

**Installation psi-value modelling of**

Ford Farm Windows

St Ive, Cornwall

for:

Rationel Windows (UK) Ltd  
Bicester, Oxon

29/07/2011

Year/Job Number: 2011 037

Written: KP

Checked: PW

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Passivhaus Trainers and Certifiers  
Associated with [warmhomes](#) development partnership

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## Introduction

WARM were commissioned to undertake a series of window installation psi value calculations by Rationel Windows (UK) Ltd, with the installation details being used on the Ford Farm scheme. This report provides a table of results for the window and door installation psi values modelled by WARM.

The outputs provided by WARM within this report are:

- Table of results
- Full results sheets including installation sketches and THERM images

Separately, Therm files of all installed frame types will be provided.

## Notes

Modelling was carried out using THERM 5.2.14 Finite Element Simulation software, developed by Lawrence Berkeley National Laboratory.

Window dimensions and material conductivities were provided by Rationel, with drawings in DWF format being used as the basis of the individual THERM files. The window installation drawings were provided by Mitchell Architects.

A 32mm homogeneous block (with a conductivity of 0.035W/mK) has been used in place of the 36mm triple glazed units which have been specified for Ford Farm. This does not have an impact on the installation psi value.

We have used THERM to model the door cills set both in walls (balcony) and in ground floors (ie normal entrance doors). In this latter case the detail interacts with the ground as well as the wall. We have therefore modelled this as a ground floor detail according to EN 13370. However, this has caused us some difficulty: THERM mesh has been unable to run with the standard 20 by 20m ground, meaning that we had to calculate the values using a 10m by 10m ground section, due to limitations within the THERM software. This is not in accordance with the convention for modelling thermal bridges in contact with the ground, as detailed in ISO 10211:2007 'Thermal Bridges in building Construction- Heat Flows and Surface Temperatures- Detailed Calculations'. We have checked this against a similar Passivhaus ground/wall junction in both 20 and 10m ground sections and found that the psi value changes were only in the third decimal place. We therefore declare taking a smaller earth section of 10 m to be acceptable solution in this case.

## Results

Assem- bly No.	Frame type	U <sub>f</sub> -Value	Thermal Bridge
		frame (averaged)	Ψ <sub>installation</sub> (averaged)
		W/(m <sup>2</sup> K)	W/(mK)
1	Rational Aldus Fixed	1.21	0.023
2	Rational Aldus Tilt & Turn (Plain Wall)	1.32	0.022
3	Rational Aldus Tilt & Turn (Ground Floor used as a door)	1.31	0.018
4	Rational Aldus Topguided	1.34	0.022
5	Rational Aldus Inward Opening Door (in Plain Wall eg balcony)	1.49	0.013
6	Rational Aldus Inward Opening Door (Ground Floor)	1.49	0.008

Summary of standard sizes used for averaging and individual psi calculation results:

Assem- bly No.	Frame type	standard window size for averaging		Individual U <sub>f</sub> -Values			Ψ <sub>installations</sub>		
		Height	Width	side	top	bottom	side	top	bottom
		m	m	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K)	W/(mK)	W/(mK)	W/(mK)
1	Rational Aldus Fixed	1.48	1.23	1.16	1.19	1.33	0.019	0.023	0.034
2	Rational Aldus Tilt & Turn (Plain Wall)	1.48	1.23	1.30	1.32	1.36	0.017	0.022	0.034
3	Rational Aldus Tilt & Turn (Ground Floor used as a door)	2.10	0.90	1.30	1.32	1.36	0.017	0.022	0.018
4	Rational Aldus Topguided	1.48	1.23	1.33	1.26	1.44	0.018	0.022	0.033
5	Rational Aldus Inward Opening Door (in Plain Wall eg balcony)	2.10	0.90	1.51	1.37	1.50	0.009	0.011	0.032
6	Rational Aldus Inward Opening Door (Ground Floor)	2.10	0.90	1.51	1.37	1.50	0.009	0.011	0.001

The standard sizes used for averaging affect the proportion of cill, jamb and head, which is used to average both the Frame U value (U<sub>f</sub>) and the installation psi value. These values have been taken as the standard EN size for windows of 1.48 m by 1.23 m, whilst for doors we have assumed a standard size of 2.1 m high by 0.9 m wide.

# Fixed Window Jamb Head and Cill

## Jamb

Sketch

Sketch installed

Psi calculation

Therm report outputs

## Head

Sketch installed

Psi calculation

Therm report outputs

## Cill

Sketch installed

Psi calculation

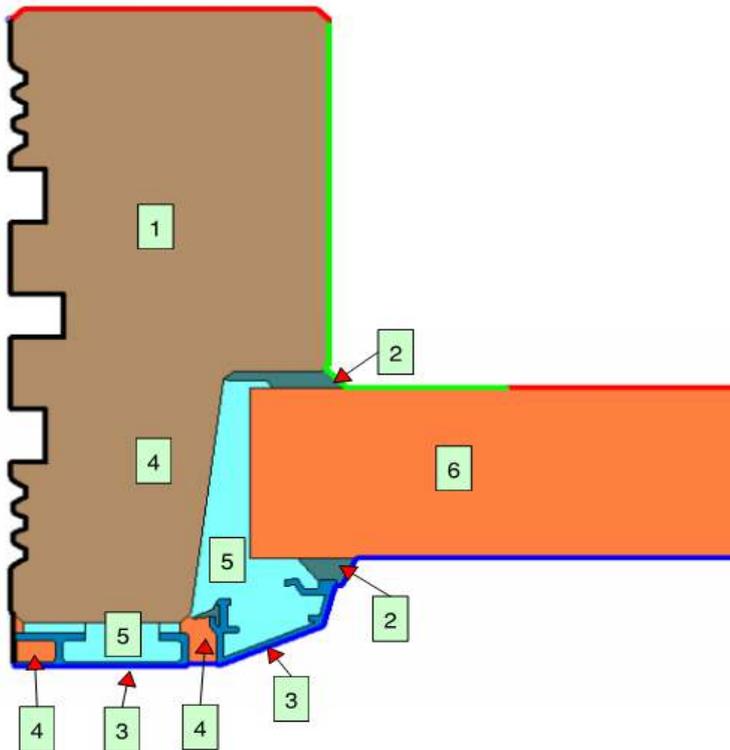
Therm report outputs

Aldus Window

Materials

- 1 Timber 0.13W/mK
- 2 EPDM Seal 0.25W/mK
- 3 Painted Aluminium 160W/mK
- 4 CEN Frame Cavity Slightly Ventilated
- 5 CEN Frame Cavity Unventilated
- 6 Glazing replaced by equivalent thickness of material at 0.035W/mK

Therm model generated from DXF file provided by Rational



Boundary Conditions

External

— Resistance 0.04m<sup>2</sup>K/W Temperature 0C

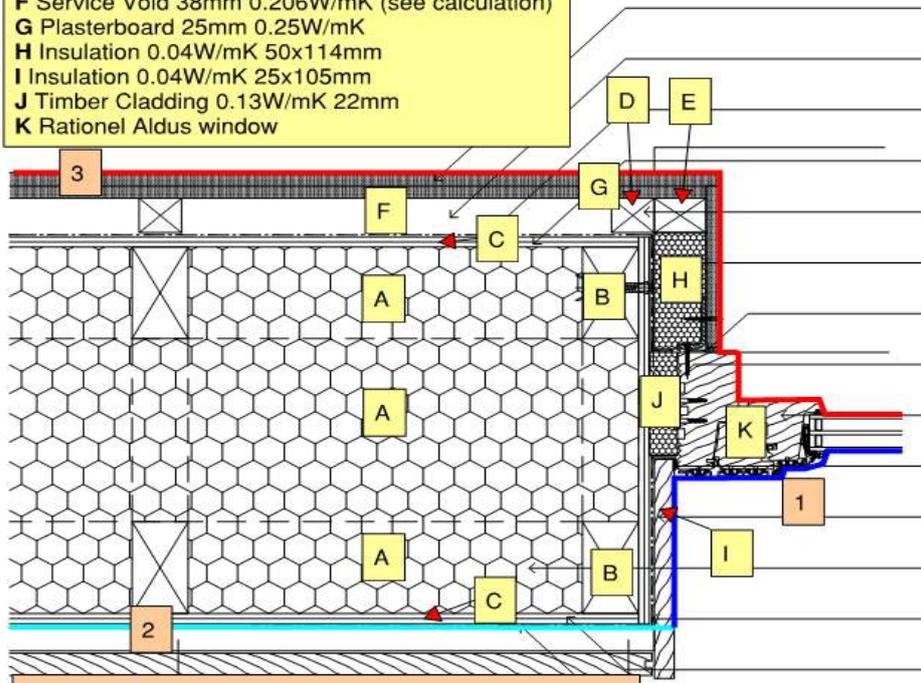
Internal

— Resistance 0.13m<sup>2</sup>K/W Temperature 20C

— Resistance 0.2m<sup>2</sup>K/W 20C

Defined as per EN ISO 10077-2 2003

- Materials**
- A Insulation 0.035W/mK
  - B Softwood 0.13W/mK 38x89mm
  - C OSB 0.13W/mK 9mm
  - D Softwood 0.13W/mK 38x38mm
  - E Softwood 0.13W/mK 38x50mm
  - F Service Void 38mm 0.206W/mK (see calculation)
  - G Plasterboard 25mm 0.25W/mK
  - H Insulation 0.04W/mK 50x114mm
  - I Insulation 0.04W/mK 25x105mm
  - J Timber Cladding 0.13W/mK 22mm
  - K Rational Aldus window



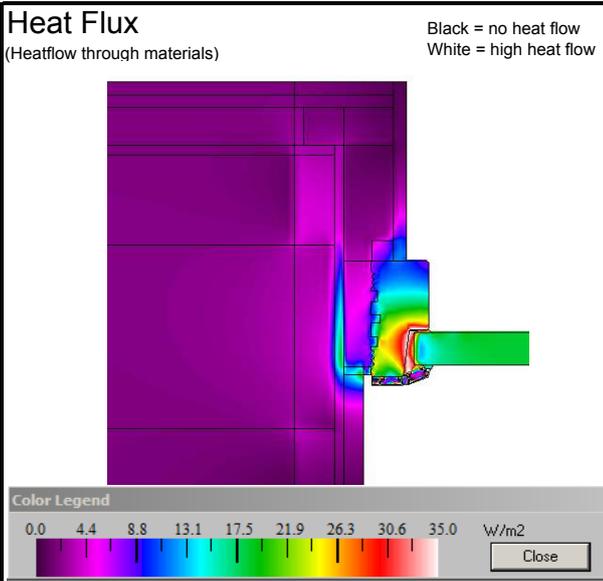
- Boundary Conditions**
- 1 External  
Resistance 0.04m<sup>2</sup>K/W Temperature 0C
  - 2 External Resistance 0.13m<sup>2</sup>K/W Temp 0C (Sheltered)
  - 3 Internal Resistance 0.13 Temperature 20C  
and increased resistance 0.2m<sup>2</sup>K/W as per EN ISO 10077-2 2003

Secondary Calculation: Equivalent Thermal Conductivity of Still Air Spaces

Air Layer Thickness:	38	mm	$h_u$	1.25	W/(m <sup>2</sup> K)	$\lambda$	0.206	W/(mK)
Direction of Heat Flow:	x	Horizontal	$h_v$	4.17	W/(m <sup>2</sup> K)			
(check only one field):		Downwards						

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Software: Therm 5.2 Date: 27/07/2011  
 Job Name: Rational Psi values Job No: 2011 037  
 Tab name: Window (Uf & PSInst) Completed by: KP  
 Descr: Fixed Jamb Checked by: PW



Data column	Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	16	Frame+Ins.	Internal			0.2415
T	16	Wall	Internal	1000.00	0.0912	
U	16	Wall+Frame	Internal			0.3583

Uframe for EN 10077-2 Window Calc.

dimension	U-value	heat flow
mm	W/m2K	W/mK
L2D with insulation replacing glazing		0.2415
Insulation thickness	32	0.922
visible width	190	0.1752
Frame width	57.048	
<b>U Frame ( W/m2K)</b>		<b>1.162</b>

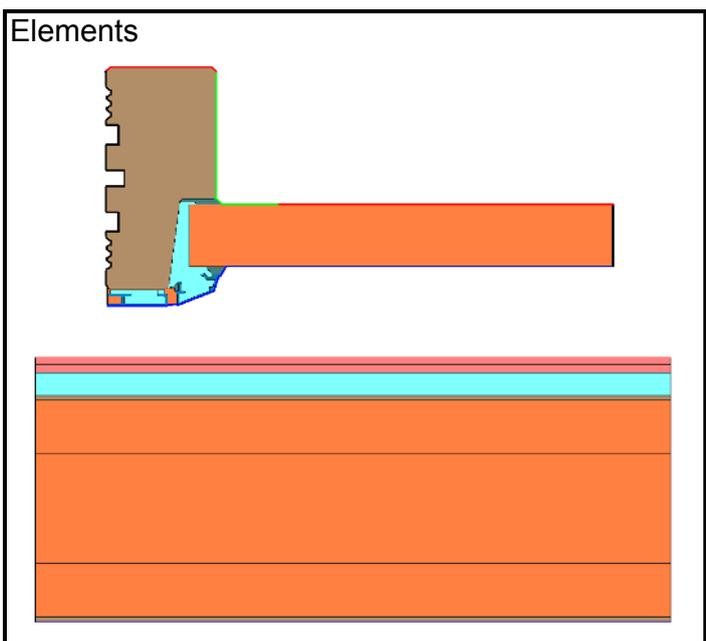
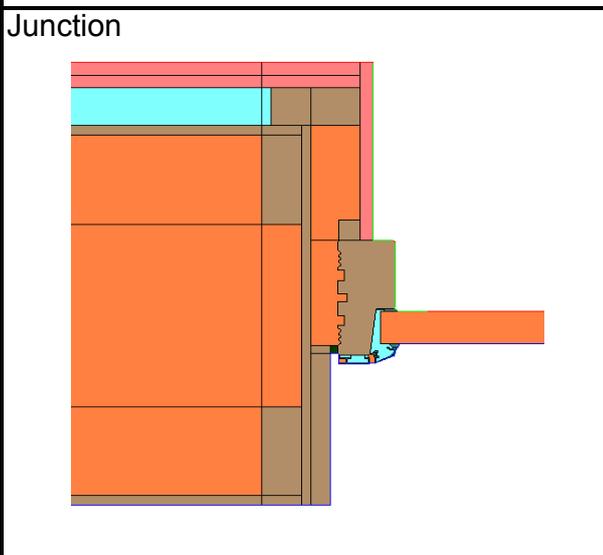
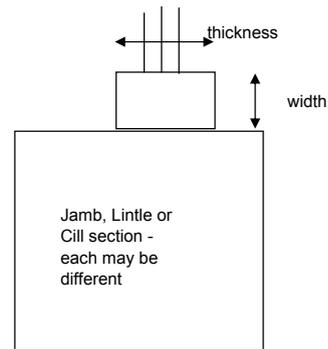
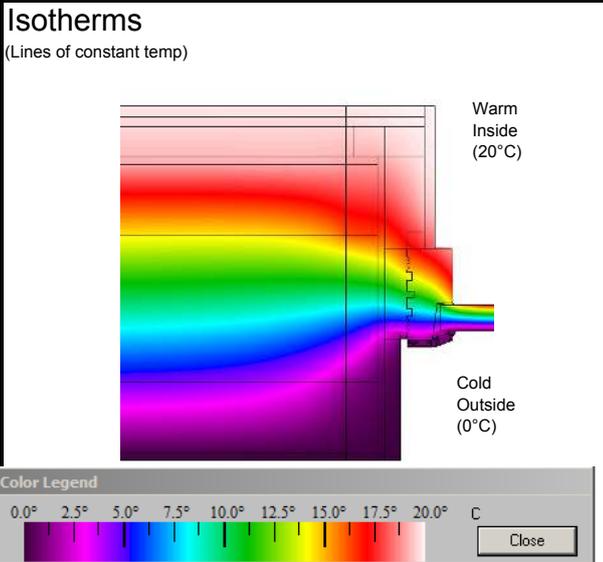
U - value calculation for data row Wall

Check surface resistances correct	y
Check total length correct	y
<b>Modelling U Value ( W/m2K)</b>	
<b>0.091</b>	

Psi Window Installation according to Pa

dimension	U-value	heat flow
mm	W/m2K	W/mK
Wall and Frame with insulated panel		0.3583
Frame and Insulated panel		0.2415
Wall	1072	0.091
<b>Installation Psi</b>		<b>0.019 W/mK</b>

Error in calculation: From them report - worst cell 5.9 %



Therm Version 5.2 (5.2.14)  
 Date: Wed May 11 13:49:21 2011

Therm Version 5.2 (5.2.14)  
 Date: Mon Jun 27 11:30:44 2011

Therm Version 5.2 (5.2.14)  
 Date: Mon Jun 27 11:49:03 2011

Created by:  
 Created for:

Created by:  
 Created for:

Created by:  
 Created for:

Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational PS Underlay Name: Z:\01 WARM\01 Jobs\2011 037 Rational PS

Cross Section Type: Sill  
 Underlay Name: Z:\01 WARM\01 Jobs\2011 037 Rational PS

Cross Section Type: Sill  
 Underlay Name:

Cross Section Type: Sill  
 Underlay Name:

U-factors

U-factors

U-factors

Name	Length mm	Basis	U-factor W/m2-K
Internal	1000.00	Custom	0.2415
External	248.08	Projected X	0.9735

Name	Length mm	Basis	U-factor W/m2-K
Internal	1000.00	Total Length	0.0912
External	1000.00	Total Length	0.0912

Name	Length mm	Basis	U-factor W/m2-K
Internal	1000.00	Custom	0.3583
External	1320.59	Projected X	0.2713

Solid Materials

Solid Materials

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Aluminum Painted	160.00	0.20
CEN EPDM	0.25	0.90

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Ford Farm Wall Horizontal kp1:3		
8mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Aluminum Painted	160.00	0.20
CEN EPDM	0.25	0.90
FixedvJamb Install:38mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90
AA INS k040	0.04	0.90
Foam Weatherstripping*	0.03	0.90

Cavities

Cavities

Cavities

Name: CEN frame cavity unventilated  
 Gas Fill: Air  
 Convection Model: CEN  
 Radiation Model: Standard

None

Name: CEN frame cavity unventilated  
 Gas Fill: Air  
 Convection Model: CEN  
 Radiation Model: Standard

Poly Heat ID Flow Dir	Side 1 Temp C	Side 2 Temp C	Dimension mm	N None	Height mm
14 Down	15.00	0.90	5.00	0.90	3.61 1.96
17 Down	15.00	0.90	5.00	0.90	10.43 1.96
21 Down	15.00	0.90	5.00	0.90	18.16 6.61
7 Down	15.00	0.90	5.00	0.90	14.76 33.49

Name	Temperature C	Film Coefficient W/m2-K
AA External Protected 0.13 OC	0.00	7.690
AA Interior Horizontal R0.13 2 OC	20.00	7.690

Poly Heat ID Flow Dir	Side 1 Temp C	Side 2 Temp C	Dimension mm	N None	Height mm
96 Down	15.00	0.90	5.00	0.90	3.61 1.96
95 Down	15.00	0.90	5.00	0.90	10.43 1.96
94 Down	15.00	0.90	5.00	0.90	18.16 6.61
92 Down	15.00	0.90	5.00	0.90	14.76 33.49

Name: CEN frame cavity slightly ventilated  
 Gas Fill: Air  
 Convection Model: CEN Ventilated  
 Radiation Model: Standard

None

Name: CEN frame cavity slightly ventilated

Gas Fill: Air  
 Convection Model: CEN Ventilated  
 Radiation Model: Standard

Poly Heat ID Flow Dir	Side 1 Temp C	Side 2 Temp C	Dimension mm	Nu	Keff	Cavity
25 Down	15.00	0.90	5.00	0.90	5.20 8.04	Mesh Parameter : 6
9 Down	15.00	0.90	5.00	0.90	6.53 3.81	Estimated Error: 5.1e-006%
20 Down	15.00	0.90	5.00	0.90	0.47 4.58	Calculations done in Version 5.2 (5.2.14)
24 Down	15.00	0.90	5.00	0.90	1.25 3.32	N/A 0.0679 N/A

Poly Heat ID Flow Dir	Side 1 Temp C	Side 2 Temp C	Dimension mm	Nu	Keff	Cavity
93 Down	15.00	0.90	5.00	0.90	5.20 8.04	
91 Down	15.00	0.90	5.00	0.90	6.53 3.81	
90 Down	15.00	0.90	5.00	0.90	0.47 4.58	
89 Down	15.00	0.90	5.00	0.90	1.25 3.32	

Glazing Systems

Glazing Systems

Glazing Systems

None

None

None

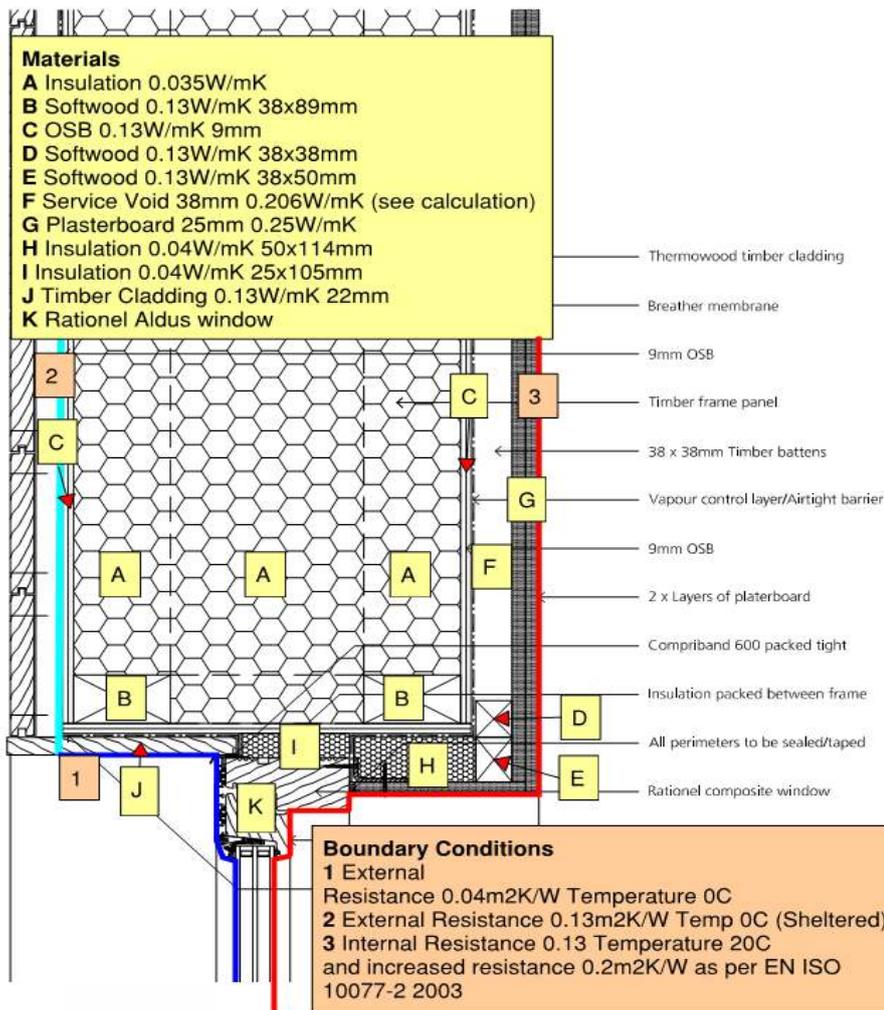
Standard Boundary Conditions

Standard Boundary Conditions

Name	Temperature C	Film Coefficient W/m2-K
AA External R0.04 OC	0.00	25.000
AA Interior Horizontal R0.13 2 OC	20.00	7.690
AA Internalhorizreducedrad R0.2 20C	20.00	5.000

Name	Temperature C	Film Coefficient W/m2-K
AA External protected 0.13 OC	0.00	7.690
AA External R0.04 OC	0.00	25.000
AA Interior Horizontal R0.13 2 OC	20.00	7.690
AA Internalhorizreducedrad R0.2 20C	20.00	5.000

Calculation Specifications

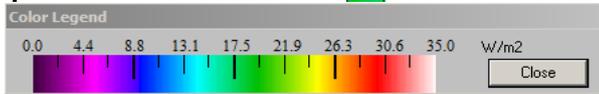
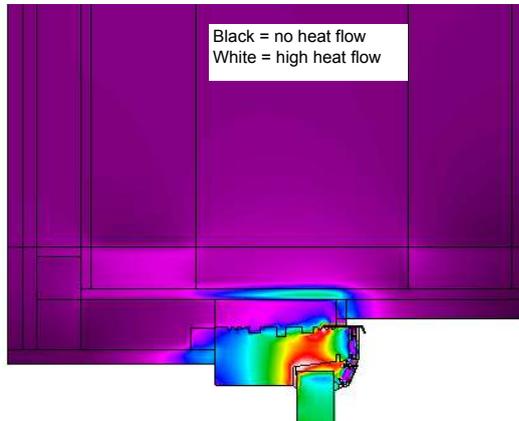


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Software: Therm 5.2	Date: 27.06.11
Job Name: Rational psi values	Job No: 2011 037
Tab name: Window (Uf & PSIinst)	Completed by: KP
Descr: Fixed Head	Checked by: PW

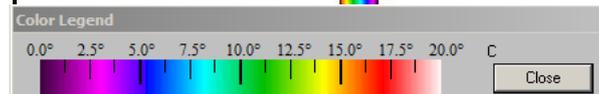
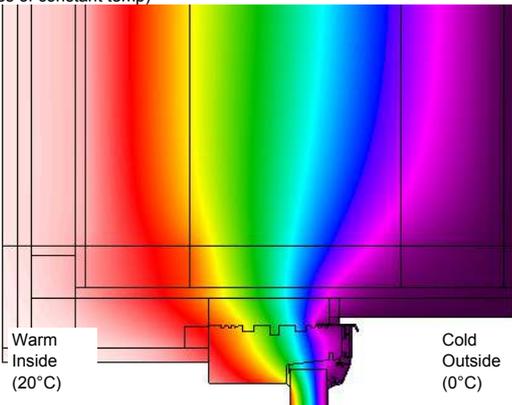
**Heat Flux**

(Heatflow through materials)

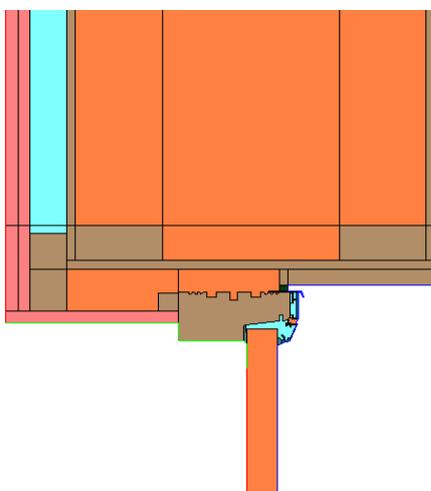


**Isotherms**

(Lines of constant temp)



**Junction**



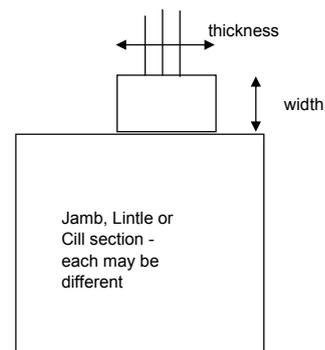
Data column	Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	16	Frame+Ins.	External			0.2432
T	16	Wall	Internal	1000.00	0.0912	
U	16	Wall+Frame	Internal			0.3640

Uframe for EN 10077-2 Window Calc.		dimension	U-value	heat flow
		mm	W/m2K	W/mK
L2D with insulation replacing glazing				0.2432
Insulation	thickness	32	0.922	
	visible width	190		0.1752
Frame	width	57.048		
<b>U Frame ( W/m2K)</b>				<b>1.191</b>

