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Report in Accordance with BS EN ISO 10077-1:2017

Thermal Performance of Windows, Doors & Shutters

Calculation of Thermal Transmittance Part 1: Simplified Method

CONFIDENTIAL

Report reference:	CU21577-37
Issue date:	16 May 2022
Project:	Aluminium Korniche Bi-Fold Doorset
Prepared for:	Aanco (UK) Ltd T/A Made For Trade Wellington House, Wynyard Avenue Wynyard Billingham TS22 5TB
Prepared by:	Sue Peatey

1 Introduction

This document details the thermal performance calculation of the doorset configuration as detailed below.

The results in this report relate only to the specimen tested and as drawings and specification received.

The frame profile results detailed below are provided by computer simulation using LBL software program THERM 5.2 and validated against proofs in Annex I (I1 to I10) of BS EN ISO 10077-2:2017. The frame profile results detailed below are provided from methods contained in BS EN ISO 10077-1:2017 and in accordance with thermal transmittance requirements detailed in BS EN 14351-1:2006 +A1:2010. Cavities are calculated in accordance with BS EN ISO 10077-2 section 6.4.3 Treatment of cavities using the single equivalent thermal conductivity method.

2 Summary of Results

2.1 Frame thermal transmittance (in accordance with BS EN ISO 10077-1: 2017)

Frame Profile	Frame Thermal Transmittance (U_f)
Left Jamb	3.0 W/m^{2}K
Right Jamb	2.8 W/m^{2}K
Head	2.9 W/m^{2}K
Threshold	2.9 W/m^{2}K
Meeting Stile	2.3 W/m^{2}K

2.2 Linear thermal transmittance (in accordance with BS EN ISO 10077-1: 2017)

Frame Profile	Linear Thermal Transmittance (ψ)
Left Jamb	0.040 W/m.K
Right Jamb	0.037 W/m.K
Head	0.037 W/m.K
Threshold	0.037 W/m.K
Meeting Stile	0.084 W/m.K

2.3 Centre pane U-Value of glazing calculated in accordance with BS EN 673: 2011

Glazing unit	Centre pane U-value (U_g)
Nominal dimensions 4-18-6.8 90% argon 10% air filled, normal emissivity 0.01 (4mm float, 18mm Superspacer Premium, 6.8mm Pilkington S1+)	1.1 W/m^{2}K

2.4 U-Value

The thermal performance of the doorset (U_d) in accordance with EN ISO 10077-1:2017 is:

