

Report in Accordance with BFRC Guidelines and Regulations



CONFIDENTIAL

Simulator: Andy Gibson

Project Reference: SIM00315 A

Issue Date: 11 August 2011

Description: Liniar Sculptured Suite

Window Type: Casement, Fixed Light/Side Hung

Liniar Windows
Flamstead House
Denby Hall Business Park
Denby
Derbyshire
DE5 8JX

T: 01332 883900
F: 01332 883901



Approved Simulator 018

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1 Introduction

The U-value calculations of the Liniar Sculptured suite detailed below were commissioned by Adrian Redshaw of HL Plastics Ltd.

2 Validation of program

The THERM 5.2 analysis software has been validated against proofs in Annex D (D1 to D10) of BS EN ISO 10077-2:20003

3 Analysis Method

The frame profile results detailed below are provided by computer simulation using LBNL software program THERM 5.2 alongside BFRC guidelines and regulations.

4 Summary of results

A summary of results are detailed in the following sections.

4.1 Frame thermal transmittance (following the principles of BS EN ISO 10077-2)

HL Plastics Sculptured suite' Frame Profile	Frame Thermal Transmittance (U_f)
Fixed	1.1899 W/(m ² ·K)
Mullion	1.4680 W/(m ² ·K)
Sash	1.3098 W/(m ² ·K)
	n/a W/(m ² ·K)

4.2 Linear thermal transmittance (following the principles of BS EN ISO 10077-2)

HL Plastics Sculptured suite' Frame Profile	Linear Thermal Transmittance (Ψ)
Fixed	0.0255 W/(m ² ·K)
Mullion	0.0256 W/(m ² ·K)
Sash	0.0251 W/(m ² ·K)
	n/a W/(m ² ·K)

4.3 Centre pane U-value of glazing calculated in accordance with BS EN 673

Glazing Unit	Centre Pane U-value (U_g)
Planilux 90% Argon Planitherm Total + Super Spacer	1.221 W/(m ² ·K)

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4.4 The thermal performance of the window (Uw) in accordance to BFRC guidelines and regulations:

HL Plastics Sculptured suite' Frame Profile	Window U-value
Planilux 90% Argon Planitherm Total + Super Spacer	1.35 W/(m ² ·K)

4.5 The effective L50 in accordance to BFRC guidelines and regulations:

HL Plastics Sculptured suite' Frame Profile	Effective L ₅₀
Air permeability @ 50 Pa	0.00 W/(m ² ·K)

4.6 Total solar energy transmittance (g) in accordance with EN 410

HL Plastics Sculptured suite' Frame Profile	g _{window}
Planilux 90% Argon Planitherm Total + Super Spacer	0.44

5 BFRC Rating

5.1 HL Plastics Sculptured suite window system

HL Plastics Sculptured suite' Frame Profile	Rating
Planilux 90% Argon Planitherm Total + Super Spacer	3.71 (Rating Scale A)

6 Authorisation

Signature:



Name:

Andy Gibson

Title:

Liniar Technical Draughtsperson

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7 Technical Specification

Profiles	Ref. No.	Material	Size
Outer Frame	LSW011	PVC-U	57 x 70mm
Transom / Mullion	LSW022	PVC-U	67 x 70mm
Casement Vent	LSW031	PVC-U	75 x 70mm
Glazing Bead	LSW041	PVC-U	25.5 x 17mm

Reinforcements	Ref. No.	Material	Size
Outer Frame	n/a	n/a	n/a
Mullion	LSR021	Steel	36 x 11.6mm
Casement Vent	n/a	n/a	n/a

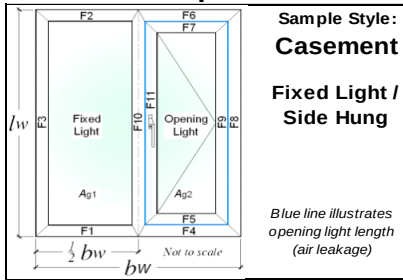
Weather Seals	Ref. No.	Material	Continuous or Jointed corners
Glazing Bead	n/a	PVC-P, Co-Extruded	Jointed
Glazing Rebate	n/a	PVC-P, Co-Extruded	Continuous
Casement Perimeter Seal	n/a	PVC-P, Co-Extruded	Continuous
Frame Rebate	n/a	PVC-P, Co-Extruded	Continuous

