THERMAL SIMULATION REPORT

Report Number:	**SWA-TCL2012-SWA-010**
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:	**Stainless Steel Glazing Bead**

Results

Thermal Transmittance (U_{window})	**1.6**	*W/(m^2K)*

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

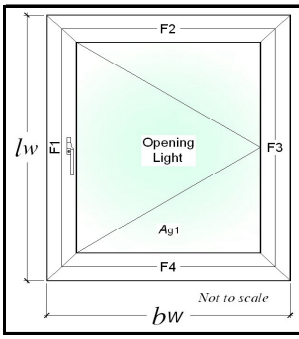
Report Prepared By *Dr Gary Morgan*
Therm Consulting

Signed: *G Morgan*

Date: *14th September 2012*

The simulations in this report were performed using Therm 5.2.14 according to EN ISO 10077 – 2:2012
The Therm files generated are attached to this report as appendices

British Fenestration Rating Council
BFRC Certified Simulator 016



Window Style:
L2
Side Hung Casement

Report Number: TCL2012-SWA10
Report Date: 14th September 2012
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	**52**	**0.5**	52.5
	F2 head	**52**	**0.5**	52.5
	F3 RH jamb	**52**	**0.5**	52.5
	F4 sill	**52**	**0.5**	52.5
	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	1376	1126	1.5494	1.5469
Total glazing, A_g			1.5494	1.5469

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}	**0.5157**	**190**	L_ψ^{2D}	**0.4820**	190
F2 head		**0.5157**	190		**0.4820**	190
F3 RH jamb		**0.5157**	190		**0.4820**	190
F4 sill		**0.5157**	190		**0.4820**	190

Frame	(mm)	(mm)	(m^2)	(m^2)
F1	1480	52	0.0743	0.0749
F2	1230	52	0.0613	0.0618
F3	1480	52	0.0743	0.0749
F4	1230	52	0.0613	0.0618
Total Frame			0.2710	0.2735
Total Window, A_w			1.8204	1.8204
Percentage glass area			85.11%	84.97%

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	0.0525	6.0919	0.0749	0.4565	0.0450	1.3750	0.0619
F2 head	0.0525	6.0919	0.0618	0.3766	0.0450	1.1250	0.0506
F3 RH jamb	0.0525	6.0919	0.0749	0.4565	0.0450	1.3750	0.0619
F4 sill	0.0525	6.0919	0.0618	0.3766	0.0450	1.1250	0.0506
		Totals	0.2735	1.6663		Total	0.2250

Other parameters needed for calculation, taken from simulations:
Panel thickness, $d_p = d_g =$ 0.028 m $U_p =$ 1.0309 W/(m²·K)
$\lambda_p =$ 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}	$U_w =$ **1.56**	W/(m²·K)
Thermal transmittance, W/(m²·K)	U_{window} **1.6**	

