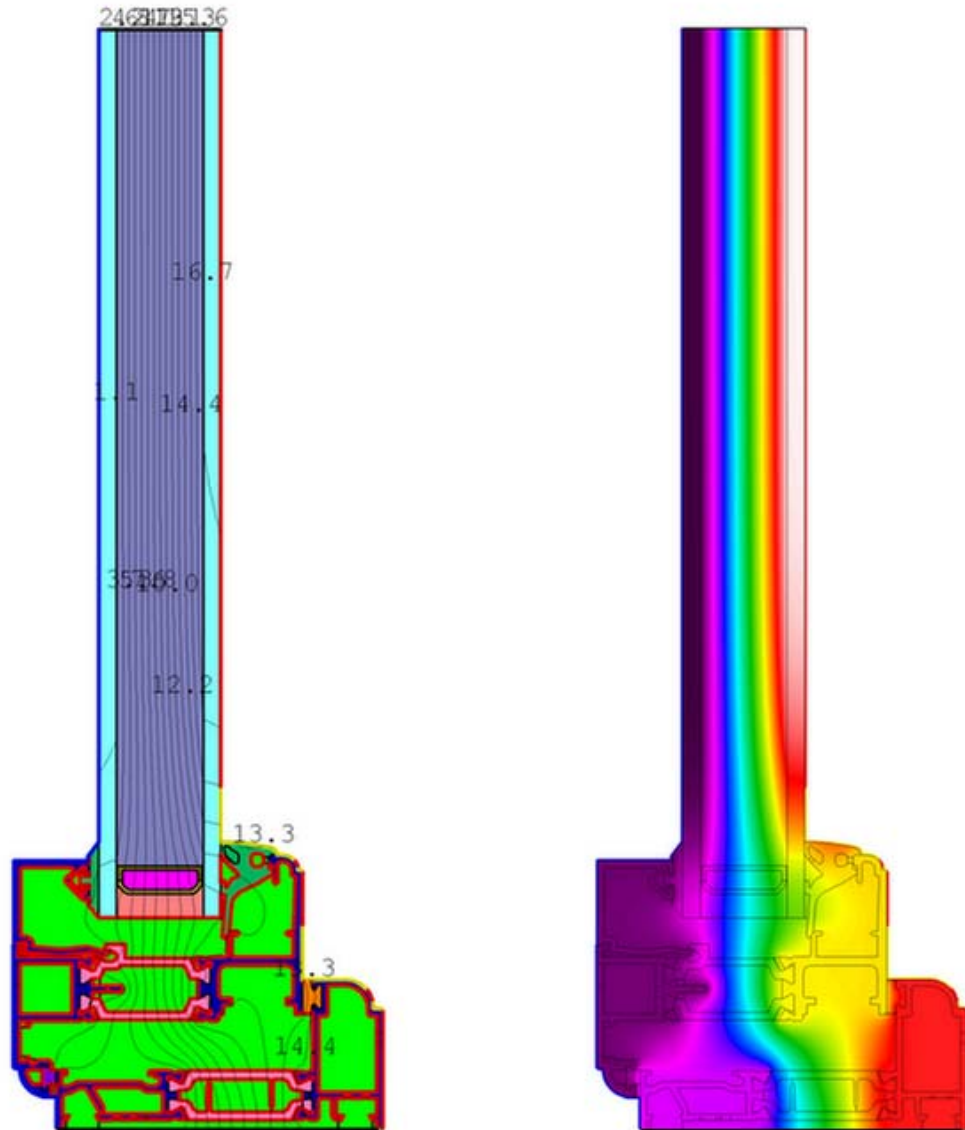
Climate zone is: **UK**

Thermal transmittance, W/(m ² K)	U_{window}	1.6
Solar factor	g_{window}	0.52
Window air leakage heat loss, W/(m ² K)	L_{factor}	0.00



