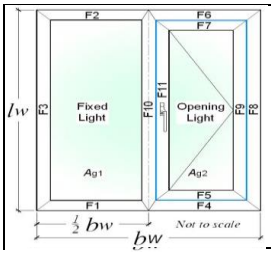
THERMAL SIMULATION REPORT

CENSOLUTIONS



Sample Style:
Casement

Fixed Light / Side Hung

Blue line illustrates opening light length (air leakage)

Report Number: BR17/010
Report Date: 22 September 2017
Project Details: Costello Windows, Casement Hardwood. Optifloat, Swiss Ultimate & Argon, Planitherm One

Issue No 22.1: 11/03/2013

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Frame offset:	Yes

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

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

Nominal 4mm etc to **0DP**, others **1DP**

Glazing dimensions and properties:

Thickness of pane 1	4	mm
Pane 1/2 distance	16	mm
Gas fill (1/2)	Argon 90%	
Thickness of pane 2	4	mm
Complete next 3 cells for TG IGU		
Pane 2/3 distance		mm
Gas fill (2/3)		
Thickness of pane 3		mm
Glazing Trans. - **3DP** U_g	1.045	W/(m²·K)
g-value - **2DP** $g_\perp$	0.53	

Thermal transmittance of window from hot box test

U_w - 2DP		W/(m²·K)

Frame dimensions:

	(b_f)	Frame width, b_f (mm)	Frame offset, b_{OF} (mm)	Gasket protrusion, b_{gt} (mm)	Frame & gasket widths (mm)	
All frame values round to nearest 1mm, gaskets to **1DP**	F1 fixed sill	59	3	1.0	60.0	
	F2 fixed head	59	3	1.0	60.0	
	F3 fixed jamb	59	3	1.0	60.0	Total
F4 + F5 sash sill	F4 fixed sash sill	59	n/a	n/a	59.0	106.0
	F5 moving sash sill	43	0	4.0	47.0	
F6 + F7 sash head	F6 fixed sash head	59	n/a	n/a	59.0	106.0
	F7 moving sash head	43	0	4.0	47.0	
F8 + F9 sash jamb	F8 Fixed sash jamb	59	n/a	n/a	59.0	106.0
	F9 moving sash jamb	43	0	4.0	47.0	
F10 + F11 mullion	F10 fixed mullion	67	4	0.0	67.0	114.0
	F11 moving mullion	43	0	4.0	47.0	
	Total gasket area			0.016041	m^2	

Window Dimensions:

Section	Length (m)	Width (m)	Area No gasket (m^2)	Area With gasket (m^2)
Fixed Light	1.3620	0.5225	0.7116	0.7092
Opening light	1.2760	0.4365	0.5570	0.5433
Total glazing, A_g			1.2686	1.2526
Frame	(m)	(m)	(m^2)	(m^2)
F1	0.6150	0.0590	0.0336	0.0341
F2	0.6150	0.0590	0.0336	0.0341
F3	1.4800	0.0590	0.0838	0.0852
F4	0.6150	0.0590	0.0336	0.0336
F5	0.5225	0.0430	0.0206	0.0223
F6	0.6150	0.0590	0.0336	0.0336
F7	0.5225	0.0430	0.0206	0.0223
F8	1.4800	0.0590	0.0838	0.0838
F9	1.3620	0.0430	0.0567	0.0618
F10	1.4800	0.0670	0.0952	0.0952
F11	1.3620	0.0430	0.0567	0.0618
Total Frame			0.5518	0.5678
Total Window, A_w			1.8204	1.8204
Percentage fixed light glass area			39.09%	38.96%
Percentage opening light glass area			30.60%	29.85%
Percentage glass area (total)			69.69%	68.81%

Where a *Uw* value from hot box testing is available, no L_f^{2D} or L_ψ^{2D} values need to be entered

Frame conductance: — All L values to **4DP**. All b values to **0DP**

	L_f^{2D} W/(m·K)	b_p (mm)	L_ψ^{2D} W/(m·K)	b_g (mm)
F1 fixed sill	**0.3260**	**190**	**0.3355**	**190**
F2 fixed head	**0.3260**	190	**0.3355**	190
F3 fixed jamb	**0.3260**	190	**0.3355**	190
F4 + F5 sash sill	**0.4108**	190	**0.4220**	190
F6 + F7 sash head	**0.4108**	190	**0.4220**	190
F8 + F9 sash jamb	**0.4108**	190	**0.4220**	190
F10 + F11 mullion	**0.6417**	380	**0.6630**	380

Frame:

Section	Frame width, b_f (m)	Frame U-value, U_f (W/(m²·K))	Frame areas, A_f (m^2)	Frame heat flow, HU (W/K)	Linear trans, Ψ (W/(m·K))	Linear length, l_g (m)	Junction heat flow, Hψ (W/K)
F1 fixed sill	0.0590	1.7621	0.0336	0.0591	0.0330	0.5295	0.0175
F2 fixed head	0.0590	1.7621	0.0336	0.0591	0.0330	0.5295	0.0175
F3 fixed jamb	0.0590	1.7621	0.0838	0.1477	0.0330	1.3680	0.0451
F4 + F5 sash sill	0.1020	1.8506	0.0542	0.1003	0.0347	0.4365	0.0151
F6 + F7 sash head	0.1020	1.8506	0.0542	0.1003	0.0347	0.4365	0.0151
F8 + F9 sash jamb	0.1020	1.8506	0.1406	0.2601	0.0347	1.2760	0.0443
F10 + F11 mullion	0.1100	1.7966	0.1519	0.2729	0.0683	1.3220	0.0903
		Totals	0.5518	0.9996		Total	0.2449

Air Leakage loss:
Air leakage at 50 Pa per hour & per unit length of opening light (BS 6375-1) - **2DP**

					m³/(m·h)
Opening light length	3.7690	m	Total air leakage	0.000	m^3/h
L_{50}	0.00	$m^3/(m^2 \cdot h)$	Heat loss = 0.0165 L_{50}	0.00	W/(m²·K)

Solar Factor, g-value:

F_w	0.9
g_w	0.33

U_{window}		W/(m²·K)
	No bars; or attached bars	1.41
	Single cross bar in IGU	1.5
	Multiple cross bar in IGU	1.6
	Glazing bar (Georgian bar)	1.8

Other parameters needed for calculation, taken from simulations:

λ_p =	0.035	W/(m·K)	R_{se} =	0.04	·K /W	$d_p = d_g$ =	0.024 m
R_p =	0.6857	m²·K /W	R_{tot} =	0.8557	·K /W	R_{se} =	0.13 m²·K /W
						U_p =	1.1686 W/(m²·K)

BFRC Rating kWh/(m²·yr)	Label index	EWER Rating Scale	Window Rating
≥10	N/A	A+	N/A
0 to <10		A	
-10 to <0		B	
-20 to <-10		C	
-30 to <-20		D	
-50 to <-30		E	
-70 to <-50		F	

BFRC Rating =
218.6g_{window} - 68.5 x (U_{window} + Effective L_{50}) = **N/A**
Climate zone is: **UK**

Thermal transmittance, W/(m²·K)	U_{window}	1.4
Solar factor	g_{window}	0.33
Window air leakage heat loss, W/(m²·K)	L_{factor}	N/A

British Fenestration Rating Council

BFRC Certified Simulator 049

Simulator Name: Brendan Ruddy