Glazing Component	Specification
Overall sealed unit: 1. Thickness (mm)	(4/20/4mm Double Glazing) 28.0
Outer Pane: 1. Thickness (mm) 2. Manufacturer 3. Description	4.0 Saint-Gobain Glass Planilux
Inner Pane(s): 1. Thickness (mm) 2. Manufacturer 3. Description	4.0 Saint-Gobain Glass Planitherm Total +
Spacer Bar: 1. Manufacturer 2. Description	Edgetech I.G. Super Spacer
Cavity: 1. Distance (mm) 2. Gas (%)	20.0 90% Argon
Edge seal: 1. Manufacturer 2. Description	(Spacer / Sealant Sightline 10mm) n/a Butyl, Hot Melt

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8 BFRC Spreadsheet



Report Number: **SIM00315 A** Issue No.21: 04/03/2009
 Report Date: **10 August 2011**
 Project Details: **Sculp, Planilux, Argon, Planitherm Total +, Super Spacer, Hot Melt**

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/(m²·K)
g-value - 2DP	g 0.71

Thermal transmittance of window from hot box test	
$U_w - 2DP$	W/(m²·K)

Frame dimensions:	(b)	Without gasket (mm)	Gasket protrusion (mm)	With gasket (mm)	
All frame values to nearest 0.5mm, gaskets to 1DP	F1 fixed sill	57	0.0	57	Total
	F2 fixed head	57	0.0	57	
	F3 fixed jamb	57	0.0	57	
F4 + F5 sash sill	F4 fixed sash sill	57	n/a	57	104
	F5 moving sash sill	47	0.0	47	
F6 + F7 sash head	F6 fixed sash head	57	n/a	57	104
	F7 moving sash head	47	0.0	47	
F8 + F9 sash jamb	F8 fixed sash jamb	57	n/a	57	104
	F9 moving sash jamb	47	0.0	47	
F10 + F11 mullion	F10 fixed mullion	67	0.0	67	114
	F11 moving mullion	47	0.0	47	
Total gasket area		0		m²	

Window Dimensions:			Area	
Section	Length (m)	Width (m)	No gasket (m²)	With gasket (m²)
Fixed Light	13660	0.5245	0.7165	0.7165
Opening light	12720	0.4305	0.5476	0.5476
Total glazing, A_g			12641	12641
Frame	(m)	(m)	(m²)	(m²)
F1	0.6150	0.0570	0.0325	0.0325
F2	0.6150	0.0570	0.0325	0.0325
F3	14800	0.0570	0.0811	0.0811
F4	0.6150	0.0570	0.0325	0.0325
F5	0.5245	0.0470	0.0224	0.0224
F6	0.6150	0.0570	0.0325	0.0325
F7	0.5245	0.0470	0.0224	0.0224
F8	14800	0.0570	0.0811	0.0811
F9	13660	0.0470	0.0620	0.0620
F10	14800	0.0670	0.0953	0.0953
F11	13660	0.0470	0.0620	0.0620
Total Frame			0.5563	0.5563
Total Window, A_w			18204	18204
Percentage fixed light glass area			39.36%	39.36%
Percentage opening light glass area			30.08%	30.08%
Percentage glass area (total)			69.44%	69.44%

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:		All L values to 4DP - All b values to ODP			
	$L_{f, 2D}$	$W/(m \cdot K)$	b_g (mm)	$L_{w, 2D}$	$W/(m \cdot K)$
F1 fixed sill		0.2637	190		0.3253
F2 fixed head		0.2637	190		0.3253
F3 fixed jamb		0.2637	190		0.3253
F4 + F5 sash sill		0.3321	190		0.3933
F6 + F7 sash head		0.3321	190		0.3933
F8 + F9 sash jamb		0.3321	190		0.3933
F10 + F11 mullion		0.5591	380		0.6826

