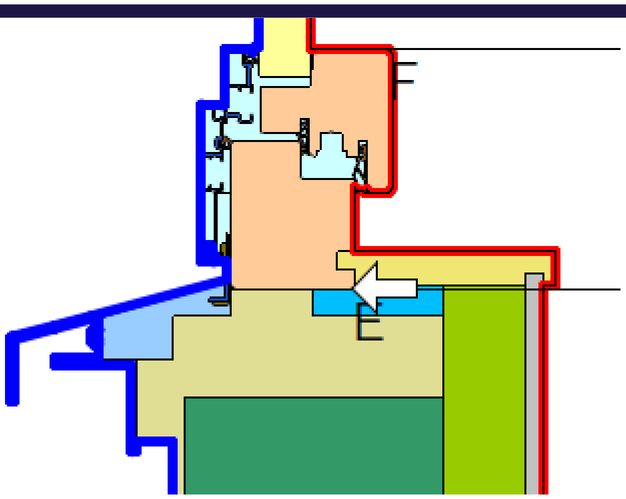
Eurotect Recessed Flashing System

Thermal Performance Modeling



Compiled by Jason Quinn

9 October 2020

Sustainable Engineering Ltd

Purpose

Model effects of the installation with Eurotect Recessed Flashing System on the performance of the window, for use in energy modelling.

Results

DETAIL	Ψ (PSI) W/(mK)	f_{RSI}
WOODALU HEAD EUROTECT RECESSED	0.025	0.701
WOODALU JAMB EUROTECT RECESSED	0.039	0.700
WOODALU SILL EUROTECT RECESSED	0.036	0.694
WOODALU DOOR SILL EUROTECT RECESSED (WOOD SHIM OPTION f_{RSI} =0.596)	0.036	0.497
THERMALHEART HEAD EUROTECT RECESSED	0.079	0.425
THERMALHEART JAMB EUROTECT RECESSED	0.078	0.421
THERMALHEART SILL EUROTECT RECESSED	0.082	0.411
THERMALHEART DOOR SILL EUROTECT RECESSED	0.093	0.294
THERMALHEART SILL NZ CURRENT PRACTICE WANZ BAR	0.174	0.325
SOLID ALU SILL NZ CURRENT PRACTICE WANZ BAR	0.200	0.127

Discussion

Thermal bridge coefficients for each installation detail using the Eurotect Recessed Flashing System were calculated. This included details for a wood aluminum window (WOODALU) and door sill, ThermalHeart thermally broken aluminum NZ joinery for a window and door sill, as well as, a comparison for a NZ current practice sill install using a WANZ bar for a ThermalHeart thermally broken aluminum NZ joinery and a solid aluminum joinery frame.

For a building performing at the certified passive house level, this would be a 16% reduction in heating demand and 10% reduction in heating load.

The most direct comparison is the change from recessing the ThermalHeart thermally broken aluminum NZ joinery from cladding face fix using a WANZ bar to a recessed installation. This lowered the installation thermal bridge value from 0.174 to 0.082 W/(mK) and increased the fRSI criteria from 0.325 to 0.411. To put this in perspective if this reduction in heat loss was applied to the joinery in the Waikato ExpoHaus the Heating Demand would reduce by 2.4 kWh/m²/year and the Heating Load would reduce by 1 W/m². For a building performing at the certified passive house level, this would be a 16% reduction in heating demand and 10% reduction in heating load.

Per NZS4218:2009 New Zealand Standard for Thermal insulation –Housing and small buildings, uses a generic window, of size 1800 mm wide x 1500 mm high with a central mullion and one opening light to compare performance. The range of U-values for the overall window produced (Table C1-3) range from 6.7 to 1.95 W/(m²K) [or R-values for the overall window of 0.15 to 0.51 m²K/W], The impact on this window of reducing the installation PSI value by 0.092 W/(mK) would be an increase in U-value of 0.28 W/(m²K), assuming the ThermalHeart impacts are transferrable. **The overall impact of using the Eurotect Recessed Flashing System on the highest performance windows in NZS4218 would be an improvement of 14% on the best windows in NZS4218 Table C1-3 and 4% for the lowest performance windows.** Note this assumes the difference seen for the thermally broken frame shifting from the standard install to apply universally.

fRSI is a minimum temperature index and is calculated using an internal surface resistance of 0.25 m2K/W which is intended to be generally conservative. Passive House Institute has defined a minimum temperature factor for different climate zones to ensure moisture build-up and/or mould can be avoided.

Moisture protection

Besides the requirement for the temperature of the building component's interior surface ($f_{Rsi=0,25\ m^2K/W}$) mentioned in Table 6, all standard cross-sections and connection details must also be planned and executed so that excessive moisture build-up in the building component can be ruled out with the intended building use.

