

Report in Accordance with BFRC Guidelines and Regulations

Product description: Munster Joinery PVC Casement window

CONFIDENTIAL

Client:	Marlene O'Mahony, Munster Joinery, Ballydesmond, County Cork, Ireland.
Project:	"Triple glazed PVC Casements"
Project reference:	CU09087-2
Prepared By:	Clive Cox Test Engineer
Issue date:	16 th March 2009

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1 Introduction

The U-value calculations of the Munster Joinery PVC Casement window detailed below were commissioned by Marlene O'Mahony of Munster Joinery.

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 BFRC 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)

'Munster Joinery PVC Casement' Frame Profile	Frame Thermal Transmittance (U_f)
Fixed	1.5 W/(m ² .K)
Sash Rein	1.8 W/(m ² .K)
Mullion	1.8 W/(m ² .K)

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

'Munster Joinery PVC Casement' Frame Profile	Linear Thermal Transmittance (ψ)
Fixed	0.028 W/(m.K)
Sash Rein	0.030 W/(m.K)
Mullion	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)
4-12-4-12-4 Low-E 0.04 uncorrected emissivity (Saint Gobain Planitherm Total) inner and central panes, 90% Argon 10% Air filled, Low iron outer pane (Saint Gobain Diamante) glazing unit with Edgetech Superspacer spacer bar with 5mm Butyl secondary seal.	0.7 W/(m ² .K)

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

'Munster Joinery PVC Casement' Frame Profile	Window U-Value
PVC-U frame system with partial Steel reinforcement with 4-12-4-12-4 Low-E 0.04 uncorrected emissivity (Saint Gobain Planitherm Total) inner and central panes, 90% Argon 10% Air filled, Low iron outer pane (Saint Gobain Diamante) glazing unit with Edgetech Superspacer spacer bar with 5mm Butyl secondary seal.	1.14 W/(m ² .K)

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

'Munster Joinery PVC Casement' Frame Profile	Effective L ₅₀
Air permeability at 50 pa	0.00 W/(m ² .K)

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

'Munster Joinery PVC Casement' Frame Profile	g _{window}
PVC-U frame system with partial Steel reinforcement with 4-12-4-12-4 Low-E 0.04 uncorrected emissivity (Saint Gobain Planitherm Total) inner and central panes, 90% Argon 10% Air filled, Low iron outer pane (Saint Gobain Diamante) glazing unit with Edgetech Superspacer spacer bar with 5mm Butyl secondary seal.	0.38

5.0 BFRC Rating

5.1 'Munster Joinery PVC Casement' window system

'Munster Joinery PVC Casement' Frame Profile	Rating
PVC-U frame system with partial Steel reinforcement with 4-12-4-12-4 Low-E 0.04 uncorrected emissivity (Saint Gobain Planitherm Total) inner and central panes, 90% Argon 10% Air filled, Low iron outer pane (Saint Gobain Diamante) glazing unit with Edgetech Superspacer spacer bar with 5mm Butyl secondary seal.	5 (Rating Scale A)

6.0 Authorisation

	Prepared by:
Signature:	
Name:	Clive Cox
Title:	Test Engineer

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Technical Specification

Profiles	Ref. No.	Material Type/Manufacturer's Name & Density (Timber only)	Dimensions (Height & Width)
Outer Frame	CWF041	PVC-U – Munster Joinery	56 mm x 58 mm
Transom/ Mullion	CWM042	PVC-U – Munster Joinery	69.6 mm x 58 mm
Casement Vent	CWS048	PVC-U – Munster Joinery	71 mm x 58 mm
Glazing Bead	CWB057T	PVC-U – Munster Joinery	21.6 mm x 22.5 mm
Joint Type	N/A	N/A	
Joint Adhesives	N/A	N/A	

Reinforce-ments	Ref. No.	Material Type/ Manufacturer's Name	Dimensions (Height & Width)
Outer Frame	n/a	n/a	n/a
Transom/ Mullion	SKY149	Steel – Munster Joinery	18 mm x 34 mm
Casement Vent	SKY149	Steel – Munster Joinery	18 mm x 34 mm

