


## Report in Accordance with BFRC Guidelines and Regulations

### Product description: “Munster Joinery EcoClad+ window”

#### CONFIDENTIAL

Client:	Munster Joinery, Ballydesmond, County Cork Ireland
Project:	“EcoClad+ Window”
Project reference:	CU12117-5
Prepared By:	Clive Cox Test Engineer
Issue date:	16/7/2012

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## 1 Introduction

The U-value calculations of the Munster Joinery EcoClad+ window detailed below were commissioned by Marlene O Mahoney of Munster Joinery 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 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 EcoClad+ Frame Profile	Frame Thermal Transmittance ( $U_f$ )
Fixed	0.6 W/(m <sup>2</sup> ·K)
Sash Rein	0.8 W/(m <sup>2</sup> ·K)
Mullion	0.8 W/(m <sup>2</sup> ·K)

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

Munster EcoClad+ Frame Profile	Linear Thermal Transmittance ( $\psi$ )
Fixed	0.021 W/(m·K)
Sash Rein	0.021 W/(m·K)
Mullion	0.021 W/(m·K)

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

Glazing Unit	Centre Pane U-value ( $U_g$ )
4-20-4-20-4 Low-E 0.05 uncorrected emissivity (SGG Planitherm Total +) Internal and central panes, 90% Argon , 10% Air filled, Float Outerpane (SGG planilux) glazing unit with Edgetech Superspacer spacer bar with 5mm Butyl Secondary Seal	0.6 W/(m <sup>2</sup> ·K)

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

Munster EcoClad+ Frame Profile	Window U-Value
PVC-U ,Softwood & Aluminium frame system 4-20-4-20-4 Low-E 0.05 uncorrected emissivity (SGG Planitherm Total +) Internal and central panes, 90% Argon , 10% Air filled, Float Outerpane (SGG planilux) glazing unit with Edgetech Superspacer spacer bar with 5mm Butyl Secondary Seal	0.71 W/(m <sup>2</sup> ·K)

#### 4.5 The Effective L<sub>50</sub> in accordance with BFRC guidelines and regulations:

Munster EcoClad+ Frame Profile	Effective L <sub>50</sub>
Air permeability at 50 pa	0.00 W/(m <sup>2</sup> ·K)

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


Munster EcoClad+ Frame Profile	g <sub>window</sub>
PVC-U ,Softwood & Aluminium frame system 4-20-4-20-4 Low-E 0.05 uncorrected emissivity (SGG Planitherm Total +) Internal and central panes, 90% Argon , 10% Air filled, Float Outerpane (SGG planilux) glazing unit with Edgetech Superspacer spacer bar with 5mm Butyl Secondary Seal	0.38

### 5.0 BFRC Rating

#### 5.1 Munster EcoClad+ window system

Munster EcoClad+ Frame Profile	Rating
PVC-U ,Softwood & Aluminium frame system 4-20-4-20-4 Low-E 0.05 uncorrected emissivity (SGG Planitherm Total +) Internal and central panes, 90% Argon , 10% Air filled, Float Outerpane (SGG planilux) glazing unit with Edgetech Superspacer spacer bar with 5mm Butyl Secondary Seal	+34 (Rating Scale A)

## 6.0 Authorisation

	<b>Prepared by:</b>
<b>Signature:</b>	
<b>Name:</b>	Clive Cox
<b>Title:</b>	Test Engineer

## Technical Specification

Profiles	Ref. No.	Material Type/Manufacturer's Name & Density (Timber only)	Dimensions (Height & Width)
Outer Frame	EC9041	Munster Joinery – PVC-U	56mm x 120mm
Transom/ Mullion	EC9048	Munster Joinery – PVC-U	70mm x 120mm
Casement Vent	EC9047	Munster Joinery – PVC-U	75mm x 120mm
Glazing Bead	EC9053	Munster Joinery – PVC-U	17mm x 45mm
Glazing Strip	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	N/A	N/A	N/A
Casement Vent	N/A	N/A	N/A

