

Report in Accordance with BFRC Guidelines and Regulations

Product description: “Renaissance Vertical Sliding System” window”

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Client:	Quickslide Ltd 15 Heaton Estate, Bradford Road, Baliff Bridge Brighouse, West Yorkshire HD6 4BW
Project:	“Renaissance Vertical Sliding System”
Project reference:	CU10084-17
Prepared By:	Richard Bate Test Engineer
Issue date:	17 th August 2010

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Approved Simulator 001

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1 Introduction

The U-value calculations of the Slide renaissance vertical sliding system window detailed below were commissioned by Don Warren of Quickslide 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 10077-2:2003.

3 Analysis Method

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

4 Summary of Results

A summary of results are detailed in the following sections. The details supplied for the analysis as well as all information required to verify the analysis can be found in the attached CD.

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

Renaissance Vertical Sliding Frame Profile	Frame Thermal Transmittance (U_f)
Head	1.4 W/(m ² ·K)
Jamb Top	1.5 W/(m ² ·K)
Meeting Stiles	2.0 W/(m ² ·K)
Jamb Bottom	1.5 W/(m ² ·K)
Cill Bottom Rail	1.5 W/(m ² ·K)

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

Renaissance Vertical Sliding Frame Profile	Linear Thermal Transmittance (ψ)
Head	0.030 W/(m·K)
Jamb Top	0.030 W/(m·K)
Meeting Stiles	0.063 W/(m·K)
Jamb Bottom	0.030 W/(m·K)
Cill Bottom Rail	0.030 W/(m·K)

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

Glazing Unit	Centre Pane U-value (U_g)
4-16-4 Low-E 0.05 uncorrected emissivity (Planitherm Total +), 90% Argon filled, 10% Air filled. Low Iron (Diamant) glazing unit with Superspacer with butyl secondary seal.	1.2 W/(m ² ·K)

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

Renaissance Vertical Sliding Frame Profile	Window U-Value
PVCu frame system with steel reinforcement to BFRC requirements with 4-16-4 Low-E 0.05 uncorrected emissivity (Planitherm Total +), 90% Argon filled, 10% Air filled. Low Iron (Diamant) glazing unit with Superspacer with butyl secondary seal.	1.42W/(m ² ·K)

4.5 The Effective L₅₀ in accordance with BFRC guidelines and regulations:

Renaissance Vertical Sliding Frame Profile	Effective L ₅₀
Air permeability at 50 pa	0.02 W/(m ² ·K)

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

Renaissance Vertical Sliding Frame Profile	g _{window}
PVCu frame system with steel reinforcement to BFRC requirements with 4-16-4 Low-E 0.05 uncorrected emissivity (Planitherm Total +), 90% Argon filled, 10% Air filled. Low Iron (Diamant) glazing unit with Superspacer with butyl secondary seal.	0.45


5.0 BFRC Rating

5.1 Renaissance Vertical Sliding window system

Renaissance Vertical Sliding Frame Profile	Rating
PVCu frame system with steel reinforcement to BFRC requirements with 4-16-4 Low-E 0.05 uncorrected emissivity (Planitherm Total +), 90% Argon filled, 10% Air filled. Low Iron (Diamant) glazing unit with Superspacer with butyl secondary seal.	0 (Rating Scale A)

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6.0 Authorisation

	Prepared by:
Signature:	
Name:	Richard Bate
Title:	Technical Director

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Technical Specification

Profiles	Ref. No.	Material Type/Manufacturer's Name & Density (Timber only)	Dimensions (Height & Width)
Outer Frame	VR 01	PVCu / Synseal	135mm x 70mm
Upper Sash	VR 02	PVCu / Synseal	53.5mm x 48mm
Lower Sash	VR 03	PVCu / Synseal	53.5mm x 60mm
Glazing Bead	VR 23	PVCu / Synseal	155mm x 60mm
Joint Type	VR 06 VR 07	PVCu / Synseal	

Reinforcements	Ref. No.	Material Type/ Manufacturer's Name	Dimensions (Height & Width)
Outer Frame (verticals)	N/A	N/A	N/A
Outer Frame (horizontal)	1004	NW Metals	34mm x 12mm
Lower sash	1226	NW Metals	19.50mm x 17mm
Upper sash	1213	NW Metals	25mm x 7.50mm

Weather Seals	Ref. No.	Material Type/ Manufacturer's Name	Continuous or Joined @ Corners
Glazing Bead	VR06 VR07	Co Ex	Glazing Bead
Glazing Rebate		Co Ex	
Casement Perimeter Seal	PB-69-800-CF	Wool Pile / Schlegel	Glazing Rebate
Frame Rebate	PB-69-800-CF	Wool Pile / Schlegel	Casement Perimeter Seal
Extra Cill seal	B201	TPE/Central extrusions ltd	Frame Rebate
			Extra Cill seal