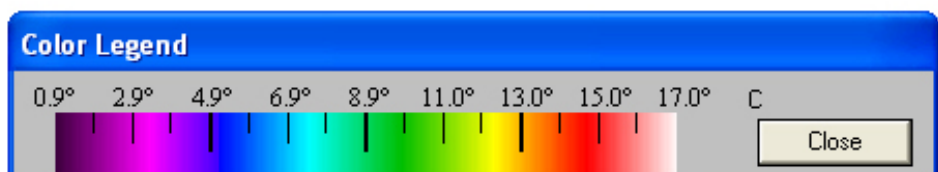
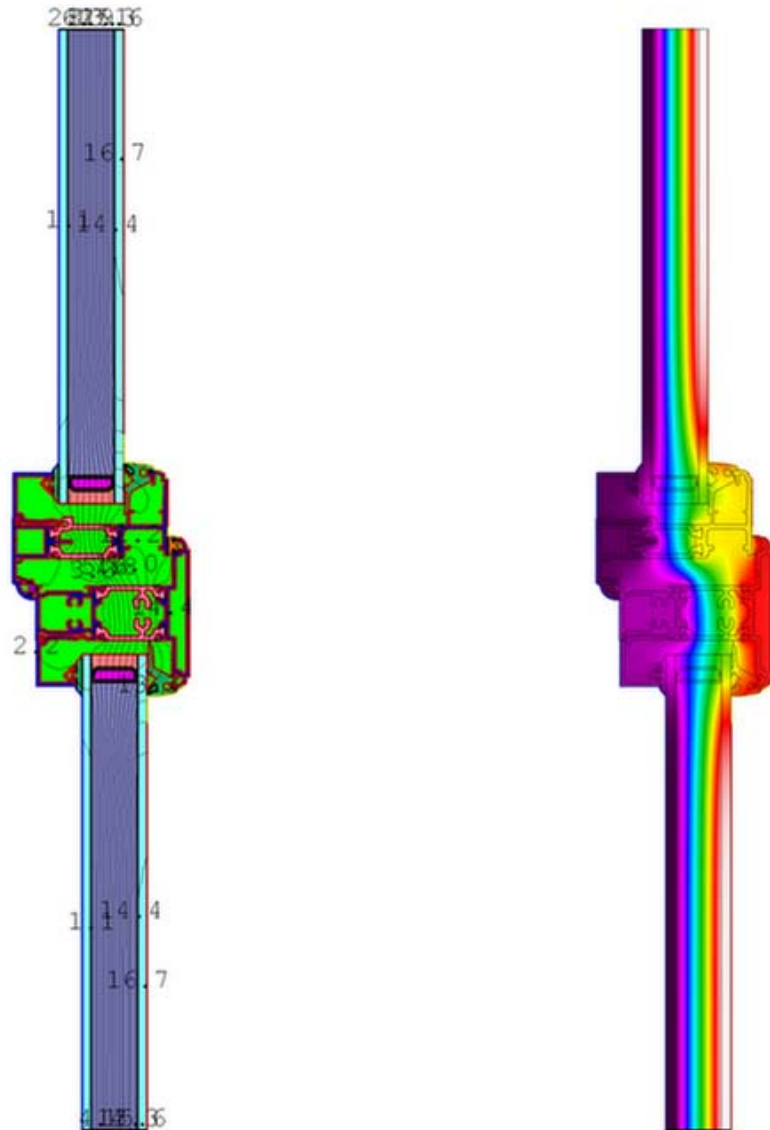
Simulator Name: **Ms Becky Hewlett** BFRC Certified Simulator **No 038**

Thermal Simulation Analysis - Outerframe/Ventframe
 Output From Therm 5.2



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Thermal Simulation Analysis - Mullion/Ventframe
Output From Therm 5.2



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BS EN 673 Spreadsheet

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

Number of spaces		1	
Glazing orientation		Vertical	
Resistivity panes	1	m-K/W	
Outside		Spaces 1	
		Pane 1	90%
			Pane 2
		Gas	
		Argon	
Thickness (mm)	4.0	20	4.0
Normal emissivity		0.89	0.05
$\sum d_j \cdot r_j = 0.008$		Uncoated	