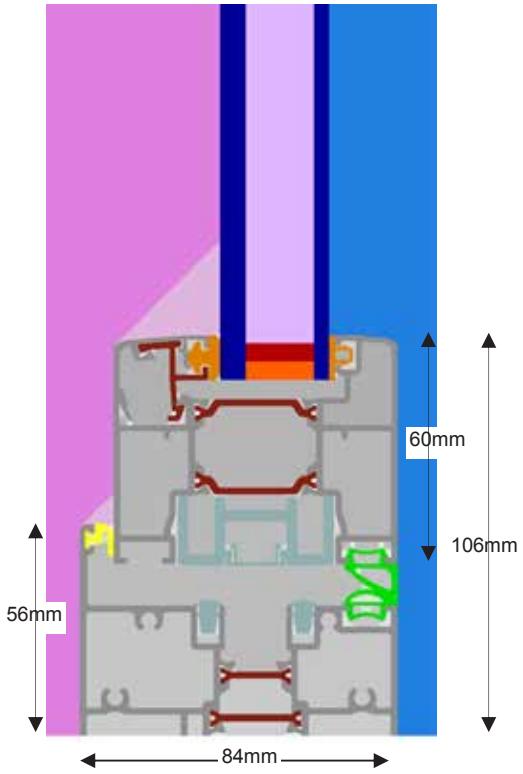
1.6 W/m^{2}K

All profile calculations based on BS EN ISO 10077-2:2017

3 Authorisation

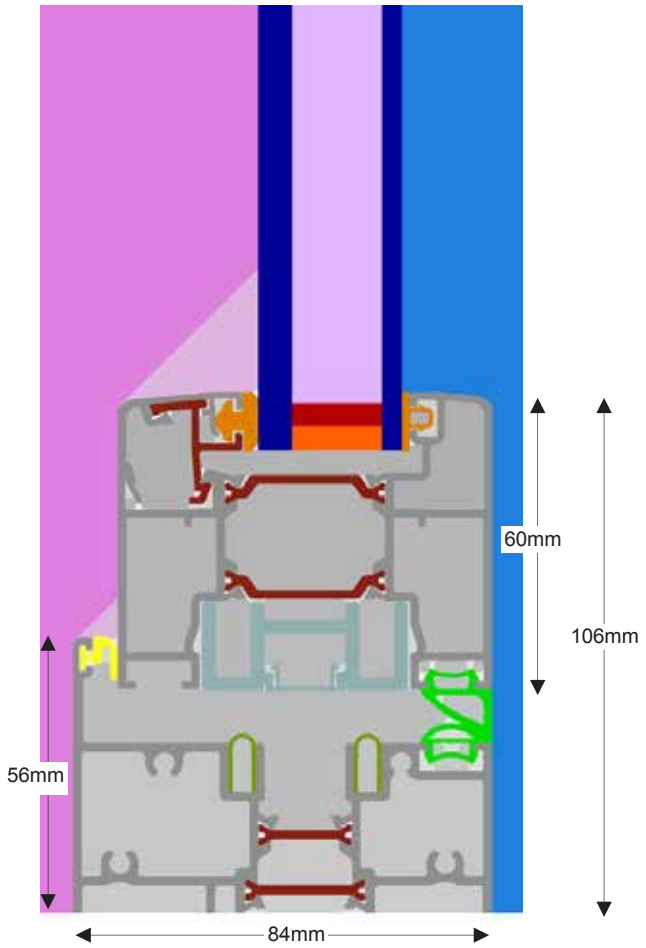
	Issued by:	**Checked by:**
Signature:		
Name:	Sue Peatey	Richard Bate
Title:	Laboratory Manager	Technical Director

Figure 1. Technical drawing of Head profile.



	Material	Thermal Conductivity W/(m.K)
	PVC-U Rigid, BS EN 10077-2	0.17
	PVC Flexible, BS EN 10077-2	0.14
	Aluminium, BS EN 10077-2	160.0
	Soda Lime Glass, BS EN 10077-2	1.0
	Superspacer Premium, IFT Rosenheim report 13-002649-PR02 (declared value)	0.15
	Hot Melt Butyl, BS EN 10077-2	0.24
	Polyurethane Foam, BS 10456	0.05
	EPDM, BS EN 10077-2	0.25
	Polyamide (1.8 & 2mm thick), BS EN 10077-2	0.30

Figure 2. Technical drawing of Threshold profile.



	Material	Thermal Conductivity W/(m.K)
	PVC-U Rigid, BS EN 10077-2	0.17
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	Aluminium, BS EN 10077-2	160.0
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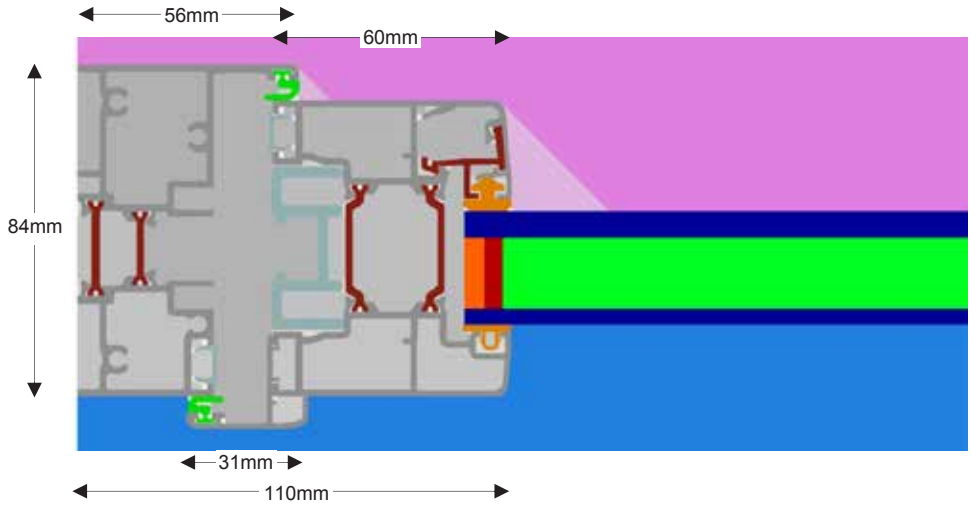
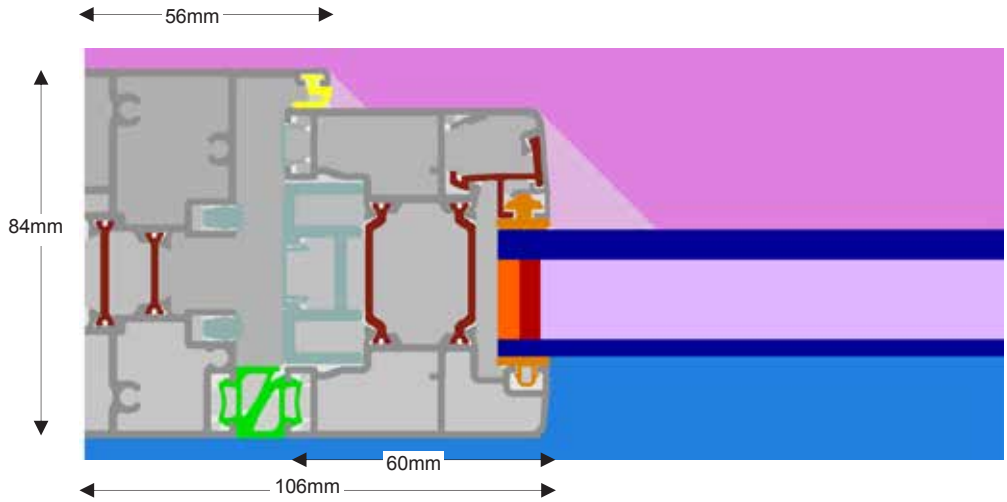
	Superspacer Premium, IFT Rosenheim report 13-002649-PR02 (declared value)	0.15
	Hot Melt Butyl, BS EN 10077-2	0.24
	Polyurethane Foam, BS 10456	0.05
	EPDM, BS EN 10077-2	0.25
	Polyamide (1.8 & 2mm thick), BS EN 10077-2	0.30