From "Criteria for the Passive House, EnerPHit and PHI Low Energy Building Standard", version 9f, revised 15.08.2016

Table 6 Criteria for moisture protection

Climate zone	Min. temperature factor $f_{Rsi=0.25\ m^2K/W}$ []
Arctic	0.80
Cold	0.75
Cool-temperate	0.70
Warm-temperate	0,65
Warm	0.55
Hot	-
Very hot	-

It is important to note that the current Passive House fRSI criteria for NZ Warm and Warm-Temperate climates (which applies to both Passive House, EnerPHit and PHI Low Energy Building certifications) is met only for the wood aluminum windows (WOODALU). The WOODALU door sill with the wood shim under the entire threshold narrowly meets the fRSI criteria for Warm climates (Auckland and north) and just misses the 0.65 or higher requirement for the cool-temperate climates in most of the remainder of NZ. This can often be accepted in Certified Passive House or PHI Low Energy Building on a case-by-case basis for a near miss (0.60 is very close to 0.65).

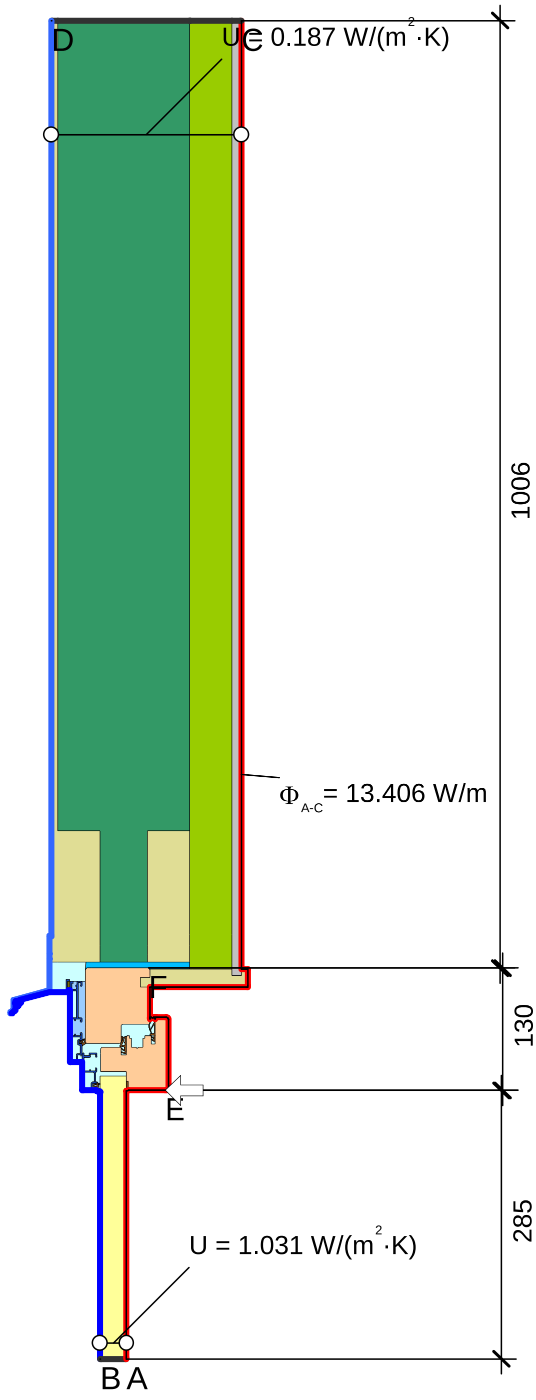
Appendix: Thermal Bridge reports and frame sheets used

WA_Head_PSI

Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Exterior, Ventilated	0.000	0.130
Interior, heat flux, downwards	20.000	0.170
Interior, heat flux, upwards	20.000	0.100
Interior, normal, horizontal	20.000	0.130
Symmetry/Model section		

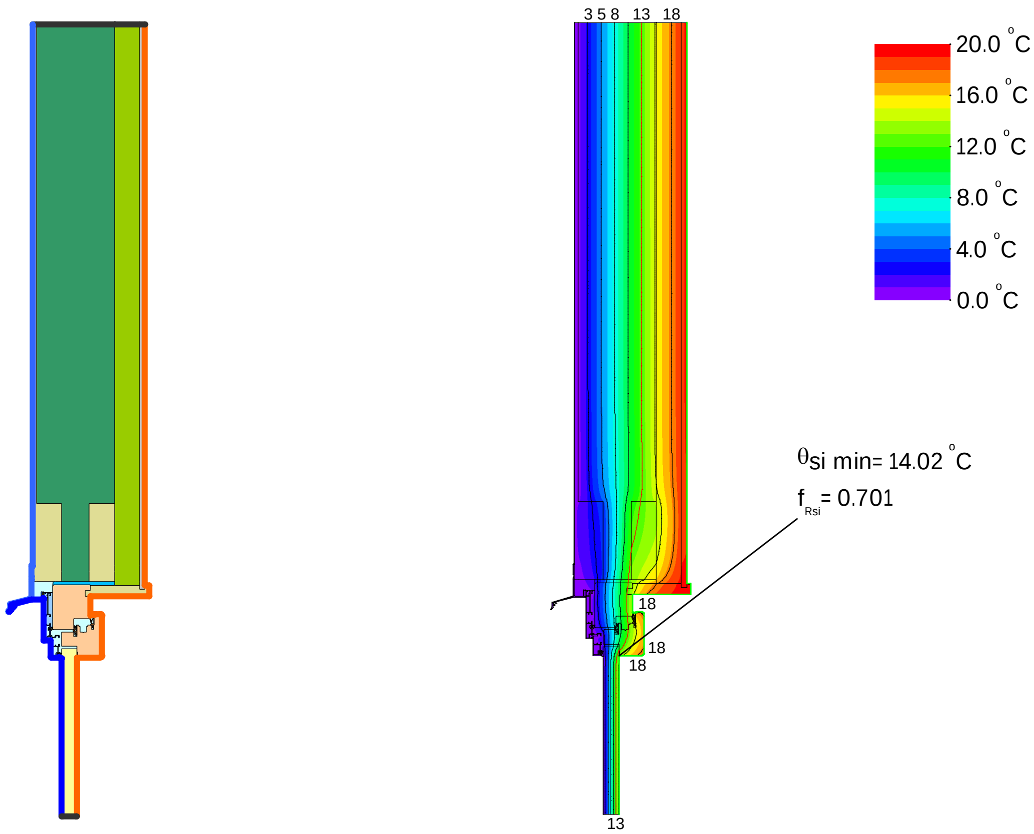
Material	λ[W/(m·K)]
Air34mmU	0.180
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
Larch	0.110
PUGunFoam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Plasterboard	0.250
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach



$$\psi_{A\text{-}E\text{-}C,*} = \frac{13.406}{20.000} - 1.031 \cdot 0.285 - 1.260 \cdot 0.130 - 0.187 \cdot 1.006 = 0.025 \text{ W/(m·K)}$$

WA_Head_fRSI

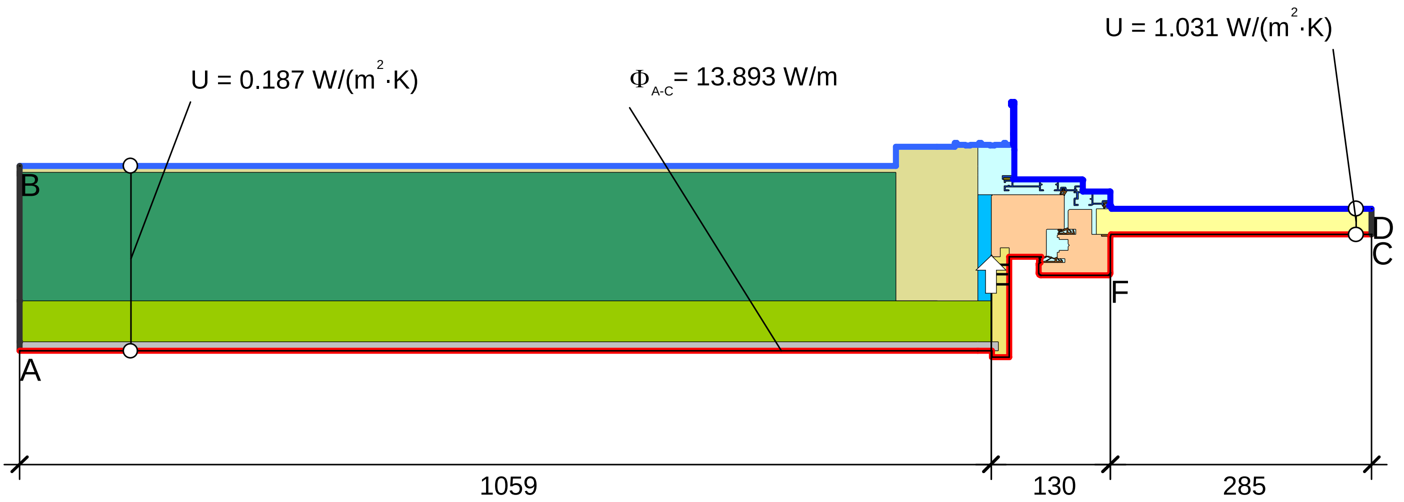


Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Exterior, Ventilated	0.000	0.130
Interior, frsi = 0.25	20.000	0.250
Symmetry/Model section		

Material	λ[W/(m·K)]
Air34mmU	0.180
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
Larch	0.110
PUGunFoam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Plasterboard	0.250
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

WA_Jamb_PSI



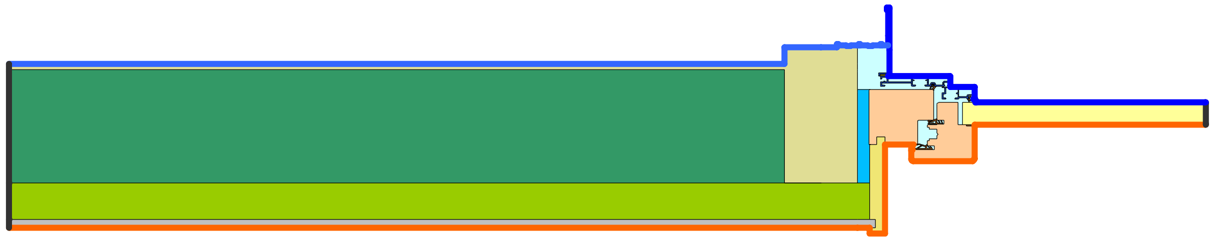
$$\psi_{A\text{-}E\text{-}C,*} = \frac{13.893}{20.000} - 0.187 \cdot 1.059 - 1.260 \cdot 0.130 - 1.031 \cdot 0.285 = 0.039\ W/(m \cdot K)$$