British Fenestration Rating Council
BFRC Certified Simulator 016

Simulator Name: Dr Gary Morgan

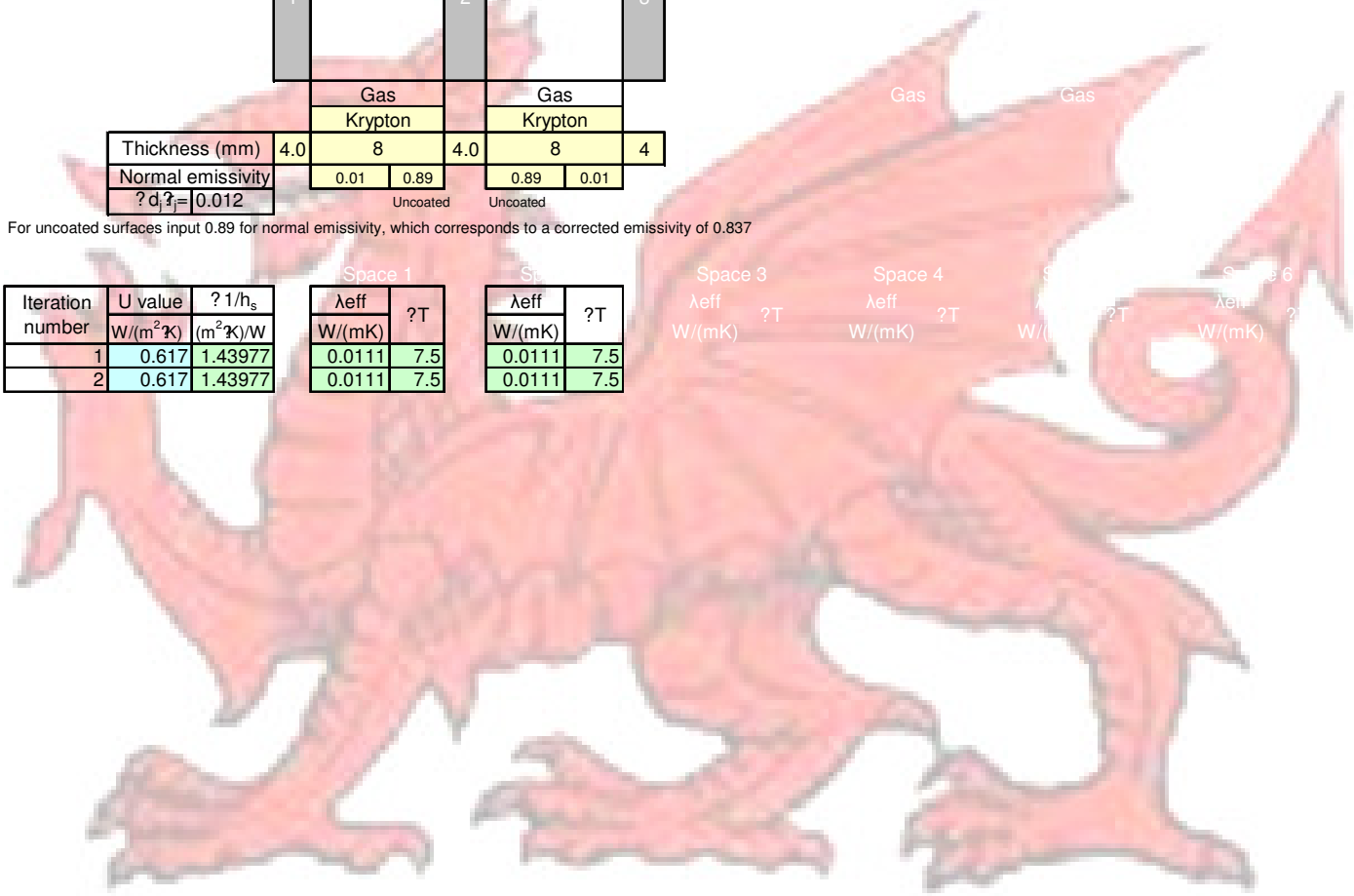
Version 10 22/07/2011. Calculations according to BS EN 673:2011