Figure 3. Technical drawing of Left Jamb profile.



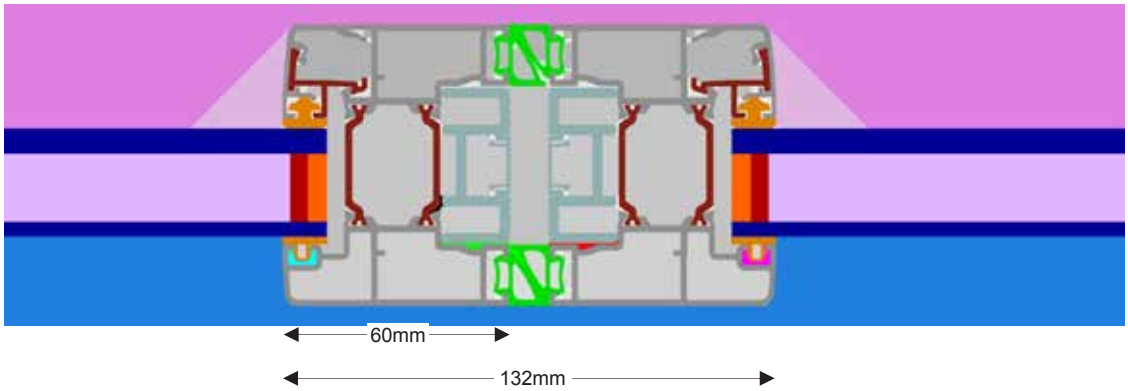
	Material	Thermal Conductivity W/(m.K)
	PVC-U Rigid, BS EN 10077-2	0.17
	PVC Flexible, BS EN 10077-2	0.14
	Aluminium, BS EN 10077-2	160.0
	Soda Lime Glass, BS EN 10077-2	1.0
	Superspacer Premium, IFT Rosenheim report 13-002649-PR02 (declared value)	0.15
	Hot Melt Butyl, BS EN 10077-2	0.24
	Polyurethane Foam, BS 10456	0.05
	EPDM, BS EN 10077-2	0.25
	Polyamide (1.8 & 2mm thick), BS EN 10077-2	0.30

Figure 4. Technical drawing of Right Jamb profile.