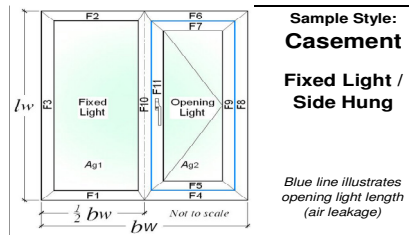
Weather Seals	Ref. No.	Material Type/ Manufacturer's Name	Continuous or Joined @ Corners
Glazing Bead	n/a	Flexible PVC - Co-extruded to beading	
Glazing Rebate	ALFAS	Foam glazing tape	
Casement Perimeter Seal	3821	EPDM	
Frame Rebate	4500	EPDM	

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Glazing Component	Specification
Overall sealed unit: 1. Thickness (mm)	1. 36mm
Outer pane 1. Thickness (mm) 2. Manufacturer 3. Description	1. 4mm 2. Saint Gobain 3. Diamante
Centre pane 1. Thickness (mm) 2. Manufacturer 3. Description	1. 4mm 2. Saint Gobain 3. Planitherm Total
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 % 3. Duality	1. 12mm 2. Argon 90% Air 10% 3. Each cavity identical
Edge seal 1. Manufacturer 2. Description	1. N/A 2. 5mm Butyl

Additional Notes
Reinforcement is present only in mullion profile and all casement members. Air leakage data is taken from BBA Test report ref. 2863. Dated:15/01/2008 Air Leakage result at 50pa : 0.00m³/h/m 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.

BFRC Spreadsheet



Report Number: **U09087-2** Issue No.21: 04/03/2009
 Report Date: **13 March 2009**
 Project Details: **Triple Glazed PVC-u casement window, Argon, SS, Plani total, Diamante**

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	12 mm
Gas fill (1/2)	Argon 90%
Thickness of pane 2	4 mm
Complete next 3 cells for TG IGU	
Pane 2/3 distance	12 mm
Gas fill (2/3)	Argon 90%
Thickness of pane 3	4.0 mm
Glazing Trans. - 3DP	U_g 0.743 W/(m²·K)
g-value - 2DP	g_L 0.60

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

Frame dimensions:	(b _f)	Without gasket (mm)	Gasket protrusion (mm)	With gasket (mm)	
All frame values to nearest 0.5mm, gaskets to 1DP	F1 fixed sill	56	0.0	56	
	F2 fixed head	56	0.0	56	
	F3 fixed jamb	56	0.0	56	
F4 + F5 sash sill	F4 fixed sash sill	56	n/a	56	99
	F5 moving sash sill	43	0.0	43	
F6 + F7 sash head	F6 fixed sash head	43	n/a	43	99
	F7 moving sash head	56	0.0	56	
F8 + F9 sash jamb	F8 fixed sash jamb	43	n/a	43	99
	F9 moving sash jamb	56	0.0	56	
F10 + F11 mullion	F10 fixed mullion	69.5	0.0	69.5	112.5
	F11 moving mullion	43	0.0	43	
Total gasket area				0	m²

Window Dimensions:	Length	Width	Area	
	(m)	(m)	No gasket (m²)	With gasket (m²)
Fixed Light	1.3680	0.5243	0.7172	0.7172
Opening light	1.2820	0.4383	0.5618	0.5618
Total glazing, A _g			1.2790	1.2790
Frame	(m)	(m)	(m²)	(m²)
F1	0.6150	0.0560	0.0319	0.0319
F2	0.6150	0.0560	0.0319	0.0319
F3	1.4800	0.0560	0.0797	0.0797
F4	0.6150	0.0560	0.0248	0.0248
F5	0.5373	0.0430	0.0210	0.0210
F6	0.6150	0.0430	0.0323	0.0323
F7	0.5373	0.0560	0.0273	0.0273
F8	1.4800	0.0430	0.0615	0.0615
F9	1.3810	0.0560	0.0746	0.0746
F10	1.4800	0.0695	0.0992	0.0992
F11	1.3810	0.0430	0.0573	0.0573
Total Frame			0.5414	0.5414
Total Window, A _w			1.8204	1.8204
Percentage fixed light glass area			39.40%	39.40%
Percentage opening light glass area			30.86%	30.86%
Percentage glass area (total)			70.26%	70.26%