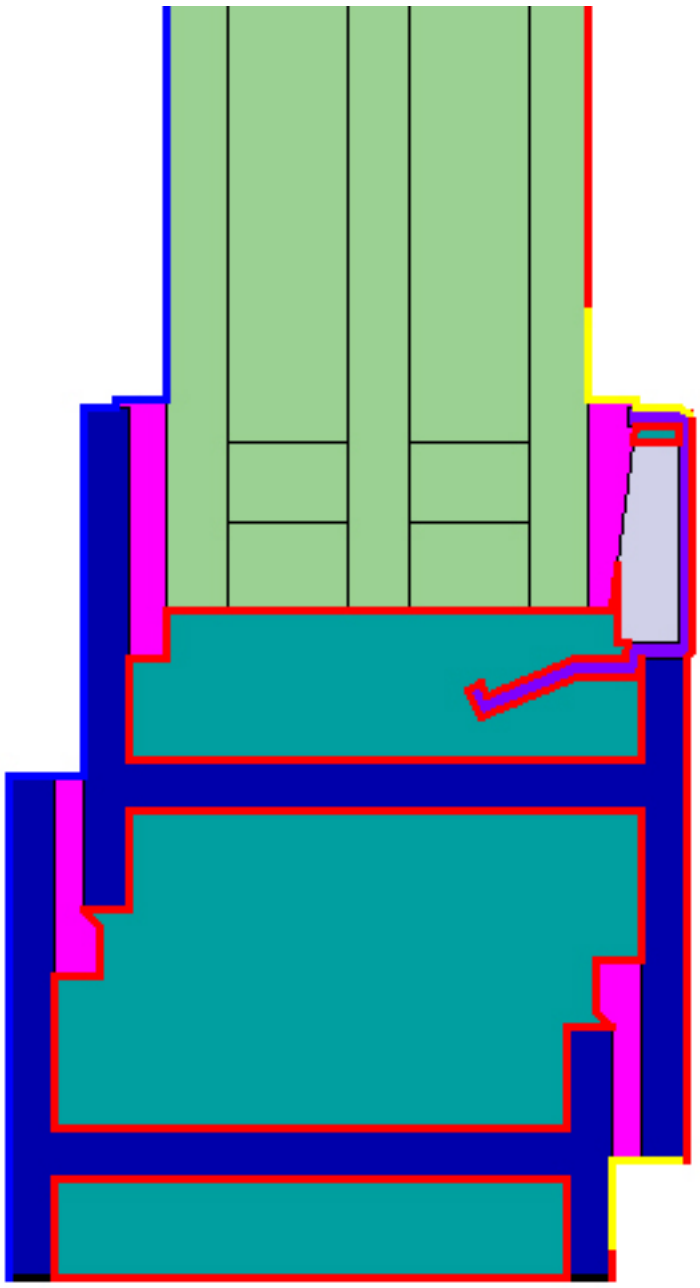
Number of spaces
2

Spaces		1		2	
Glazing orientation	Vertical				
Resistivity panes	1 m·K/W	Pane 1	90%	Pane 2	90%
Outside					Pane 3
		Gas		Gas	
		Krypton		Krypton	
Thickness (mm)	4.0	8		8	4
Normal emissivity		0.01	0.89	0.89	0.01
$\Sigma d_i/\lambda_i$ =	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/(m²K)	$\Sigma 1/h_s$ (m²K)/W	Space 1 λeff W/(mK)	Space 1 ΔT	Space 2 λeff W/(mK)	Space 2 ΔT
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





Therm Version 5.2 (5.2.14)
Date: Fri Sep 14 15:43:47 2012

Created by:
Created for:

Therm Filename: D:\MyDocs from Thermbridge\Therm Output Files\Steel Window Association\September 2012\NSB-THERM- Simulations\NSB T28\NSB T28 Sash Panel.THM
Cross Section Type: Sill
Underlay Name: D:\MyDocs from Thermbridge\Therm Output Files\Steel Window Association\September 2012\NSB-THERM- Simulations\NSB T28\NSB-T28-THERM.dxf

U-factors

Name	Length mm	Basis	U-factor W/m2-K
Linear Transmittance	1000.00	Custom	0.5157

Solid Materials

Name	Conductivity W/m-K	Emissivity

CEN Insulation Panel	0.04	0.90
CEN Steel	50.00	0.90
CEN PVC Flexible	0.14	0.90
CEN Stainless Steel	17.00	0.90
Expanded Polystyrene (EPS)*	0.04	0.90

Cavities

Name: CEN Cavity (Unventilated) - Detailed
Gas Fill: Air
Convection Model: CEN
Radiation Model: Advanced

Poly ID	Heat Flow Dir	Side 1 Temp C	Side 1 Emis	Side 2 Temp C	Side 2 Emis	Dimension Horz. mm	Dimension Vert. mm	Nu #	Keff W/m-K	Cavity Height mm
4	Horizontal	15.00	0.90	5.00	0.90	28.73	9.82	N/A	0.0452	N/A
6	Horizontal	15.00	0.90	5.00	0.90	2.88	0.99	N/A	0.0250	N/A
7	Horizontal	15.00	0.90	5.00	0.90	36.75	17.90	N/A	0.0578	N/A
12	Horizontal	15.00	0.90	5.00	0.90	34.00	6.00	N/A	0.0535	N/A