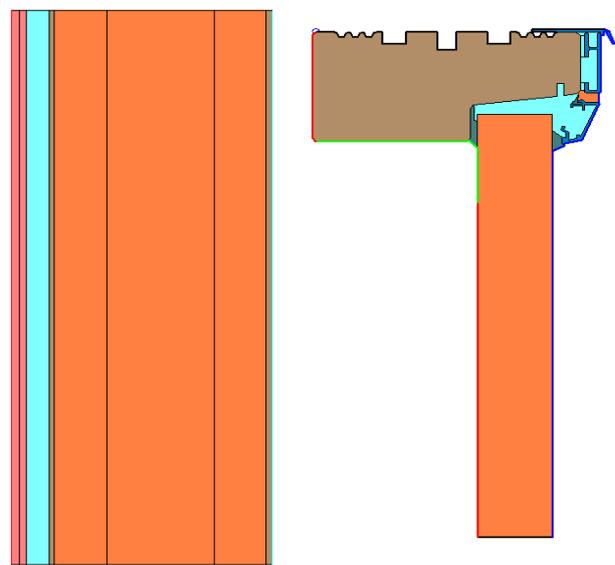
U - value calculation for data row		Wall
Check surface resistances correct		y
Check total length correct		y
<b>Modelling U Value ( W/m2K)</b>		<b>0.091</b>

Psi Window Installation according to Pa		dimension	U-value	heat flow
		mm	W/m2K	W/mK
Wall and Frame with insulated panel				0.3640
Frame and Insulated panel				0.2432
Wall		1072	0.091	0.0978
<b>Installation Psi</b>				<b>0.023 W/mK</b>

Error in calculation:	From them report - worst cell	6.1 %
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**Elements**



Therm Version 5.2 (5.2.14)  
Date: Wed May 11 15:18:08 2011

Therm Version 5.2 (5.2.14)  
Date: Mon Jun 27 11:30:44 2011

Therm Version 5.2 (5.2.14)  
Date: Mon Jun 27 11:47:36 2011

Created by:  
Created for:

Created by:  
Created for:

Created by:  
Created for:

Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P  
Cross Section Type: Sill  
Underlay Name:

Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P  
Cross Section Type: Sill  
Underlay Name:

Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational PS  
Cross Section Type: Sill  
Underlay Name:

U-factors

U-factors

U-factors

Name	Length mm	Basis	U-factor W/m2-K
External	1000.00	Custom	0.2432
Internal	70.97	Projected X	3.4270

Name	Length mm	Basis	U-factor W/m2-K
Internal	1000.00	Total Length	0.0912
External	1000.00	Total Length	0.0912

Name	Length mm	Basis	U-factor W/m2-K
Internal	1566.28	Total Length	0.2324
External	1511.96	Total Length	0.2408

Solid Materials

Solid Materials

Solid Materials

Name	Conductivity W/m-K	Emissivity
Aluminum Painted	160.00	0.20
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
CEN EPDM	0.25	0.90

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Ford Farm Wall Horizontal kp1:3		
8mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90

Name	Conductivity W/m-K	Emissivity
Aluminum Painted	160.00	0.20
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
CEN EPDM	0.25	0.90
Fixed Head Install:38mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90
AA INS k040	0.04	0.90
Foam Weatherstripping*	0.03	0.90

Cavities

Cavities

Cavities

Name: CEN frame cavity unventilated  
Gas Fill: Air  
Convection Model: CEN  
Radiation Model: Standard

None

Name: CEN frame cavity unventilated  
Gas Fill: Air  
Convection Model: CEN  
Radiation Model: Standard

Poly Heat	Side 1	Side 2	Dimension	N	None
ID Flow	Temp	Emis	Temp	Emis	Horz. Vert. #
Dir	C	C	mm	mm	W/m-K mm
Standard Boundary Conditions					
14 Horizontal	15.00	0.90	5.00	0.90	1.96 10.43 N/A 0.0327 N/A
15 Horizontal	15.00	0.90	5.00	0.90	1.96 3.61
17 Horizontal	15.00	0.90	5.00	0.90	6.61 18.16
10 Horizontal	15.00	0.90	5.00	0.90	7.12 5.13
20 Horizontal	15.00	0.90	5.00	0.90	31.16 16.43
Name: CEN frame cavity slightly ventilated					
Gas Fill: Air					
Convection Model: CEN Ventilated					
Radiation Model: Standard					
Calculation Specifications					
Mesh Parameter : 6					
Estimated Error: 5.1e-006%					
Calculations done in Version 5.2 (5.2.14)					

Poly Heat	Side 1	Side 2	Dimension	N
ID Flow	Temp	Emis	Temp	Emis
Dir	C	C	mm	mm
155 Up	15.00	0.90	5.00	0.90
154 Up	15.00	0.90	5.00	0.90
153 Up	15.00	0.90	5.00	0.90
152 Up	15.00	0.90	5.00	0.90
151 Up	15.00	0.90	5.00	0.90

Poly Heat	Side 1	Side 2	Dimension	N	Calculation Specifications
ID Flow	Temp	Emis	Temp	Emis	Horz. Vert. #
Dir	C	C	mm	mm	W/m-K mm

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

26 Horizontal	15.00	0.90	5.00	0.90	8.04 5.20
---------------	-------	------	------	------	-----------

Poly Heat	Side 1	Side 2	Dimension	N
ID Flow	Temp	Emis	Temp	Emis
Dir	C	C	mm	mm
150 Up	15.00	0.90	5.00	0.90

Glazing Systems

Glazing Systems

Glazing Systems

None

None

None

Standard Boundary Conditions

Standard Boundary Conditions

Name	Temperature C	Film Coefficient W/m2-K
AA External R0.04 0C	0.00	25.000
AA Interior Horizontal R0.13 2 0C	20.00	7.690
AA Internalhorizreducedrad R0.2 20C	20.00	5.000

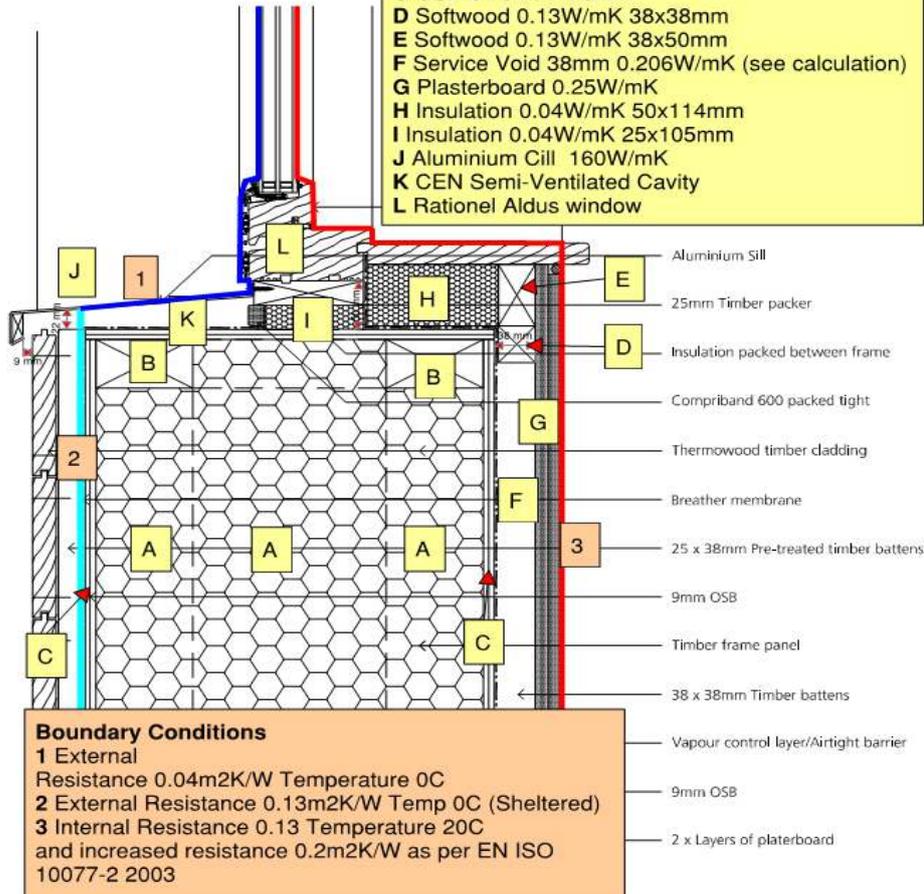
Name	Temperature C	Film Coefficient W/m2-K
AA External R0.04 0C	0.00	25.000
AA Interior Horizontal R0.13 2 0C	20.00	7.690
AA Internalhorizreducedrad R0.2 2 20C	20.00	5.000
AA External protected 0.13 0C	0.00	7.690

Calculation Specifications

Mesh Parameter : 6

F - Window Sill Detail [Timber Clad]  
 Scale = 1:5 [Base ref: 365]

- Materials**
- A Insulation 0.035W/mK
  - B Softwood 0.13W/mK 38x89mm
  - C OSB 0.13W/mK 9mm
  - D Softwood 0.13W/mK 38x38mm
  - E Softwood 0.13W/mK 38x50mm
  - F Service Void 38mm 0.206W/mK (see calculation)
  - G Plasterboard 0.25W/mK
  - H Insulation 0.04W/mK 50x114mm
  - I Insulation 0.04W/mK 25x105mm
  - J Aluminium Cill 160W/mK
  - K CEN Semi-Ventilated Cavity
  - L Rational Aldus window

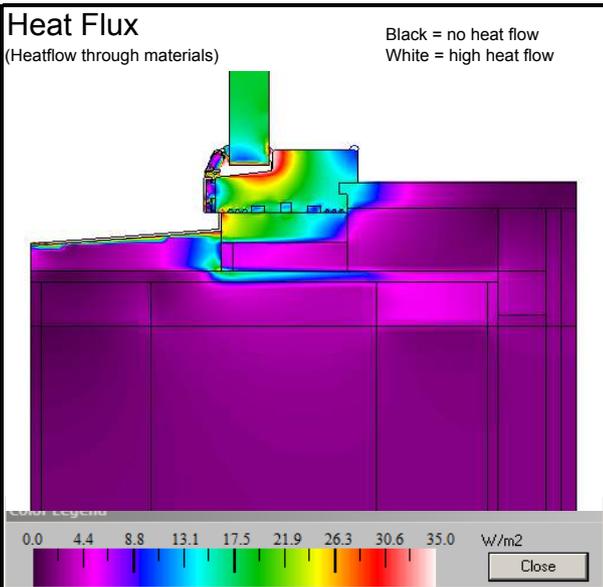


Secondary Calculation: Equivalent Thermal Conductivity of Still Air Spaces

Air Layer Thickness	38	mm		
Direction of		Upwards	$h_a$	1.25 W/(m <sup>2</sup> K)
Heat Flow	x	Horizontal	$h_r$	4.17 W/(m <sup>2</sup> K)
(check only one field)		Downwards		
			$\lambda$	0.206 W/(mK)

**WARM: Low Energy Building Practice**  
 7 The Crescent, Plymouth PL1 3AB - 01752 542 546 - www.peterwarm.co.uk

Software: Therm 5.2 Date: 01/06/2011  
 Job Name: Rational Psi values Job No: 2011 037  
 Tab name: Window (Uf & PSInst) Completed by: KP  
 Descr: Fixed Cill Checked by: PW



Data column	Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	16	Frame+Ins.	External			0.2530
T	16	Wall	Internal	1000.00	0.0912	
U	16	Wall+Frame	External			0.3871

Uframe for EN 10077-2 Window Calc. dimension U-value heat flow  
 mm W/m2K W/mK

L2D with insulation replacing glazing				0.2530
Insulation	thickness	32	0.922	
	visible width	190		0.1752
Frame	width	58.309		
<b>U Frame ( W/m2K)</b>				<b>1.334</b>

U - value calculation for data row Wall

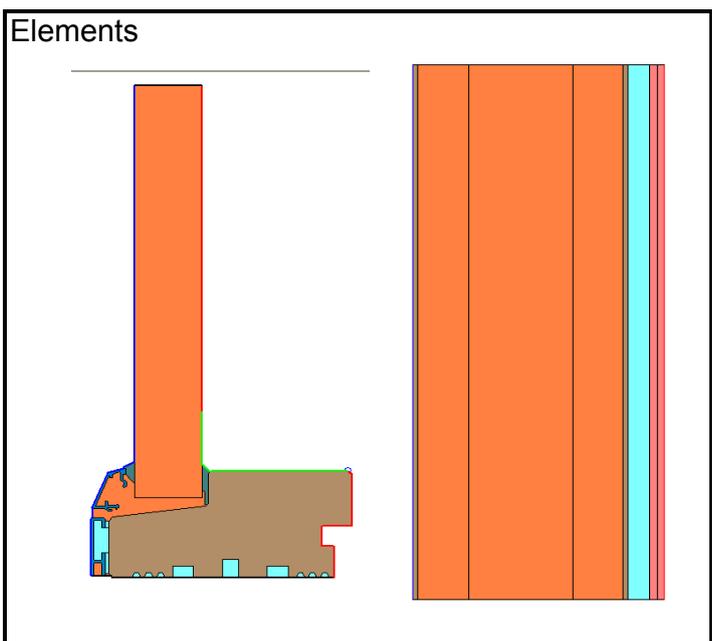
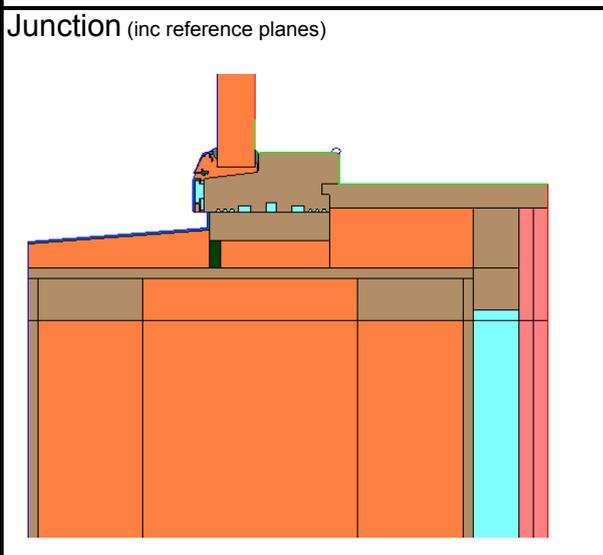
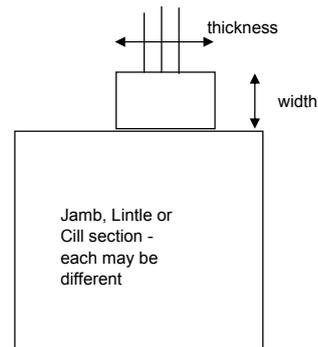
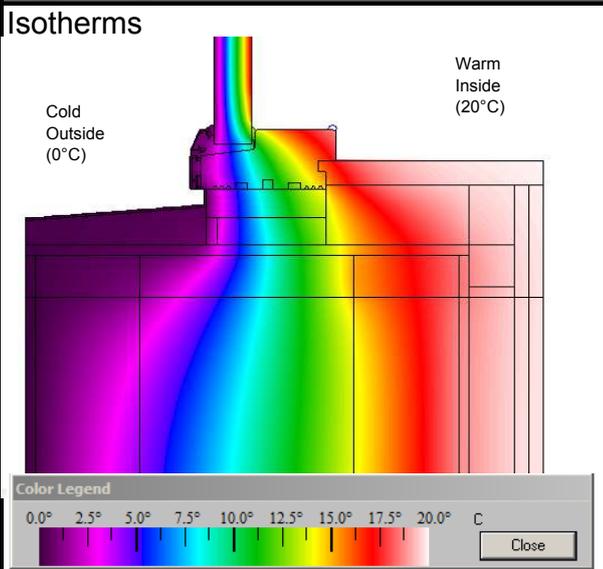
Check surface resistances correct y  
 Check total length correct y

**Modelling U Value ( W/m2K) 0.091**

Psi Window Installation according to Pa dimension U-value heat flow  
 mm W/m2K W/mK

Wall and Frame with insulated panel				0.3871
Frame and Insulated panel				0.2530
Wall	1097	0.091		0.1000
<b>Installation Psi</b>				<b>0.034 W/mK</b>

Error in calculation: From them report - worst cell 5 %



<b>Therm Version 5.2 (5.2.14)</b>	Therm Version 5.2 (5.2.14)	Therm Version 5.2 (5.2.14)
Date: Wed Jun 01 15:51:34 2011	Date: Mon Jun 27 11:36:51 2011	Date: Mon Jun 27 11:36:05 2011
Created by:	Created by:	Created by:
Created for:	Created for:	Created for:

Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P; Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P; Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational PS  
 Cross Section Type: Sill Cross Section Type: Sill Cross Section Type: Sill  
 Underlay Name: Underlay Name: Underlay Name:

U-factors

Name	Length mm	Basis	U-factor W/m2-K
External	1000.00	Custom	0.2530
Internal	70.96	Projected X	3.5654

U-factors

Name	Length mm	Basis	U-factor W/m2-K
Internal	1000.00	Total Length	0.0912
External	1000.00	Total Length	0.0912

U-factors

Name	Length mm	Basis	U-factor W/m2-K
External	1507.28	Total Length	0.2568
Internal	1591.71	Total Length	0.2431

Solid Materials

Name	Conductivity W/m-K	Emissivity
Aluminum Painted	160.00	0.20
AA INS k035	0.04	0.90
CEN EPDM	0.25	0.90
AA TIM General Timber	0.13	0.90

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Ford Farm Wall Vertical kp1:38		
mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90

Solid Materials

Name	Conductivity W/m-K	Emissivity
Aluminum Painted	160.00	0.20
AA INS k035	0.04	0.90
CEN EPDM	0.25	0.90
AA TIM General Timber	0.13	0.90
Fixed Cill Install kp1:38mm S		
ervice Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90
AA INS k040	0.04	0.90
Foam Weatherstripping*	0.03	0.90

Cavities

Name: CEN frame cavity unventilated  
 Gas Fill: Air  
 Convection Model: CEN  
 Radiation Model: Standard

Cavities

None

Glazing Systems

Poly Heat	Side 1	Side 2	Dimension	N	None
ID Flow	Temp	Emis	Temp	Emis	Horz. Vert. #
Dir	C	C	mm	mm	W/m-K mm
Standard Boundary Conditions					
60 Horizontal	15.00	0.90	5.00	0.90	2.00 10.44 N/A 0.0328 N/A
58 Horizontal	15.00	0.90	5.00	0.90	2.00 3.57 Name
57 Horizontal	15.00	0.90	5.00	0.90	10.00 6.00 C
59 Horizontal	15.00	0.90	5.00	0.90	13.29 1.92 Temperature Film Coefficient
73 Horizontal	15.00	0.90	5.00	0.90	13.29 1.92 AA Interior Horizontal R0.13 2
72 Horizontal	15.00	0.90	5.00	0.90	8.00 9.00 OC 20.00 7.690
71 Horizontal	15.00	0.90	5.00	0.90	10.00 6.00 AA External Protected 0.13 OC 0.00 7.690
76 Horizontal	15.00	0.90	5.00	0.90	6.64 18.15 N/A 0.0494 N/A

Name: CEN frame cavity unventilated  
 Gas Fill: Air  
 Convection Model: CEN  
 Radiation Model: Standard

Poly Heat	Side 1	Side 2	Dimension	N
ID Flow	Temp	Emis	Temp	Emis
Dir	C	C	mm	mm
60 Horizontal	15.00	0.90	5.00	0.90
58 Horizontal	15.00	0.90	5.00	0.90
55 Horizontal	15.00	0.90	5.00	0.90
57 Horizontal	15.00	0.90	5.00	0.90
59 Horizontal	15.00	0.90	5.00	0.90
73 Horizontal	15.00	0.90	5.00	0.90
72 Horizontal	15.00	0.90	5.00	0.90
71 Horizontal	15.00	0.90	5.00	0.90

Name: CEN frame cavity slightly ventilated  
 Gas Fill: Air

Convection Model: CEN Ventilated  
 Radiation Model: Standard

Calculation Specifications

Poly Heat	Side 1	Side 2	Dimension	N	Mesh Parameter : 6
ID Flow	Temp	Emis	Temp	Emis	Horz. Ver
Dir	C	C	mm	mm	W/n Calculations done in Version 5.2 (5.2.14)
46 Horizontal	15.00	0.90	5.00	0.90	4.30 6.29 N/A 0.0789 N/A
45 Horizontal	15.00	0.90	5.00	0.90	3.22 1.25 N/A 0.0674 N/A
44 Horizontal	15.00	0.90	5.00	0.90	34.53 15.65 N/A 0.2991 N/A

Name: CEN frame cavity slightly ventilated  
 Gas Fill: Air  
 Convection Model: CEN Ventilated  
 Radiation Model: Standard

Poly Heat	Side 1	Side 2	Dimension	N
ID Flow	Temp	Emis	Temp	Emis
Dir	C	C	mm	mm
46 Horizontal	15.00	0.90	5.00	0.90
45 Horizontal	15.00	0.90	5.00	0.90
44 Horizontal	15.00	0.90	5.00	0.90
41 Horizontal	15.00	0.90	5.00	0.90

Glazing Systems

None

Standard Boundary Conditions

Name	Temperature C	Film Coefficient W/m2-K
AA Interior Horizontal R0.13 2		
OC	20.00	7.690
AA Internalthorizedrad R0.2 20C	20.00	5.000
AA External R0.04 OC	0.00	25.000

Glazing Systems

None

Standard Boundary Conditions

Name	Temperature C	Film Coefficient W/m2-K
AA Interior Horizontal R0.13 2		
OC	20.00	7.690

# Topguided Window Jamb Head and Cill

## Jamb

Sketch

Sketch installed

Psi calculation

Therm report outputs

## Head

Sketch installed

Psi calculation

Therm report outputs

## Cill

Sketch installed

Psi calculation

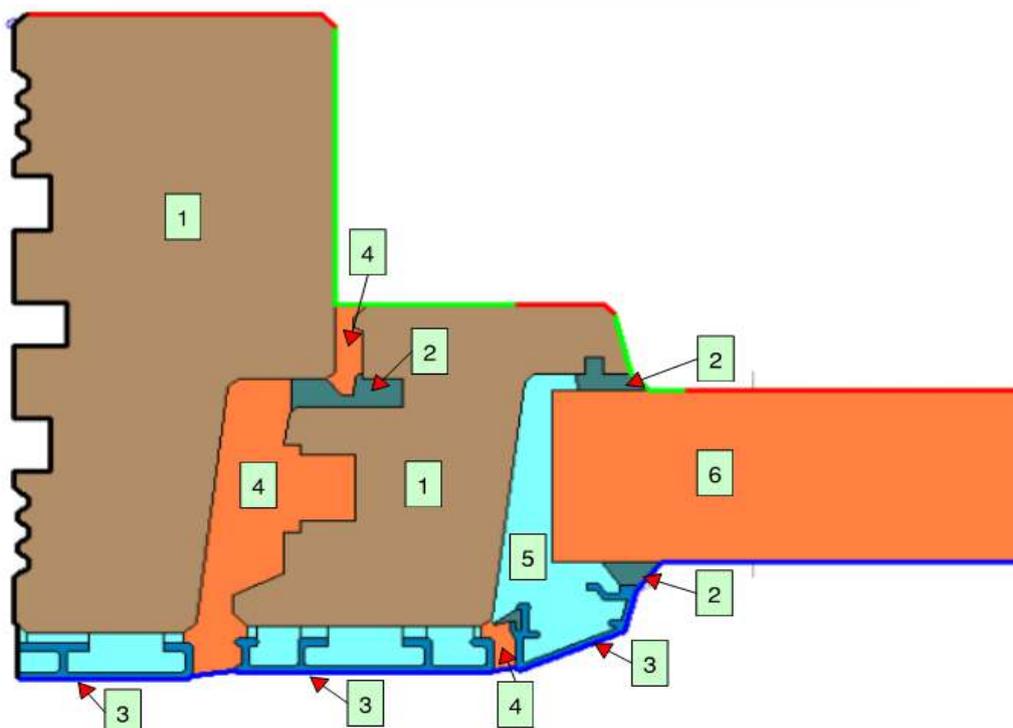
Therm report outputs

Aldus Window

Materials

- 1 Timber 0.13W/mK
- 2 EPDM Seal 0.25W/mK
- 3 Painted Aluminium 160W/mK
- 4 CEN Frame Cavity Slightly Ventilated
- 5 CEN Frame Cavity Unventilated
- 6 Glazing replaced by equivalent thickness of material at 0.035W/mK

Therm model generated from DXF file provided by Rationel



Boundary Conditions

External

— Resistance 0.04m2K/W Temperature 0C

Internal

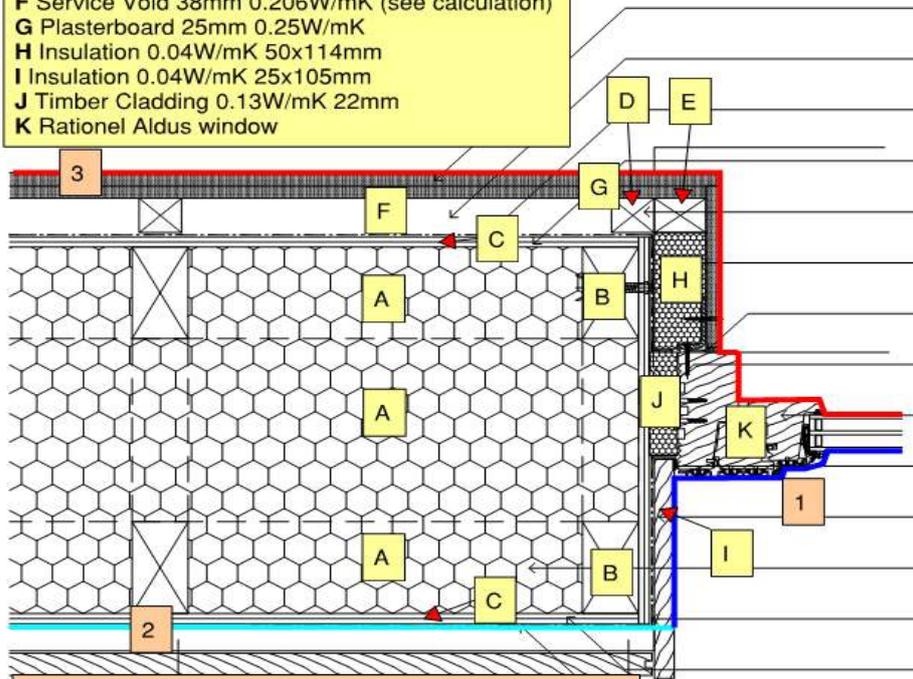
— Resistance 0.13m2K/W Temperature 20C

— Resistance 0.2m2K/W 20C

Defined as per EN ISO 10077-2 2003

**Materials**

- A** Insulation 0.035W/mK
- B** Softwood 0.13W/mK 38x89mm
- C** OSB 0.13W/mK 9mm
- D** Softwood 0.13W/mK 38x38mm
- E** Softwood 0.13W/mK 38x50mm
- F** Service Void 38mm 0.206W/mK (see calculation)
- G** Plasterboard 25mm 0.25W/mK
- H** Insulation 0.04W/mK 50x114mm
- I** Insulation 0.04W/mK 25x105mm
- J** Timber Cladding 0.13W/mK 22mm
- K** Rational Aldus window



**Boundary Conditions**

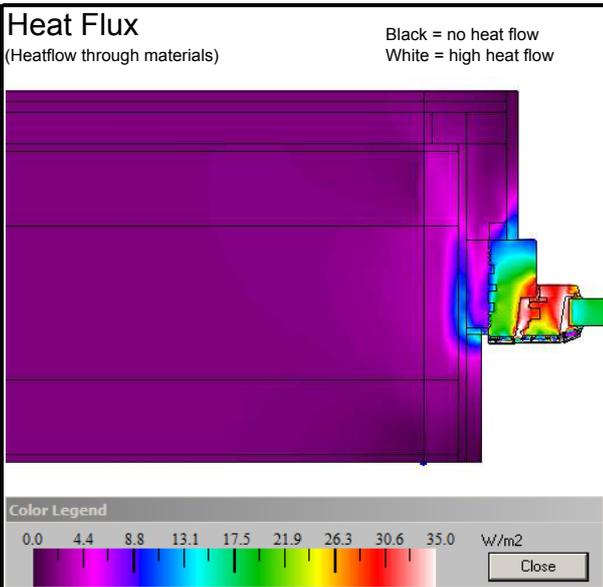
- 1** External  
Resistance 0.04m<sup>2</sup>K/W Temperature 0C
- 2** External Resistance 0.13m<sup>2</sup>K/W Temp 0C (Sheltered)
- 3** Internal Resistance 0.13 Temperature 20C  
and increased resistance 0.2m<sup>2</sup>K/W as per EN ISO 10077-2 2003