Frame:	b_f (no gaskets)	U_f	Frame areas (no gaskets)	Heat flow	ψ	l_g	Heat flow
Section	(m)	(W/(m²·K))	(m²)	(W/K)	(W/(m·K))	(m)	(W/K)
F1 fixed sill	0.0570	1.1899	0.0325	0.0386	0.0255	0.5245	0.034
F2 fixed head	0.0570	1.1899	0.0325	0.0386	0.0255	0.5245	0.034
F3 fixed jamb	0.0570	1.1899	0.0811	0.0965	0.0255	13660	0.0348
F4 + F5 sash sill	0.1040	1.3098	0.0549	0.0719	0.0251	0.4305	0.0308
F6 + F7 sash head	0.1040	1.3098	0.0549	0.0719	0.0251	0.4305	0.0308
F8 + F9 sash jamb	0.1040	1.3098	0.1431	0.1874	0.0251	12720	0.0319
F10 + F11 mullion	0.1140	1.4680	0.1573	0.2310	0.0513	13190	0.0676
Totals			0.5563	0.7361		Total	0.1827

Solar Factor, g-value:	F_w 0.9
	g_w 0.44

U_{window}	U_w 1.35 W/(m²·K)
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Air Leakage loss:			
Air leakage at 50 Pa per hour & per unit length of opening light (BS 6375-1) - 2DP			
Opening light length	3.7810 m	Total air leakage	0.000 m³/h
L_{50}	0.00 m³/(m²·h)	Heat loss = 0.0165 L_{50}	0.00 W/(m²·K)

Other parameters needed for calculation, taken from simulations:			
Panel thickness, $d_p = d_g$	0.028 m	λ_p 0.035 W/(m·K)	R_{se} 0.04 m²·K/W
		R_p 0.8000 m²·K/W	R_{tot} 0.9700 m²·K/W
			U_p 10309 W/(m²·K)

BFRC Rating kWh/(m²·yr)	Label index	EWER Rating Scale	Window Rating
≥ 0	4	A	A
-10 to <0		B	
-20 to <-10		C	
-30 to <-20		D	
-50 to <-30		E	
-70 to <-50		F	
<-70		G	

BFRC Rating =	
218.6g window - 68.5 x (U_{window} + Effective L_{50}) =	3.71
Climate zone is:	
UK	
Thermal transmittance, $W/(m²·K)$	U_{window} 1.4
Solar factor	g_{window} 0.44
Window air leakage heat loss, $W/(m²·K)$	L_{factor} 0.00



Simulator Name: **Andy Gibson** BFRC Certified Simulator **018**

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9 BS EN 673 Spreadsheet

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

Number of spaces	Help		
1			
Spaces		1	
Glazing orientation			
Vertical			
Resistivity panes	1	m·K/W	
Outside			
Emissivities			
Calculate			
		Gas	
		Argon	
Thickness (mm)	4.0	20	4.0
Normal emissivity	0.89	0.05	
$\sum d_j \cdot \epsilon_j =$	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	W/(mK)	
1	1.221	0.64228	0.0311	15
2	1.221	0.64228	0.0311	15

10 Thermal Conductivity Values Used

Material	Conductivity (W/(m·K))	Reference / Source
PVC-U	0.17	Annex A, BS EN ISO 10077-2
Steel	50.00	Annex A, BS EN ISO 10077-2
PVC-P	0.14	Annex A, BS EN ISO 10077-2
Soda lime Glass	1.00	Annex A, BS EN ISO 10077-2
Super Spacer Main Body	0.122	Manufacturer
Butyl, Hot Melt	0.24	Annex A, BS EN ISO 10077-2