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

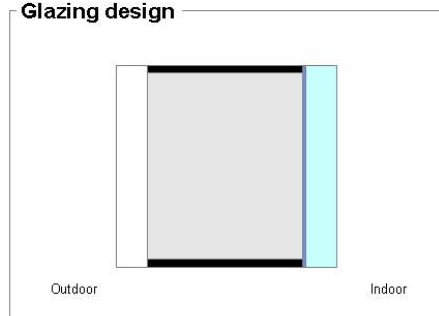
Iteration number	U value	$\sum 1/h_s$	λ_{eff}	ΔT
	W/(m ² ·K)	(m ² ·K)/W		
1	1.221	0.64228	0.0311	15
2	1.221	0.64228	0.0311	15

Glass Supplier Information (EN410)



12 July 2010

Glazing design



	First glazing	Second glazing
Gas		Argon 90% 20mm
Coating		PLANITHERM TOTAL+
First glass	DIAMANT 4mm	PLANILUX 4mm
Coating		
Layer		
Coating		
Second glass		
Coating		

Manufacturing sizes

Nominal thickness : **28.0 mm**
Weight : **20.0 kg/m²**

Luminous factors

Transmittance : **81 %**
Outdoor reflectance : **12 %**
Indoor reflectance : **12 %**

Energy factors EN 410

Transmittance : **63 %**
Outdoor reflectance : **22 %**
Indoor reflectance : **19 %**
Absorptance A1 : **3 %**
Absorptance A2 : **13 %**

Solar factor g : **0.74**
Shading coefficient : **0.85**

Thermal transmission - 0° related to vertical position

U_g : **1.2 W/(m²K)**



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This Calumen®II program has been approved by TNO S&I to do ITC (Initial Type Calculations), for the purpose of an ITT Report according to EN 673 and EN 410 intended uses. Ref. Report TNO No TC-RAP-06-17266/mso

The Calumen software calculates the spectrophotometric values of Saint-Gobain Glass products, and of combinations of those products. It is the responsibility of the user of this software to check if the intended use of the product is allowed, in respect with the current domestic regulations and standards. Saint-Gobain Glass cannot be considered as responsible if the software is used for wrong applications of glass products.

These values are calculated according to standards EN 410 (luminous and energy values) and EN 673 (thermal transmittance U_g). These computed values are average values, given for indicative purposes only and are subject to modifications. These computed values are average values, given for indicative purposes only and are subject to modifications. The tolerance is +/- 3% for the values of the light and energy factors and +/- 0.1 W/m².K for the value of the U_g coefficient.

BS4873 Air Leakage Report

Extract from Weather Performance Test report

Report No 261/4676528

Page 5 of 6

AIR PERMEABILITY TEST RESULTS

Clause 10.2 Air Permeability

Table 1

Air pressure (Pa)	Blank reading (m³/h)	Maximum total air flow (m³/h)	Actual rate of air leakage (m³/h)	Maximum rate of air leakage (m³/h)	Select the perimeter type (Opening or Gasket) (m³/h/m)
50	3.7	4.2	0.5	0.5	0.13
100	6.7	7.0	0.3	0.3	0.08
150	8.2	8.6	0.4	0.4	0.10
200	9.8	10.3	0.5	0.5	0.13
300	12.5	13.0	0.5	0.6	0.16
400	15.0	15.3	0.3	0.5	0.13
500	16.8	17.2	0.4	0.4	0.10
600	18.5	19.0	0.5	0.7	0.18
700	20.1	20.8	0.7	0.7	0.18
600	18.3	19.0	0.7	-	-
500	16.7	17.0	0.3	-	-
400	14.7	15.2	0.5	-	-
300	12.2	12.8	0.6	-	-
200	9.6	10.0	0.4	-	-
150	8.1	8.4	0.3	-	-
100	6.2	6.5	0.3	-	-
50	4.0	4.2	0.2	-	-

Opening perimeter (m) :3.86