Clip-in profiles	Ref. No.	Material Type/ Manufacturer's Name	Dimensions (Height & Width)	Clip-in profiles
Sash meeting edges	VR 08	Interlock / Synseal	53mm x 3mm	Sash meeting edges
Upper Sash	VR 08	Interlock / Synseal	53mm x 3mm	Upper Sash

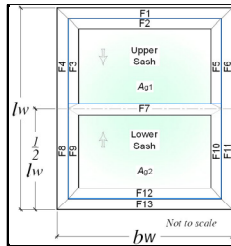
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Glazing Component	Specification
Overall sealed unit: 1. Thickness (mm)	1. 24mm
Outer pane 1. Thickness (mm) 2. Manufacturer 3. Description	1. 4mm 2. Saint Gobain 3. Diamant
Inner pane: 1. Thickness 2. Manufacturer 3. Description	1. 4mm 2. Saint Gobain 3. Planitherm Total+
Spacer bar: 1. Manufacturer 2. Description	1. Edgetech 2. Superspacer
Cavity 1. Distance (mm) 2. Gas %	1. 16 mm 2. Argon 90% Air 10%
Edge seal 1. Manufacturer 2. Description	1. N/A 2. 5mm Butyl on back of spacer Secondary seal.

Additional Notes
<p>Reinforcement is present in all profiles apart from the outer frame cill (VR23) and the vertical jamb outerframes.</p> <p>UKAS air leakage data was taken from report ref W10234, issue 16th August 2010 (average data at 50Pa pressure = 0.30)</p> <p>Solar heat gain figures are calculated from g-values supplied by the product manufacturer from EN 410 calculations for the glass units used in this simulation. The value used is 0.74</p>

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BFRC Spreadsheet



Sample Style:
Vertical Sliding Sash

Blue line illustrates opening light length (air leakage)

Report Number: **U10084-17** Report Issue No.11 (03/03/09)
 Report Date: **17th August 2010**
 Project Details: **Quickslide vertical sash window - 4-16-4 Total+, Dimant, Superspacer, Argon fill**

Input Values:
 Yellow input, green intermediary, blue finals X' DP is no. of decimal place 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**

Upper Panel Glazing dim's and properties:

Thickness of pane 1	4	mm
Pane 1/2 distance	16	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	1.197 W/(m ² ·K)
g-value - 2DP	g_{\pm}	0.74

Thermal transmittance of window from hot box test
 U_{w-2DP} W/(m²·K)

Section	Window Dimensions:		Area	
	Length (m)	Width (m)	No gasket (m ²)	With gasket (m ²)
Upper glazing	0.6040	1.0210	0.6167	0.6167
Lower glazing	0.6075	1.0210	0.6203	0.6203
Total of glazing			1.2369	1.2369
Frame				
F1	1.2300	0.0540	0.0635	0.0635
F2	1.1220	0.0505	0.0541	0.0541
F3	0.6860	0.0505	0.0326	0.0326
F4	0.7400	0.0540	0.0385	0.0385
F5	0.6860	0.0505	0.0326	0.0326
F6	0.7400	0.0540	0.0385	0.0385
F7	1.1220	0.0630	0.0679	0.0679
F8	0.7400	0.0420	0.0298	0.0298
F9	0.6800	0.0625	0.0402	0.0402
F10	0.6800	0.0625	0.0402	0.0402
F11	0.7400	0.0420	0.0298	0.0298
F12	1.1460	0.0410	0.0444	0.0444
F13	1.2300	0.0600	0.0713	0.0713
Total Frame			0.5835	0.5835
Total Window, A_w			1.8204	1.8204
Percentage upper glass area			33.88%	33.88%
Percentage lower glass area			34.07%	34.07%
Percentage glass area (total)			67.95%	67.95%

Solar Factor, g-value:
 F_w 0.9
 g_w 0.45

U_{window} U_w 1.42 W/(m²·K)

Other parameters needed for calculation, taken from simulations:
 Upper glazing: Panel thickness, $d_p = d_g = 0.024$ m
 $\lambda_p = 0.035$ W/(m·K) $R_{se} = 0.04$ m²·K/W $R_{so} = 0.13$ m²·K/W
 $R_p = 0.6857$ m²·K/W $R_{tot} = 0.8557$ m²·K/W $U_p = 1.1686$ W/(m²·K)