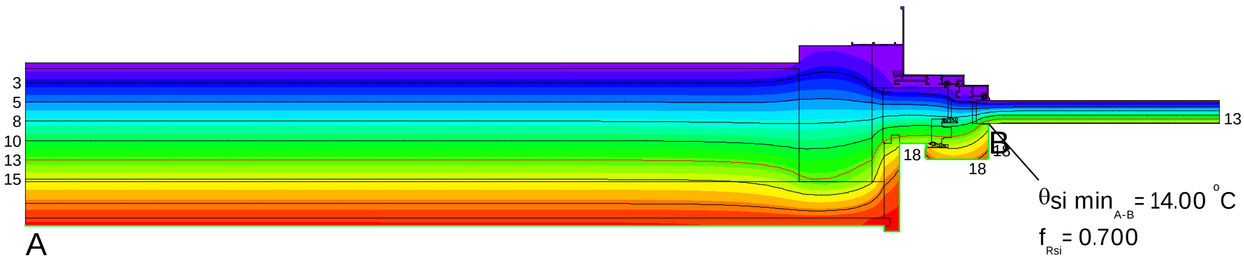
Boundary Condition	θ[°C]	R[(m²·K) / W]
Exterior, Normal	0.000	0.040
Exterior, Ventilated	0.000	0.130
Interior, normal, horizontal	20.000	0.130
Symmetry / Model section		

Material	λ[W / (m·K)]
Air52mmU	0.280
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
Larch	0.110
Larch (1)	0.110
PUGunFoam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Plasterboard	0.250
Softwood 500, typical construction timber	0.130
Timber (Softwood)	0.130
Unventilated air cavity *	

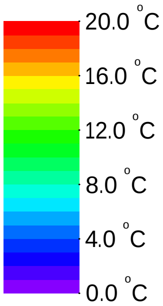
* Simplified approach

WA_Jamb_fRSI





Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Exterior, Normal	0.000	0.040	
Exterior, Ventilated	0.000	0.130	
Interior, frsi = 0.25	20.000	0.250	
Symmetry/Model section			

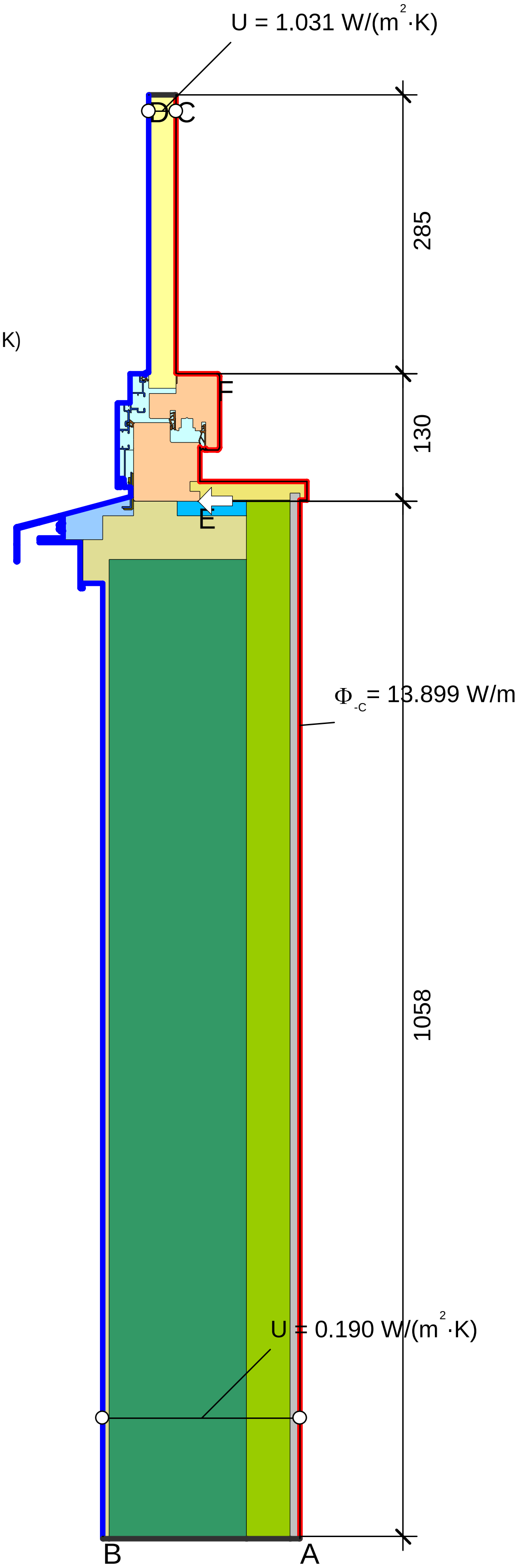


Material	λ[W/(m·K)]
Air52mmU	0.280
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
Larch	0.110
Larch (1)	0.110
PUGunFoam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Plasterboard	0.250
Softwood 500, typical construction timber	0.130
Timber (Softwood)	0.130
Unventilated air cavity *	

* Simplified approach

WA_Sill_PSI

$$\psi_{A\text{-}E\text{-}C,*} = \frac{13.892}{20.000} - 0.190 \cdot 1.058 - 1.260 \cdot 0.130 - 1.031 \cdot 0.285 = 0.036 \text{ W/(m·K)}$$