Secondary Calculation: Equivalent Thermal Conductivity of Still Air Spaces

Air Layer Thickness:	38	mm		
Direction of Heat Flow:	x	Horizontal	$h_u$	1.25 W/(m <sup>2</sup> K)
(check only one field):		Downwards	$h_v$	4.17 W/(m <sup>2</sup> K)
			$\lambda$	0.206 W/(mK)

**WARM: Low Energy Building Practice**  
 7 The Crescent, Plymouth PL1 3AB - 01752 542 546 - www.peterwarm.co.uk

Software: Therm 5.2 Date: 04/05/2011  
 Job Name: Rational Installation Psi Values Job No: 2011 037  
 Tab name: Window (no glass) Completed by: KP  
 Descrpt: TopGuided Jamb Checked by: PW



Data column	Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	16	Frame+Ins.	Internal			0.3197
T	16	Wall	Internal	1000.00	0.0912	
U	16	Wall+Frame	Internal			0.4353

Uframe for EN 10077-2 Window Calc. dimension U-value heat flow  
 mm W/m2K W/mK

L2D with insulation replacing glazing				0.3197
Insulation	thickness	32	0.922	
	visible width	190		0.1752
Frame	width	108.74		
<b>U Frame ( W/m2K)</b>				<b>1.329</b>

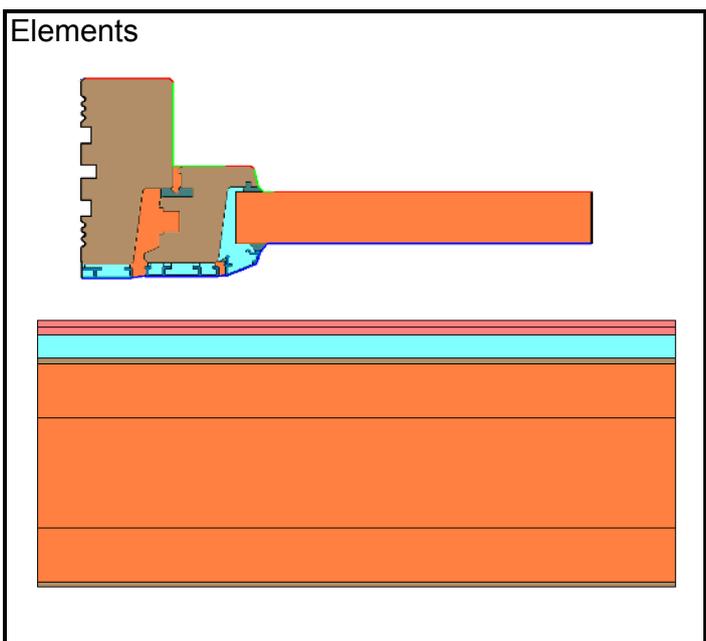
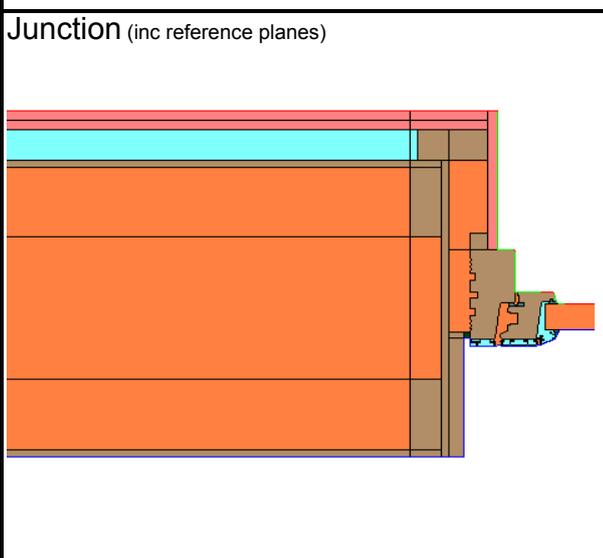
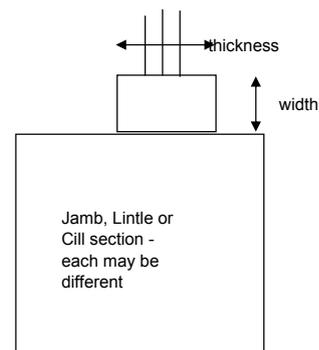
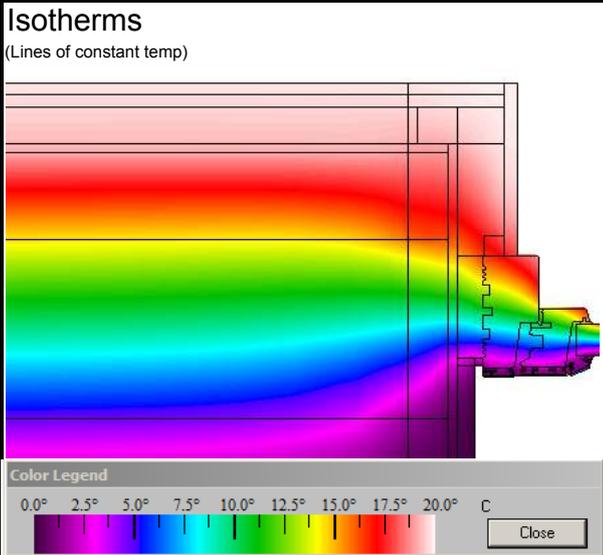
U - value calculation for data row Wall

Check surface resistances correct	y
Check total length correct	y
<b>Modelling U Value ( W/m2K)</b>	
<b>0.091</b>	

Psi Window Installation according to Pa dimension U-value heat flow  
 mm W/m2K W/mK

Wall and Frame with insulated panel				0.4353
Frame and Insulated panel				0.3197
Wall	1072	0.091		0.0978
<b>Installation Psi</b>				<b>0.018 W/mK</b>

Error in calculation: From them report - worst cell **6.9 %**



<b>Therm Version 5.2 (5.2.14)</b> Date: Wed Jul 20 11:55:07 2011 Created by: Created for:	<b>Therm Version 5.2 (5.2.14)</b> Date: Mon Jun 27 10:44:57 2011 Created by: Created for:	<b>Therm Version 5.2 (5.2.14)</b> Date: Wed Jul 20 11:53:40 2011 Created by: Created for:
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Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P... Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P... Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational PS  
Cross Section Type: Sill Cross Section Type: Sill Cross Section Type: Sill  
Underlay Name: Z:\01 WARM\01 Jobs\2011 037 Rational PS Underlay Name: Underlay Name:

U-factors

Name	Length mm	Basis	U-factor W/m2-K
Internal	296.74	Projected X	1.0775
External	297.71	Projected X	1.0740

U-factors

Name	Length mm	Basis	U-factor W/m2-K
Internal	1000.00	Total Length	0.0912
External	0.00	Projected Y	71129.96

U-factors

Name	Length mm	Basis	U-factor W/m2-K
Internal	1370.74	Projected X	0.3176
External	1370.74	Projected X	0.3176

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA TIM General Timber	0.13	0.90
Aluminum Painted	160.00	0.20
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Ford Farm Wall Horizontal kp1:3		
8mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA TIM General Timber	0.13	0.90
Aluminum Painted	160.00	0.20
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90
Topguided Jamb Install:38mm Se		
vice Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90
AA INS k040	0.04	0.90
Foam Weatherstripping*	0.03	0.90

Cavities

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

Cavities

None

Glazing Systems

Poly Heat ID Flow Dir	Side 1		Side 2		Dimension mm	N mm	None W/m-K	Height
	Temp C	Emis C	Temp C	Emis C				
26 Down	15.00	0.90	5.00	0.90	5.32	12.95	N/A	0.1205
34 Down	15.00	0.90	5.00	0.90	19.54	37.34	Name	Temperature Film Coefficient
11 Down	15.00	0.90	5.00	0.90	4.89	7.56	I	C W/m2-K

Name: CEN frame cavity unventilated  
Gas Fill: Air  
Convection Model: CEN  
Radiation Model: Standard

AA External Protected	0.13	0C	0.00	7.690
AA Interior Horizontal	R0.13	2		
OC	20.00		7.690	

Poly Heat ID Flow Dir	Side 1		Side 2		Dimension mm	Nu	Keff	Cavity Height
	Temp C	Emis C	Temp C	Emis C				
28 Down	15.00	0.90	5.00	0.90	10.45	2.00	N/A	0.0328
29 Down	15.00	0.90	5.00	0.90	3.58	2.00	I	Mesh Parameter : 6
31 Down	15.00	0.90	5.00	0.90	18.15	6.64	I	Estimated Error: 3.8e-006%
32 Down	15.00	0.90	5.00	0.90	4.40	2.02	I	Calculations done in Version 5.2 (5.2.14)
3 Down	15.00	0.90	5.00	0.90	4.18	2.02	N/A	0.0322
6 Down	15.00	0.90	5.00	0.90	18.10	6.65	N/A	0.0495
24 Down	15.00	0.90	5.00	0.90	14.87	34.54	N/A	0.1489
7 Down	15.00	0.90	5.00	0.90	1.34	2.02	N/A	0.0309
12 Down	15.00	0.90	5.00	0.90	8.28	6.90	N/A	0.0474
45 Down	15.00	0.90	5.00	0.90	1.23	2.02	N/A	0.0308
5 Down	15.00	0.90	5.00	0.90	9.16	6.70	N/A	0.0473
8 Down	15.00	0.90	5.00	0.90	6.29	4.30	N/A	0.0395
22 Down	15.00	0.90	5.00	0.90	1.24	3.34	N/A	0.0340

Glazing Systems

None

Standard Boundary Conditions

Name	Temperature C	Film Coefficient W/m2-K
AA External R0.04	OC	0.00 25.000
AA Interior Horizontal	R0.13	2
OC	20.00	7.690

Cavities

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

Poly Heat ID Flow Dir	Side 1		Side 2		Dimension mm	N mm	None W/m
	Temp C	Emis C	Temp C	Emis C			
179 Down	15.00	0.90	5.00	0.90	5.32	12.95	
168 Down	15.00	0.90	5.00	0.90	19.54	37.34	
165 Down	15.00	0.90	5.00	0.90	4.89	7.56	

Name: CEN frame cavity unventilated  
Gas Fill: Air

Convection Model: CEN  
Radiation Model: Standard

Poly Heat ID Flow Dir	Side 1		Side 2		Dimension mm	N mm	None W/m
	Temp C	Emis C	Temp C	Emis C			
178 Down	15.00	0.90	5.00	0.90	10.45	2.00	
177 Down	15.00	0.90	5.00	0.90	3.58	2.00	
176 Down	15.00	0.90	5.00	0.90	18.15	6.64	
175 Down	15.00	0.90	5.00	0.90	4.40	2.02	
174 Down	15.00	0.90	5.00	0.90	4.18	2.02	
173 Down	15.00	0.90	5.00	0.90	18.10	6.65	
172 Down	15.00	0.90	5.00	0.90	14.87	34.54	
170 Down	15.00	0.90	5.00	0.90	1.34	2.02	
169 Down	15.00	0.90	5.00	0.90	8.28	6.90	
167 Down	15.00	0.90	5.00	0.90	1.23	2.02	
166 Down	15.00	0.90	5.00	0.90	9.16	6.70	
164 Down	15.00	0.90	5.00	0.90	6.29	4.30	
163 Down	15.00	0.90	5.00	0.90	1.24	3.34	

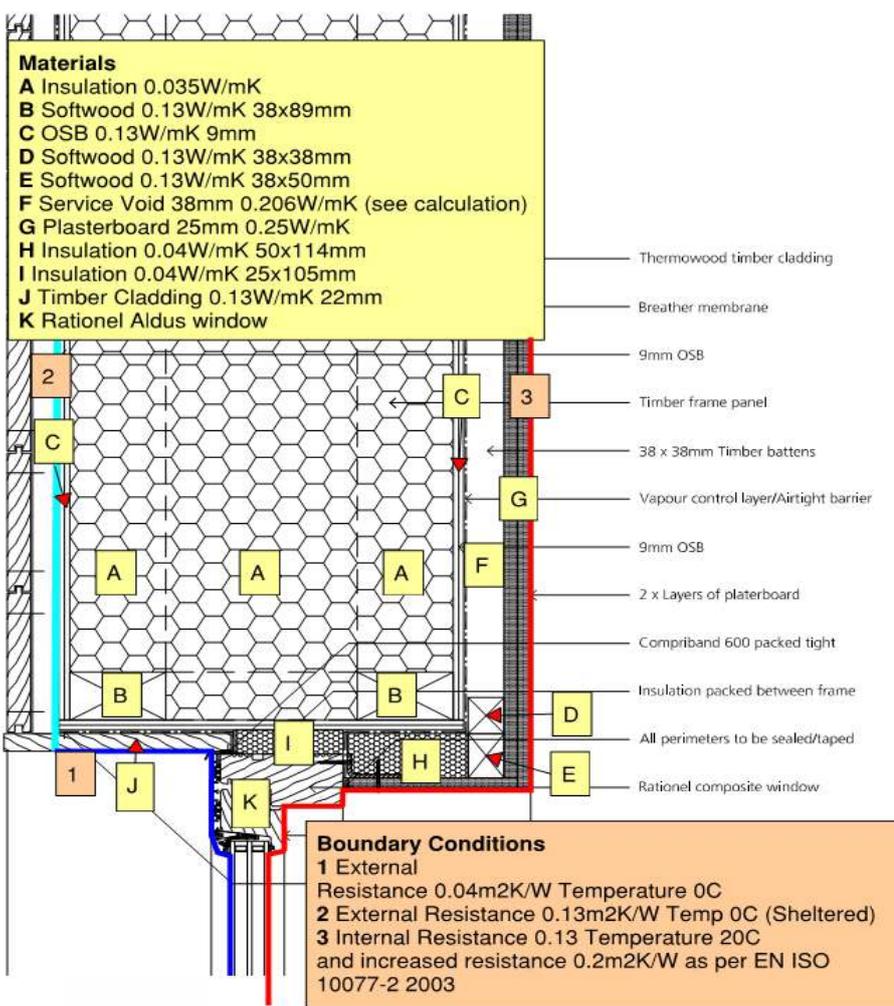
Glazing Systems

None

Standard Boundary Conditions

Name	Temperature	Film Coefficient
------	-------------	------------------

Sketch (Installation)



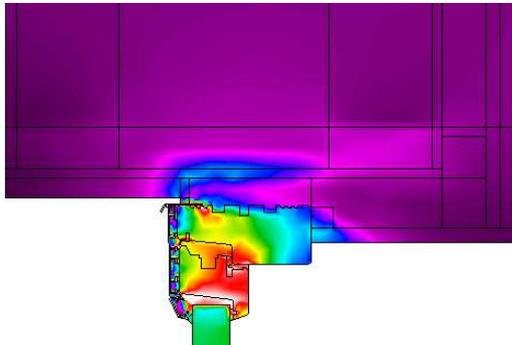
**WARM: Low Energy Building Practice**  
7 The Crescent, Plymouth PL1 3AB - 01752 542 546 - www.peterwarm.co.uk

Software: Therm 5.2 Date: 19/07/2011  
Job Name: Rational Psi Values Job No: 2011 037  
Tab name: Window (Uf & PSInst) Completed by: KP  
Descrpt: Topguided Head Checked by: PW

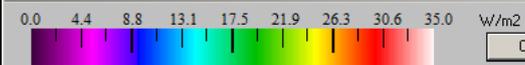
### Heat Flux

(Heatflow through materials)

Black = no heat flow  
White = high heat flow

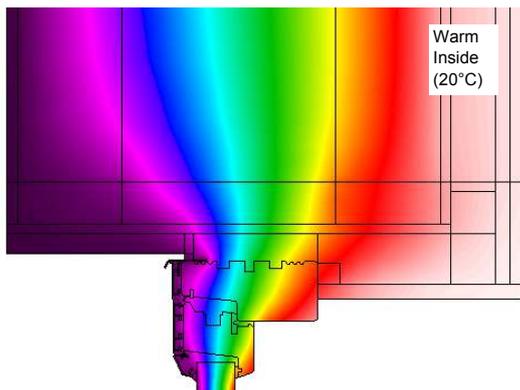


Color Legend

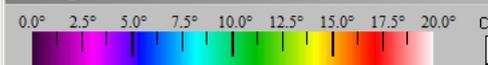


### Isotherms

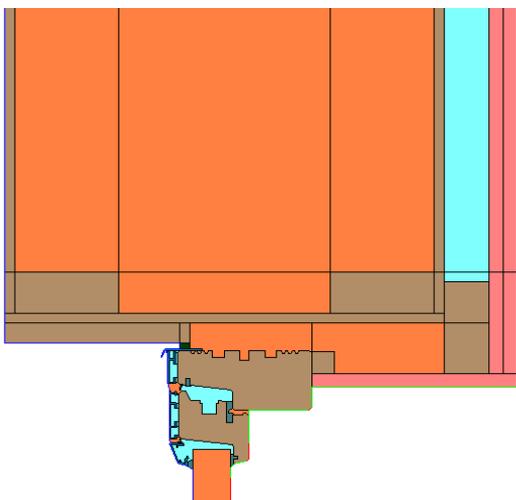
(Lines of constant temp)



Color Legend



### Junction



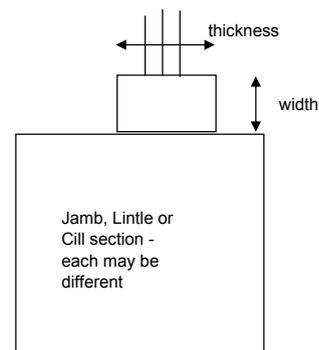
Data column	Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	17	Frame+Ins.	External			0.3122
T	16	Wall	Internal	1000.00	0.0912	
U	16	Wall+Frame	Internal			0.4321

Uframe for EN 10077-2 Window Calc.		dimension mm	U-value W/m2K	heat flow W/mK
L2D with insulation replacing glazing				0.3122
Insulation	thickness	32	0.922	
	visible width	190		0.1752
Frame	width	108.74		
<b>U Frame ( W/m2K)</b>				<b>1.259</b>

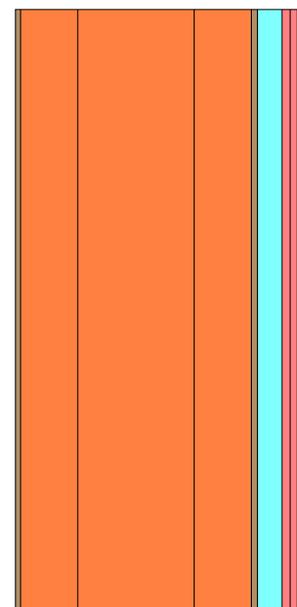
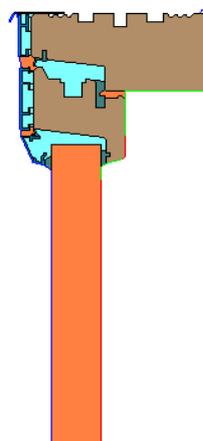
U - value calculation for data row		Wall
Check surface resistances correct		y
Check total length correct		y
<b>Modelling U Value ( W/m2K)</b>		<b>0.091</b>

Psi Window Installation according to Pa		dimension mm	U-value W/m2K	heat flow W/mK
Wall and Frame with insulated panel				0.4321
Frame and Insulated panel				0.3122
Wall		1072	0.091	0.0978
<b>Installation Psi</b>				<b>0.022 W/mK</b>

Error in calculation: From them report - worst cell **6.7 %**



### Elements



<b>Therm Version 5.2 (5.2.14)</b> Date: Wed Jul 20 11:49:53 2011 Created by: Created for:	<b>Therm Version 5.2 (5.2.14)</b> Date: Mon Jun 27 11:00:17 2011 Created by: Created for:	<b>Therm Version 5.2 (5.2.14)</b> Date: Wed Jul 20 11:48:23 2011 Created by: Created for:
--	--	--

Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P... Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P... Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P...  
Cross Section Type: Sill  
Underlay Name:

U-factors

Name	Length mm	Basis	U-factor W/m2-K
Internal	296.74	Projected Y	1.0521
External	299.03	Projected Y	1.0440

U-factors

Name	Length mm	Basis	U-factor W/m2-K
Internal	1000.00	Projected Y	0.0912
External	1000.00	Projected Y	0.0912

U-factors

Name	Length mm	Basis	U-factor W/m2-K
Internal	1370.74	Projected Y	0.3152
External	1370.74	Projected Y	0.3152

Solid Materials

Name	Conductivity W/m-K	Emissivity
Aluminum Painted	160.00	0.20
AA TIM General Timber	0.13	0.90
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Ford Farm Wall Vertical kp1:38		
mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90

Solid Materials

Name	Conductivity W/m-K	Emissivity
Aluminum Painted	160.00	0.20
AA TIM General Timber	0.13	0.90
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90
Topguided Head Install:38mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90
AA INS k040	0.04	0.90
Foam Weatherstripping*	0.03	0.90

Cavities

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

Cavities

None

Glazing Systems

Poly Heat ID Flow Dir	Side 1		Side 2		Dimension mm	N None	Keff W/m-K	Cavity Height mm
	Temp C	Emis C	Temp C	Emis C				
45 Horizontal	15.00	0.90	5.00	0.90	12.95	5.32	N/A	0.1205
32 Horizontal	15.00	0.90	5.00	0.90	9.50	8.73		
55 Horizontal	15.00	0.90	5.00	0.90	7.56	4.89		

Name: CEN frame cavity unventilated  
Gas Fill: Air  
Convection Model: CEN  
Radiation Model: Standard

Name	Temperature C	Film Coefficient W/m2-K
AA Interior Horizontal R0.13 2	20.00	7.690
AA External Protected 0.13 0C	0.00	7.690

Poly Heat ID Flow Dir	Side 1		Side 2		Dimension mm	Nu	Keff W/n	Cavity Height mm
	Temp C	Emis C	Temp C	Emis C				
44 Horizontal	15.00	0.90	5.00	0.90	2.00	10.45	N/A	0.0328
43 Horizontal	15.00	0.90	5.00	0.90	2.00	3.58	Mesh	Parameter : 6
42 Horizontal	15.00	0.90	5.00	0.90	6.64	18.15	Estimated Error:	7.8e-012%
41 Horizontal	15.00	0.90	5.00	0.90	2.02	4.40	Calculations done in	Version 5.2 (5.2.14)
40 Horizontal	15.00	0.90	5.00	0.90	2.02	4.18	N/A	0.0322
39 Horizontal	15.00	0.90	5.00	0.90	6.65	18.10	N/A	0.0495
36 Horizontal	15.00	0.90	5.00	0.90	34.54	14.87	N/A	0.1489
34 Horizontal	15.00	0.90	5.00	0.90	33.22	19.05	N/A	0.1472
33 Horizontal	15.00	0.90	5.00	0.90	2.02	1.34	N/A	0.0309
30 Horizontal	15.00	0.90	5.00	0.90	6.90	8.28	N/A	0.0474
51 Horizontal	15.00	0.90	5.00	0.90	2.02	1.23	N/A	0.0308
53 Horizontal	15.00	0.90	5.00	0.90	6.70	9.16	N/A	0.0473
48 Horizontal	15.00	0.90	5.00	0.90	7.16	5.14	N/A	0.0462

Glazing Systems

None

Standard Boundary Conditions

Name	Temperature C	Film Coefficient W/m2-K
AA External R0.04 0C	0.00	25.000
AA Interior Horizontal R0.13 2		
0C	20.00	7.690

Cavities

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

Poly Heat ID Flow Dir	Side 1		Side 2		Dimension mm	N None	Keff W/m
	Temp C	Emis C	Temp C	Emis C			
45 Horizontal	15.00	0.90	5.00	0.90	12.95	5.32	
32 Horizontal	15.00	0.90	5.00	0.90	9.50	8.73	
55 Horizontal	15.00	0.90	5.00	0.90	7.56	4.89	

Name: CEN frame cavity unventilated  
Gas Fill: Air

Convection Model: CEN  
Radiation Model: Standard

Poly Heat ID Flow Dir	Side 1		Side 2		Dimension mm	Nu	Keff W/m
	Temp C	Emis C	Temp C	Emis C			
44 Horizontal	15.00	0.90	5.00	0.90	2.00	10.45	
43 Horizontal	15.00	0.90	5.00	0.90	2.00	3.58	
42 Horizontal	15.00	0.90	5.00	0.90	6.64	18.15	
41 Horizontal	15.00	0.90	5.00	0.90	2.02	4.40	
40 Horizontal	15.00	0.90	5.00	0.90	2.02	4.18	
39 Horizontal	15.00	0.90	5.00	0.90	6.65	18.10	
36 Horizontal	15.00	0.90	5.00	0.90	34.54	14.87	
34 Horizontal	15.00	0.90	5.00	0.90	33.22	19.05	
33 Horizontal	15.00	0.90	5.00	0.90	2.02	1.34	
30 Horizontal	15.00	0.90	5.00	0.90	6.90	8.28	
51 Horizontal	15.00	0.90	5.00	0.90	2.02	1.23	
53 Horizontal	15.00	0.90	5.00	0.90	6.70	9.16	
48 Horizontal	15.00	0.90	5.00	0.90	7.16	5.14	

Glazing Systems

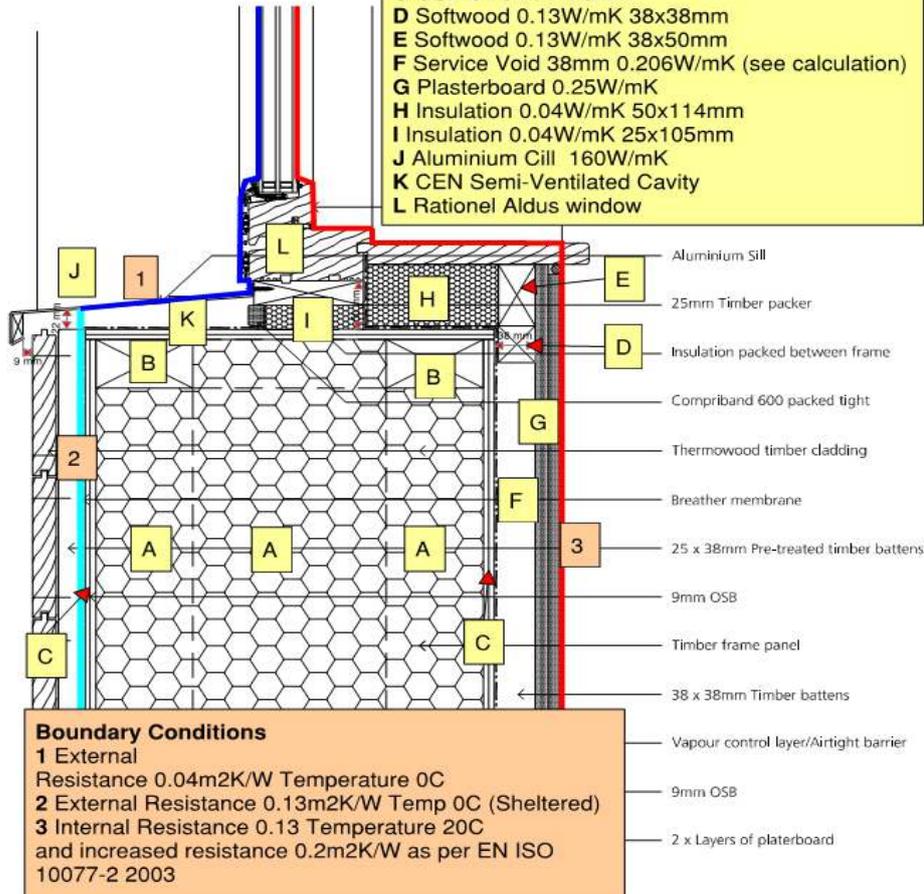
None

Standard Boundary Conditions

Name	Temperature	Film Coefficient
------	-------------	------------------

F - Window Sill Detail [Timber Clad]  
 Scale = 1:5 [Base ref: 365]

