THERMAL SIMULATION REPORT

Report Number:	**TCL2014-SWA-005**
Prepared For:	**Steel Window Association 42 Heath Street Tamworth Staffordshire B79 7HJ**
Window System Identifier:	**W40 PLUS**
Fixed Outer Frame Identifier:	**SW7**
Transom Frame Identifier:	**N/A**
Vent Frame Identifier:	**SWX7**
Glazing System:	**4mm Planitherm 4S (or One) 8mm 90% Krypton 4mm Float 8mm 90% Krypton 4mm Planitherm 4S (or One)**
Spacer Bar:	**Edgetech Super Spacer Standard**
Notes:	**As per drawing number SWA - W40 Plus - 011**

Results

Thermal Transmittance (U_{window})	**1.5**	*W/(m^2K)*

(Window Configuration as defined in BS EN 14351-1 Annex E)
(1230mm wide x 1480mm high – single pane vent)

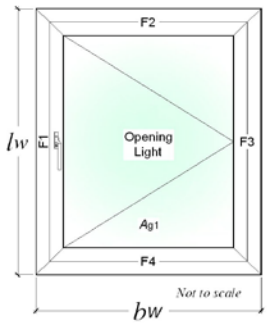
Report Prepared By *Dr Gary Morgan*
Therm Consulting

Signed: *G Morgan*

Date: *28th April 2014*

The simulations in this report were performed using Therm 5.2.14 according to EN ISO 10077 – 2:2012
The Therm outputs generated are included in this report.

British Fenestration Rating Council
BFRC Certified Simulator 016



Window Style:
L2
Side Hung Casement

Report Number: TCL2014-SWA 005
Report Date: 28 April 2014
Report Issue Status: 02 *(04/2008)*
Project Details: W40 Plus Casement 4mm Planitherm 4S - 8mm 90% Krypton - 4mm Float - 8mm 90% Krypton - 4mm Planitherm 4S

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

Parameter	*Symbol*		*Units*
Total window height ***0DP***	l_w	1480	mm
Total window width ***0DP***	b_w	1230	mm

Glazing dimensions and properties:
Nominal 4mm etc to ***0DP***, others ***1DP***

Thickness of pane 1	**4**	mm
Pane 1/2 distance	**8**	mm
Krypton Gas fill (1/2)	**90**	%
Thickness of pane 2	**4**	mm
No further entry required for double glazed units		
Pane 2/3 distance (n/a for DG)	**8**	mm
Krypton Gas fill (2/3)	**90**	%
Thickness of pane 3 (n/a for DG)	**4**	mm
Thermal transmittance of glazing - ***3DP***		
U_g	**0.617**	W/(m²·K)

Frame dimensions:
All frame values to nearest 0.5mm, gaskets to ***1DP***

	(b_f)	No gasket (mm)	Gasket protrusion (mm)	With gasket (mm)
	F1 LH jamb	**50**	**0.5**	50.5
	F2 head	**50**	**0.5**	50.5
	F3 RH jamb	**50**	**0.5**	50.5
	F4 sill	**50**	**0.5**	50.5
	Total gasket area		0.0025	m^2

Window Dimensions:

Section	Length (mm)	Width (mm)	Area No gasket (m^2)	Area With gasket (m^2)
Window	1380	1130	1.5594	1.5569
Total glazing, A_g			1.5594	1.5569

All *L* values to ***4DP***. All b values to ***0DP***

		W/(m·K)	b_p (mm)		W/(m·K)	b_g (mm)
F1 LH jamb	$L_f{}^{2D}$	**0.5046**	**190**	$L_\psi{}^{2D}$	**0.4714**	190
F2 head		**0.5046**	190		**0.4714**	190
F3 RH jamb		**0.5046**	190		**0.4714**	190
F4 sill		**0.5046**	190		**0.4714**	190

Frame	(mm)	(mm)	(m^2)	(m^2)
F1	1480	50	0.0715	0.0722
F2	1230	50	0.0590	0.0596
F3	1480	50	0.0715	0.0722
F4	1230	50	0.0590	0.0596
Total Frame			0.2610	0.2635
Total Window, A_w			1.8204	1.8204
Percentage glass area			85.66%	85.52%

Frame: Section	b_f *(with gaskets)* (m)	U_f W/(m²·K)	Frame areas (with gaskets) m²	Heat flow W/K	ψ W/(m·K)	l_g (m)	Heat flow W/K
F1 LH jamb	0.0505	6.1133	0.0722	0.4413	0.0450	1.3790	0.0621
F2 head	0.0505	6.1133	0.0596	0.3641	0.0450	1.1290	0.0508
F3 RH jamb	0.0505	6.1133	0.0722	0.4413	0.0450	1.3790	0.0621
F4 sill	0.0505	6.1133	0.0596	0.3641	0.0450	1.1290	0.0508
		Totals	0.2635	1.6109		Total	0.2257

Other parameters needed for calculation, taken from simulations:
Panel thickness, $d_p = d_g$ = 0.028 m U_p = 1.0309 W/(m²·K)
λ_p = 0.035 W/(m·K) R_{se} = 0.04 m²·K/W R_{tot} = 0.9700 m²·K/W R_p = 0.8000 m²·K/W R_{si} = 0.13 m²·K/W

U_{window}	U_w =	**1.54**	W/(m²·K)

