

THERMAL SIMULATION REPORT

Report Number:	TCL2015-SWA-003
Prepared For:	Steel Window Association 42 Heath Street Tamworth Staffordshire B79 7HJ
Door System Identifier:	W40
Lock Panel Frame Identifier	SWZ7
Meeting Rail Identifier:	N/A
Vent Frame Identifier:	SW5
Outer Frame Identifier:	SW8
Glazing System:	4mm Optitherm S1 Plus 16mm 90% Argon 4mm KOW with coating reversed
Spacer Bar:	16mm Edgetech Super Spacer Premium with butyl secondary sealant
Notes:	Aluminium Bead Reference Drawing SWA-W40-017

Result

Thermal Transmittance (U_{Door})	1.8	W/(m ² K)
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(Door Configuration as defined in BS EN 14351-1 Annex E)
(1230mm wide x 2180 high – single leaf)

Report Prepared By Dr Gary Morgan
Therm Consulting Ltd.

Signed: 

Date: 3rd February 2015

The simulations in this report were performed using Win IsoPro 7.94
strictly according to EN ISO 10077 – 2:2012
The files generated are attached to this report as appendices



**BFRC Certified
Simulator 016**

GENERAL WINDOW / DOOR U VALUE

Frame Elements

Frame Element (Name)	Area (mm ²)	Area (m ²)	Uframe	Sight Line Length (mm)	Sight Line Length (m)	Psi value	Area x Uf	Lengthx Psi	Total Heat Flow
Head	63504.1	0.063504	6.262	1122	1.122	0.0450	0.397663	0.05049	0.448152674
Left Jamb	114804.23	0.114804	6.262	2072	2.072	0.0450	0.718904	0.09324	0.812144101
Right Jamb	114804.23	0.114804	6.262	1852	1.852	0.0450	0.718904	0.08334	0.802244101
Sill	63504.1	0.063504	6.262	1122	1.122	0.0450	0.397663	0.05049	0.448152674
Lock Frame	20520.149	0.02052	6.54	546	0.546	0.0420	0.134202	0.022932	0.157133771
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0
		0			0		0	0	0

Note, when dealing with Transom or Mullion sections, take the average of both sight line dimensions.

Totals		0.377137							2.667827321
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Glazing

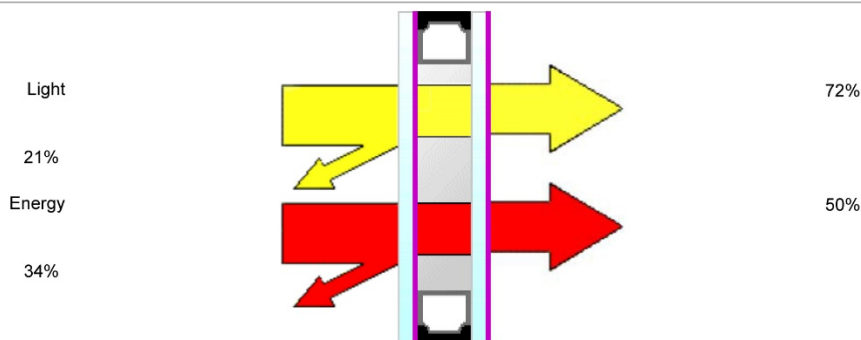
Glazing Pane	Area (mm ²)	Area (m ²)	Uglass	Area x Ug	Total Heat Flow
Glass	2288924.4	2.288924	0.95	2.174478	2.174478182
Lock Panel	15339.919	0.01534	0.709	0.010876	0.010876003
		0		0	0
		0		0	0
		0		0	0
		0		0	0
		0		0	0
		0		0	0

Totals		2.304264			2.185354185
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Overall Window / Door Dimensions	
Height (mm)	2180
Width (mm)	1230

Total Window / Door Area m ² =	2.6814	Total Window / Door Area Calculated =	2.681401	% Error	-0.00004230
Note - Both areas should match to better than 1%, if not, check figures carefully					

Window / Door U value = 1.81



Description

Position	Product	Process	Thickness (nominal) mm	Weight kg/m ²
Glass 1	Pilkington Optitherm S1 Plus	Annealed	4	10
Cavity 1	Argon (90%)		16	
Glass 2	Pilkington K Glass OW	Annealed	4	10
Product Code	-16Ar-K4w		24	20

Performance

Light			Sound Reduction		
Transmittance	LT	72%	R _w dB (C;C _{tr})	31 (-2; -5)	
	UV %	34%			
Reflectance Out	LR out	21%	Thermal Transmittance	W/m ² K	0.95
Reflectance In	LR in	20%			
Energy			Ra		
Direct Transmittance	ET	47%	98		
Reflectance	ER	34%			
Absorptance	EA	19%			
Total Transmittance	g	50%			
Shading Coefficient Total		0.58			
Shading Coefficient Shortwave		0.54			
			Performance Code		
			U-value/Light/Energy	0.95 / 72 / 50	
The values of some of characteristics are displayed as NPD. This stands for No Performance Determined.					