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				
	$W/(m²·K)$	b_g (mm)	$W/(m²·K)$	b_g (mm)	
F1 fixed sill	0.2412	190	0.2521	190	
F2 fixed head	0.2412	190	0.2521	190	
F3 fixed jamb	0.2412	190	0.2521	190	
F4 + F5 sash sill	0.3347	190	0.3479	190	
F6 + F7 sash head	0.3347	190	0.3479	190	
F8 + F9 sash jamb	0.3347	190	0.3479	190	
F10 + F11 mullion	0.5168	380	0.5415	380	

Frame:	b_f (no gaskets)	U_f	Frame areas (no gaskets)	Heat flow	ψ	l_g	Heat flow
	(m)	(W/(m²·K))	(m²)	(W/K)	(W/(m·K))	(m)	(W/K)
F1 fixed sill	0.0560	1.4764	0.0319	0.0471	0.0283	0.5243	0.0148
F2 fixed head	0.0560	1.4764	0.0319	0.0471	0.0283	0.5243	0.0148
F3 fixed jamb	0.0560	1.4764	0.0797	0.1177	0.0283	1.3680	0.0386
F4 + F5 sash sill	0.0990	1.7796	0.0457	0.0814	0.0306	0.4383	0.0134
F6 + F7 sash head	0.0990	1.7796	0.0596	0.1060	0.0306	0.4383	0.0134
F8 + F9 sash jamb	0.0990	1.7796	0.1361	0.2422	0.0306	1.2820	0.0392
F10 + F11 mullion	0.1125	1.7756	0.1564	0.2778	0.0594	1.3250	0.0787
Totals			0.5414	0.9193		Total	0.2129

Solar Factor, g-value:	F_w 0.9
	g_w 0.38
U_{window}	U_w 1.14 W/(m²·K)

Air Leakage loss:	
Air leakage at 50 Pa per hour & per unit length of opening light (BS 6375-1) - 2DP	0.00 m³/(m·h)
Opening light length 3.8365 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:
 $\lambda_p = 0.035$ W/(m·K) $R_{se} = 0.04$ m²·K/W $R_{so} = 0.13$ m²·K/W
 $R_p = 1.0286$ m²·K/W $R_{tot} = 1.1986$ m²·K/W $U_p = 0.8343$ W/(m²·K)

BFRC Rating kWh/(m²·yr)	Label index	EWER Rating Scale	Window Rating
≥ 0	5	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) =	4.98
Climate zone is:	UK
Thermal transmittance, W/(m²·K)	U _{window} 1.1
Solar factor	g _{window} 0.38
Window air leakage heat loss, W/(m²·K)	L _{factor} 0.00
Simulator Name:	Clive Cox



BS EN 673 Spreadsheet

Version 4 Feb 2009. Calculations according to BS EN 673:1998 (A1)

Number of spaces
2

		Spaces		1	2		
Glazing orientation				P a n e 1	90%	P a n e 2	
	Vertical						P a n e 3
Resistivity panes		1	m·K/W				
Outside							

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

Iteration number	U value W/(m ² ·K)	$\sum 1/h_s$ (m ² ·K)/W	λ_{eff} W/(mK)	ΔT	λ_{eff} W/(mK)	ΔT
1	0.743	1.16587	0.0206	7.5	0.0206	7.5
2	0.743	1.16587	0.0206	7.5	0.0206	7.5