Thermal transmittance, W/(m²·K)	U_{window}	**1.5**

British Fenestration Rating Council

BFRC Certified Simulator 016

Simulator Name: Dr Gary Morgan

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

Number of spaces
2

Glazing orientation	
	Vertical
Resistivity panes	1 m·K/W

Outside

Spaces		1		2	
	Pane 1		Pane 2		Pane 3
		90%		90%	
		Gas		Gas	
		Krypton		Krypton	
Thickness (mm)	4.0	8	4.0	8	4
Normal emissivity		0.01 / 0.89		0.89 / 0.01	
		Uncoated		Uncoated	

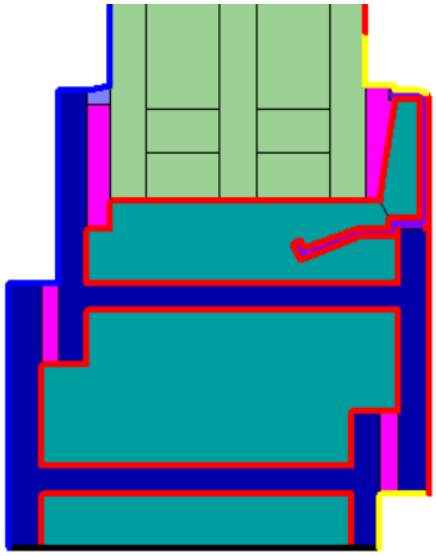
$\Sigma d_j / \lambda_j$ = 0.012

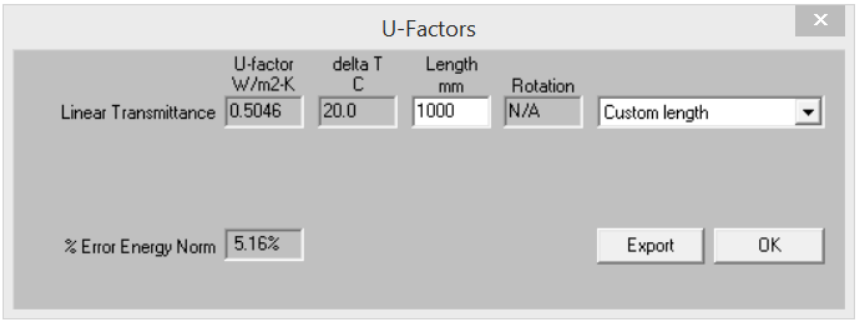
For uncoated surfaces input 0.89 for normal emissivity, which corresponds to a corrected emissivity of 0.837

Iteration number	U value	$\Sigma 1/h_s$	Space 1 λeff	Space 1 ΔT	Space 2 λeff	Space 2 ΔT
	W/(m²K)	(m²K)/W	W/(mK)		W/(mK)	
1	0.617	1.43977	0.0111	7.5	0.0111	7.5
2	0.617	1.43977	0.0111	7.5	0.0111	7.5

Space 3 λeff ΔT W/(mK) | Space 4 λeff ΔT W/(mK) | Space 5 λeff ΔT W/(mK) | Space 6 λeff ΔT W/(mK)

Material	Conductivity W/(m.K)	Emissivity	Source
Structural Mild Steel	50	0.9	BS EN ISO 10077-2:2012
Stainless Steel	17	0.9	BS EN ISO 10077-2:2012
PVC - Flexible	0.14	0.9	BS EN ISO 10077-2:2012
Glass	1	0.9	BS EN ISO 10077-2:2012
Butyl Solid / Hot Melt	0.24	0.9	BS EN ISO 10077-2:2012
Silicone (unfilled)	0.35	0.9	BS EN ISO 10077-2:2012
Glazing Cavity Effective Conductivity	0.01111	0.9	Derived from BS EN 673
Super Spacer Standard	0.13	0.9	Manufacturer Supplied Value (unvalidated)

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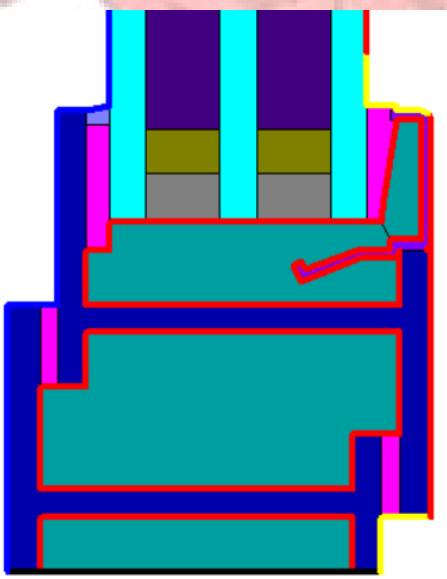

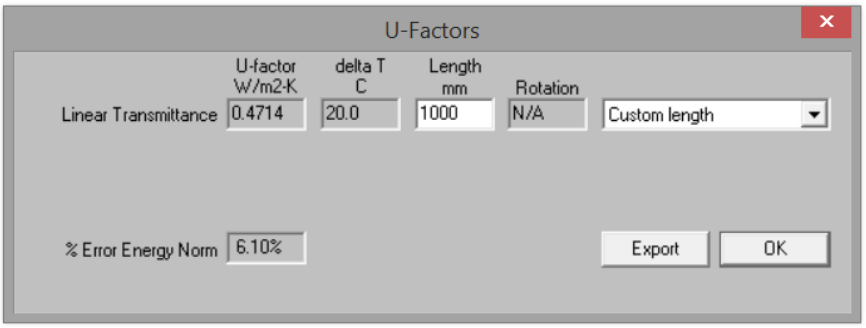
U-Factors
U-factor W/m2-K
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Length mm
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