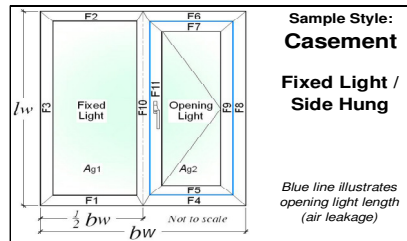
Weather Seals	Ref. No.	Material Type/ Manufacturer's Name	Continuous or Joined @ Corners
Glazing Bead	N/A	Epdm – Co-extruded to profile	
Glazing Rebate	N/A	Epdm – Co-extruded to profile	
Casement Perimeter Seal	N/A	Epdm – Co-extruded to profile	
Frame Rebate	N/A	Epdm – Co-extruded to profile	

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Glazing Component	Specification
<b>Overall sealed unit:</b> 1. Thickness (mm)	1. 52mm
<b>Outer pane</b> 1. Thickness (mm) 2. Manufacturer 3. Description	1. 4mm 2. Saint Gobain 3. Planilux
<b>Central pane</b> 1. Thickness (mm) 2. Manufacturer 3. Description	1. 4mm 2. Saint Gobain 3. Planitherm Total +
<b>Inner pane:</b> 1. Thickness 2. Manufacturer 3. Description	1. 3mm 2. Saint Gobain 3. Planitherm Total +
<b>Spacer bar (x2):</b> 1. Manufacturer 2. Description	1. Edgetech 2. Superspacer
<b>Cavity (x2)</b> 1. Distance (mm) 2. Gas %	1. 20mm 2. Argon 90% Air 10%

Additional Notes
<p>No Reinforcement is present in this simulation due to Munster Joinery reinforcement guidelines on this 1230mm x 1480mm window.</p> <p>Air leakage data is taken from Wintech Test report ref. 12294 dated 13/07/2012 (data at 50Pa pressure = 0.14).</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 0.71</p> <p>Envirofoam E11 used in all Profiles in central &amp; shoulder cavities.</p> <p>Glazing flipper and Cavity Flippers were used in this simulation</p>

# BFRC Spreadsheet



Sample Style:  
**Casement**

Fixed Light /  
Side Hung

Blue line illustrates  
opening light length  
(air leakage)

Report Number: **U12117-5**  
Report Date: **14 July 2012**  
Project Details: **EcoClad+ - 4-20-4-20-4 SS Argon 5%**

Issue No.21: 04/03/2009

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

Parameter	Symbol	Units
Total window height <b>ODP</b>	$l_w$	1480 mm
Total window width <b>ODP</b>	$b_w$	1230 mm

Nominal 4mm etc to <b>ODP</b> , others <b>1DP</b>	
<b>Glazing dimensions and properties:</b>	
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	20 mm
Gas fill (2/3)	Argon 90%
Thickness of pane 3	4.0 mm
Glazing Trans. - <b>3DP</b>	$U_g$ 0.567 W/(m²·K)
g-value - <b>2DP</b>	$g$ 0.61

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

Window Dimensions:		Area	
	Length	Width	No gasket
Section	(m)	(m)	(m²)
Fixed Light	1.3680	0.5240	0.7168
Opening light	1.2740	0.4300	0.5478
Total glazing, $A_g$		1.2647	1.2647
Frame	(m)	(m)	(m²)
F1	0.6150	0.0560	0.0319
F2	0.6150	0.0560	0.0319
F3	1.4800	0.0560	0.0797
F4	0.6150	0.0560	0.0319
F5	0.5240	0.0470	0.0224
F6	0.6150	0.0560	0.0319
F7	0.5240	0.0470	0.0224
F8	1.4800	0.0560	0.0797
F9	1.3680	0.0470	0.0621
F10	1.4800	0.0700	0.0997
F11	1.3680	0.0470	0.0621
Total Frame		0.5557	0.5557
Total Window, $A_w$		1.8204	1.8204
Percentage fixed light glass area		39.38%	39.38%
Percentage opening light glass area		30.09%	30.09%
Percentage glass area (total)		69.47%	69.47%

<b>Solar Factor, g-value:</b>		$F_w$ 0.9
		$g_w$ 0.38
$U_{window}$	$U_w$ 0.71	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	$R_{se} = 0.13$ m²·K/W
Panel thickness, $d_p = d_g = 0.052$ m		$R_p = 1.4857$ m²·K/W	$R_{tot} = 1.6557$ m²·K/W	$U_p = 0.6040$ W/(m²·K)

BFRC Rating	Label index	EWER Rating Scale	Window Rating
≥ 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	