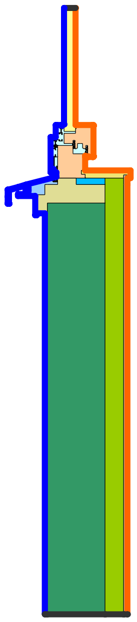


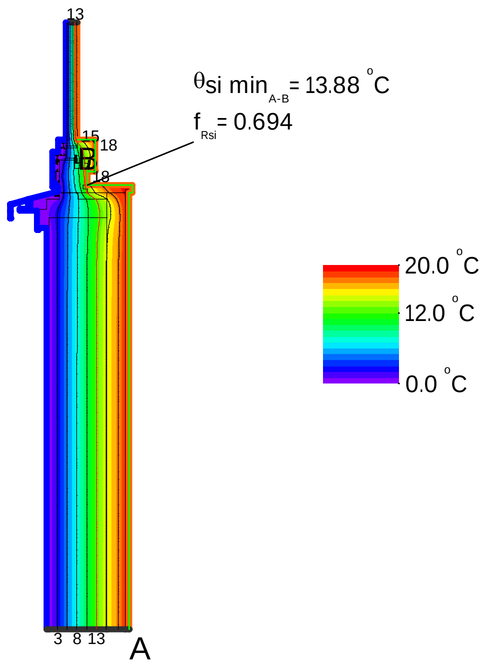
Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Interior, normal, horizontal	20.000	0.130
Symmetry/Model section		

Material	λ[W/(m·K)]
Air52mmU	0.280
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
Larch	0.110
Larch (1)	0.110
PUGunFoam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Plasterboard	0.250
Softwood 500, typical construction timber	0.130
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

WA_Sill_fRSI



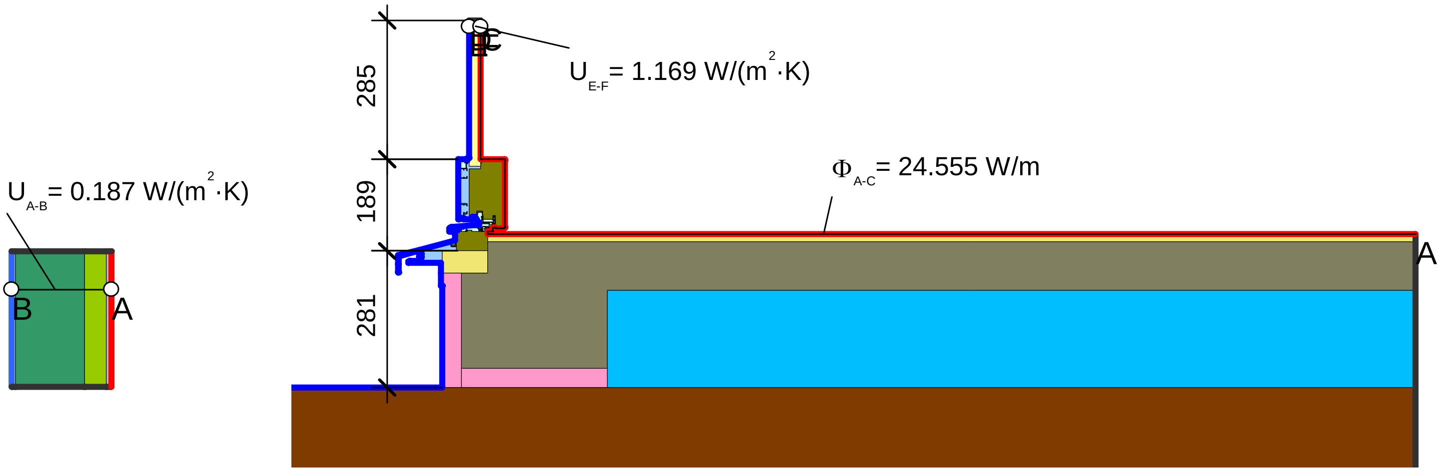


Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Exterior, Normal	0.000	0.040	
Interior, frsi = 0.25	20.000	0.250	
Symmetry/Model section			

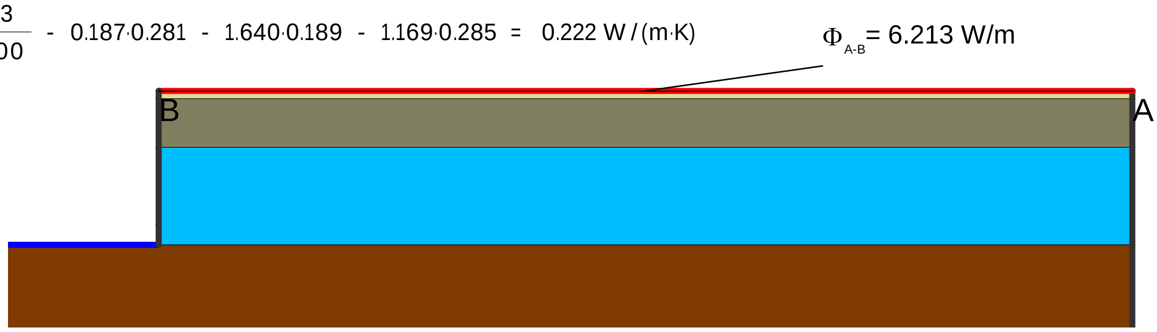
Material	λ[W/(m·K)]
Air52mmU	0.280
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
Larch	0.110
Larch (1)	0.110
PUGunFoam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Plasterboard	0.250
Softwood 500, typical construction timber	0.130
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