Pilkington Spectrum allows you to combine a wide range of products available from Pilkington and determine their key properties such as light transmittance, g value and U value. The program includes restrictions that prevent some combinations being selected that may be considered unwise or impractical. Even with these restrictions, it is still possible to create product combinations that may not be available from your supplier. Please check with your supplier that your chosen product combination is possible, available in the sizes required and in a timescale appropriate to your project. Furthermore, it is essential that you check that your product combination is appropriate for satisfying local, regional, national and other project-specific requirements.

Calculations are made according to EN standards 410 and 673/12898

Pilkington Spectrum Version 4.0.0

23/01/2015

Simulation software: WinIso2D 7.80

Date: 21.05.2014

File: C:\Users\Gary\Documents\MyDocs from Thermbridge\Thermal Simulation Output Files\Steel Window Association\May 2014\W40 - SIMULATIONS Doors and Windows\W40-012\Lock Panel.f2d



Calculation of the thermal transmission coefficient U_f according to EN ISO 10077-2:2003-12

Simulation model:

Dimensions (width x height): 200,00 x 54,99 mm

Number of elements in simulation model: X-direction: 100; Y-direction: 28



Boundary conditions:

External:

Temperature Θ_e : 0,00 °C

Surface resistance R_{se} : 0,040 m²K/W

Internal:

Temperature Θ_i : 20,00 °C

Surface resistance R_{si} 1: 0,130 m²K/W

Surface resistance R_{si} 2: m²K/W

Results:

Temperature difference dT : 20,00 K

Total heat flow Q : 2,838 W/m

2D thermal conductance L_{2D} : 0,142 W/mK

Length top/left: 200,00 mm

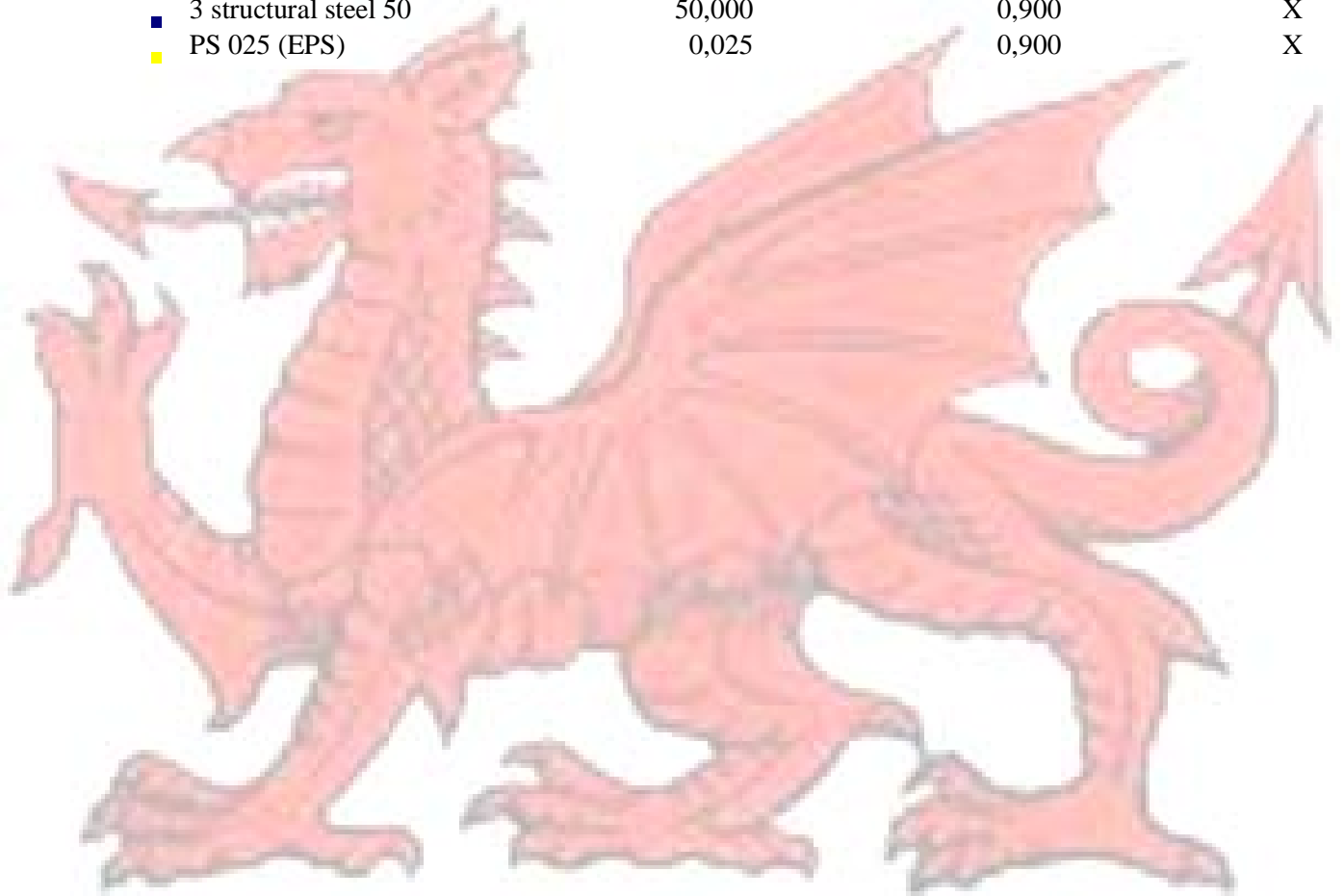
U-value top/left: 0,709 W/m²K

Length bottom/right: 0,00 mm

U-value bottom/right: 0,000 W/m²K

Materials:

Material	R (m ² K/W)	T (°C)	Q(gesamt) (W/m)	10077 konform
****ADIABAT****	0,000	0,000	0,000	
■ 1 boundary condition outside 0,04, 0°C, 80%	0,040	0,000	-2,838	X
■ 1 boundary condition inside 0,13, 20°C, 50%	0,130	20,000	2,838	X
Material	L (W/mK)	Emiss		10077 konform
■ 3 structural steel 50	50,000	0,900		X
■ PS 025 (EPS)	0,025	0,900		X



Simulation software: WinIso2D 7.94

Date: 23.01.2015

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Calculation of the linear thermal transmission coefficient Ψ according to EN ISO 10077-2

Simulation model:

Dimensions (width x height): 243,98 x 70,90 mm

Number of elements in simulation model: X-direction: 344; Y-direction: 263



Boundary conditions:

External:

Temperature Θ_e : 0,00 °C

Surface resistance R_{se} : 0,040 m²K/W

Internal:

Temperature Θ_i : 20,00 °C

Surface resistance R_{si} 1: 0,130 m²K/W

Surface resistance R_{si} 2: 0,200 m²K/W

Results:

Temperature difference dT : 20,00 K

Total heat flow Q : 11,266 W/m

2D thermal conductance L_{2D} : 0,563 W/mK

Length top/left: 190,00 mm

U-value top/left: 0,950 W/m²K

Length bottom/right: 0,00 mm

U-value bottom/right: 0,000 W/m²K

Ψ -value: 0,045 W/mK

Materials:

Material	R (m ² K/W)	T (°C)	Q(gesamt) (W/m)	10077 konform
****ADIABAT****	0,000	0,000	0,000	
1 boundary condition inside 0,13, 20°C, 50%	0,130	20,000	8,552	X
1 boundary condition outside 0,04, 0°C, 80%	0,040	0,000	-11,266	X
1 boundary condition inside 0,20, 20°C, 50%	0,200	20,000	2,714	X
1 air EN ISO 10077-2 (cavities in profiles)				X
1 air EN ISO 10077-2 (cavities in profiles <=2mm)				X
1 air EN ISO 10077-2 (cavities in profiles, sparse ventilated)				X

Material	L (W/mK)	Emiss	10077 konform
3 alu (Si-Leg.) 160	160,000	0,900	X
2 Float Glass 1.0	1,000	0,837	X
3 structural steel 50	50,000	0,900	X
5 Elastomeric Foam Flexible	0,050	0,900	X
5 PVC soft	0,140	0,900	X
6 Silicon, unfilled	0,350	0,900	X
021 Edgetech Super Spacer Premium 4.7mm	0,150	0,900	-
6 butyle	0,240	0,900	X
SZR L=0.0183	0,018	0,900	-