- Materials**
- A Insulation 0.035W/mK
  - B Softwood 0.13W/mK 38x89mm
  - C OSB 0.13W/mK 9mm
  - D Softwood 0.13W/mK 38x38mm
  - E Softwood 0.13W/mK 38x50mm
  - F Service Void 38mm 0.206W/mK (see calculation)
  - G Plasterboard 0.25W/mK
  - H Insulation 0.04W/mK 50x114mm
  - I Insulation 0.04W/mK 25x105mm
  - J Aluminium Cill 160W/mK
  - K CEN Semi-Ventilated Cavity
  - L Rationel Aldus window



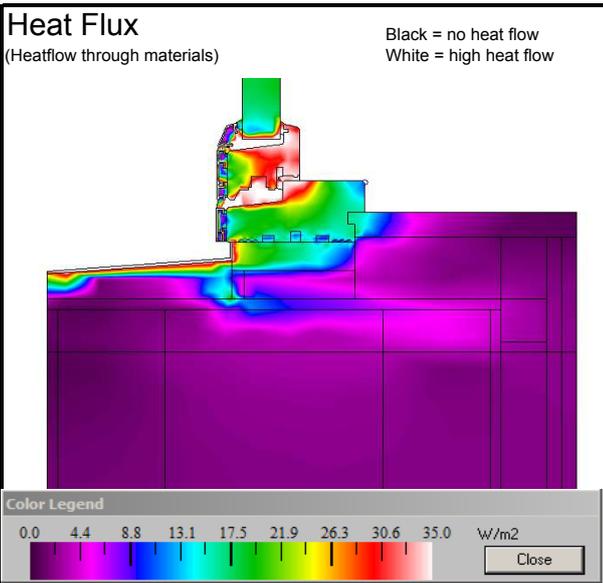
- Boundary Conditions**
- 1 External  
Resistance 0.04m<sup>2</sup>K/W Temperature 0C
  - 2 External Resistance 0.13m<sup>2</sup>K/W Temp 0C (Sheltered)
  - 3 Internal Resistance 0.13 Temperature 20C  
and increased resistance 0.2m<sup>2</sup>K/W as per EN ISO 10077-2 2003

**Secondary Calculation: Equivalent Thermal Conductivity of Still Air Spaces**

Air Layer Thickness	38	mm		
Direction of		Upwards	$h_a$	1.25 W/(m <sup>2</sup> K)
Heat Flow	x	Horizontal	$h_r$	4.17 W/(m <sup>2</sup> K)
(check only one field)		Downwards		
			$\lambda$	0.206 W/(mK)

**WARM: Low Energy Building Practice**  
 7 The Crescent, Plymouth PL1 3AB - 01752 542 546 - www.peterwarm.co.uk

Software: Therm 5.2 Date: 11.05.11  
 Job Name: Rational Psi values Job No: 2011 037  
 Tab name: Window (Uf & PSInst) Completed by: KP  
 Descr: Topguided Cill Checked by: pw



Data column	Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	17	Frame+Ins.	Internal			0.3312
T	16	Wall	Internal	1000.00	0.0912	
U	16	Wall+Frame	External			0.4645

Uframe for EN 10077-2 Window Calc.

dimension	U-value	heat flow
mm	W/m2K	W/mK
L2D with insulation replacing glazing		0.3312
Insulation thickness	32	0.922
visible width	190	0.1752
Frame width	108.29	
<b>U Frame ( W/m2K)</b>		<b>1.440</b>

U - value calculation for data row Wall

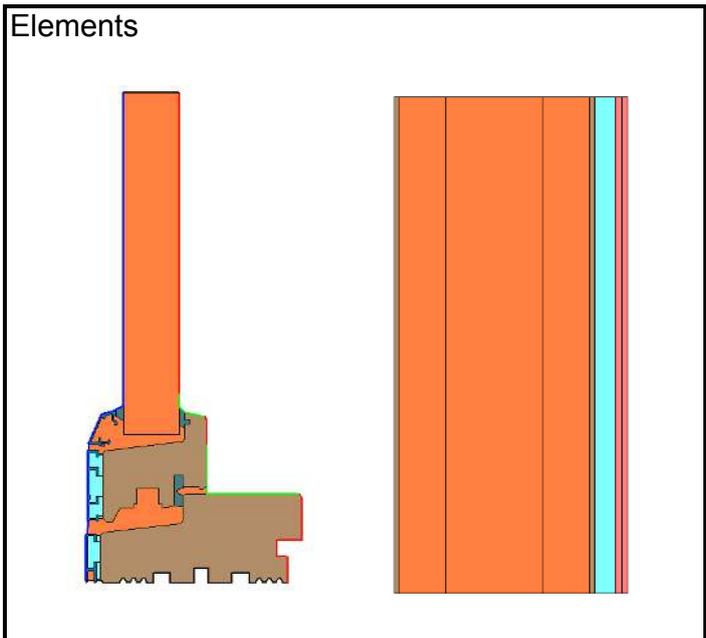
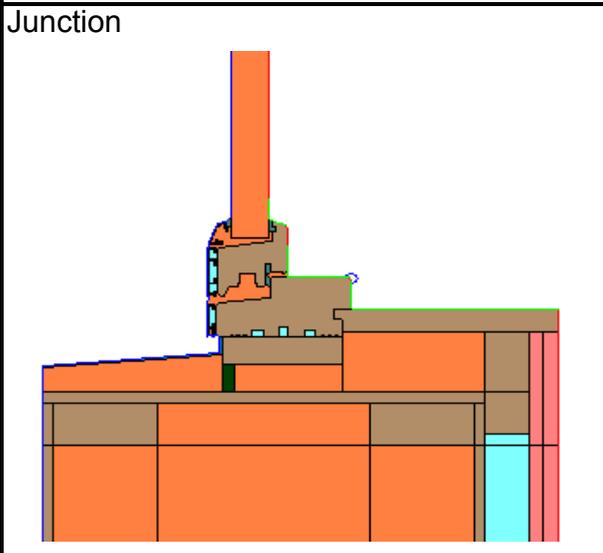
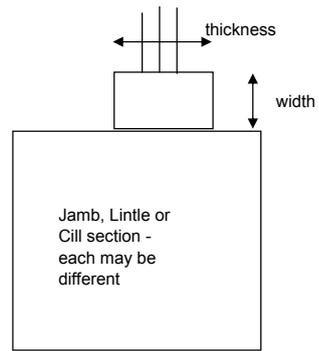
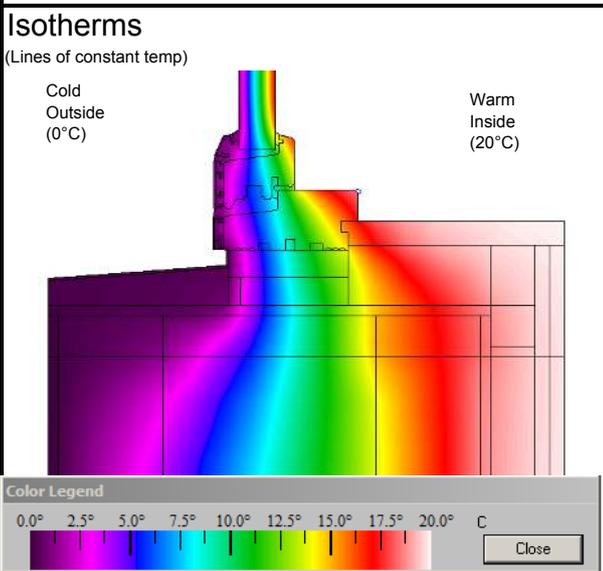
Check surface resistances correct y  
 Check total length correct y

**Modelling U Value ( W/m2K) 0.091**

Psi Window Installation according to Pa

dimension	U-value	heat flow
mm	W/m2K	W/mK
Wall and Frame with insulated panel		0.4645
Frame and Insulated panel		0.3312
Wall	1097	0.1000
<b>Installation Psi</b>		<b>0.033 W/mK</b>

Error in calculation: From them report - worst cell 7.4 %



<b>Therm Version 5.2 (5.2.14)</b> Date: Wed Jul 20 11:39:02 2011 Created by: Created for:	<b>Therm Version 5.2 (5.2.14)</b> Date: Mon Jun 27 10:58:16 2011 Created by: Created for:	<b>Therm Version 5.2 (5.2.14)</b> Date: Wed Jul 20 11:43:29 2011 Created by: Created for:
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Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P; Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P; Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational PS  
Cross Section Type: Sill  
Underlay Name:

U-factors

Name	Length mm	Basis	U-factor W/m2-K
External	297.77	Projected Y	1.1123
Internal	298.29	Projected Y	1.1104

U-factors

Name	Length mm	Basis	U-factor W/m2-K
Internal	1000.00	Projected Y	0.0912
External	1000.00	Projected Y	0.0912

U-factors

Name	Length mm	Basis	U-factor W/m2-K
External	1395.29	Projected Y	0.3329
Internal	1395.29	Projected Y	0.3329

Solid Materials

Name	Conductivity W/m-K	Emissivity
Aluminum Painted	160.00	0.20
AA TIM General Timber	0.13	0.90
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Ford Farm Wall Vertical kp1:38		
mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA TIM General Timber	0.13	0.90
Aluminum Painted	160.00	0.20
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90
Topguided Cill Install kp1:38m		
m Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90
AA INS k040	0.04	0.90
Foam Weatherstripping*	0.03	0.90

Cavities

Name: CEN frame cavity unventilated  
Gas Fill: Air  
Convection Model: CEN  
Radiation Model: Standard

Cavities

None

Glazing Systems

Poly Heat	Side 1	Side 2	Dimension	N	None
ID Flow	Temp	Emis	Temp	Emis	Horz. Vert. #
Dir	C	C	mm	mm	W/m-K mm
Standard Boundary Conditions					
7 Horizontal	15.00	0.90	5.00	0.90	2.02 1.32 N/A
6 Horizontal	15.00	0.90	5.00	0.90	6.62 18.02
15 Horizontal	15.00	0.90	5.00	0.90	6.01 11.63
3 Horizontal	15.00	0.90	5.00	0.90	6.06 10.90
35 Horizontal	15.00	0.90	5.00	0.90	2.02 1.25
36 Horizontal	15.00	0.90	5.00	0.90	2.00 3.57
37 Horizontal	15.00	0.90	5.00	0.90	2.00 10.44
38 Horizontal	15.00	0.90	5.00	0.90	6.64 18.15

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air

Convection Model: CEN Ventilated  
Radiation Model: Standard

Calculation Specifications

Poly Heat	Side 1	Side 2	Dimension	N	Mesh	Parameter
ID Flow	Temp	Emis	Temp	Emis	Horz. Vert. #	Ver Estimated Error
Dir	C	C	mm	mm	W/n	Calculations done in Version 5.2 (5.2.14)
5 Horizontal	15.00	0.90	5.00	0.90	35.17 15.49	N/A 0.3038 N/A
2 Horizontal	15.00	0.90	5.00	0.90	2.63 0.90	N/A 0.0640 N/A
1 Horizontal	15.00	0.90	5.00	0.90	3.81 6.53	N/A 0.0763 N/A
44 Horizontal	15.00	0.90	5.00	0.90	13.37 5.54	N/A 0.1228 N/A
26 Horizontal	15.00	0.90	5.00	0.90	37.48 19.75	N/A 0.3293 N/A

Glazing Systems

None

Standard Boundary Conditions

Name	Temperature C	Film Coefficient W/m2-K
AA External R0.04 OC	0.00	25.000
AA Interior Horizontal R0.13 2		
OC	20.00	7.690
AA Internalthorizedrad R0.2 20C	20.00	5.000

Cavities

Name: CEN frame cavity unventilated  
Gas Fill: Air  
Convection Model: CEN  
Radiation Model: Standard

Poly Heat	Side 1	Side 2	Dimension	N
ID Flow	Temp	Emis	Temp	Emis
Dir	C	C	mm	mm
18 Horizontal	15.00	0.90	5.00	0.90
14 Horizontal	15.00	0.90	5.00	0.90
13 Horizontal	15.00	0.90	5.00	0.90
12 Horizontal	15.00	0.90	5.00	0.90
11 Horizontal	15.00	0.90	5.00	0.90
6 Horizontal	15.00	0.90	5.00	0.90
53 Horizontal	15.00	0.90	5.00	0.90
55 Horizontal	15.00	0.90	5.00	0.90
57 Horizontal	15.00	0.90	5.00	0.90
59 Horizontal	15.00	0.90	5.00	0.90
63 Horizontal	15.00	0.90	5.00	0.90
108 Horizontal	15.00	0.90	5.00	0.90
110 Horizontal	15.00	0.90	5.00	0.90

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

Poly Heat	Side 1	Side 2	Dimension	N
ID Flow	Temp	Emis	Temp	Emis
Dir	C	C	mm	mm
38 Horizontal	15.00	0.90	5.00	0.90
31 Horizontal	15.00	0.90	5.00	0.90
30 Horizontal	15.00	0.90	5.00	0.90
41 Horizontal	15.00	0.90	5.00	0.90
65 Horizontal	15.00	0.90	5.00	0.90
74 Horizontal	15.00	0.90	5.00	0.90

Glazing Systems

None

# Tilt & Turn Window Jamb Head and Cill

## Jamb

- Sketch
- Sketch installed
- Psi calculation
- Therm report outputs

## Head

- Sketch installed
- Psi calculation
- Therm report outputs

## Cill

- Sketch installed
- Psi calculation
- Therm report outputs

## Cill on ground (used as door)

- Sketch installed
- Psi calculation
- Therm report outputs

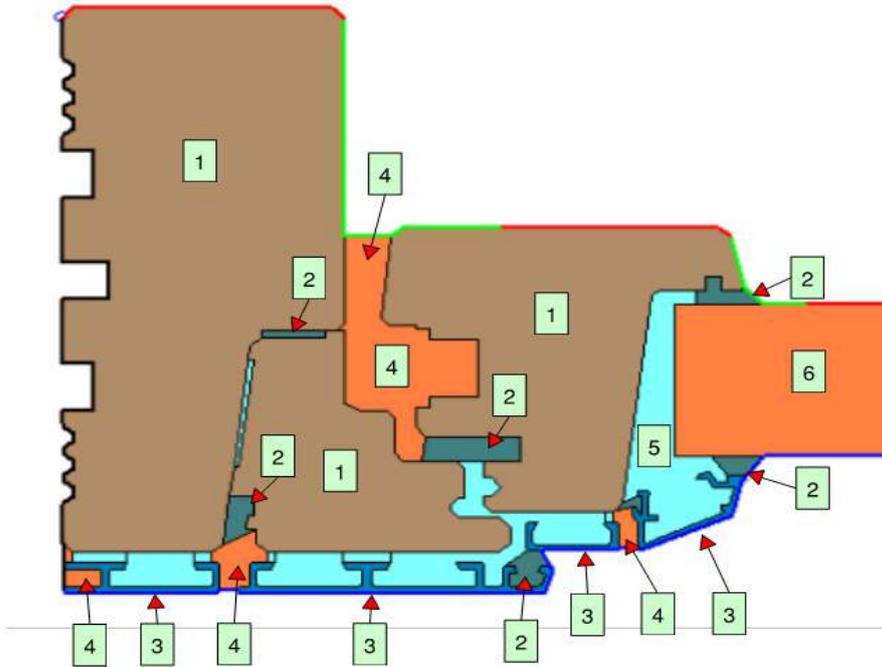
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Aldus Window

Materials

- 1 Timber 0.13W/mK
- 2 EPDM Seal 0.25W/mK
- 3 Painted Aluminium 160W/mK
- 4 CEN Frame Cavity Slightly Ventilated
- 5 CEN Frame Cavity Unventilated
- 6 Glazing replaced by equivalent thickness of material at 0.035W/mK

Therm model generated from DXF file provided by Rationel



Boundary Conditions

External

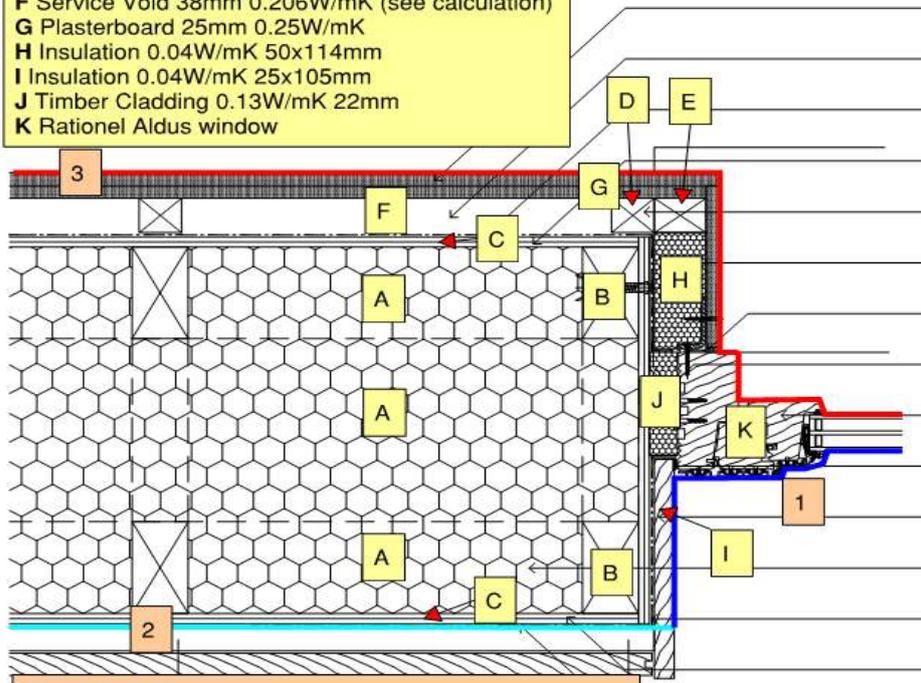
- Resistance 0.04m2K/W Temperature 0C

Internal

- Resistance 0.13m2K/W Temperature 20C
- Resistance 0.2m2K/W 20C

Defined as per EN ISO 10077-2 2003

- Materials**
- A** Insulation 0.035W/mK
  - B** Softwood 0.13W/mK 38x89mm
  - C** OSB 0.13W/mK 9mm
  - D** Softwood 0.13W/mK 38x38mm
  - E** Softwood 0.13W/mK 38x50mm
  - F** Service Void 38mm 0.206W/mK (see calculation)
  - G** Plasterboard 25mm 0.25W/mK
  - H** Insulation 0.04W/mK 50x114mm
  - I** Insulation 0.04W/mK 25x105mm
  - J** Timber Cladding 0.13W/mK 22mm
  - K** Rational Aldus window



- Boundary Conditions**
- 1** External  
Resistance 0.04m<sup>2</sup>K/W Temperature 0C
  - 2** External Resistance 0.13m<sup>2</sup>K/W Temp 0C (Sheltered)
  - 3** Internal Resistance 0.13 Temperature 20C  
and increased resistance 0.2m<sup>2</sup>K/W as per EN ISO 10077-2 2003

Secondary Calculation: Equivalent Thermal Conductivity of Still Air Spaces

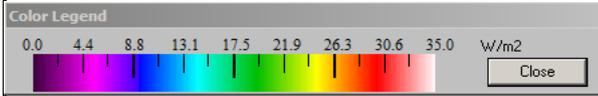
Air Layer Thickness:	38	mm	$h_a$	1.25	W/(m <sup>2</sup> K)	$\lambda$	0.206	W/(mK)
Direction of Heat Flow:	x	Horizontal	$h_v$	4.17	W/(m <sup>2</sup> K)			
(check only one field):		Downwards						

**WARM: Low Energy Building Practice**  
 7 The Crescent, Plymouth PL1 3AB - 01752 542 546 - www.peterwarm.co.uk

Software: Therm 5.2	Date: 12.05.11
Job Name: Rationel psi values	Job No: 2011 037
Tab name: Window (Uf & PSIinst)	Completed by: KP
Descr: T&T Jamb	Checked by: PW

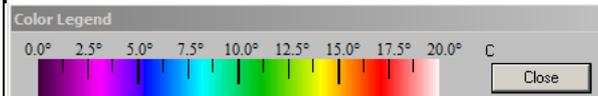
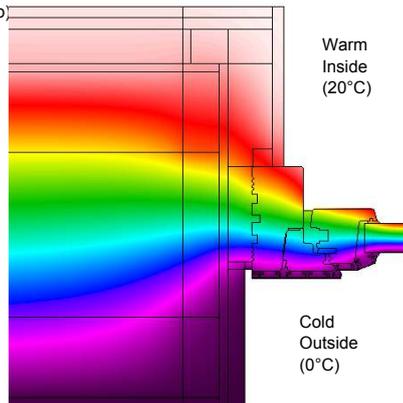
**Heat Flux**

(Heatflow through materials)

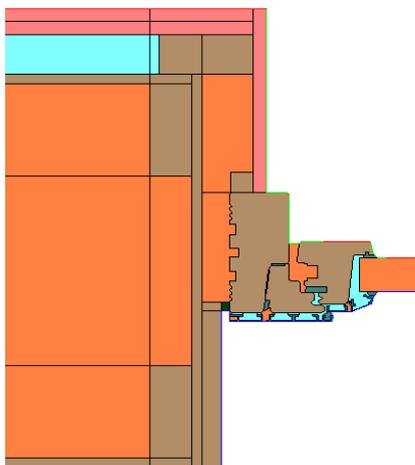


**Isotherms**

(Lines of constant temp)



**Junction**



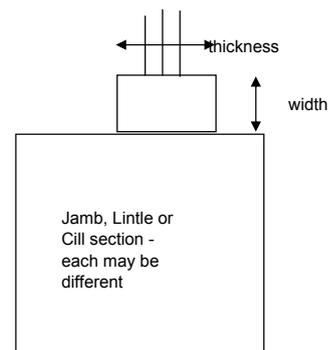
Data column Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	16	Frame+Ins.	Internal		0.3498
T	16	Wall	Internal	1000.00	0.0912
U	16	Wall+Frame	Internal		0.4644

Uframe for EN 10077-2 Window Calc.	dimension mm	U-value W/m2K	heat flow W/mK
L2D with insulation replacing glazing			0.3498
Insulation thickness	32	0.922	
Insulation visible width	190		0.1752
Frame width	134.01		
<b>U Frame ( W/m2K)</b>			<b>1.303</b>

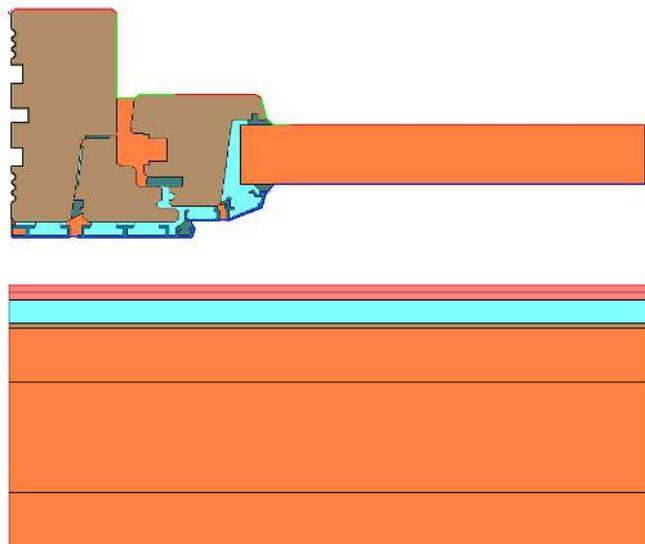
U - value calculation for data row	Wall	
Check surface resistances correct	y	
Check total length correct	y	
<b>Modelling U Value ( W/m2K)</b>		<b>0.091</b>

Psi Window Installation according to Pa	dimension mm	U-value W/m2K	heat flow W/mK
Wall and Frame with insulated panel			0.4644
Frame and Insulated panel			0.3498
Wall	1072	0.091	0.0978
<b>Installation Psi</b>			<b>0.017 W/mK</b>

Error in calculation: From them report - worst cell %



**Elements**



Therm Version 5.2 (5.2.14)  
Date: Thu May 12 09:54:46 2011

Therm Version 5.2 (5.2.14)  
Date: Mon Jun 27 12:23:51 2011

Therm Version 5.2 (5.2.14)  
Date: Mon Jun 27 12:22:31 2011

Created by:  
Created for:

Created by:  
Created for:

Created by:  
Created for:

Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P... Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P... Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P...  
Cross Section Type: Sill Cross Section Type: Sill Cross Section Type: Sill  
Underlay Name: Z:\01 WARM\01 Jobs\2011 037 Rational PS Underlay Name: Underlay Name:

U-factors

U-factors

U-factors

Name	Length mm	Basis	U-factor W/m2-K
Internal	1000.00	Custom	0.3498
External	323.45	Projected X	1.0814

Name	Length mm	Basis	U-factor W/m2-K
Internal	1000.00	Total Length	0.0912
External	1000.00	Total Length	0.0912

Name	Length mm	Basis	U-factor W/m2-K
Internal	1631.24	Total Length	0.2847
External	1577.43	Total Length	0.2944

Solid Materials

Solid Materials

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA TIM General Timber	0.13	0.90
CEN EPDM	0.25	0.90
Aluminum Painted	160.00	0.20
AA INS k035	0.04	0.90

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Ford Farm Wall Horizontal kp1:3		
8mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90

Name	Conductivity W/m-K	Emissivity
AA TIM General Timber	0.13	0.90
CEN EPDM	0.25	0.90
Aluminum Painted	160.00	0.20
AA INS k035	0.04	0.90
T & T Jamb Install:38mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90
AA INS k040	0.04	0.90
Foam Weatherstripping*	0.03	0.90

Cavities

Cavities

Cavities

Name: CEN frame cavity unventilated  
Gas Fill: Air  
Convection Model: CEN  
Radiation Model: Standard

None

Glazing Systems

Poly Heat ID Flow Dir	Side 1 Temp C	Side 1 Emis C	Side 2 Temp C	Side 2 Emis C	Dimension mm	N Horiz. mm	N Vert. #	N W/m-K	Height mm
Standard Boundary Conditions									
7 Down	15.00	0.90	5.00	0.90	1.95	11.60	N/A	0.0539	N/A
26 Down	15.00	0.90	5.00	0.90	10.48	2.00	Name	Temperature	Film Coefficient
27 Down	15.00	0.90	5.00	0.90	3.55	2.00	I	C	W/m2-K
28 Down	15.00	0.90	5.00	0.90	1.73	2.00	I		
29 Down	15.00	0.90	5.00	0.90	9.40	2.00	IAA External protected	0.13	0C 0.00 7.690
30 Down	15.00	0.90	5.00	0.90	1.45	2.00	IAA Interior Horizontal R0.13 2	20.00	7.690
4 Down	15.00	0.90	5.00	0.90	24.94	14.63	0C		
12 Down	15.00	0.90	5.00	0.90	14.07	35.25	N/A	0.1510	N/A
14 Down	15.00	0.90	5.00	0.90	18.20	6.64	N/A	0.0494	N/A
120 Down	15.00	0.90	5.00	0.90	18.22	6.67	N/A	0.0495	N/A

Name: CEN frame cavity unventilated  
Gas Fill: Air  
Convection Model: CEN  
Radiation Model: Standard

Poly Heat ID Flow Dir	Side 1 Temp C	Side 1 Emis C	Side 2 Temp C	Side 2 Emis C	Dimension mm	N Horiz. mm	N Vert. #	N W/m-K
122 Down	15.00	0.90	5.00	0.90	1.95	11.60		
118 Down	15.00	0.90	5.00	0.90	10.48	2.00		
117 Down	15.00	0.90	5.00	0.90	3.55	2.00	I	
116 Down	15.00	0.90	5.00	0.90	1.73	2.00	I	
115 Down	15.00	0.90	5.00	0.90	9.40	2.00	I	
114 Down	15.00	0.90	5.00	0.90	1.45	2.00	I	
111 Down	15.00	0.90	5.00	0.90	24.94	14.63		
110 Down	15.00	0.90	5.00	0.90	14.07	35.25		
109 Down	15.00	0.90	5.00	0.90	18.20	6.64		
106 Down	15.00	0.90	5.00	0.90	18.22	6.67		