Frame dimensions:	(b _i) (mm)	Without gasket (mm)	Gasket protrusion (mm)	With gasket (mm)	Total
All frame values to nearest 0.5mm, gaskets to 1DP					
F1 fixed top rail	54	n/a	54	54	104.5
F2 moving top rail	50.5	0.0	50.5	50.5	104.5
F3 top (LH) jamb (moving sash)	50.5	0.0	50.5	50.5	104.5
F4 top (LH) jamb (fixed frame)	54	n/a	54	54	104.5
F5 top (RH) jamb (moving sash)	50.5	0.0	50.5	50.5	104.5
F6 top (RH) jamb (fixed frame)	54	n/a	54	54	104.5
F7 mid rail	63	0.0	63	63	63
	(upper gasket)	0.0	0.0	0.0	0.0
	(lower gasket)	0.0	0.0	0.0	0.0
F8 bottom (LH) jamb (fixed frame)	42	n/a	42	42	104.5
F9 bottom (LH) jamb (moving sash)	62.5	0.0	62.5	62.5	104.5
F10 bottom (RH) jamb (moving sash)	62.5	0.0	62.5	62.5	104.5
F11 bottom (RH) jamb (fixed frame)	42	n/a	42	42	104.5
F12 bottom moving rail	41	0.0	41	41	101
F13 bottom fixed rail	60	n/a	60	60	101
Total gasket area				0	m ²

Where a U_f value from hot box testing is available, no L_f or L_{ψ} values need to be entered

Frame conductance:	All L values to 4DP . All b values to ODP			
	$W/(m^2 \cdot K)$	b_g (mm)	$W/(m^2 \cdot K)$	b_g (mm)
F1+F2 top rail	0.3721	190	0.4075	190
F3+F4 top (LH) jamb	0.3788	190	0.4144	190
F5+F6 top (RH) jamb	0.3788	190	0.4144	190
F7 mid rail	0.5699	380	0.6439	380
F8+F9 bottom (LH) jamb	0.3778	190	0.4136	190
F10+F11 bottom (RH) jamb	0.3778	190	0.4136	190
F12+F13 bottom rail	0.3699	190	0.4054	190

Frame:	b_f (no gaskets)	U_f	Frame areas (no gaskets)	Heat flow	ψ	l_g	Heat flow
Section	(m)	(W/(m ² ·K))	(m ²)	(W/K)	(W/(m ² ·K))	(m)	(W/K)
F1+F2 top rail	0.1045	1.4360	0.1176	0.1689	0.0300	1.0210	0.0306
F3+F4 top left jamb	0.1045	1.5001	0.0711	0.1066	0.0302	0.6040	0.0182
F5+F6 top right jamb	0.1045	1.5001	0.0711	0.1066	0.0302	0.6040	0.0182
F7 mid rail	0.0630	1.9972	0.0679	0.1356	0.0632	1.0210	0.0645
F8+F9 btm left jamb	0.1045	1.4906	0.0701	0.1044	0.0304	0.6075	0.0185
F10+F11 btm right jamb	0.1045	1.4906	0.0701	0.1044	0.0304	0.6075	0.0185
F12+F13 bottom rail	0.1010	1.4640	0.1157	0.1694	0.0301	1.0210	0.0307
Totals			0.5835	0.8959			0.1994

Air Leakage loss:
 Air leakage at 50 Pa per hour & per unit length of opening light (BS 6375-1) - **2DP** 0.30 m³/(m·h)
 Opening light length 6.1220 m Total air leakage 1.837 m³/h
 L_{50} 1.01 m³/(m²·h) Heat loss = 0.0165 L_{50} 0.02 W/(m²·K)

BFRC Rating kWh/(m ² ·yr)	Label index	EWER Rating Scale	Window Rating
≥ 0	0	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) =	-0.27
Climate zone is:		UK
Thermal transmittance, W/(m ² ·K)	U _{window}	1.4
Solar factor	g _{window}	0.45
Window air leakage heat loss, W/(m ² ·K)	L _{factor}	0.02



Simulator Name: **Richard Bate** Simulator **001**

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BS EN 673 Spreadsheet

Version 8 February 2010. Calculations according to BS EN 673:1998 (A1)

Number of spaces		1	
Spaces 1			
Glazing orientation	Vertical		
Resistivity panes	1	m·K/W	
Outside		P a n e 1	P a n e 2
		90%	
		Gas	
		Argon	
Thickness (mm)	4.0	16	4.0
Normal emissivity		0.89	0.05
$\sum d_j r_j =$	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	W/(mK)	
1	1.197	0.65864	0.0243	15
2	1.197	0.65864	0.0243	15