ET_WA_DoorSill_PSI



$$\psi_{A\text{-}C,*} = \frac{24.555}{20.000} - \frac{6.213}{20.000} - 0.187\cdot 0.281 - 1.640\cdot 0.189 - 1.169\cdot 0.285 = 0.222\ \mathrm{W/(m\cdot K)}$$



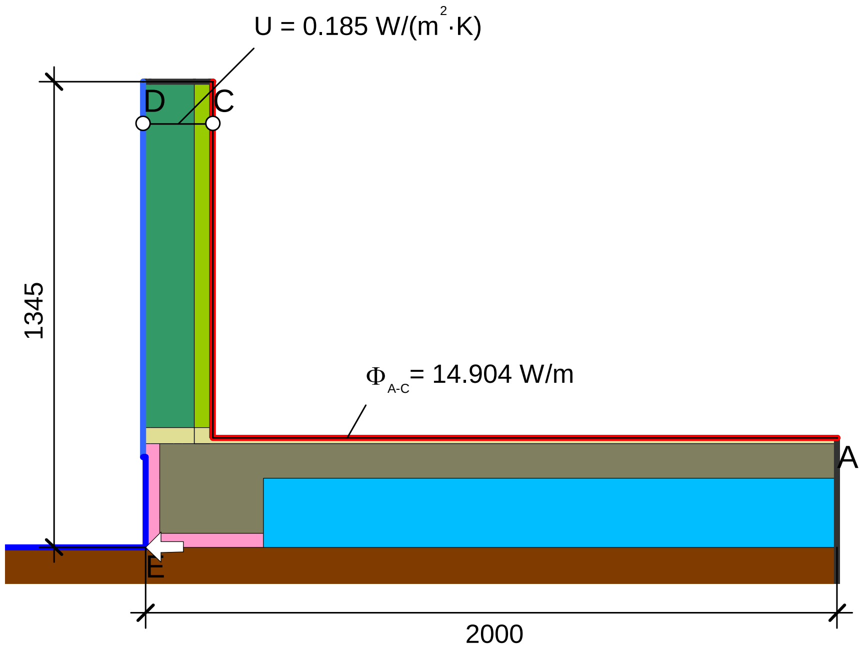
PSI_WITH=PSI_FSEW+WITH - PSI_FSEW = 0.222 - 0.186 = 0.036

Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Interior, heat flux, downwards	20.000	0.170
Interior, normal, horizontal	20.000	0.130
Symmetry/Model section		

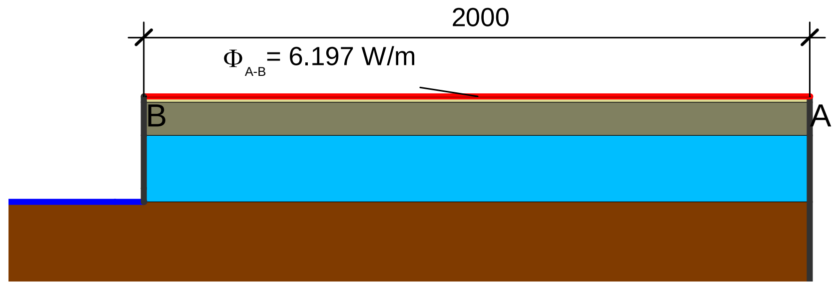
Material	λ[W/(m·K)]
Aluminium (Si Alloys)	160.000
Concrete	2.100
EPDM (ethylene propylene diene monomer)	0.250
Ground	2.000
arch (2)	0.110
arch (2)	0.110
arch (2)	0.110
arch (2)	0.110
arch (2)	0.110
arch (2)	0.110
Larch (2)	0.110
PVC, flexible (PVC-P) 40% softener	0.140
PVC-U (polyvinylchloride), rigid	0.170
Panel	0.035
RigidInsulation 0.028	0.028
RigidInsulation 0.038	0.038
RigidInsulation 0.038 (1)	0.028
Softwood 500, typical construction timber	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

SlabEdge_PSI



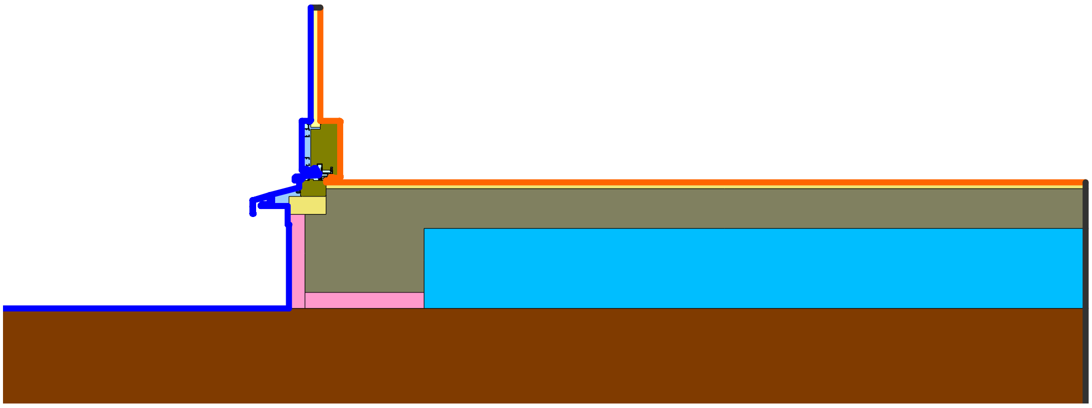
$$\psi_{A\text{-}E\text{-}C,*} = \frac{14.904}{20.000} - \frac{6.197}{20.000} - 0.185 \cdot 1.345 = 0.186\ W/(m \cdot K)$$