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

Calculation Specifications

Mesh Parameter : 6  
Estimated Error: 3.8e-006%  
N Calculations done in Version 5.2 (5.2.14)

Poly Heat ID Flow Dir	Side 1 Temp C	Side 1 Emis C	Side 2 Temp C	Side 2 Emis C	Dimension mm	N Horiz. mm	N Vert. #	N W/m-K	Height mm
36 Down	15.00	0.90	5.00	0.90	4.13	7.69	N/A	0.0935	N/A
21 Down	15.00	0.90	5.00	0.90	8.04	10.00	N/A	0.1105	N/A
39 Down	15.00	0.90	5.00	0.90	18.47	32.31	N/A	0.2862	N/A
115 Down	15.00	0.90	5.00	0.90	6.29	4.30	N/A	0.0789	N/A

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

Poly Heat ID Flow Dir	Side 1 Temp C	Side 1 Emis C	Side 2 Temp C	Side 2 Emis C	Dimension mm	N Horiz. mm	N Vert. #	N W/m-K
112 Down	15.00	0.90	5.00	0.90	4.13	7.69	I	
108 Down	15.00	0.90	5.00	0.90	8.04	10.00		
107 Down	15.00	0.90	5.00	0.90	18.47	32.31		
104 Down	15.00	0.90	5.00	0.90	6.29	4.30	I	

Glazing Systems

None

Glazing Systems

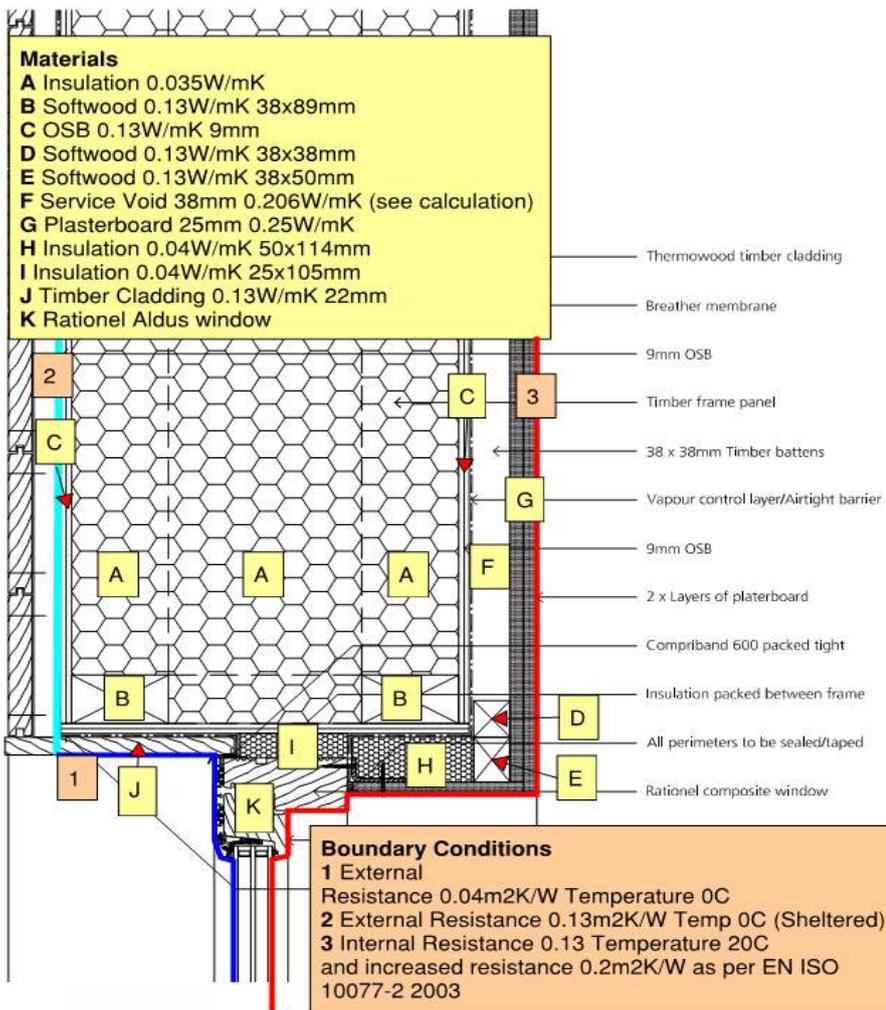
None

Standard Boundary Conditions

Name	Temperature C	Film Coefficient W/m2-K
AA External R0.04 0C	0.00	25.000
AA Interior Horizontal R0.13 2 0C	20.00	7.690
AA Internalhorizreducedrad R0. 2 20C	20.00	5.000

Standard Boundary Conditions

Name	Temperature C	Film Coefficient W/m2-K
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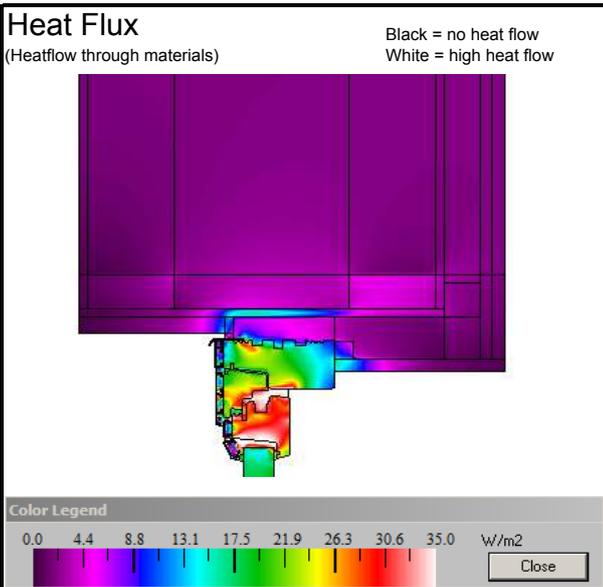


Secondary Calculation: Equivalent Thermal Conductivity of Still Air Spaces

Air Layer Thickness:	38	mm		
Direction of Heat Flow:	x	Horizontal	$h_a$	1.25 W/(m <sup>2</sup> K)
(check only one field):		Upwards	$h_r$	4.17 W/(m <sup>2</sup> K)
		Downwards	$\lambda$	0.206 W/(mK)

**WARM: Low Energy Building Practice**  
 7 The Crescent, Plymouth PL1 3AB - 01752 542 546 - www.peterwarm.co.uk

Software: Therm 5.2 Date: 12.05.11  
 Job Name: rationel psi values Job No: 2011 037  
 Tab name: Window (Uf & PSInst) Completed by: KP  
 Descr: T&T Head Checked by:



Data column	Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	16	Frame+Ins.	Internal			0.3544
T	16	Wall	Internal	1000.00	0.0912	
U	16	Wall+Frame	Internal			0.4737

Uframe for EN 10077-2 Window Calc. dimension U-value heat flow  
 mm W/m2K W/mK

L2D with insulation replacing glazing				0.3544
Insulation	thickness	32	0.922	
	visible width	190		0.1752
Frame	width	136.1		
<b>U Frame ( W/m2K)</b>				<b>1.316</b>

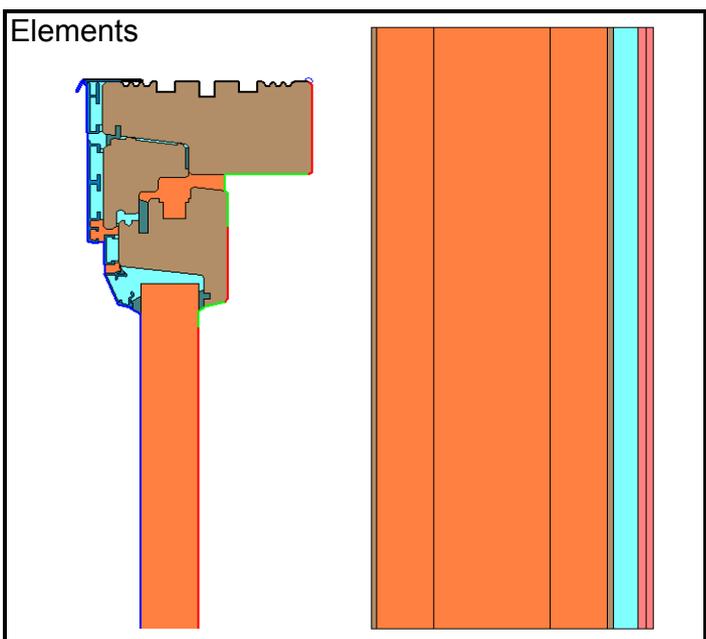
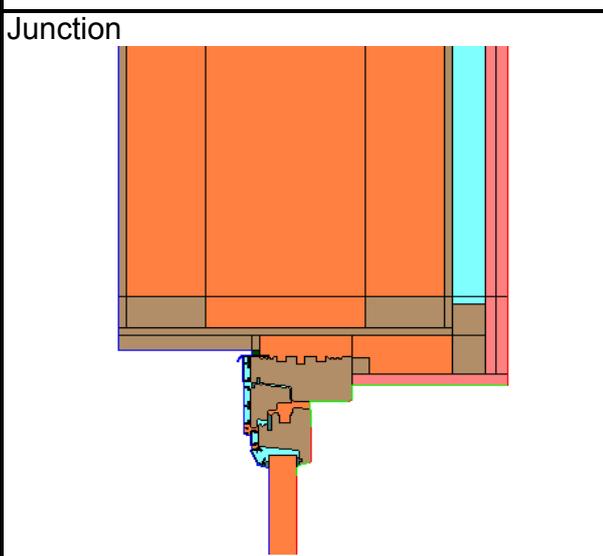
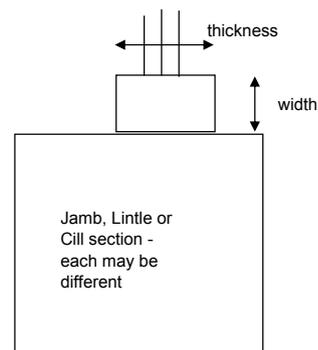
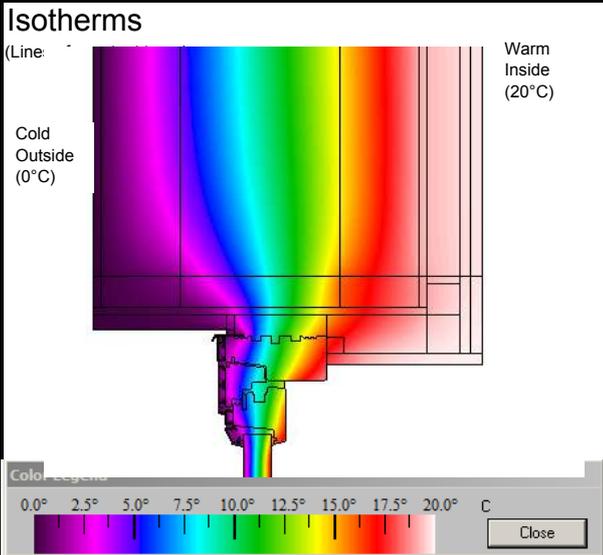
U - value calculation for data row Wall

Check surface resistances correct	y
Check total length correct	y
<b>Modelling U Value ( W/m2K)</b>	
<b>0.091</b>	

Psi Window Installation according to Pa dimension U-value heat flow  
 mm W/m2K W/mK

Wall and Frame with insulated panel				0.4737
Frame and Insulated panel				0.3544
Wall	1072	0.091		0.0978
<b>Installation Psi</b>				<b>0.022 W/mK</b>

Error in calculation: From them report - worst cell **5.6 %**



<b>Therm Version 5.2 (5.2.14)</b> Date: Wed Jul 20 12:09:25 2011 Created by: Created for:	<b>Therm Version 5.2 (5.2.14)</b> Date: Mon Jun 27 12:50:49 2011 Created by: Created for:	<b>Therm Version 5.2 (5.2.14)</b> Date: Wed Jul 20 12:10:38 2011 Created by: Created for:
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Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P; Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P; Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational PS  
Cross Section Type: Sill  
Underlay Name:

U-factors				U-factors				U-factors			
Name	Length mm	Basis	U-factor W/m2-K	Name	Length mm	Basis	U-factor W/m2-K	Name	Length mm	Basis	U-factor W/m2-K
Internal	330.33	Projected Y	1.0728	Internal	1000.00	Total Length	0.0912	Internal	1402.33	Projected Y	0.3378
External	331.54	Projected Y	1.0689	External	1000.00	Total Length	0.0912	External	1402.33	Projected Y	0.3378

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA TIM General Timber		0.13 0.90
Aluminum Painted	160.00	0.20
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber		0.13 0.90
Ford Farm Wall Vertical kp1:38		
mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA TIM General Timber		0.13 0.90
Aluminum Painted	160.00	0.20
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90
T&T Head Install:38mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90
AA INS k040	0.04	0.90
Foam Weatherstripping*	0.03	0.90

Cavities  
Name: CEN frame cavity unventilated  
Gas Fill: Air  
Convection Model: CEN  
Radiation Model: Standard

Cavities  
None  
Glazing Systems

Cavities  
Name: CEN frame cavity unventilated  
Gas Fill: Air  
Convection Model: CEN  
Radiation Model: Standard

Poly Heat

ID	Flow	Dir	Side 1 Temp C	Side 2 Emis C	Side 2 Temp C	Dimension mm	N Emis mm	None Horz. W/m-K	Vert. # mm	Height	
Standard Boundary Conditions											
65	Horizontal		15.00	0.90	5.00	0.90	2.00	1.44	N/A	0.0309	N/A
64	Horizontal		15.00	0.90	5.00	0.90	2.00	2.00	Name	Temperature	Film Coefficient
63	Horizontal		15.00	0.90	5.00	0.90	1.78	2.06	C	W/m2-K	
62	Horizontal		15.00	0.90	5.00	0.90	1.75	3.43	-----		
59	Horizontal		15.00	0.90	5.00	0.90	15.24	2.73	AA Interior Horizontal R0.13 2		
58	Horizontal		15.00	0.90	5.00	0.90	7.84	21.94	OC	20.00	7.690
57	Horizontal		15.00	0.90	5.00	0.90	6.49	14.32	AA External protected 0.13 OC	0.00	7.690
56	Horizontal		15.00	0.90	5.00	0.90	0.62	0.75	N/A	0.0270	N/A
55	Horizontal		15.00	0.90	5.00	0.90	34.72	14.50	N/A	0.1493	N/A
53	Horizontal		15.00	0.90	5.00	0.90	8.13	8.53	N/A	0.0508	N/A
52	Horizontal		15.00	0.90	5.00	0.90	6.54	39.52	N/A	0.0508	N/A
51	Horizontal		15.00	0.90	5.00	0.90	1.00	1.50	Calculation Specifications		
50	Horizontal		15.00	0.90	5.00	0.90	9.19	7.46	-----		

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

Mesh Parameter : 6  
Estimated Error: 7.8e-012%  
Calculations done in Version 5.2 (5.2.14)

Poly Heat

ID	Flow	Dir	Side 1 Temp C	Side 2 Emis C	Side 2 Temp C	Dimension mm	N Emis mm	None Horz. W/m	Vert
155	Horizontal		15.00	0.90	5.00	0.90	2.00	1.44	
154	Horizontal		15.00	0.90	5.00	0.90	2.00	2.00	
153	Horizontal		15.00	0.90	5.00	0.90	1.78	2.06	
152	Horizontal		15.00	0.90	5.00	0.90	1.75	3.43	
149	Horizontal		15.00	0.90	5.00	0.90	15.24	2.73	
148	Horizontal		15.00	0.90	5.00	0.90	7.84	21.94	
147	Horizontal		15.00	0.90	5.00	0.90	6.49	14.32	
146	Horizontal		15.00	0.90	5.00	0.90	0.62	0.75	
145	Horizontal		15.00	0.90	5.00	0.90	34.72	14.50	
143	Horizontal		15.00	0.90	5.00	0.90	8.13	8.53	
142	Horizontal		15.00	0.90	5.00	0.90	6.54	39.52	
141	Horizontal		15.00	0.90	5.00	0.90	1.00	1.50	
140	Horizontal		15.00	0.90	5.00	0.90	9.19	7.46	

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

Poly Heat

ID	Flow	Dir	Side 1 Temp C	Side 2 Emis C	Side 2 Temp C	Dimension mm	Nu Emis mm	Keff W/m-K	Cavity #	Height	
61	Horizontal		15.00	0.90	5.00	0.90	31.39	18.27	N/A	0.2786	N/A
54	Horizontal		15.00	0.90	5.00	0.90	7.86	5.09	N/A	0.0958	N/A
49	Horizontal		15.00	0.90	5.00	0.90	11.40	9.73	N/A	0.1197	N/A

Glazing Systems  
None

Poly Heat

ID	Flow	Dir	Side 1 Temp C	Side 2 Emis C	Side 2 Temp C	Dimension mm	Nu Emis mm	Keff W/m	Cavity #	Height
151	Horizontal		15.00	0.90	5.00	0.90	31.39	18.27		
144	Horizontal		15.00	0.90	5.00	0.90	7.86	5.09		
139	Horizontal		15.00	0.90	5.00	0.90	11.40	9.73		

Standard Boundary Conditions

Name	Temperature C	Film Coefficient W/m2-K
AA External R0.04 OC	0.00	25.000
AA Interior Horizontal R0.13 2 OC	20.00	7.690

Glazing Systems

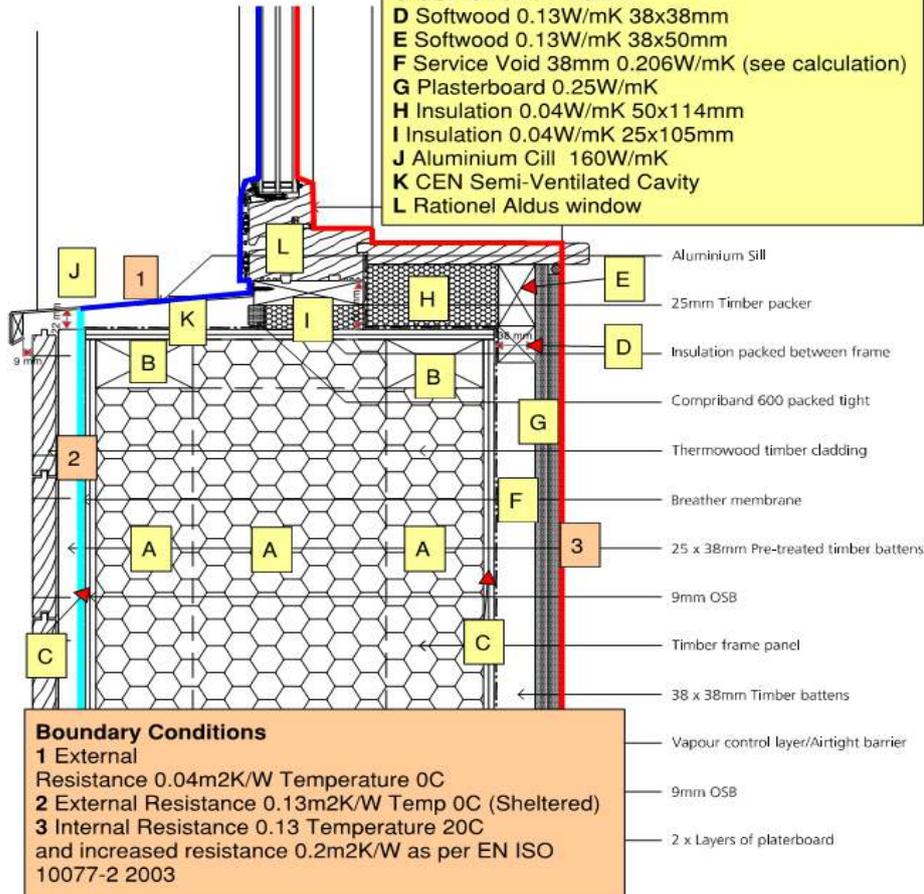
None

Standard Boundary Conditions

Name	Temperature	Film Coefficient
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F - Window Sill Detail [Timber Clad]  
 Scale = 1:5 [Base ref: 365]

- Materials**
- A Insulation 0.035W/mK
  - B Softwood 0.13W/mK 38x89mm
  - C OSB 0.13W/mK 9mm
  - D Softwood 0.13W/mK 38x38mm
  - E Softwood 0.13W/mK 38x50mm
  - F Service Void 38mm 0.206W/mK (see calculation)
  - G Plasterboard 0.25W/mK
  - H Insulation 0.04W/mK 50x114mm
  - I Insulation 0.04W/mK 25x105mm
  - J Aluminium Cill 160W/mK
  - K CEN Semi-Ventilated Cavity
  - L Rational Aldus window

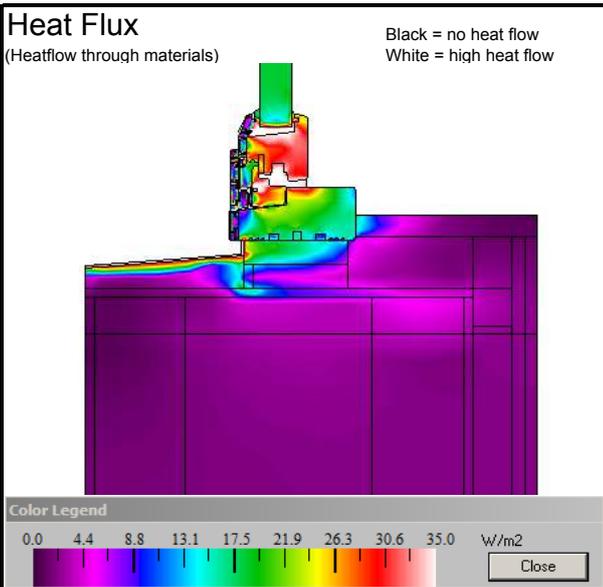


Secondary Calculation: Equivalent Thermal Conductivity of Still Air Spaces

Air Layer Thickness	38	mm		
Direction of		Upwards	$h_a$	1.25 W/(m <sup>2</sup> K)
Heat Flow	x	Horizontal	$h_r$	4.17 W/(m <sup>2</sup> K)
(check only one field)		Downwards		
			$\lambda$	0.206 W/(mK)

**WARM: Low Energy Building Practice**  
 7 The Crescent, Plymouth PL1 3AB - 01752 542 546 - www.peterwarm.co.uk

Software: Therm 5.2 Date: 12.05.11  
 Job Name: Rationel psi values Job No: 2011 037  
 Tab name: Window (Uf & PSInst) Completed by: KP  
 Descr: T&T Cill Checked by:



Data column	Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	16	Frame+Ins.	Internal			0.3588
T	16	Wall	Internal	1000.00	0.0912	
U	16	Wall+Frame	External			0.4926

Uframe for EN 10077-2 Window Calc. dimension U-value heat flow  
 mm W/m2K W/mK

L2D with insulation replacing glazing				0.3588
Insulation	thickness	32	0.922	
	visible width	190		0.1752
Frame	width	134.77		
<b>U Frame ( W/m2K)</b>				<b>1.362</b>

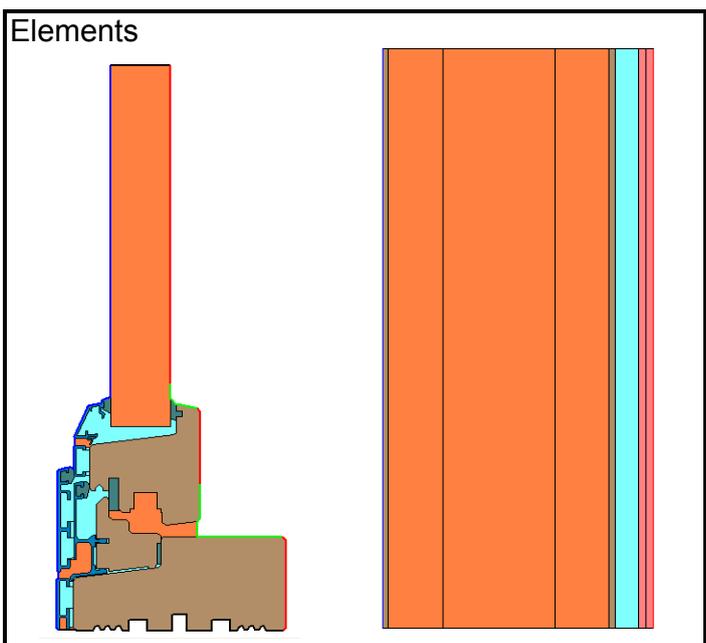
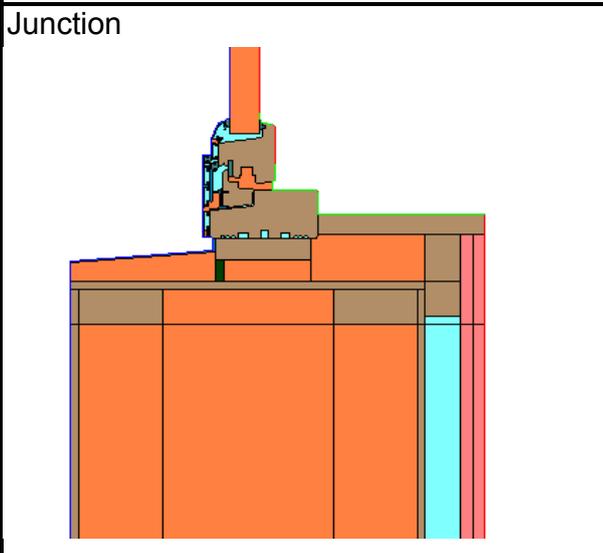
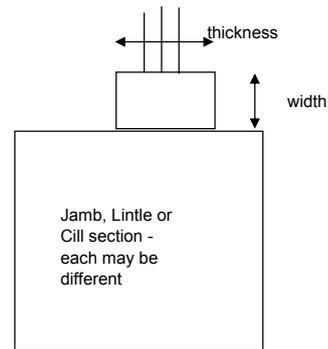
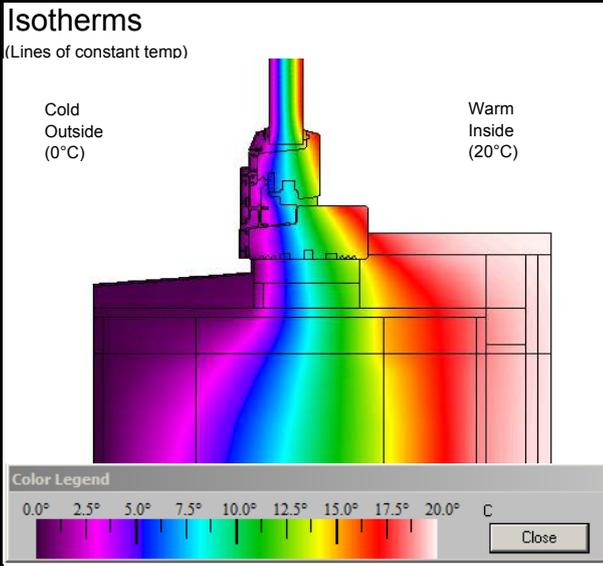
U - value calculation for data row Wall

Check surface resistances correct	y
Check total length correct	y
<b>Modelling U Value ( W/m2K)</b>	
<b>0.091</b>	

Psi Window Installation according to Pa dimension U-value heat flow  
 mm W/m2K W/mK

Wall and Frame with insulated panel			0.4926
Frame and Insulated panel			0.3588
Wall	1097	0.091	0.1000
<b>Installation Psi</b>			<b>0.034 W/mK</b>

Error in calculation: From them report - worst cell **8.1 %**



Therm Version 5.2 (5.2.14)  
 Date: Wed Jul 20 12:15:31 2011

Therm Version 5.2 (5.2.14)  
 Date: Mon Jun 27 12:58:12 2011

Therm Version 5.2 (5.2.14)  
 Date: Wed Jul 20 12:22:26 2011

Created by:  
 Created for:

Created by:  
 Created for:

Created by:  
 Created for:

Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P... Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P... Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational PS

Cross Section Type: Sill  
 Underlay Name: Z:\01 WARM\01 Jobs\2011 037 Rational PS

Cross Section Type: Sill  
 Underlay Name:

Cross Section Type: Sill  
 Underlay Name:

U-factors

Name	Length mm	Basis	U-factor W/m2-K
Internal	324.77	Projected Y	1.1049
External	324.18	Projected Y	1.1069

U-factors

Name	Length mm	Basis	U-factor W/m2-K
Internal	1000.00	Total Length	0.0912
External	1000.00	Total Length	0.0912

U-factors

Name	Length mm	Basis	U-factor W/m2-K
External	1421.77	Projected Y	0.3465
Internal	1421.77	Projected Y	0.3465

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA TIM General Timber	0.13	0.90
Aluminum Painted	160.00	0.20
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Ford Farm Wall Vertical kp1:38		
mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA TIM General Timber	0.13	0.90
Aluminum Painted	160.00	0.20
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90
T&T Cill Install kp1:38mm Serv		
ice Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90
AA INS k040	0.04	0.90
Foam Weatherstripping*	0.03	0.90

Cavities  
 Name: CEN frame cavity unventilated  
 Gas Fill: Air  
 Convection Model: CEN  
 Radiation Model: Standard

Cavities  
 None  
 Glazing Systems

Cavities  
 Name: CEN frame cavity unventilated  
 Gas Fill: Air  
 Convection Model: CEN  
 Radiation Model: Standard

Poly Heat

ID	Flow	Dir	Side 1 Temp C	Side 2 Emis C	Side 2 Temp mm	Dimension mm	Nu	Keff W/m-K	Cavity #	Height mm	
Standard Boundary Conditions											
131	Horizontal		15.00	0.90	5.00	0.90	2.00	1.34	N/A	0.0309	N/A
132	Horizontal		15.00	0.90	5.00	0.90	0.66	0.55	Name	Temperature	Film Coefficient
133	Horizontal		15.00	0.90	5.00	0.90	2.00	3.50		C	W/m2-K
134	Horizontal		15.00	0.90	5.00	0.90	2.00	10.51			
135	Horizontal		15.00	0.90	5.00	0.90	6.64	18.15	AA Interior Horizontal R0.13 2		
139	Horizontal		15.00	0.90	5.00	0.90	1.58	1.88	OC	20.00	7.690
140	Horizontal		15.00	0.90	5.00	0.90	2.75	0.77	AA External protected 0.13 OC	0.00	7.690
141	Horizontal		15.00	0.90	5.00	0.90	1.91	9.40	N/A	0.0325	N/A
142	Horizontal		15.00	0.90	5.00	0.90	2.04	10.31	N/A	0.0329	N/A
143	Horizontal		15.00	0.90	5.00	0.90	6.47	17.94	N/A	0.0489	N/A
144	Horizontal		15.00	0.90	5.00	0.90	6.50	14.34	N/A	0.0483	N/A
Calculation Specifications											
16	Horizontal		15.00	0.90	5.00	0.90	34.90	14.54			
24	Horizontal		15.00	0.90	5.00	0.90	9.83	19.20			
2	Horizontal		15.00	0.90	5.00	0.90	13.39	23.64	N/A	0.0714	N/A
Mesh Parameter : 6											
36	Horizontal		15.00	0.90	5.00	0.90	2.00	2.00			
Estimated Error: 7.8e-012%											
Calculations done in Version 5.2 (5.2.14)											

Name: CEN frame cavity slightly ventilated  
 Gas Fill: Air  
 Convection Model: CEN Ventilated  
 Radiation Model: Standard

Poly Heat

ID	Flow	Dir	Side 1 Temp C	Side 2 Emis C	Side 2 Temp mm	Dimension mm	Nu	Keff W/m-K	Cavity #	Height mm
188	Horizontal		15.00	0.90	5.00	0.90	2.00	1.33		
187	Horizontal		15.00	0.90	5.00	0.90	0.66	0.55		
186	Horizontal		15.00	0.90	5.00	0.90	2.00	3.50		
185	Horizontal		15.00	0.90	5.00	0.90	2.00	10.51		
184	Horizontal		15.00	0.90	5.00	0.90	6.64	18.15		
180	Horizontal		15.00	0.90	5.00	0.90	1.58	1.88		
179	Horizontal		15.00	0.90	5.00	0.90	2.75	0.77		
178	Horizontal		15.00	0.90	5.00	0.90	1.92	9.40		
169	Horizontal		15.00	0.90	5.00	0.90	2.04	10.31		
168	Horizontal		15.00	0.90	5.00	0.90	6.47	17.94		
167	Horizontal		15.00	0.90	5.00	0.90	6.50	14.34		
166	Horizontal		15.00	0.90	5.00	0.90	34.90	14.54		
164	Horizontal		15.00	0.90	5.00	0.90	9.83	19.20		
163	Horizontal		15.00	0.90	5.00	0.90	13.39	23.64		
161	Horizontal		15.00	0.90	5.00	0.90	14.89	2.98		
158	Horizontal		15.00	0.90	5.00	0.90	2.00	2.00		
53	Horizontal		15.00	0.90	5.00	0.90	10.00	6.00		
55	Horizontal		15.00	0.90	5.00	0.90	8.00	9.00		
57	Horizontal		15.00	0.90	5.00	0.90	10.00	6.00		
63	Horizontal		15.00	0.90	5.00	0.90	13.29	1.92		
266	Horizontal		15.00	0.90	5.00	0.90	13.29	1.92		

Name: CEN frame cavity slightly ventilated  
 Gas Fill: Air  
 Convection Model: CEN Ventilated  
 Radiation Model: Standard

Poly Heat

ID	Flow	Dir	Side 1 Temp C	Side 2 Emis C	Side 2 Temp mm	Dimension mm	Nu	Keff W/m-K	Cavity #	Height mm	
136	Horizontal		15.00	0.90	5.00	0.90	4.30	6.29	N/A	0.0789	N/A
137	Horizontal		15.00	0.90	5.00	0.90	3.30	1.19	N/A	0.0677	N/A
7	Horizontal		15.00	0.90	5.00	0.90	13.03	15.47	N/A	0.1345	N/A
28	Horizontal		15.00	0.90	5.00	0.90	7.80	5.00	N/A	0.0954	N/A
32	Horizontal		15.00	0.90	5.00	0.90	31.55	18.00	N/A	0.2795	N/A

Glazing Systems

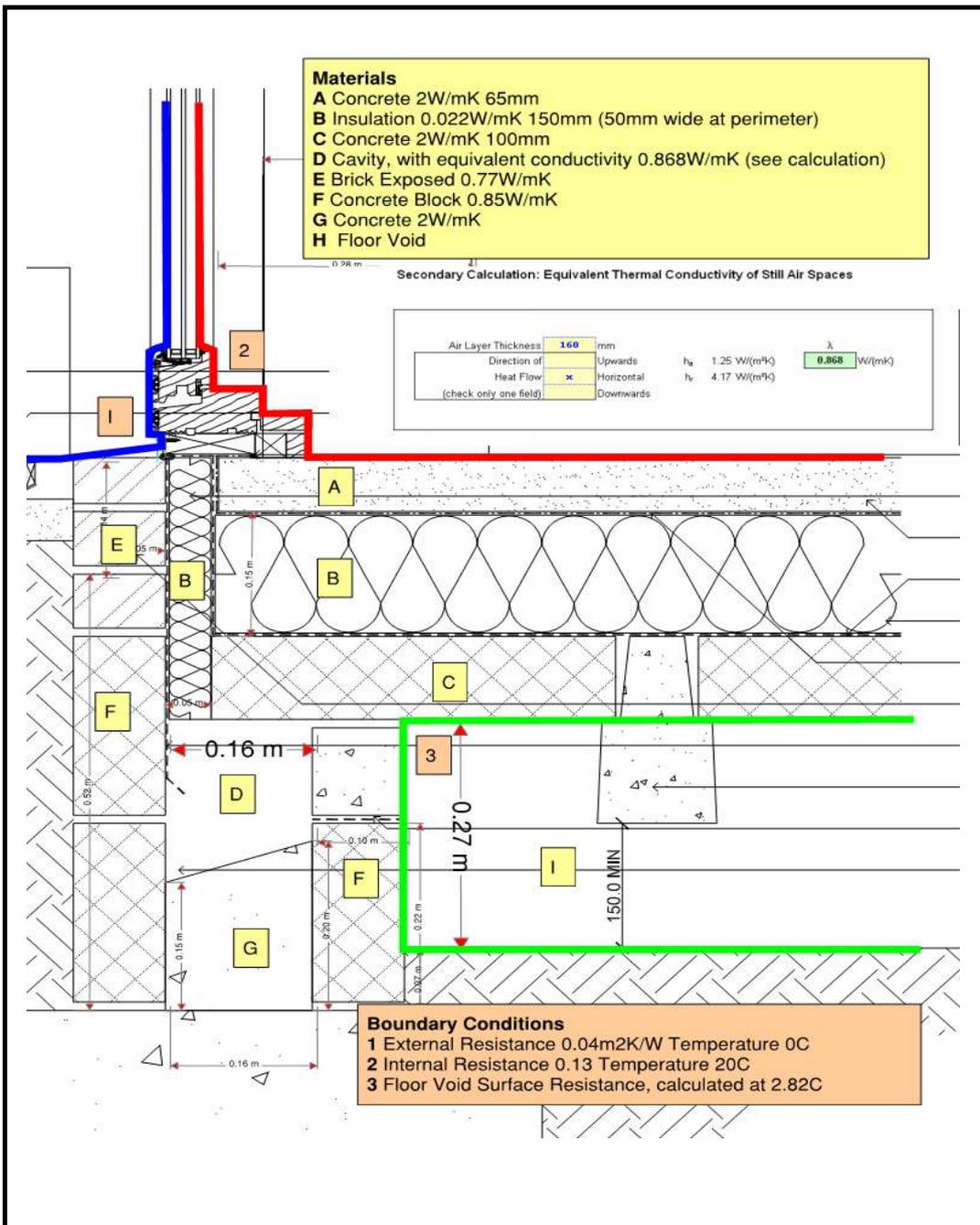
None

Standard Boundary Conditions

Name	Temperature	Film Coefficient
------	-------------	------------------

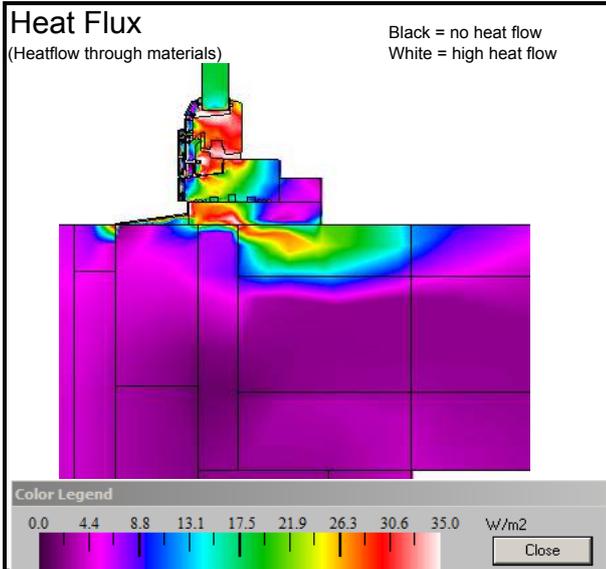
Poly Heat

ID	Flow	Dir	Side 1 Temp C	Side 2 Emis C	Side 2 Temp mm	Dimension mm	Nu	Keff W/m-K	Cavity #	Height mm
183	Horizontal		15.00	0.90	5.00	0.90	4.30	6.29		
182	Horizontal		15.00	0.90	5.00	0.90	3.30	1.19		
162	Horizontal		15.00	0.90	5.00	0.90	13.03	15.47		
160	Horizontal		15.00	0.90	5.00	0.90	7.80	5.00		
159	Horizontal		15.00	0.90	5.00	0.90	31.55	18.00		



**WARM: Low Energy Building Practice**  
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Software: Therm 5.2	Date: 06/07/2011
Job Name: Rational Psi Values	Job No: 2011 037
Tab name: GFDoor to SuspFloor Junction	Completed by: KP
Descrpt: Tilt and Turn cill	Checked by: PW



Data colum	Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	16	Wall	Internal	1000	0.0912	
T	16	Floor Cassette	Internal	4000	0.1414	
U	16	L2D Door	Internal			0.3588
V	17	L2D All	Internal			0.9239

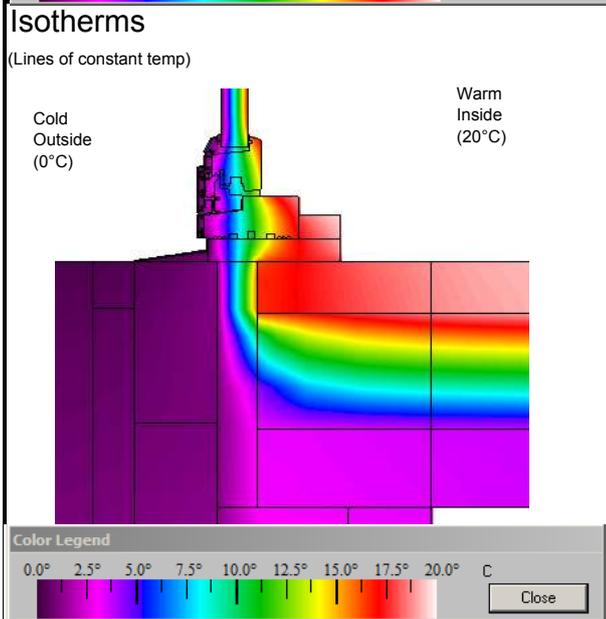
U - value calculation for data row	Wall
Check surface resistances correct	y
Check total length correct	y
<b>Modelling U Value ( W/m2K) 0.091</b>	

U - value calculation for data row	Floor Cassette
Check surface resistance correct ( zero under)	y
Check total length correct	y
<b>Floor Cassette Modelling U Value ( W/m2K) 0.141</b>	

VENTED Ground Floor Calculation using ISO 13770, check values below

ventilation opening	0.0015	windspeed	5
wind shielding	0.05	ground k	2.0 W/m2K
areas m2	3.916 m2	perim k	1 m
wall thick	0 m	Rgins	0
Void ht above ground	0 m	Uwall	2
dg	0.42	B'	7.832
Ug	0.65	Vcpro	0.2721

**FLOOR VOID Temperature (20/0) C 3.27**  
**FLOOR Modelling U Value ( W/m2K) 0.118**



Psi calculation	length mm	U-value/L2D W/m2K	heat flow W/mK	psi value W/mK
L2D All				0.924
L2D Door				0.359
Wall	Height time U value:	30	0.091	0.003
Floor	Length time U value:	3916	0.118	0.463
				0.099

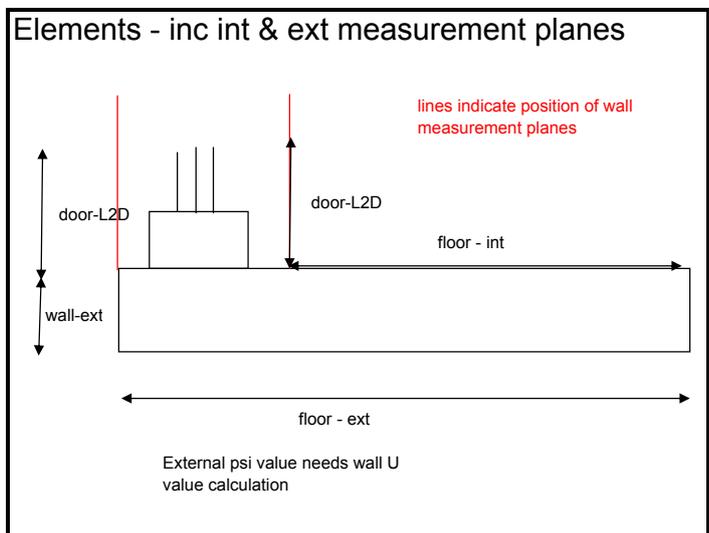
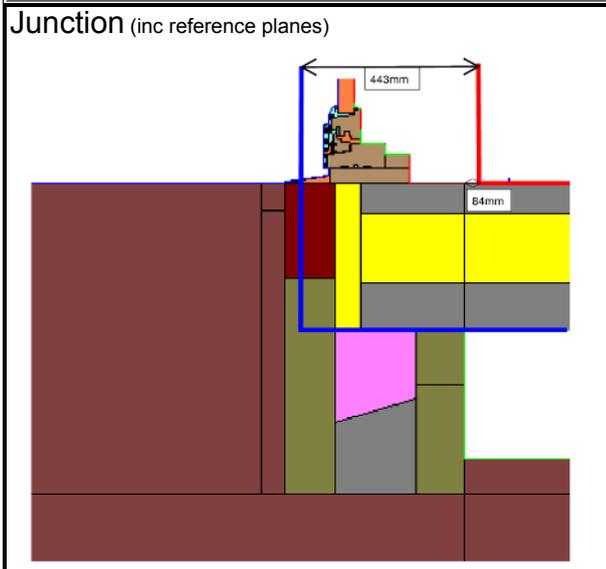
**psi Internal 0.099 W/mK**

Psi calculation	length mm	U-value/L2D W/m2K	heat flow W/mK	psi value W/mK
L2D All				0.924
L2D Door				0.359
Wall	Height time U value:	345	0.091	0.031
Floor	Length time U value:	4359	0.118	0.516
				0.018

**psi External 0.018 W/mK**

Error in calculation: From therm report - worst cell **8.5 %**

Run with 10m by 14m ground slab due to THERM limitations





# Inward Opening Door Jamb Head and Cill

## Jamb

- Sketch
- Sketch installed
- Psi calculation
- Therm report outputs

## Head

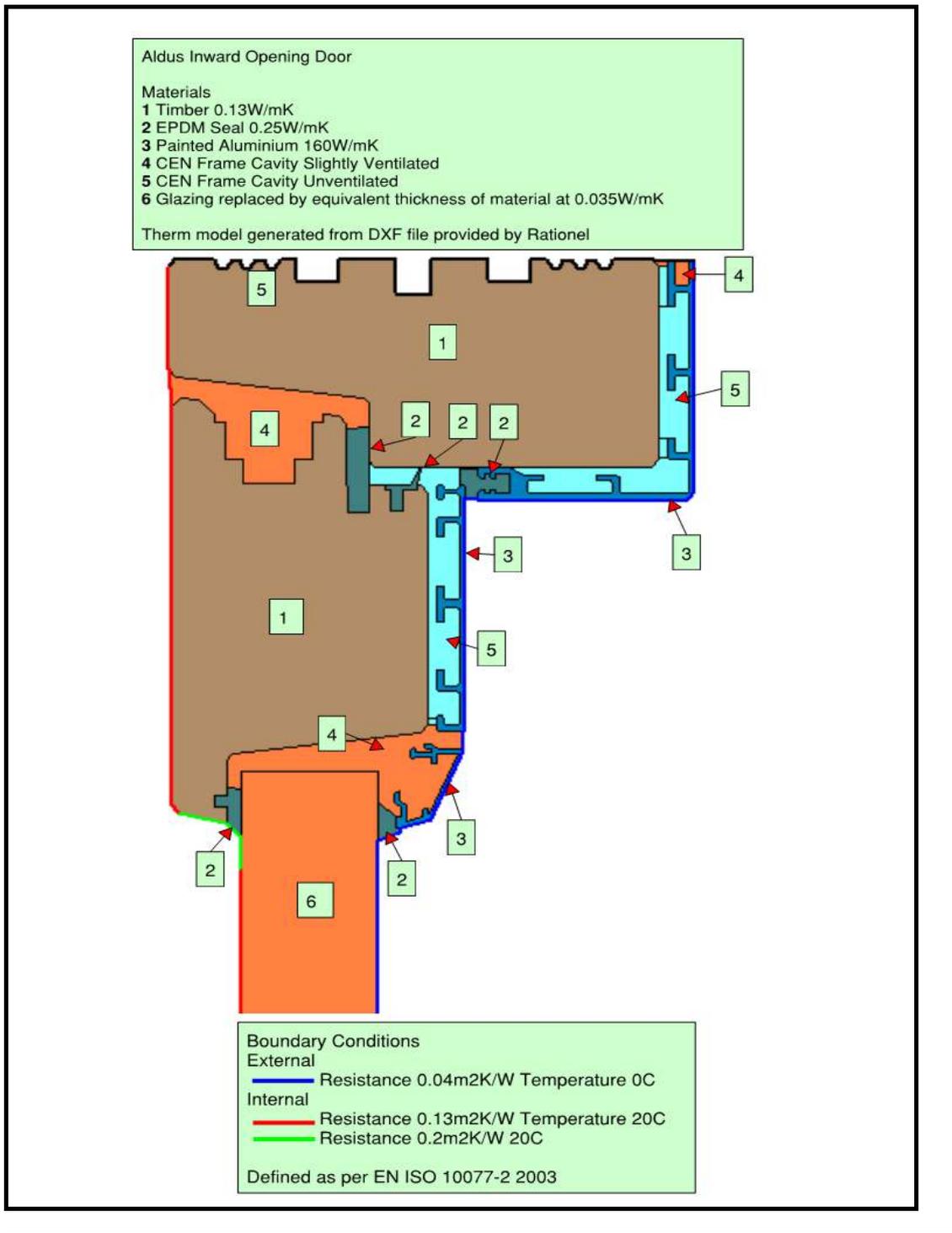
- Sketch installed
- Psi calculation
- Therm report outputs

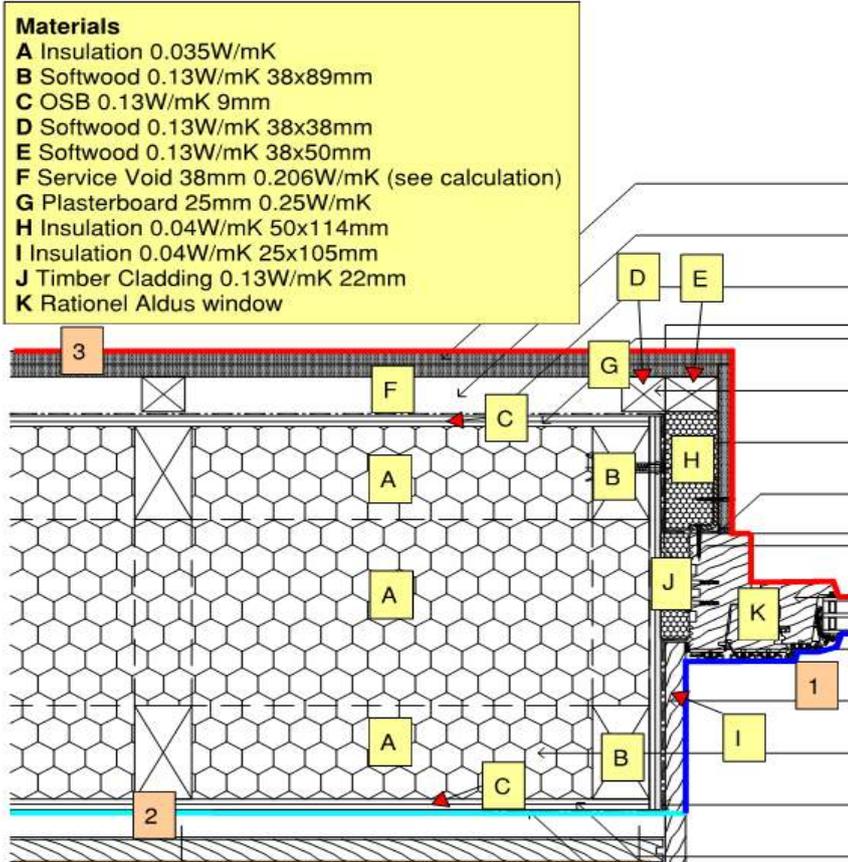
## Cill

- Sketch
- Sketch installed
- Psi calculation
- Therm report outputs

## Cill on ground (used as door)

- Sketch installed
- Psi calculation
- Therm report outputs





**Materials**  
**A** Insulation 0.035W/mK  
**B** Softwood 0.13W/mK 38x89mm  
**C** OSB 0.13W/mK 9mm  
**D** Softwood 0.13W/mK 38x38mm  
**E** Softwood 0.13W/mK 38x50mm  
**F** Service Void 38mm 0.206W/mK (see calculation)  
**G** Plasterboard 25mm 0.25W/mK  
**H** Insulation 0.04W/mK 50x114mm  
**I** Insulation 0.04W/mK 25x105mm  
**J** Timber Cladding 0.13W/mK 22mm  
**K** Rationel Aldus window

**Boundary Conditions**  
**1** External  
 Resistance 0.04m<sup>2</sup>K/W Temperature 0C  
**2** External Resistance 0.13m<sup>2</sup>K/W Temp 0C (Sheltered)  
**3** Internal Resistance 0.13 Temperature 20C  
 and increased resistance 0.2m<sup>2</sup>K/W as per EN ISO 10077-2 2003

**Secondary Calculation: Equivalent Thermal Conductivity of Still Air Spaces**

Air Layer Thickness:	38	mm		
Direction of Heat Flow:	x	Horizontal	$h_a$	1.25 W/(m <sup>2</sup> K)
(check only one field):		Upwards	$h_r$	4.17 W/(m <sup>2</sup> K)
		Downwards	$\lambda$	0.206 W/(mK)

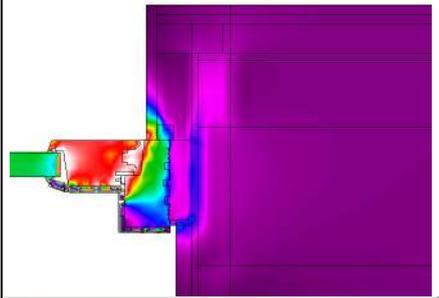
30

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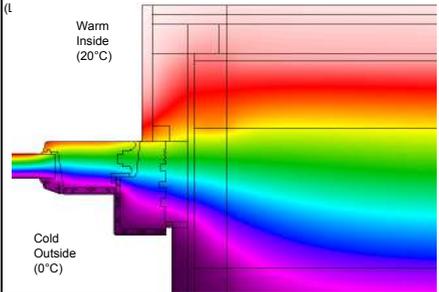
Software: Therm 5.2 Date: 06/07/2011  
 Job Name: Rational Installation Psi Values Job No: 2011 037  
 Tab name: Window (Uf & PSIinst) Completed by: KP  
 Descrip: Inward Opening Jamb Checked by: PW

**Heat Flux**  
 (Heatflow through materials)

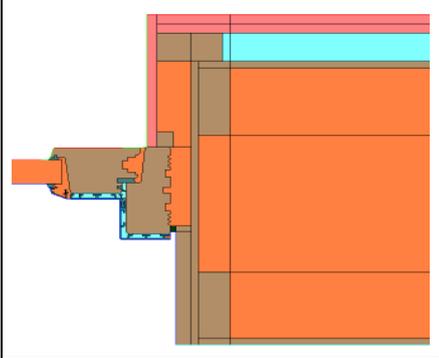
Black = no heat flow  
 White = high heat flow



**Isotherms**



**Junction (inc reference planes)**



Data column	Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	16	Frame+Ins.	Internal			0.4026
T	16	Wall	Internal	1000.00	0.0912	
U	16	Wall+Frame	Internal			0.5097

Uframe for EN 10077-2 Window Calc.

	dimension mm	U-value W/m2K	heat flow W/mK
L2D with insulation replacing glazing			0.4026
Insulation thickness	32	0.922	
Insulation visible width	190		0.1752
Frame width	150.6		
<b>U Frame ( W/m2K)</b>			<b>1.510</b>

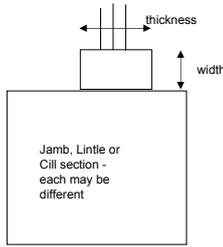
U - value calculation for data row Wall

Check surface resistances correct	y
Check total length correct	y
<b>Modelling U Value ( W/m2K)</b>	
<b>0.091</b>	