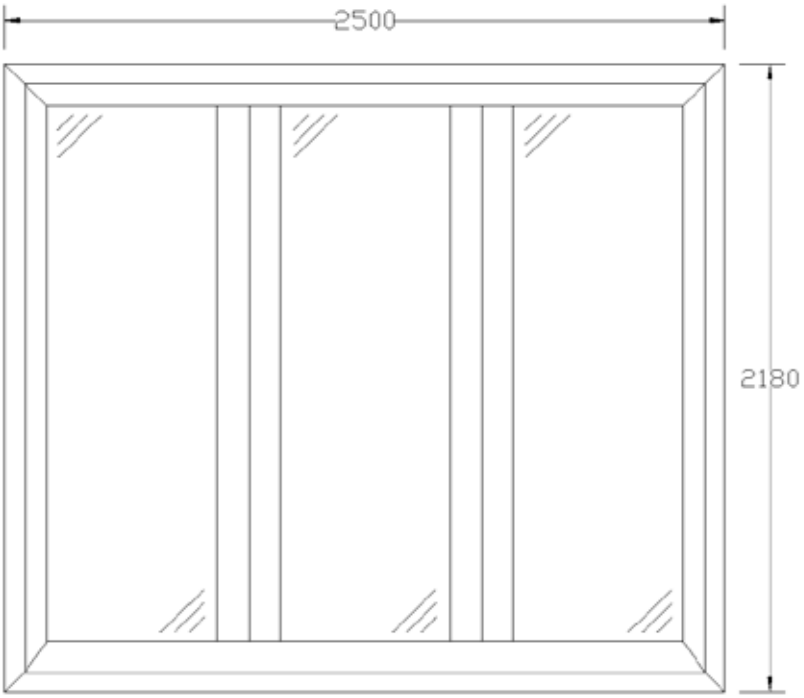
	Material	Thermal Conductivity W/(m.K)
	PVC-U Rigid, BS EN 10077-2	0.17
	PVC Flexible, BS EN 10077-2	0.14
	Aluminium, BS EN 10077-2	160.0
	Soda Lime Glass, BS EN 10077-2	1.0
	Superspacer Premium, IFT Rosenheim report 13-002649-PR02 (declared value)	0.15
	Hot Melt Butyl, BS EN 10077-2	0.24
	Polyurethane Foam, BS 10456	0.05
	EPDM, BS EN 10077-2	0.25
	Polyamide (1.8 & 2mm thick), BS EN 10077-2	0.30

Figure 5. Technical drawing of Meeting Stile profile.



	Material	Thermal Conductivity W/(m.K)
	PVC-U Rigid, BS EN 10077-2	0.17
	PVC Flexible, BS EN 10077-2	0.14
	Aluminium, BS EN 10077-2	160.0
	Soda Lime Glass, BS EN 10077-2	1.0
	Superspacer Premium, IFT Rosenheim report 13-002649-PR02 (declared value)	0.15
	Hot Melt Butyl, BS EN 10077-2	0.24
	Polyurethane Foam, BS 10456	0.05
	EPDM, BS EN 10077-2	0.25
	Polyamide (1.8 & 2mm thick), BS EN 10077-2	0.30

Figure 6. Drawing of the doorset configuration and overall dimensions (from the internal face)



Internal projected frame area ($A_{f,i}$)	1.475 m^2
External projected frame area ($A_{f,e}$)	1.475 m^2
Glazed area of configuration (A_g)	3.975 m^2
Frame area of configuration (A_f)	1.475 m^2
Perimeter length of the glazing (l_g)	15.848 m

Glazing unit 4-18-6.8 Low E 0.01 uncorrected 90% argon 10% air filled

BS EN 673:2011 Glass in building- Determination of thermal transmittance (*U* value)-Calculation method.					
Standardised boundary conditions (section 8)					
r		1	m.K/w		Thermal resistivity of soda lime glass
ε glass		0.837			Corrected emissivity of uncoated soda lime and borosilicate glass surface
delta T		15	K		Temperature difference between bounding glass surface
Tm		283	K		Mean temperature of gas space
σ		5.67E-08	W/(m2K4)		Stefan-Boltzmann's constant
he		25	W/(m2K)		External heat transfer coeff. for uncoated soda lime glass surfaces
hi		7.7	W(m2K)		Internal heat transfer coeff. for uncoated soda lime glass surfaces
A		0.035			Constant
n		0.38			Exponent
Gas properties (section 6)					
Density: ρ		1.6523	kg/m3		
Dynamic viscosity: μ		2.12E-05	kg/(ms)		
Thermal conductance: λ		0.017652	W/(m.K)		
Specific Heat Capacity: c		567.9	J/(kg.K)		
s		0.018	m		width of gas space
ε 1		0.837			corrected emissivity of surface 1
ε 2		0.013			corrected emissivity of surface 2
Glass pane 1 d		0.004	m		thickness of glass 1
Glass pane 2 d		0.0068	m		thickness of glass 2
Calculated values					
Pr		6.83E-01			
Gr		1.84E+04			
Nu		1.26E+00	1	1.26E+00	If Nu is less than 1, use Nu = 1.
hr		6.46E-02			
hg		1.24E+00			
hs = hr + hg		1.30E+00			
1/ht		7.78E-01			
1/U = 1/he + 1/ht + 1/hi		9.48E-01			
Centre pane U value		**1.055**			