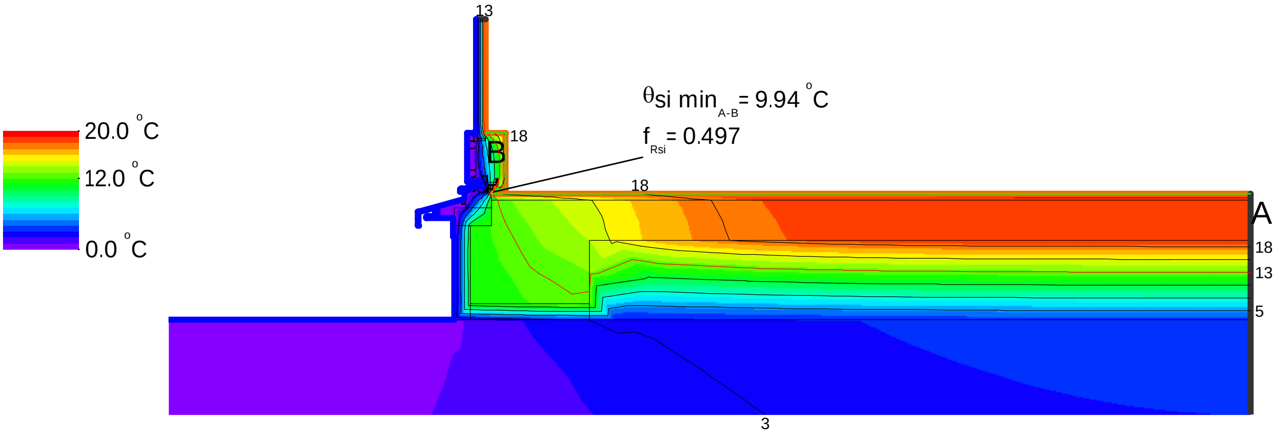


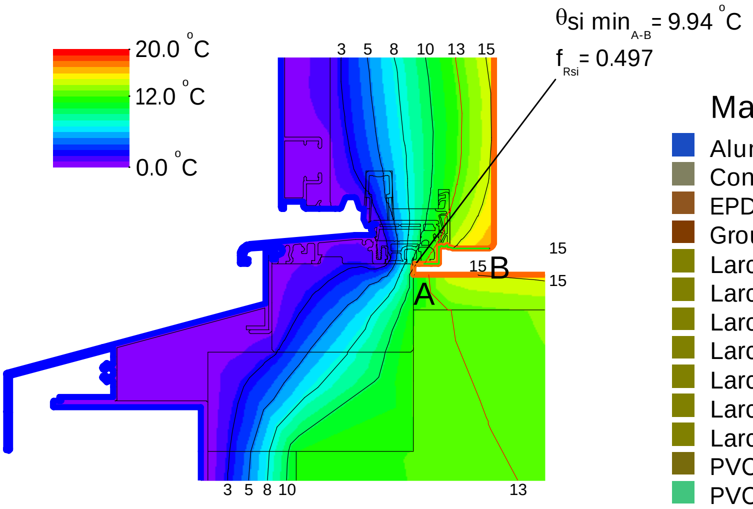
Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Exterior, Ventilated	0.000	0.130
Interior, heat flux, downwards	20.000	0.170
Symmetry/Model section		

Material	λ[W/(m·K)]
Concrete	2.100
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
Ground	2.000
Plasterboard	0.250
RigidInsulation 0.028	0.028
RigidInsulation 0.038	0.038
Timber (Softwood)	0.130