Glazing Systems

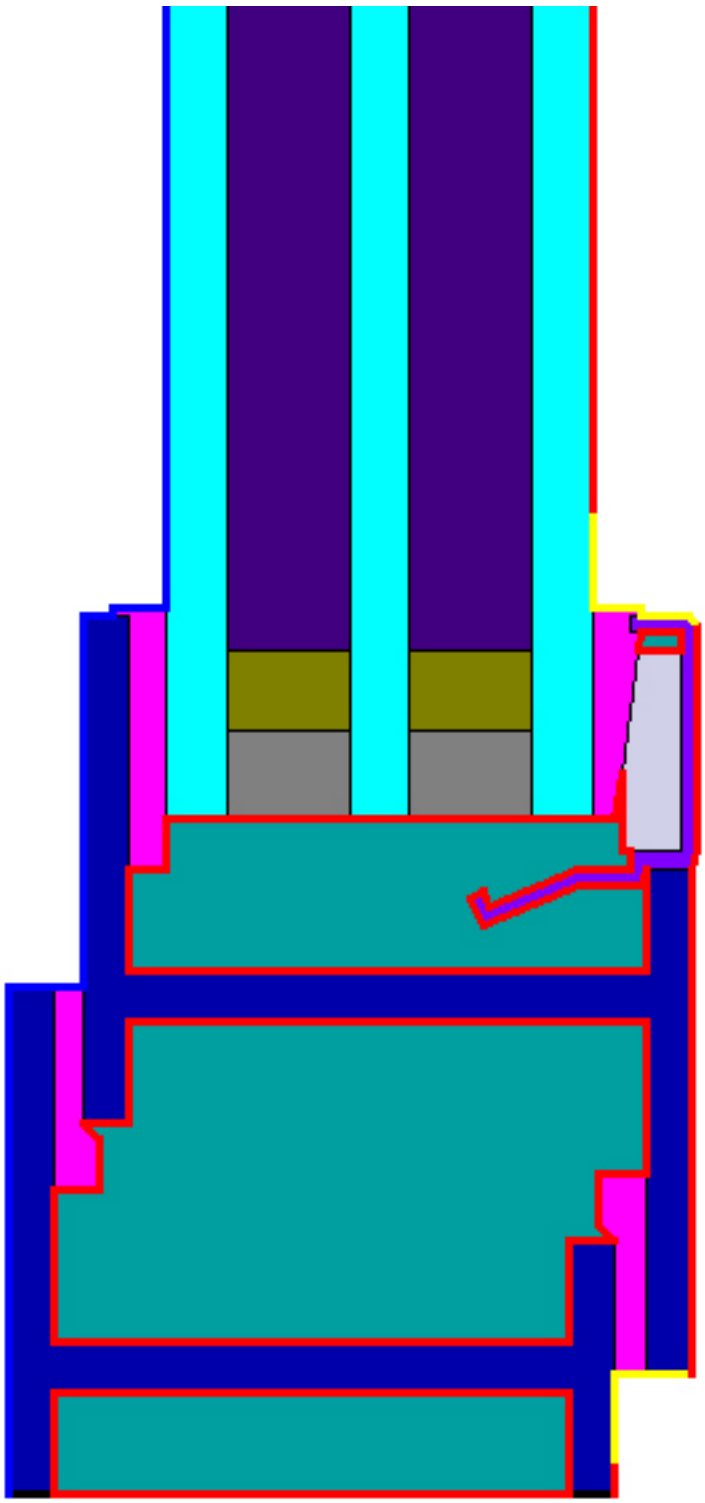
None

Standard Boundary Conditions

Name	Temperature C	Film Coefficient W/m2-K
CEN Interior	20.00	7.692
CEN Red Rad	20.00	5.000
CEN Exterior	0.00	25.000

Calculation Specifications

Mesh Parameter : 9
Estimated Error: 5.6%
Calculations done in Version 5.2 (5.2.14)



Therm Version 5.2 (5.2.14)
Date: Fri Sep 14 15:44:50 2012

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Therm Filename: D:\MyDocs from Thermbridge\Therm Output Files\Steel Window Association\September 2012\NSB-THERM- Simulations\NSB T28\NSB T28 Sash.THM
Cross Section Type: Sill
Underlay Name: D:\MyDocs from Thermbridge\Therm Output Files\Steel Window Association\September 2012\NSB-THERM- Simulations\NSB T28\NSB-T28-THERM.dxf

U-factors

Name	Length mm	Basis	U-factor W/m2-K

Linear Transmittance1000.00	Custom		0.4820

Solid Materials

Name	Conductivity W/m-K	Emissivity
CEN Edgetech Super Spacer Standard	0.12	0.90
CEN Butyl Solid / Hot Melt	0.24	0.90
CEN Glass	1.00	0.90
CEN Steel	50.00	0.90
CEN PVC Flexible	0.14	0.90
CEN Stainless Steel	17.00	0.90
Expanded Polystyrene (EPS)*	0.04	0.90
4 8 4 Planitherm 4S and 90% Argon	0.01	0.90

Cavities

Name: CEN Cavity (Unventilated) - Detailed
Gas Fill: Air
Convection Model: CEN
Radiation Model: Advanced

Poly ID	Heat Flow Dir	Side 1 Temp C	Side 1 Emis	Side 2 Temp C	Side 2 Emis	Dimension Horz. mm	Dimension Vert. mm	Nu #	Keff W/m-K	Cavity Height mm
4	Horizontal	15.00	0.90	5.00	0.90	28.73	9.82	N/A	0.0452	N/A
6	Horizontal	15.00	0.90	5.00	0.90	2.88	0.99	N/A	0.0250	N/A
7	Horizontal	15.00	0.90	5.00	0.90	36.75	17.90	N/A	0.0578	N/A
12	Horizontal	15.00	0.90	5.00	0.90	34.00	6.00	N/A	0.0535	N/A

Glazing Systems

None

Standard Boundary Conditions

Name	Temperature C	Film Coefficient W/m2-K
CEN Interior	20.00	7.692
CEN Red Rad	20.00	5.000
CEN Exterior	0.00	25.000

Calculation Specifications

Mesh Parameter : 9
Estimated Error: 6.5%
Calculations done in Version 5.2 (5.2.14)