Thermal Conductance Values Used

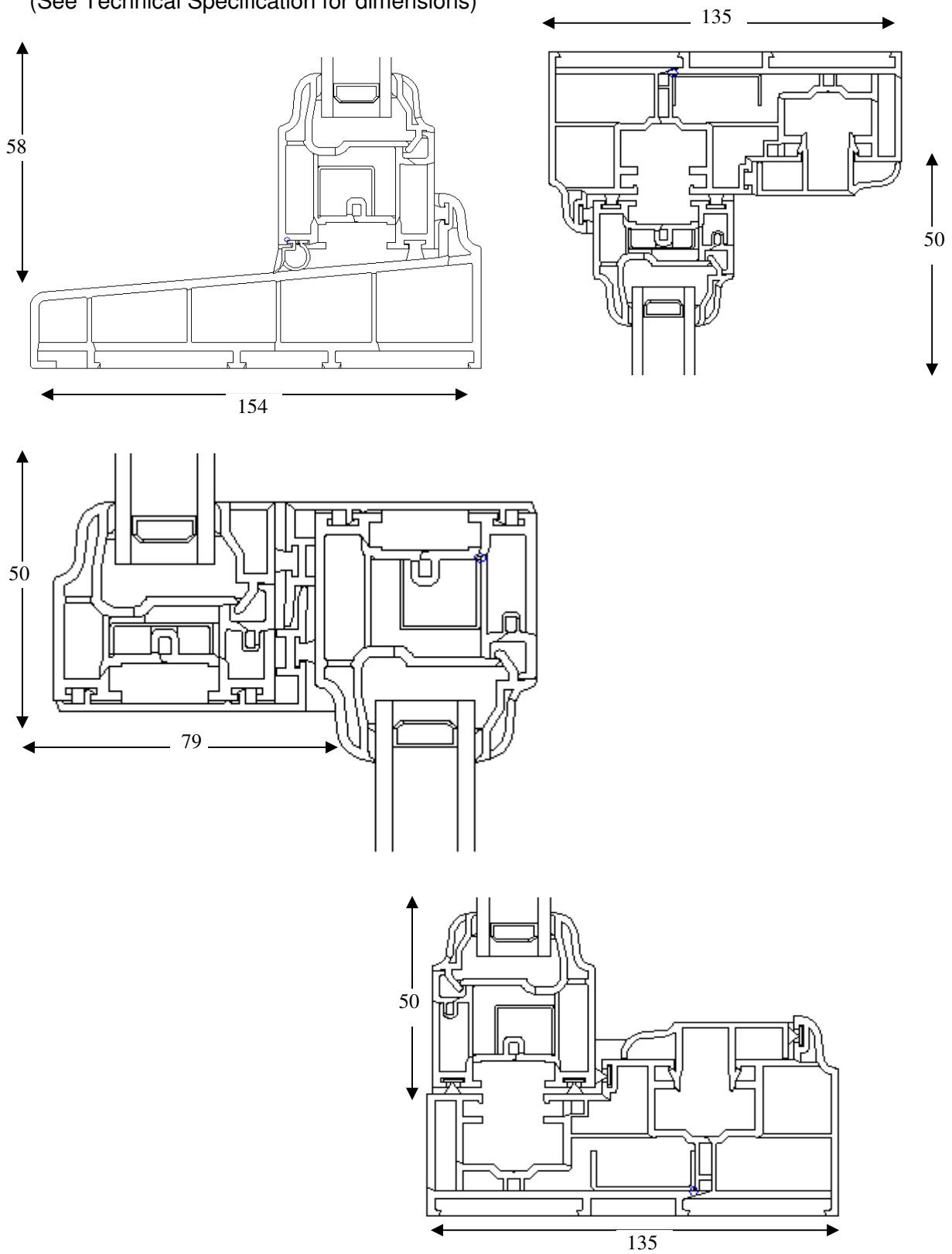
Material/ Thermal conductivity values W/(m.K)	Reference
PVCu / 0.17	(Annex A BS EN ISO 10077-2)
Steel / 50	(Annex A BS EN ISO 10077-2)
Butyl / 0.24	(Annex A BS EN ISO 10077-2)
Molecular Sieve / 0.10	(Annex A BS EN ISO 10077-2)
Soda Lime Glass / 1.0	(Annex A BS EN ISO 10077-2)
Aluminium SI / 160	(Annex A BS EN ISO 10077-2)
PVC Flexible / 0.14	(Annex A BS EN ISO 10077-2)
Polypropylene / 0.22	(BS EN 12524 Table 1)
Superspacer / 0.122	Manufacturers data

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Appendix

Profile Drawings

(See Technical Specification for dimensions)



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