Simulation software: WinIso2D 7.94

Date: 23.01.2015

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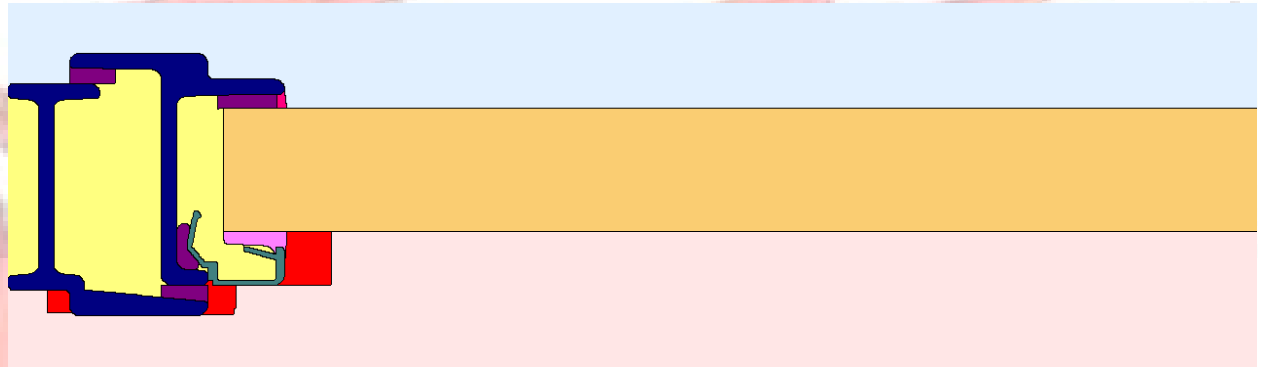


Calculation of the thermal transmission coefficient U_f according to EN ISO 10077-2:2003-12

Simulation model:

Dimensions (width x height): 243,98 x 70,90 mm

Number of elements in simulation model: X-direction: 344; Y-direction: 263



Boundary conditions:

External:

Temperature Θ_e : 0,00 °C
Surface resistance R_{se} : 0,040 m²K/W

Internal:

Temperature Θ_i : 20,00 °C
Surface resistance R_{si} 1: 0,130 m²K/W
Surface resistance R_{si} 2: 0,200 m²K/W

Results:

Temperature difference dT : 20,00 K
Total heat flow Q : 11,205 W/m
2D thermal conductance L_{2D} : 0,560 W/mK

Length 1: 190,00 mm
U-value 1: 1,169 W/m²K

Length 2: 0,00 mm
U-value 2: 0,000 W/m²K

U_f -value: 6,262 W/m²K

Materials:

Material	R (m ² K/W)	T (°C)	Q(gesamt) (W/m)	10077 konform
****ADIABAT****	0,000	0,000	0,000	
1 boundary condition inside 0,13, 20°C, 50%	0,130	20,000	8,552	X
1 boundary condition outside 0,04, 0°C, 80%	0,040	0,000	-11,266	X
1 boundary condition inside 0,20, 20°C, 50%	0,200	20,000	2,714	X
1 air EN ISO 10077-2 (cavities in profiles)				X
1 air EN ISO 10077-2 (cavities in profiles <=2mm)				X
1 air EN ISO 10077-2 (cavities in profiles, sparse ventilated)				X

Material	L (W/mK)	Emiss	10077 konform
3 alu (Si-Leg.) 160	160,000	0,900	X
2 Float Glass 1.0	1,000	0,837	X
3 structural steel 50	50,000	0,900	X
5 Elastomeric Foam Flexible	0,050	0,900	X
5 PVC soft	0,140	0,900	X
6 Silicon, unfilled	0,350	0,900	X
021 Edgetech Super Spacer Premium 4.7mm	0,150	0,900	-
6 butyle	0,240	0,900	X
SZR L=0.0183	0,018	0,900	-

Simulation software: WinIso2D 7.94

Date: 02.02.2015

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Calculation of the linear thermal transmission coefficient Ψ according to EN ISO 10077-2

Simulation model:

Dimensions (width x height): 245,05 x 60,00 mm

Number of elements in simulation model: X-direction: 321; Y-direction: 187



Boundary conditions:

External:

Temperature Θ_e : 0,00 °C

Surface resistance R_{se} : 0,040 m²K/W

Internal:

Temperature Θ_i : 20,00 °C

Surface resistance R_{si} 1: 0,130 m²K/W

Surface resistance R_{si} 2: 0,200 m²K/W

Results:

Temperature difference dT : 20,00 K

Total heat flow Q : 11,635 W/m

2D thermal conductance L_{2D} : 0,582 W/mK

Length top/left: 190,00 mm

U-value top/left: 0,950 W/m²K

Length bottom/right: 0,00 mm

U-value bottom/right: 0,000 W/m²K

Ψ -value: 0,042 W/mK

Materials:

Material	R (m ² K/W)	T (°C)	Q(gesamt) (W/m)	10077 konform
****ADIABAT****	0,000	0,000	0,000	
1 boundary condition inside 0,13, 20°C, 50%	0,130	20,000	10,515	X
1 boundary condition outside 0,04, 0°C, 80%	0,040	0,000	-11,635	X
1 boundary condition inside 0,20, 20°C, 50%	0,200	20,000	1,120	X
1 air EN ISO 10077-2 (cavities in profiles)				X
1 air EN ISO 10077-2 (cavities in profiles <=2mm)				X
1 air EN ISO 10077-2 (cavities in profiles, sparse ventilated)				X

Material	L (W/mK)	Emiss	10077 konform
3 structural steel 50	50,000	0,900	X
2 Float Glass 1.0	1,000	0,837	X
6 Silicon, unfilled	0,350	0,900	X
5 Elastomeric Foam Flexible	0,050	0,900	X
6 butyle	0,240	0,900	X
3 alu (Si-Leg.) 160	160,000	0,900	X
PS 025 (EPS)	0,025	0,900	-
021 Edgetech Super Spacer Premium 4.7mm	0,150	0,900	-
SZR L=0.0183	0,018	0,900	-
5 PVC soft	0,140	0,900	X

Simulation software: WinIso2D 7.94

Date: 02.02.2015

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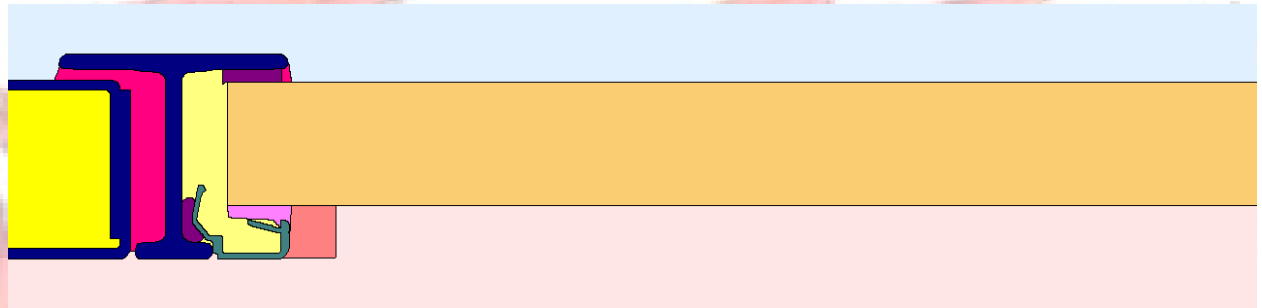


Calculation of the thermal transmission coefficient U_f according to EN ISO 10077-2:2003-12

Simulation model:

Dimensions (width x height): 245,05 x 60,00 mm

Number of elements in simulation model: X-direction: 321; Y-direction: 187



Boundary conditions:

External:

Temperature Θ_e : 0,00 °C

Surface resistance R_{se} : 0,040 m²K/W

Internal:

Temperature Θ_i : 20,00 °C

Surface resistance R_{si} 1: 0,130 m²K/W

Surface resistance R_{si} 2: 0,200 m²K/W

Results:

Temperature difference dT : 20,00 K

Total heat flow Q : 11,636 W/m

2D thermal conductance L_{2D} : 0,582 W/mK

Length 1: 190,00 mm

U-value 1: 1,169 W/m²K

Length 2: 0,00 mm

U-value 2: 0,000 W/m²K

U_f -value: 6,540 W/m²K

Materials:

Material	R (m ² K/W)	T (°C)	Q(gesamt) (W/m)	10077 konform
****ADIABAT****	0,000	0,000	0,000	
1 boundary condition inside 0,13, 20°C, 50%	0,130	20,000	10,515	X
1 boundary condition outside 0,04, 0°C, 80%	0,040	0,000	-11,635	X
1 boundary condition inside 0,20, 20°C, 50%	0,200	20,000	1,120	X
1 air EN ISO 10077-2 (cavities in profiles)				X
1 air EN ISO 10077-2 (cavities in profiles <=2mm)				X
1 air EN ISO 10077-2 (cavities in profiles, sparse ventilated)				X

Material	L (W/mK)	Emiss	10077 konform
3 structural steel 50	50,000	0,900	X
2 Float Glass 1.0	1,000	0,837	X
6 Silicon, unfilled	0,350	0,900	X
5 Elastomeric Foam Flexible	0,050	0,900	X
6 butyle	0,240	0,900	X
3 alu (Si-Leg.) 160	160,000	0,900	X
PS 025 (EPS)	0,025	0,900	-
021 Edgetech Super Spacer Premium 4.7mm	0,150	0,900	-
SZR L=0.0183	0,018	0,900	-
5 PVC soft	0,140	0,900	X