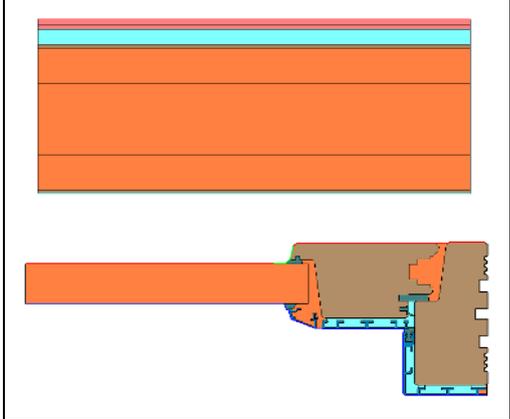
Psi Window Installation according to Pa

	dimension mm	U-value W/m2K	heat flow W/mK
Wall and Frame with insulated panel			0.5097
Frame and Insulated panel			0.4026
Wall	1072	0.091	0.0978
<b>Installation Psi</b>			<b>0.009 W/mK</b>

Error in calculation: From therm report - worst cell **5.6 %**



**Elements**



**Therm Version 5.2 (5.2.14)**  
Date: Wed Jul 20 12:29:56 2011

**Therm Version 5.2 (5.2.14)**  
Date: Wed Jul 06 14:31:14 2011

**Therm Version 5.2 (5.2.14)**  
Date: Wed Jul 20 12:31:15 2011

Created by:  
Created for:

Created by:  
Created for:

Created by:  
Created for:

Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rationel PSTherm Filename: Z:\01 WARM\01 Jobs\2011 037 Rationel PSTherm Filename: Z:\01 WARM\01 Jobs\2011 037 Rationel PSI calcs\Therm\Therm DOOR\Door Inward Jamb Install.THM  
Cross Section Type: Sill Cross Section Type: Sill Cross Section Type: Sill  
Underlay Name: Underlay Name: Underlay Name:

U-factors

U-factors

U-factors

Name	Length mm	Basis Projected X	U-factor W/m2-K
Internal	338.60	Projected X	1.1891
External	339.80	Projected X	1.1849

Name	Length mm	Basis Total Length	U-factor W/m2-K
Internal	1000.00	Total Length	0.0912
External	1000.00	Total Length	0.0912

Name	Length mm	Basis Projected X	U-factor W/m2-K
Internal	1412.60	Projected X	0.3608
External	1412.60	Projected X	0.3608

Solid Materials

Solid Materials

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA TIM General Timber	0.13	0.90
Aluminum Painted	160.00	0.20
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
38mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90

Name	Conductivity W/m-K	Emissivity
AA TIM General Timber	0.13	0.90
Aluminum Painted	160.00	0.20
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90
Door Inward Jamb Install:38mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90
Foam Weatherstripping*	0.03	0.90
AA INS k040	0.04	0.90

Cavities

Cavities

Cavities

Name: CEN frame cavity unventilated  
Gas Fill: Air  
Convection Model: CEN  
Radiation Model: Standard

None  
Glazing Systems

Cavities

Poly Heat ID	Flow Dir	Side 1 Temp C	Side 2 Temp C	Dimension mm	Nu	Keff	Cavity Height mm	W/mStandard Boundary Conditions
33	Horizontal	15.00	0.90	5.00	0.90	10.52	2.00	Name Temperature Film Coefficient
34	Horizontal	15.00	0.90	5.00	0.90	4.73	2.00	C W/m2-K
38	Horizontal	15.00	0.90	5.00	0.90	38.03	6.26	
39	Horizontal	15.00	0.90	5.00	0.90	0.23	7.20	IAA External protected 0.13 OC 0.00 7.690
6	Horizontal	15.00	0.90	5.00	0.90	7.69	34.00	IAA Interior Horizontal R0.13 2
19	Horizontal	15.00	0.90	5.00	0.90	2.11	1.93	IOC 20.00 7.690
22	Horizontal	15.00	0.90	5.00	0.90	35.62	13.40	N/A 0.1518 N/A

Poly Heat ID	Flow Dir	Side 1 Temp C	Side 2 Temp C	Dimension mm	Nu	Keff	Cavity Height mm	W/m-K
39	Horizontal	15.00	0.90	5.00	0.90	10.52	2.00	N/A 0.0514 N/A
38	Horizontal	15.00	0.90	5.00	0.90	4.73	2.00	N/A 0.0379 N/A
36	Horizontal	15.00	0.90	5.00	0.90	38.03	6.26	N/A 0.1544 N/A
35	Horizontal	15.00	0.90	5.00	0.90	0.23	7.20	N/A 0.0260 N/A
34	Horizontal	15.00	0.90	5.00	0.90	7.69	34.00	N/A 0.0547 N/A
25	Horizontal	15.00	0.90	5.00	0.90	2.11	1.93	N/A 0.0315 N/A
96	Horizontal	15.00	0.90	5.00	0.90	35.57	13.38	N/A 0.1516 N/A

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

Calculation Specifications

Name: CEN frame cavity slightly ventilated

Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

Poly Heat ID	Flow Dir	Side 1 Temp C	Side 2 Temp C	Dimension mm	N Mesh	Parameter	Estimated Error	W/m Calculations done in Version 5.2 (5.2.14)
7	Down	15.00	0.90	5.00	0.90	1.28	3.25	N/A 0.0676 N/A
8	Down	15.00	0.90	5.00	0.90	6.05	3.61	N/A 0.0748 N/A
25	Down	15.00	0.90	5.00	0.90	19.98	32.02	N/A 0.2863 N/A
46	Down	15.00	0.90	5.00	0.90	15.77	35.36	N/A 0.3059 N/A

Poly Heat ID	Flow Dir	Side 1 Temp C	Side 2 Temp C	Dimension mm	Nu	Keff	Cavity Height mm	W/m-K
33	Down	15.00	0.90	5.00	0.90	1.28	3.25	N/A 0.0676 N/A
32	Down	15.00	0.90	5.00	0.90	6.05	3.61	N/A 0.0748 N/A
22	Down	15.00	0.90	5.00	0.90	19.98	32.02	N/A 0.2863 N/A
4	Down	15.00	0.90	5.00	0.90	15.77	35.36	N/A 0.3059 N/A

Glazing Systems

None

Glazing Systems

None

Standard Boundary Conditions

Name	Temperature C	Film Coefficient W/m2-K
AA External R0.04 OC	0.00	25.000
AA Interior Horizontal R0.13 2 OC	20.00	7.690
AA Internalthorizeducedrad R0.2 2OC	20.00	5.000

Standard Boundary Conditions

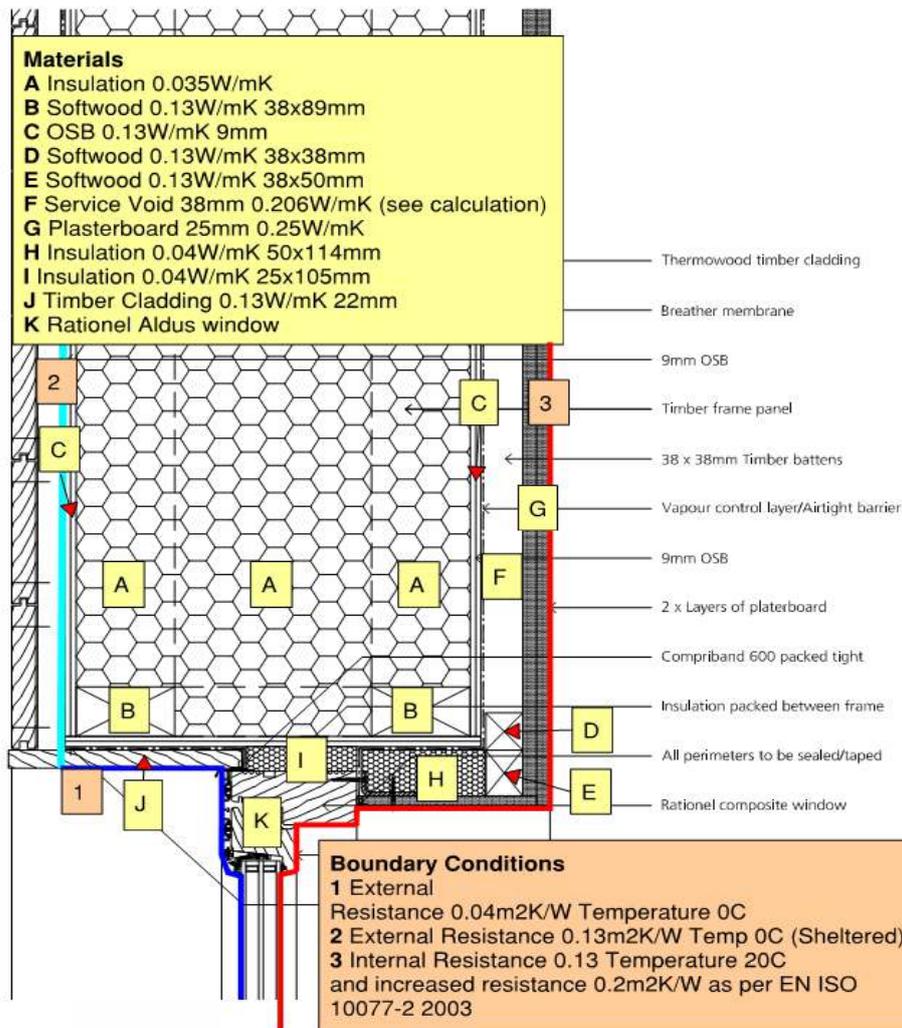
Name	Temperature C	Film Coefficient W/m2-K
AA External R0.04 OC	0.00	25.000
Door Inward Jamb Install:AA External protected 0.13 OC	0.00	7.690
AA Interior Horizontal R0.13 2 OC	20.00	7.690
AA Internalthorizeducedrad R0.2 2OC	20.00	5.000

Calculation Specifications

Mesh Parameter : 8  
Estimated Error: 5.4%  
Calculations done in Version 5.2 (5.2.14)

Calculation Specifications

Mesh Parameter : 8  
Estimated Error: 5.6%  
Calculations done in Version 5.2 (5.2.14)

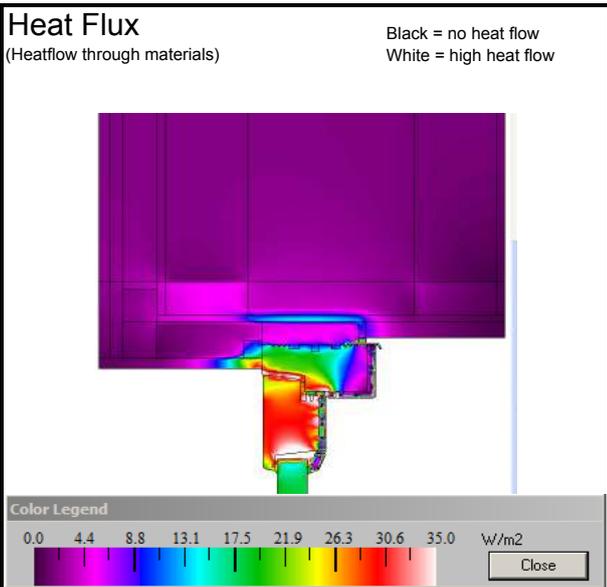


**Secondary Calculation: Equivalent Thermal Conductivity of Still Air Spaces**

Air Layer Thickness:	38	mm		
Direction of:	Upwards		$h_u$	1.25 W/(m <sup>2</sup> K)
Heat Flow:	Horizontal		$h_r$	4.17 W/(m <sup>2</sup> K)
(check only one field):	Downwards			
			$\lambda$	0.206 W/(mK)

**WARM: Low Energy Building Practice**  
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Software: Therm 5.2 Date: 06/07/2011  
 Job Name: Rationel psi values Job No: 2011 037  
 Tab name: Window (Uf & PSInst) Completed by: KP  
 Descrip: Door Inward Head Checked by: PW



Data column	Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	16	Frame+Ins.	External			0.3807
T	16	Wall	Internal	1000.00	0.0912	
U	16	Wall+Frame	Internal			0.4896

Uframe for EN 10077-2 Window Calc. dimension U-value heat flow  
 mm W/m2K W/mK

L2D with insulation replacing glazing				0.3807
Insulation	thickness	32	0.922	
	visible width	190		0.1752
Frame	width	150.47		
<b>U Frame ( W/m2K)</b>				<b>1.365</b>

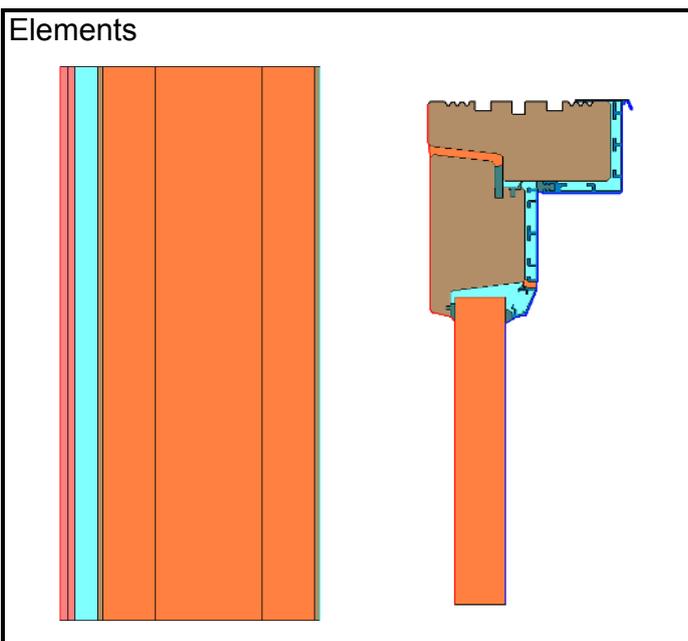
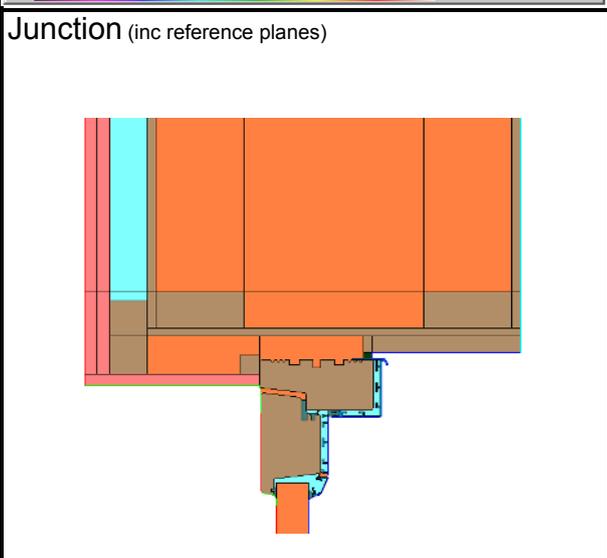
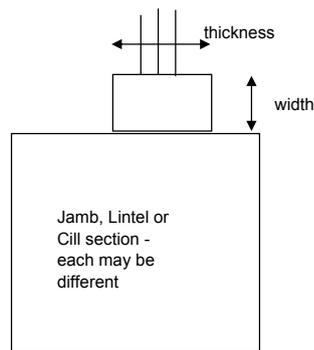
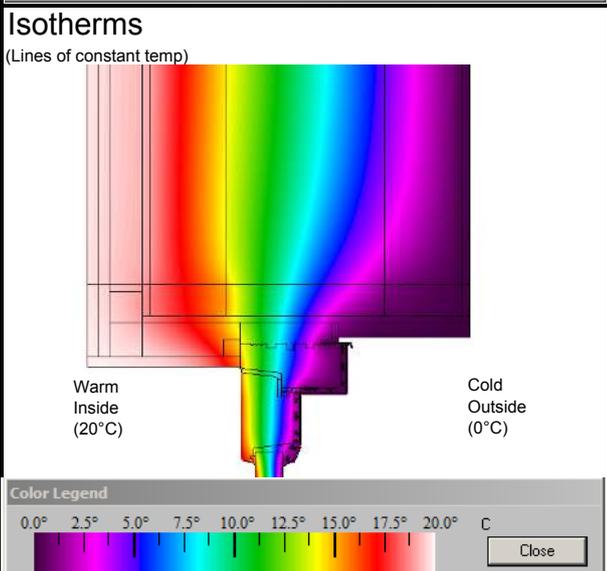
U - value calculation for data row Wall

Check surface resistances correct	y
Check total length correct	y
<b>Modelling U Value ( W/m2K)</b>	
<b>0.091</b>	

Psi Window Installation according to Pa dimension U-value heat flow  
 mm W/m2K W/mK

Wall and Frame with insulated panel			0.4896
Frame and Insulated panel			0.3807
Wall	1072	0.091	0.0978
<b>Installation Psi</b>			<b>0.011 W/mK</b>

Error in calculation: From them report - worst cell **7.1 %**



<b>Therm Version 5.2 (5.2.14)</b>	Therm Version 5.2 (5.2.14)	Therm Version 5.2 (5.2.14)
Date: Wed Jul 20 12:41:23 2011	Date: Wed Jul 06 15:26:11 2011	Date: Wed Jul 20 12:38:28 2011
Created by:	Created by:	Created by:
Created for:	Created for:	Created for:

Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P	Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P	Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational PS
Cross Section Type: Sill	Cross Section Type: Sill	Cross Section Type: Sill
Underlay Name: Z:\01 WARM\01 Jobs\2011 037 Rational PS	Underlay Name:	Underlay Name:

U-factors				U-factors				U-factors			
Name	Length	Basis	U-factor	Name	Length	Basis	U-factor	Name	Length	Basis	U-factor
	mm		W/m2-K		mm		W/m2-K		mm		W/m2-K
External	340.76	Projected X	1.1171	Internal	1000.00	Total Length	0.0912	Internal	1412.47	Projected X	0.3466
Internal	338.47	Projected X	1.1247	External	1000.00	Total Length	0.0912	External	1412.47	Projected X	0.3466

Solid Materials

Name	Conductivity	Emissivity
	W/m-K	
Aluminum Painted	160.00	0.20
AA TIM General Timber	0.13	0.90
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90

Solid Materials

Name	Conductivity	Emissivity
	W/m-K	
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Door Inward Head Install:38mm		
Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90

Solid Materials

Name	Conductivity	Emissivity
	W/m-K	
Aluminum Painted	160.00	0.20
AA TIM General Timber	0.13	0.90
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90
Door Inward Head Install:38mm		
Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90
AA INS k040	0.04	0.90
Foam Weatherstripping*	0.03	0.90

Cavities

Name: CEN frame cavity unventilated  
 Gas Fill: Air  
 Convection Model: CEN  
 Radiation Model: Standard

Cavities

None

Glazing Systems

Cavities

Name: CEN frame cavity unventilated  
 Gas Fill: Air  
 Convection Model: CEN  
 Radiation Model: Standard

Poly Heat

ID Flow	Side 1	Side 2	Dimension	N	None
Dir	Temp	Emis	Temp	Emis	Horz. Vert. # Height
	C	C	mm	mm	W/m-K mm
Standard Boundary Conditions					
29 Horizontal	15.00	0.90	5.00	0.90	0.67 0.58 N/A 0.0271 N/A
30 Down	15.00	0.90	5.00	0.90	2.07 1.70 IName Temperature Film Coefficient
39 Horizontal	15.00	0.90	5.00	0.90	0.42 0.62 C W/m2-K
10 Down	15.00	0.90	5.00	0.90	5.00 10.02
31 Down	15.00	0.90	5.00	0.90	53.29 7.69 AA Interior Horizontal R0.13 2
19 Down	15.00	0.90	5.00	0.90	24.98 22.54 0C 20.00 7.690
17 Down	15.00	0.90	5.00	0.90	14.45 34.54 AA External protected 0.13 0C 0.00 7.690

Name: CEN frame cavity slightly ventilated  
 Gas Fill: Air  
 Convection Model: CEN Ventilated  
 Radiation Model: Standard

Calculation Specifications

Poly Heat

ID Flow	Side 1	Side 2	Dimension	N
Dir	Temp	Emis	Temp	Emis
	C	C	mm	mm
163 Down	15.00	0.90	5.00	0.90
162 Down	15.00	0.90	5.00	0.90
160 Down	15.00	0.90	5.00	0.90
158 Down	15.00	0.90	5.00	0.90
156 Down	15.00	0.90	5.00	0.90
155 Down	15.00	0.90	5.00	0.90
150 Down	15.00	0.90	5.00	0.90

Name: CEN frame cavity slightly ventilated  
 Gas Fill: Air  
 Convection Model: CEN Ventilated  
 Radiation Model: Standard

Poly Heat

ID Flow	Side 1	Side 2	Dimension	Nu	Keff	Cavity
Dir	Temp	Emis	Temp	Emis	Horz. Ver Mesh Parameter : 6	
	C	C	mm	mm	W/n Estimated Error: 7.8e-012%	
Calculations done in Version 5.2 (5.2.14)						
35 Down	15.00	0.90	5.00	0.90	5.00 7.82 N/A 0.0955 N/A	
33 Down	15.00	0.90	5.00	0.90	9.53 28.98 N/A 0.2445 N/A	

Glazing Systems

None

Poly Heat

ID Flow	Side 1	Side 2	Dimension	N
Dir	Temp	Emis	Temp	Emis
	C	C	mm	mm
154 Down	15.00	0.90	5.00	0.90
149 Down	15.00	0.90	5.00	0.90

Glazing Systems

None

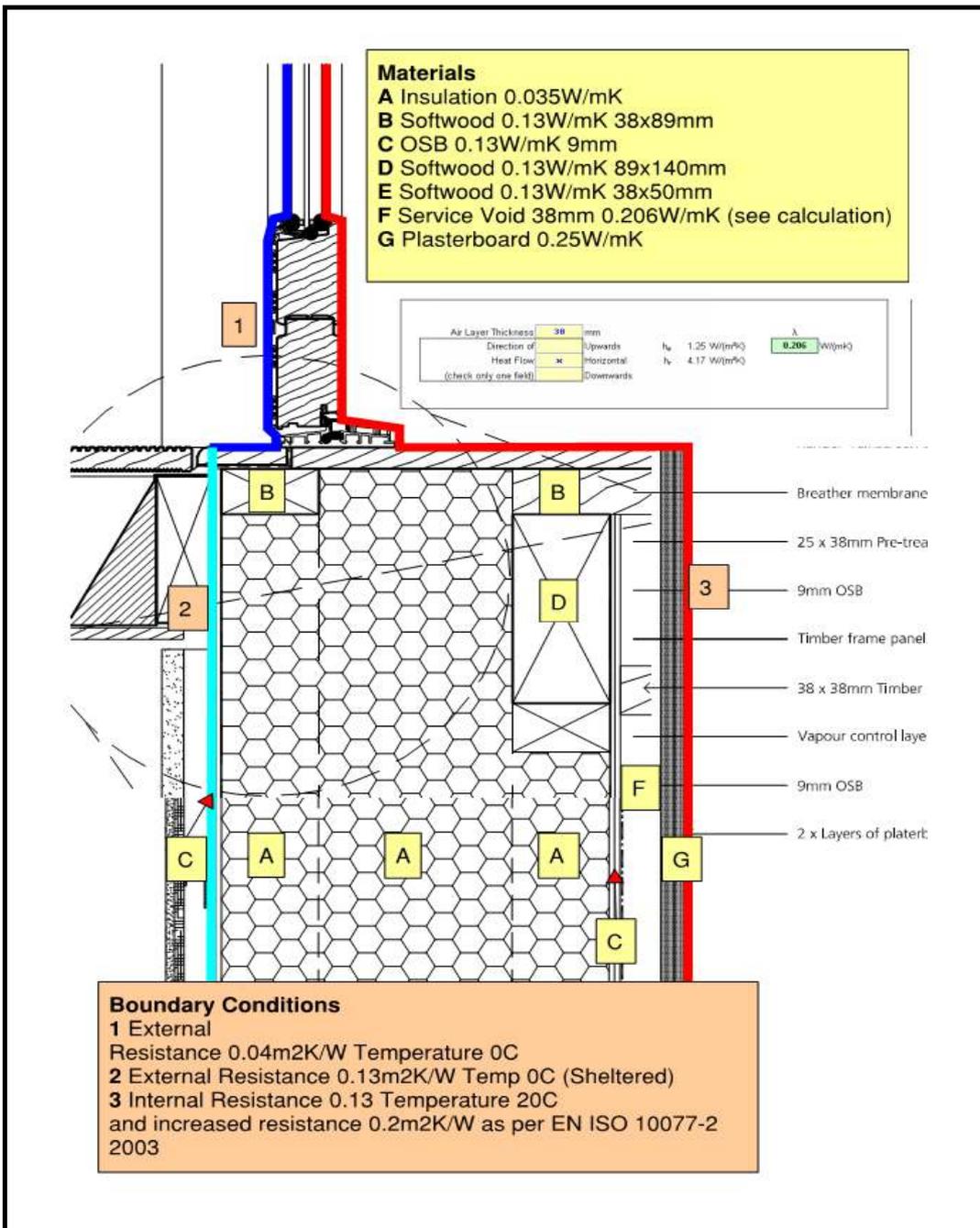
Standard Boundary Conditions

Name	Temperature	Film Coefficient
	C	W/m2-K
AA External R0.04 0C	0.00	25.000
AA Interior Horizontal R0.13 2		
0C	20.00	7.690
AA Internalthorizreducedrad R0.2 20C	20.00	5.000

Standard Boundary Conditions

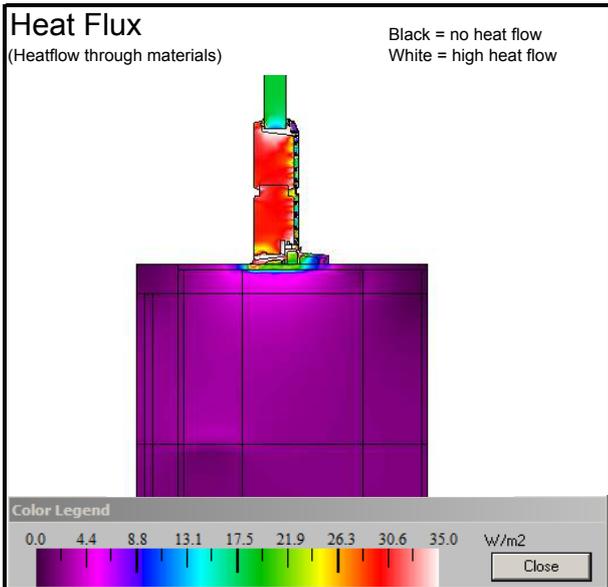
Name	Temperature	Film Coefficient
	C	W/m2-K
AA External R0.04 0C	0.00	25.000
Door Inward Head Install:AA Ex		
ternal protected 0.13 0C	0.00	7.690
AA Interior Horizontal R0.13 2		
0C	20.00	7.690

Calculation Specifications



**WARM: Low Energy Building Practice**  
 7 The Crescent, Plymouth PL1 3AB - 01752 542 546 - www.peterwarm.co.uk

Software: Therm 5.2 Date: 18/07/2011  
 Job Name: Rationel psi values Job No: 2011 037  
 Tab name: Window (Uf & PSinst) Completed by: KP  
 Descr: Inward Door Cill in plain wall Checked by: PW