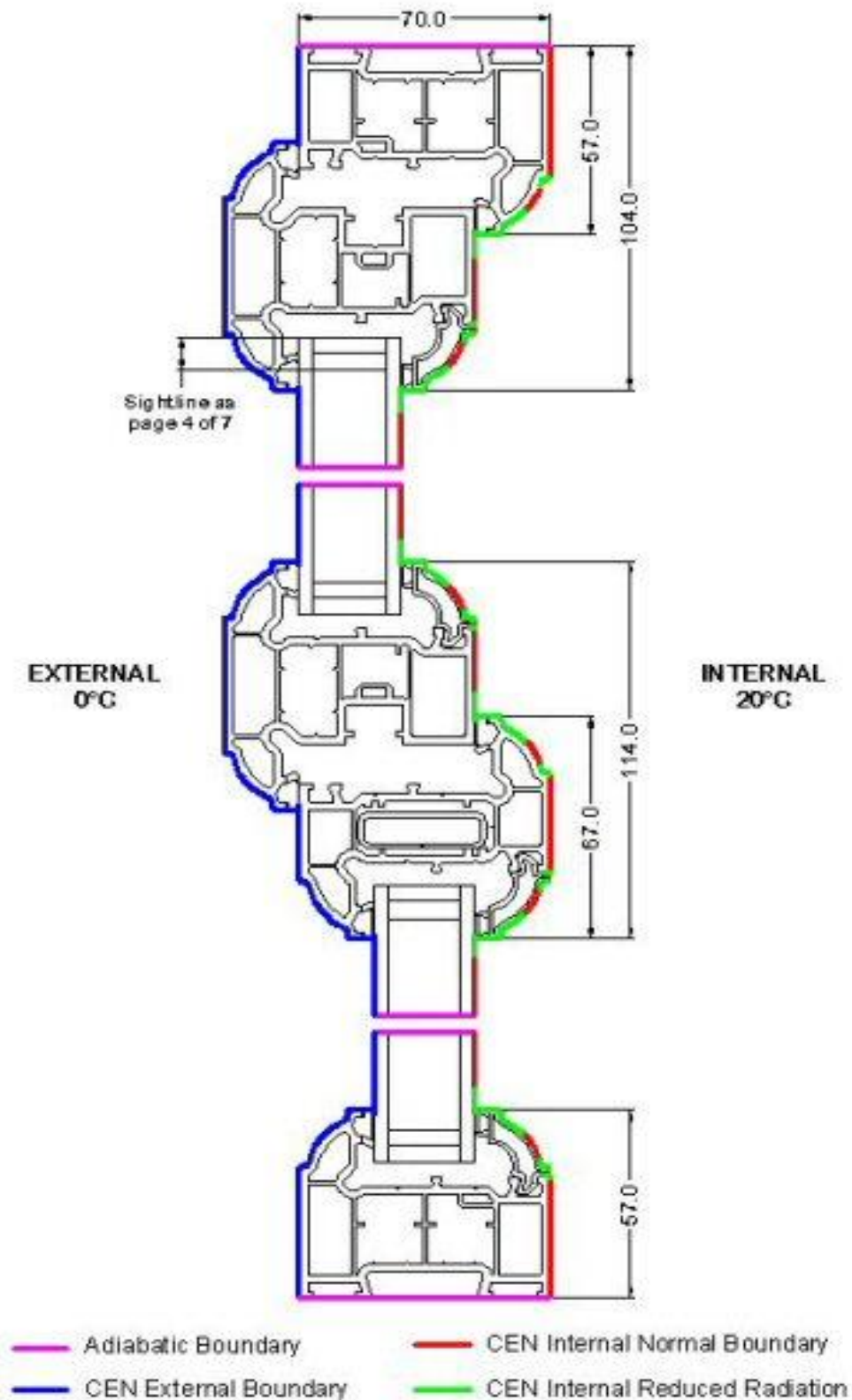
11 Additional Information

Air Leakage data is taken from BSi Test Report 261/7183666 (dated 02/04/2008)
 Solar gain value (g) taken from glass manufacturers EN410 calculator
 Temperature difference of 20 deg.C

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12 Profile Drawing (Not to Scale)



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