Thermal Conductance Values Used

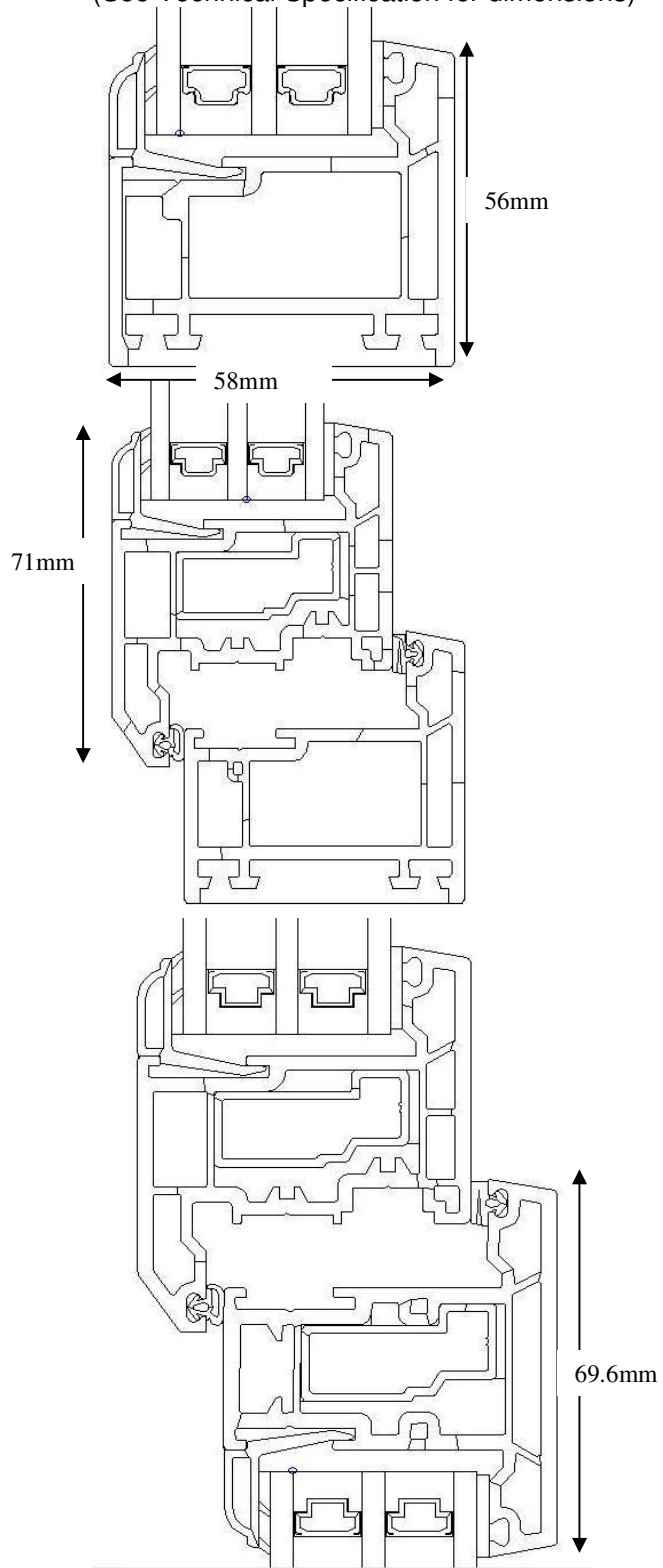
Material/Conductance W/(m.K)	Reference
PVCu / 0.17	(Annex A BS EN ISO 10077-2)
Aluminium / 160.0	(Annex A BS EN ISO 10077-2)
EPDM / 0.25	(Annex A BS EN ISO 10077-2)
Butyl/ 0.24	(Annex A BS EN ISO 10077-2)
Soda Lime Glass / 1.0	(Annex A BS EN ISO 10077-2)
Foam Glazing tape / 0.05	(Annex A BS EN ISO 10077-2)
Epdm Superspacer / 0.162	(Annex A BS EN ISO 10077-2)

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Appendix

Profile Drawings

(See Technical Specification for dimensions)



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