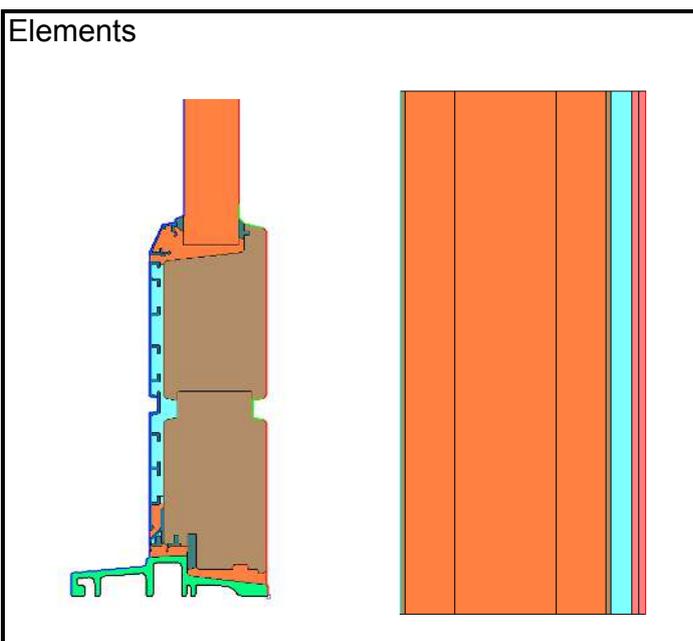
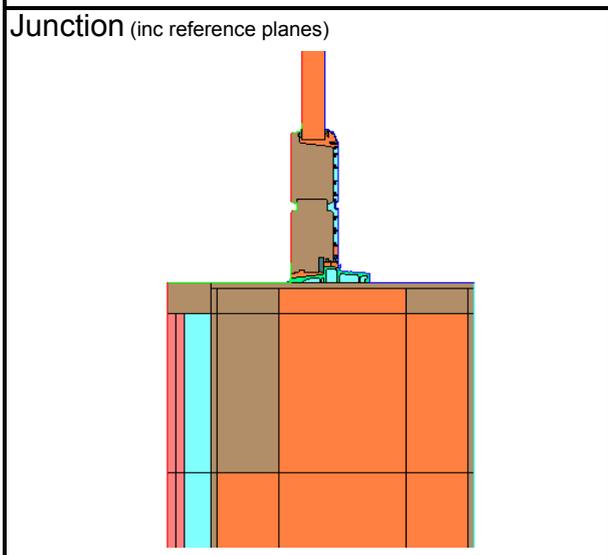
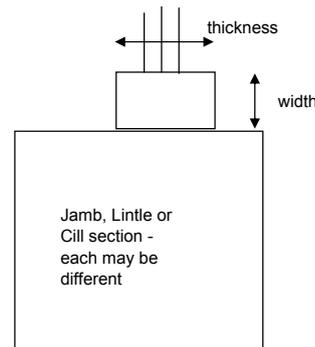
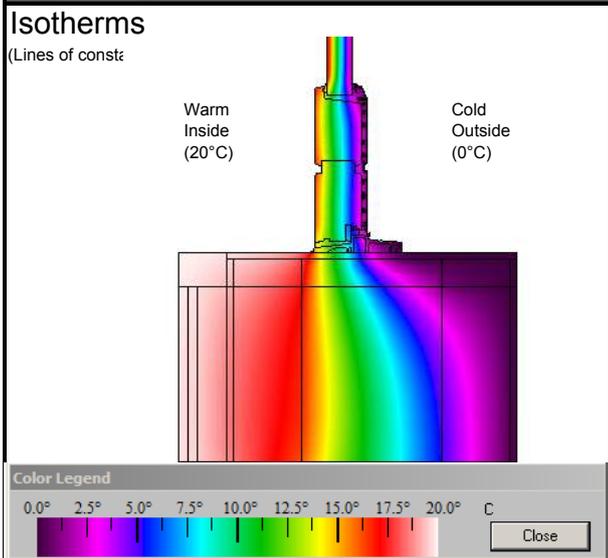
Data column	Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	16	Frame+Ins.	External			0.5298
T	16	Wall	Internal	1000.00	0.0912	
U	16	Wall+Frame	Internal			0.6797

Uframe for EN 10077-2 Window Calc.	dimension mm	U-value W/m2K	heat flow W/mK
L2D with insulation replacing glazing			0.5298
Insulation thickness	32	0.922	
Insulation visible width	190		0.1752
Frame width	235.77		
<b>U Frame ( W/m2K)</b>			<b>1.504</b>

U - value calculation for data row	Wall	U-value	heat flow
Check surface resistances correct		y	
Check total length correct		y	
<b>Modelling U Value ( W/m2K)</b>			<b>0.091</b>

Psi Window Installation according to Pa	dimension mm	U-value W/m2K	heat flow W/mK
Wall and Frame with insulated panel			0.6797
Frame and Insulated panel			0.5298
Wall	1289	0.091	0.1176
<b>Installation Psi</b>			<b>0.032 W/mK</b>

Error in calculation: From them report - worst cell **6.5 %**



Therm Version 5.2 (5.2.14)  
Date: Wed Jul 20 12:50:01 2011

Therm Version 5.2 (5.2.14)  
Date: Mon Jul 18 16:01:05 2011

Therm Version 5.2 (5.2.14)  
Date: Wed Jul 20 12:51:17 2011

Created by:  
Created for:

Created by:  
Created for:

Created by:  
Created for:

Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P; Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational P; Therm Filename: Z:\01 WARM\01 Jobs\2011 037 Rational PS

Cross Section Type: Sill  
Underlay Name:

Cross Section Type: Sill  
Underlay Name:

Cross Section Type: Sill  
Underlay Name:

U-factors

U-factors

U-factors

Name	Length mm	Basis	U-factor W/m2-K
External	425.77	Projected X	1.2443
Internal	424.97	Projected X	1.2467

Name	Length mm	Basis	U-factor W/m2-K
Internal	1000.00	Total Length	0.0912
External	1000.00	Total Length	0.0912

Name	Length mm	Basis	U-factor W/m2-K
Internal	1714.77	Projected Y	0.3964
External	1714.77	Projected Y	0.3964

Solid Materials

Solid Materials

Solid Materials

Name	Conductivity W/m-K	Emissivity
Door Inward Cill:Helo Fibre	0.22	0.90
AA TIM General Timber	0.13	0.90
Aluminum Painted	160.00	0.20
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Ford Farm Wall Vertical kp1:38		
mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90

Name	Conductivity W/m-K	Emissivity
Door Inward Cill install plain wall. rotatedTHM:Helo Fibre	0.22	0.90
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Door Inward Cill install plain wall. rotatedTHM:38mm Service Void k206	0.10	0.90
AA FIN Plasterboard	0.25	0.90
Aluminum Painted	160.00	0.20
CEN EPDM	0.25	0.90

Cavities

Cavities

Cavities

Name: CEN frame cavity unventilated  
Gas Fill: Air  
Convection Model: CEN  
Radiation Model: Standard

None  
Glazing Systems  
None

Name: CEN frame cavity unventilated  
Gas Fill: Air  
Convection Model: CEN  
Radiation Model: Standard

Poly Heat ID	Flow Dir	Side 1 Temp C	Side 1 Emis C	Side 2 Temp C	Side 2 Emis C	Dimension mm	Horz. mm	Vert. mm	Nu	Keff	Cavity Height	W/n	Standard Boundary Conditions
19	Down	15.00	0.90	5.00	0.90	2.69	2.11	1	Name	Temperature	Film Coefficient		
23	Down	15.00	0.90	5.00	0.90	3.15	2.04	1		C	W/m2-K		
25	Down	15.00	0.90	5.00	0.90	4.80	2.09	1					
26	Horizontal	15.00	0.90	5.00	0.90	0.62	0.28		AA Interior Horizontal R0.13 2				
28	Down	15.00	0.90	5.00	0.90	1.83	2.09	1	OC	20.00	7.690		
30	Down	15.00	0.90	5.00	0.90	97.29	9.98		Ford Farm Wall Vertical kp1:AA External protected 0.13 OC	0.00	7.690		

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated

Calculation Specifications  
N

Poly Heat ID	Flow Dir	Side 1 Temp C	Side 1 Emis C	Side 2 Temp C	Side 2 Emis C	Dimension mm	Horz. mm	Vert. mm	N
15	Horizontal	15.00	0.90	5.00	0.90	2.11	2.69	1	
14	Horizontal	15.00	0.90	5.00	0.90	2.04	3.15	1	
13	Horizontal	15.00	0.90	5.00	0.90	2.09	4.80	1	
12	Horizontal	15.00	0.90	5.00	0.90	0.28	0.62	1	
11	Horizontal	15.00	0.90	5.00	0.90	2.09	1.83	1	
7	Horizontal	15.00	0.90	5.00	0.90	9.98	97.29	1	
53	Horizontal	15.00	0.90	5.00	0.90	24.99	6.20		
59	Horizontal	15.00	0.90	5.00	0.90	3.20	5.39	1	
63	Horizontal	15.00	0.90	5.00	0.90	17.25	19.72		
91	Horizontal	15.00	0.90	5.00	0.90	26.45	13.32		
94	Horizontal	15.00	0.90	5.00	0.90	9.18	9.35	1	

Radiation Model: Standard

Poly Heat ID	Flow Dir	Side 1 Temp C	Side 1 Emis C	Side 2 Temp C	Side 2 Emis C	Dimension mm	Horz. mm	Vert. mm	N	Height
8	Down	15.00	0.90	5.00	0.90	16.27	6.22	1	Calculations done in Version 5.2 (5.2.14)	
14	Down	15.00	0.90	5.00	0.90	9.46	33.67	N/A	0.2810	N/A
32	Down	15.00	0.90	5.00	0.90	15.76	35.45	N/A	0.3065	N/A
39	Down	15.00	0.90	5.00	0.90	8.01	18.31	N/A	0.1581	N/A

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

Glazing Systems

None

Poly Heat ID	Flow Dir	Side 1 Temp C	Side 1 Emis C	Side 2 Temp C	Side 2 Emis C	Dimension mm	Horz. mm	Vert. mm	N
6	Horizontal	15.00	0.90	5.00	0.90	6.22	16.27	1	
5	Horizontal	15.00	0.90	5.00	0.90	33.67	9.46	1	
27	Horizontal	15.00	0.90	5.00	0.90	35.45	15.76		
49	Horizontal	15.00	0.90	5.00	0.90	18.31	8.01		

Standard Boundary Conditions

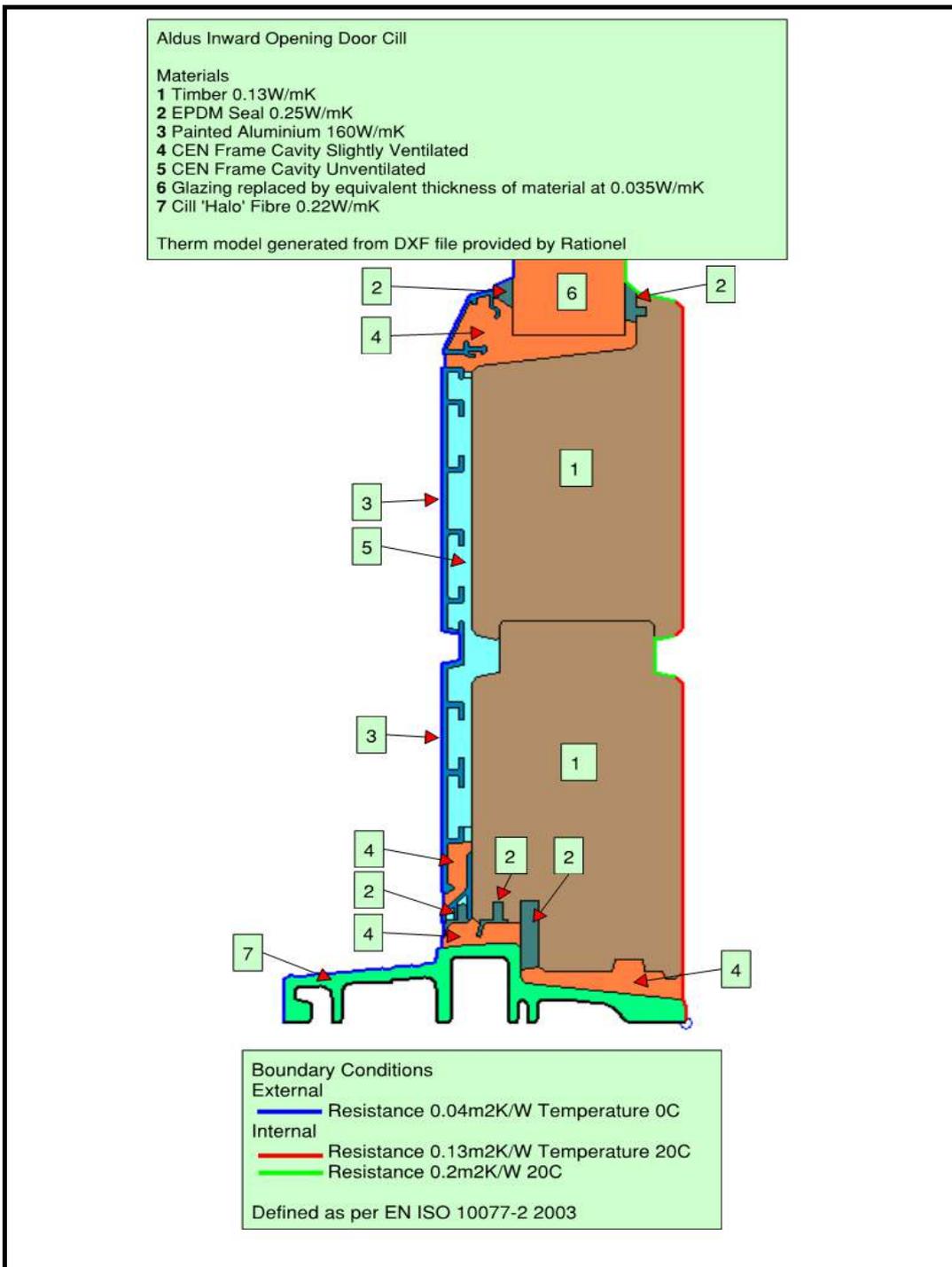
Name	Temperature C	Film Coefficient W/m2-K
AA External R0.04 OC	0.00	25.000
AA Interior Horizontal R0.13 2 OC	20.00	7.690
AA Internahorizreducedrad R0. 2 20C	20.00	5.000

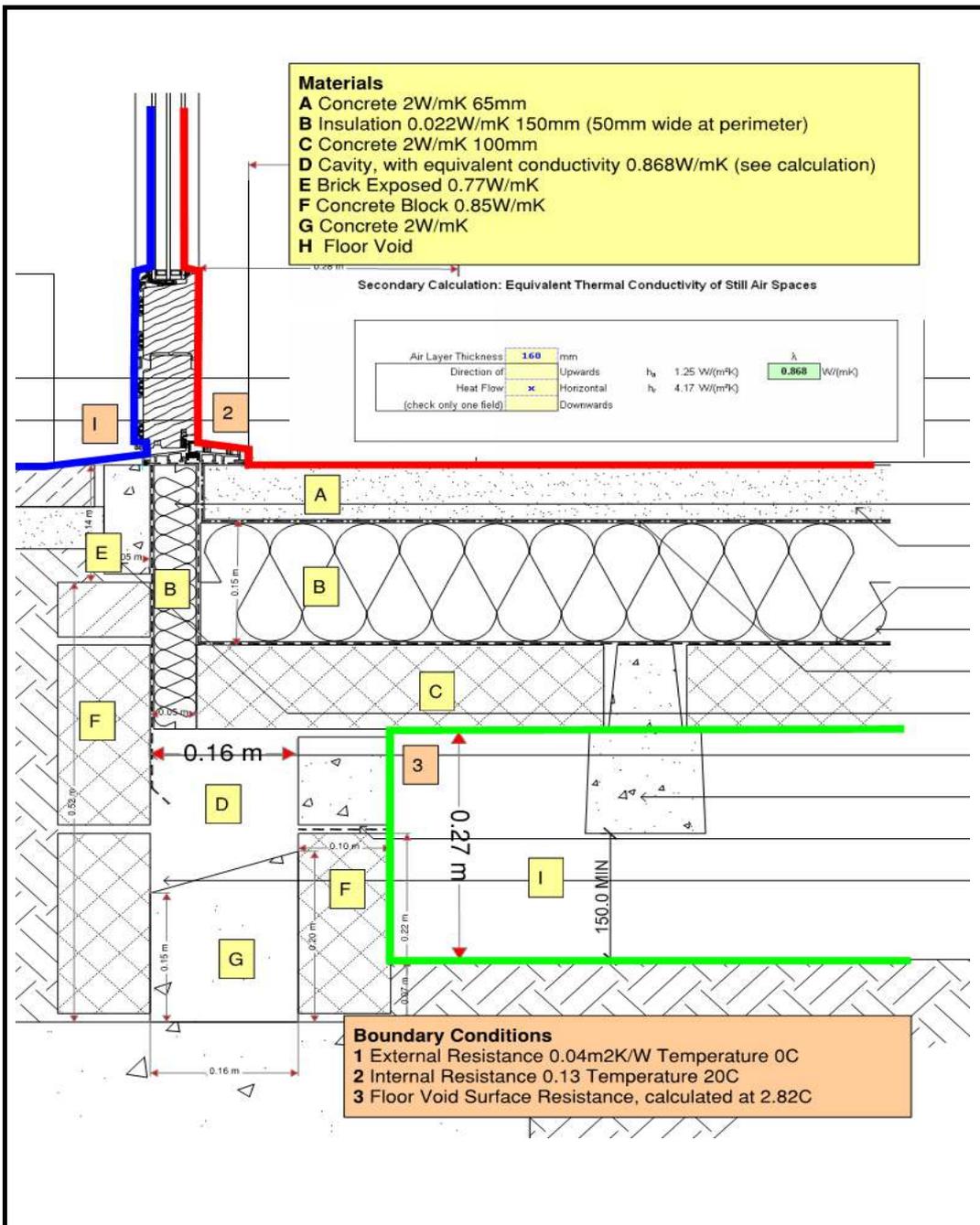
Glazing Systems

None

Standard Boundary Conditions

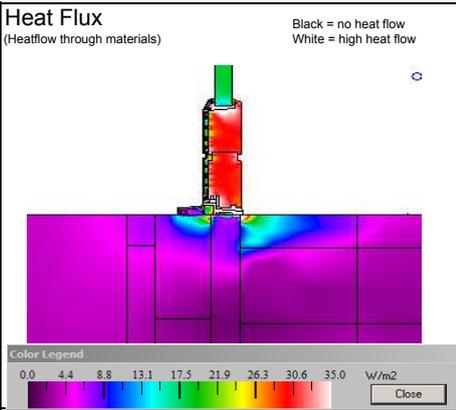
Name	Temperature	Film Coefficient
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**WARM: Low Energy Building Practice**  
7 The Crescent, Plymouth PL1 3AB - 01752 542 546 - www.peterwarm.co.uk

Software: Therm 5.2 Date: 18.07.2011  
Job Name: Tatonel Psi values Job No: 2011 037  
Tab name: GFDDoor to SuspFloor Junction Completed by: KP  
Descrip: Inward opening Cill ground floor Checked by: PW



Data colum	Row	Name	Ufactor name	Length mm	U factor	L2D W/Km
S	16	Wall	Internal	1000	0.0912	
T	16	Floor Cassett	Internal	4000	0.1414	
U	17	L2D Door	Internal			0.5298
V	16	L2D All	Internal			1.0753

U - value calculation for data row Wall  
Check surface resistances correct y  
Check total length correct y

**Modelling U Value ( W/m2K) 0.091**

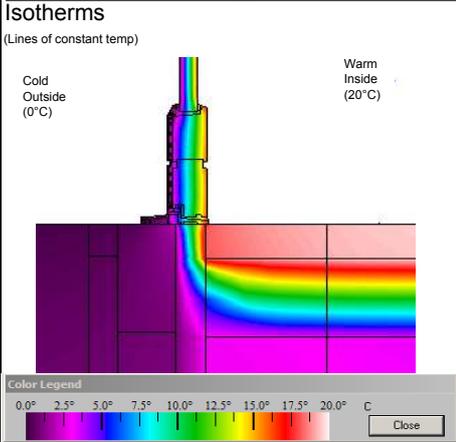
U - value calculation for data row Floor Cassette  
Check surface resistance correct ( zero under) y  
Check total length correct y

**Floor Cassette Modelling U Value ( W/m2K) 0.141**

VENTED Ground Floor Calculation using ISO 13770, check values below

ventilation opening	0.0015	wind speed	5
wind shielding	0.05	ground k	2.0 W/m2K
areas m2	3.916 m2	perim m	1 m
wall thick	0 m	Rgins	0
Void ht above ground	0 m	Uwall	2
dg	0.42	B'	7.832
Ug	0.65	Vcpro	0.2721

**FLOOR VOID Temperature (20/0) C 3.27**  
**FLOOR Modelling U Value ( W/m2K) 0.118**



Psi calculation

	length mm	U-value/L2D W/m2K	heat flow W/mK	psi value W/mK
L2D All				1.075
L2D Door				0.530
Floor	Length time U value: 3916	0.118		0.463
				0.082

**psi Internal 0.082 W/mK**

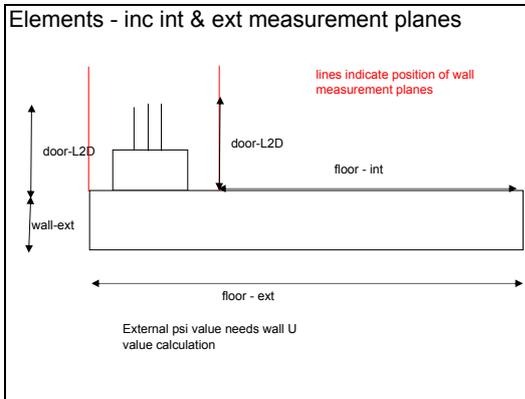
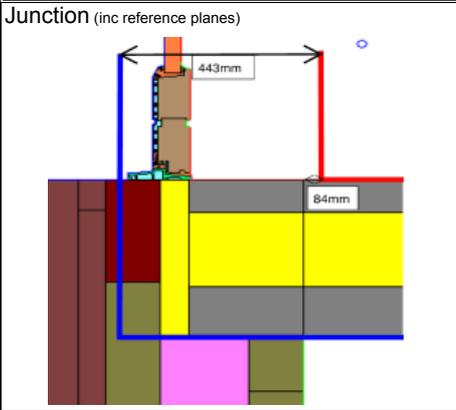
Psi calculation

	length mm	U-value/L2D W/m2K	heat flow W/mK	psi value W/mK
L2D All				1.075
L2D Door				0.530
Wall	Height time U value: 315	0.091		0.029
Floor	Length time U value: 4359	0.118		0.516
				0.001

**psi External 0.001 W/mK**

Error in calculation: From them report - worst cell 7 %

Run with 10m by 14m ground slab due to THERM limitations



<b>Therm Version 5.2 (5.2.14)</b> Date: Mon Jun 27 11:30:44 2011 Created by: Created for:	<b>Therm Version 5.2 (5.2.14)</b> Date: Mon Jul 18 12:45:34 2011 Created by: Created for:	<b>Therm Version 5.2 (5.2.14)</b> Date: Thu Jul 21 14:27:40 2011 Created by: Created for:	<b>Therm Version 5.2 (5.2.14)</b> Date: Fri Jul 22 11:58:48 2011 Created by: Created for:
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Therm Filename: Z:\01 WARM01 Jobs\2011 037 Rational PSI Cross Section Type: Sill Underlay Name:	Therm Filename: Z:\01 WARM01 Jobs\2011 Cross Section Type: Sill Underlay Name:	Therm Filename: Z:\01 WARM01 Jobs\2011 Cross Section Type: Sill Underlay Name:	Therm Filename: Z:\01 WARM01 Jobs\2011 Cross Section Type: Sill Underlay Name:
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U-factors			U-factors			U-factors			U-factors		
Name	Length Basis mm	U-factor W/m2-K	Name	Length Basis mm	U-factor W/m2-K	Name	Length Basis mm	U-factor W/m2-K	Name	Length Basis mm	U-factor W/m2-K
Internal	1000.00	Total Length 0.0912	Internal	4000.00	Total Length 0.1414	External	425.77	Projected X 1.2443	Internal	4687.45	Total Length 0.2294
External	1000.00	Total Length 0.0912	Suspended floor void	4000.00	Total Length 0	Internal	424.97	Projected X 1.2467	External	10525.7	Total Length 0.0895
									Suspended floor void		
									8275.00 Total Length 0.		

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA INS k035	0.04	0.90
AA TIM General Timber	0.13	0.90
Ford Farm Wall Horizontal kp1:3		
8mm Service Void k206	0.21	0.90
AA FIN Plasterboard	0.25	0.90

Cavities

None

Glazing Systems

None

Standard Boundary Conditions

Name	Temperature C	Film Coef W/m2-K	Coefficient
AA External Protected R0.13 OC	0.13	0.00	7.690
AA Interior Horizontal R0.13 2 OC	20.00	7.690	

Solid Materials

Name	Conductivity W/m-K	Emissivity
AA MAS Concrete	2.00	0.90
AA INS k022	0.02	0.90

Cavities

None

Glazing Systems

None

Standard Boundary Conditions

Name	Temperature C	Film Coef W/m2-K	Coe	Dir	Flow
AA NIL R0.001 OC	0.00	1000.00	19	Down	
AA Interior Down R0.17 20C	20.00	5	23	Down	
			25	Down	
			26	Horizontal	
			28	Down	
			30	Down	

Solid Materials

Name	Conductivity W/m-K	Emissivity
Door Inward Cill:Helo Fibre	0.22	0.90
AA TIM General Timber	0.13	0.90
Aluminum Painted	160.00	0.2
CEN EPDM	0.25	0.90
AA INS k035	0.04	0.90

Cavities

None

Glazing Systems

None

Standard Boundary Conditions

Name	Temperature C	Film Coef W/m2-K	Coe	Dir	Flow	Poly Heat	Side 1	Side 2	Temp C	Emis	Temp mm	Emiss	Temp mm	Er
AA NIL R0.001 OC	0.00	1000.00	19	Down		15.00	0.90	5.00	0.9	Cavities				
AA Interior Down R0.17 20C	20.00	5	23	Down		15.00	0.90	5.00	0.90	3.15	2.04	N/A	0.0319	N/A
			25	Down		15.00	0.90	5.00	0.90	4.80	2.09	N/A	0.0325	N/A
			26	Horizontal		15.00	0.90	5.00	0.90	Name: CEN frame cavity unventilated				
			28	Down		15.00	0.90	5.00	0.9	Gas Fill: Air				
			30	Down		15.00	0.90	5.00	0.9	Convection Model: CEN				

Calculation Specifications

Mesh Parameter : 6  
Estimated Error: 4.7e-012%

Calculations done in Version 5.2 (5.2.14)

Calculation Specifications

Name: CEN frame cavity slightly ventilated  
Gas Fill: Air  
Convection Model: CEN Ventilated  
Radiation Model: Standard

Calculations done in Version 5.2 (5.2.14)

Radiation Model: Standard

Poly Heat	Side 1	Side 2	Temp C	Emis	Temp mm	Emiss	Temp mm	Er
146	Down		15.00	0.90	5.00	0.9		
148	Down		15.00	0.90	5.00	0.9		
149	Horizontal		15.00	0.90	5.00	0.9		
7	Horizontal		15.00	0.90	5.00	0.9		
8	Down		15.00	0.90	5.00	0.9		
9	Down		15.00	0.90	5.00	0.9		
10	Horizontal		15.00	0.90	5.00	0.9		
11	Horizontal		15.00	0.90	5.00	0.9		
110	Horizontal		15.00	0.90	5.00	0.9		
111	Horizontal		15.00	0.90	5.00	0.9		
115	Horizontal		15.00	0.90	5.00	0.9		
120	Horizontal		15.00	0.90	5.00	0.9		
124	Horizontal		15.00	0.90	5.00	0.9		
128	Horizontal		15.00	0.90	5.00	0.9		

Standard Boundary Conditions

Name	Temperature C	Film Coef W/m2-K	Coe	Dir	Flow	Poly Heat	Side 1	Side 2	Temp C	Emis	Temp mm	Emiss	Temp mm	Er
AA External R0.04 OC	0.00	25.00	13	Horizontal		15.00	0.90	5.00	0.9					
AA Interior Horizontal R0.13 2 OC	20.00	7.690	44	Horizontal		15.00	0.90	5.00	0.9					
AA Internal horizontal reduced rad R0.2 20C	20.00	5.000	61	Horizontal		15.00	0.90	5.00	0.9					
			105	Horizontal		15.00	0.90	5.00	0.9					

Glazing Systems