Frame dimensions:		Without gasket	Gasket protrusion	With gasket	
	(b <sub>f</sub> )	(mm)	(mm)	(mm)	
All frame values to nearest 0.5mm, gaskets to <b>1DP</b>	F1 fixed sill	56	0.0	56	Total
	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	103
	F5 moving sash sill	47	0.0	47	
F6 + F7 sash head	F6 fixed sash head	56	n/a	56	103
	F7 moving sash head	47	0.0	47	
F8 + F9 sash jamb	F8 fixed sash jamb	56	n/a	56	103
	F9 moving sash jamb	47	0.0	47	
F10 + F11 mullion	F10 fixed mullion	70	0.0	70	117
	F11 moving mullion	47	0.0	47	
Total gasket area		0	0	0	m²

Where a $U_g$ value from hot box testing is available, no $L_{f,2D}$ or $L_{\psi,2D}$ values need to be entered					
All $L$ values to <b>4DP</b> . All $b$ values to <b>ODP</b>					
Frame conductance:		$L_{f,2D}$	$L_{\psi,2D}$	$b_g$ (mm)	$b_g$ (mm)
		W/(m²·K)	W/(m²·K)		
F1 fixed sill		0.1504	190	0.1642	190
F2 fixed head		0.1504	190	0.1642	190
F3 fixed jamb		0.1504	190	0.1642	190
F4 + F5 sash sill		0.1997	190	0.2132	190
F6 + F7 sash head		0.1997	190	0.2132	190
F8 + F9 sash jamb		0.1997	190	0.2132	190
F10 + F11 mullion		0.3252	380	0.3522	380

Frame:	$b_f$ (no gaskets)	$U_f$	Frame areas (no gaskets)	Heat flow	$\psi$	$l_g$	Heat flow
Section	(m)	W/(m²·K)	(m²)	(W/K)	(W/(m²·K))	(m)	(W/K)
F1 fixed sill	0.0560	0.6365	0.0319	0.0203	0.0208	0.5240	0.0109
F2 fixed head	0.0560	0.6365	0.0319	0.0203	0.0208	0.5240	0.0109
F3 fixed jamb	0.0560	0.6365	0.0797	0.0508	0.0208	1.3680	0.0285
F4 + F5 sash sill	0.1030	0.8247	0.0543	0.0448	0.0205	0.4300	0.0088
F6 + F7 sash head	0.1030	0.8247	0.0543	0.0448	0.0205	0.4300	0.0088
F8 + F9 sash jamb	0.1030	0.8247	0.1418	0.1170	0.0205	1.2740	0.0261
F10 + F11 mullion	0.1170	0.8179	0.1618	0.1323	0.0410	1.3210	0.0542
Totals		0.5557	0.4302			Total	0.1483

<b>Air Leakage loss:</b>		Air leakage at 50 Pa per hour & per unit length of opening light (BS 6375-1) - <b>2DP</b>	0.05	m³/(m·h)
Opening light length	3.7840 m	Total air leakage	0.189	m³/h
$L_{50}$ 0.10	m³/(m²·h)	Heat loss = 0.0165 $L_{50}$	0.00	W/(m²·K)

<b>BFRC Rating =</b>		<b>218.6g<sub>window</sub> - 68.5 x (U<sub>window</sub> + Effective L<sub>50</sub>) =</b>	<b>34.43</b>
<b>Climate zone is:</b>			<b>UK</b>
<b>Thermal transmittance, W/(m²·K)</b>		$U_{window}$	<b>0.7</b>
<b>Solar factor</b>		$g_{window}$	<b>0.38</b>
<b>Window air leakage heat loss, W/(m²·K)</b>		$L_{factor}$	<b>0.00</b>
<b>Simulator Name:</b>		<b>Clive Cox</b>	



## BS EN 673 Spreadsheet

Version 10 22/07/2011. Calculations according to BS EN 673:2011

Number of spaces	2	
Help		
Glazing orientation	Vertical	
Resistivity panes	1	m-K/W
Outside		
Emissivities		
Calculate		
Thickness (mm)	4.0	20
Normal emissivity	0.89	0.05
$\sum d_i r_i = 0.012$		
	Uncoated	Uncoated

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

Iteration number	U value W/(m <sup>2</sup> ·K)	$\sum 1/h_s$ (m <sup>2</sup> ·K)/W	$\lambda_{eff}$ W/(mK)	$\Delta T$
1	0.568	1.57997	0.0253	7.5
2	0.568	1.57997	0.0253	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)
Softwood / 0.13	(Annex A BS EN ISO 10077-2)
Soda Lime Glass / 1.0	(Annex A BS EN ISO 10077-2)
Butyl / 0.40	(Annex A BS EN ISO 10077-2)
Superspacer Epdm / 0.122	Edgetech Manufacturers data
Envirofoam E11 / 0.24	BFRC Approved Manufacturers data

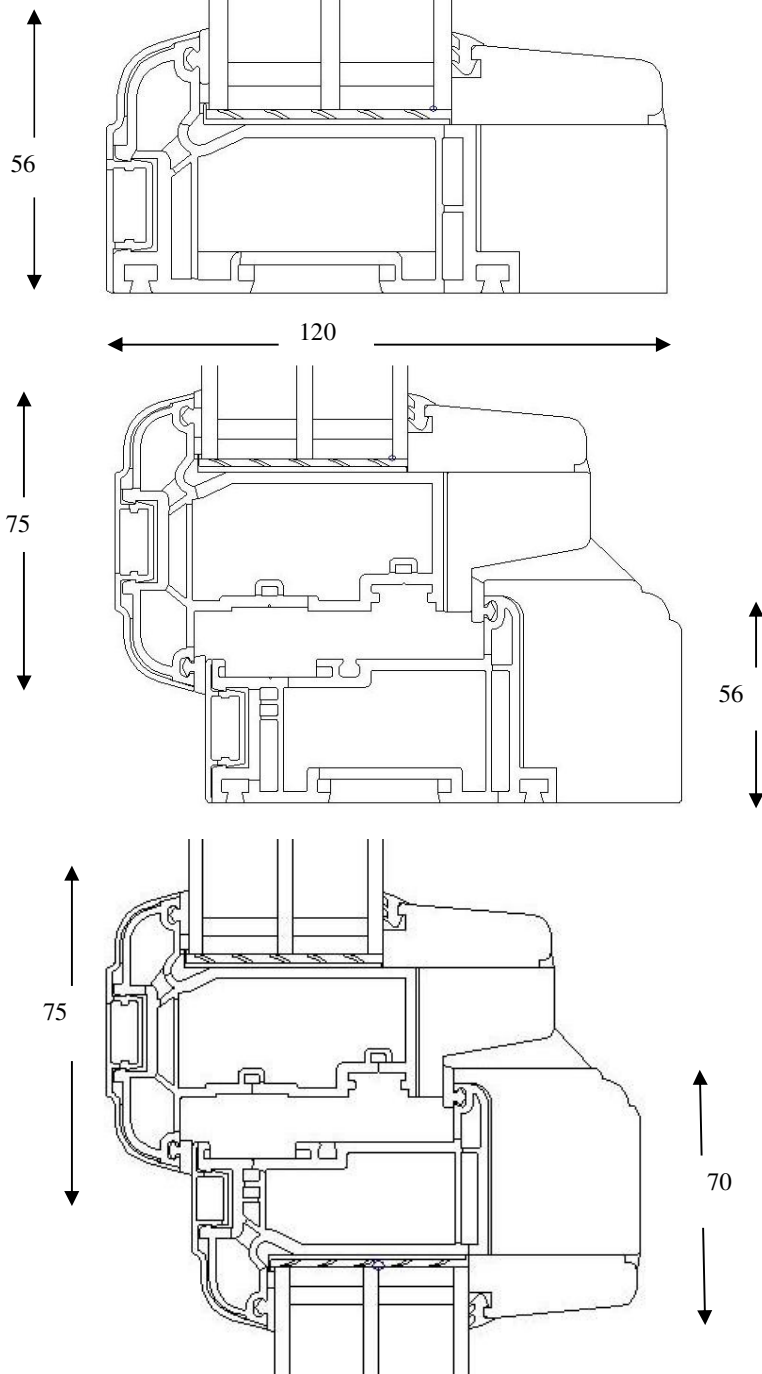
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## Appendix

### Profile Drawings

(See Technical Specification for dimensions)



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