ET_WA_DoorSill_fRSI





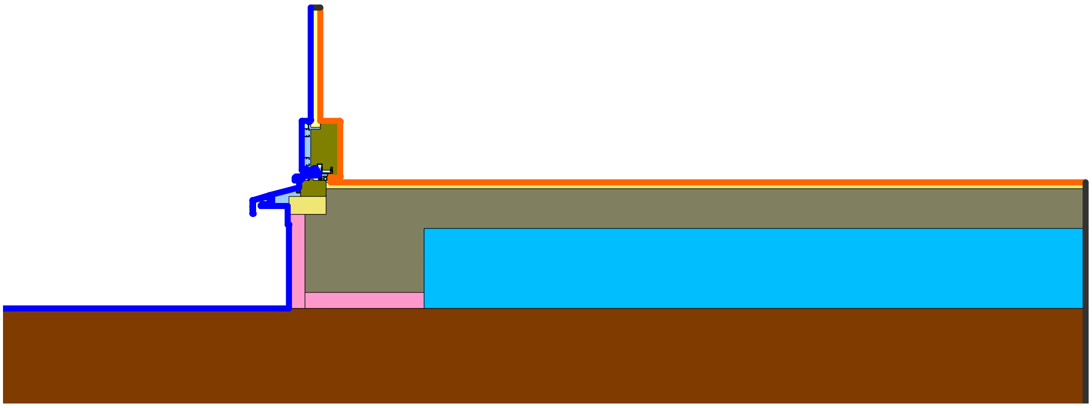


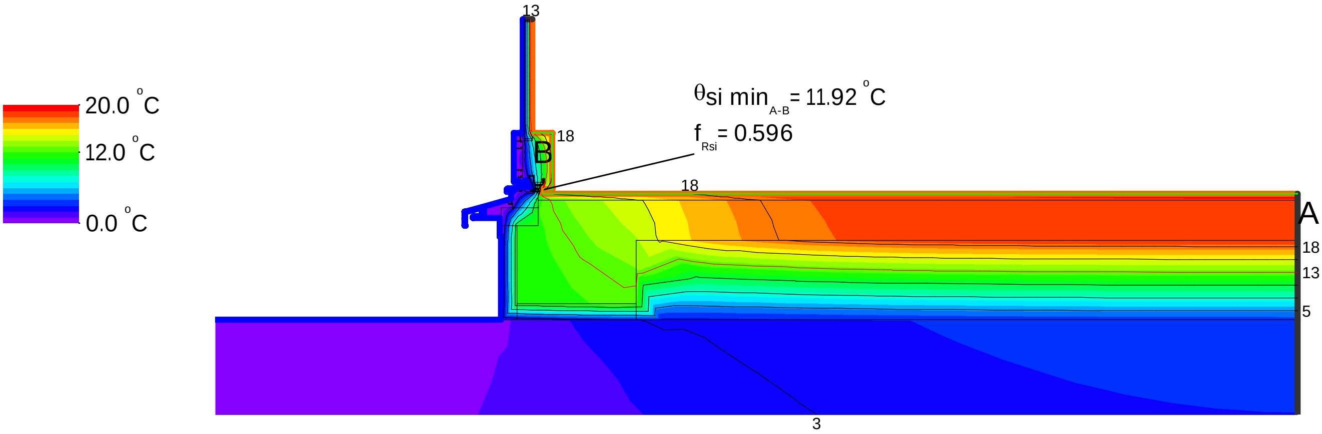
Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Interior, frsi = 0.25	20.000	0.250
Symmetry/Model section		

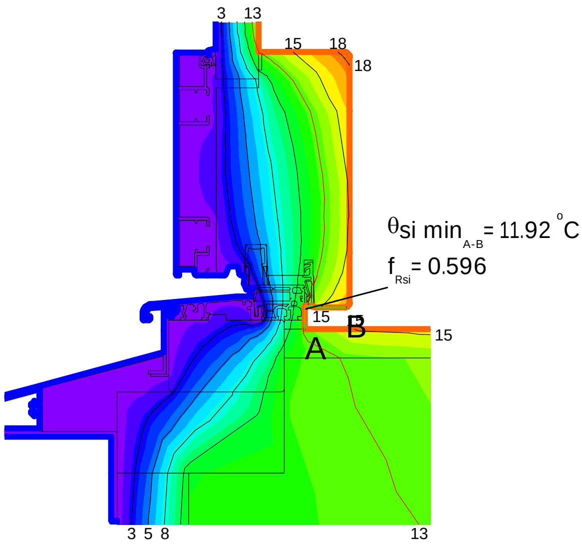
Material	λ[W/(m·K)]
Aluminium (Si Alloys)	160.000
Concrete	2.100
EPDM (ethylene propylene diene monomer)	0.250
Ground	2.000
Larch (2)	0.110
Larch (2)	0.110
Larch (2)	0.110
Larch (2)	0.110
Larch (2)	0.110
Larch (2)	0.110
Larch (2)	0.110
PVC, flexible (PVC-P) 40% softener	0.140
PVC-U (polyvinylchloride), rigid	0.170
Panel	0.035
RigidInsulation 0.028	0.028
RigidInsulation 0.038	0.038
RigidInsulation 0.038 (1)	0.028
Softwood 500, typical construction timber	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

ET_WA_DoorSillWoodShim_fRSI







Material	λ[W/(m·K)]
Aluminium (Si Alloys)	160.000
Concrete	2.100
EPDM (ethylene propylene diene monomer)	0.250
Ground	2.000
Larch (2)	0.110
Larch (2)	0.110
Larch (2)	0.110
Larch (2)	0.110
Larch (2)	0.110
Larch (2)	0.110
Larch (2)	0.110
PVC, flexible (PVC-P) 40% softener	0.140
PVC-U (polyvinylchloride), rigid	0.170
Panel	0.035
RigidInsulation 0.028	0.028
RigidInsulation 0.038	0.038
RigidInsulation 0.038 (1)	0.028
Softwood 500, typical construction timber	0.130
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Interior, frsi = 0.25	20.000	0.250
Symmetry/Model section		

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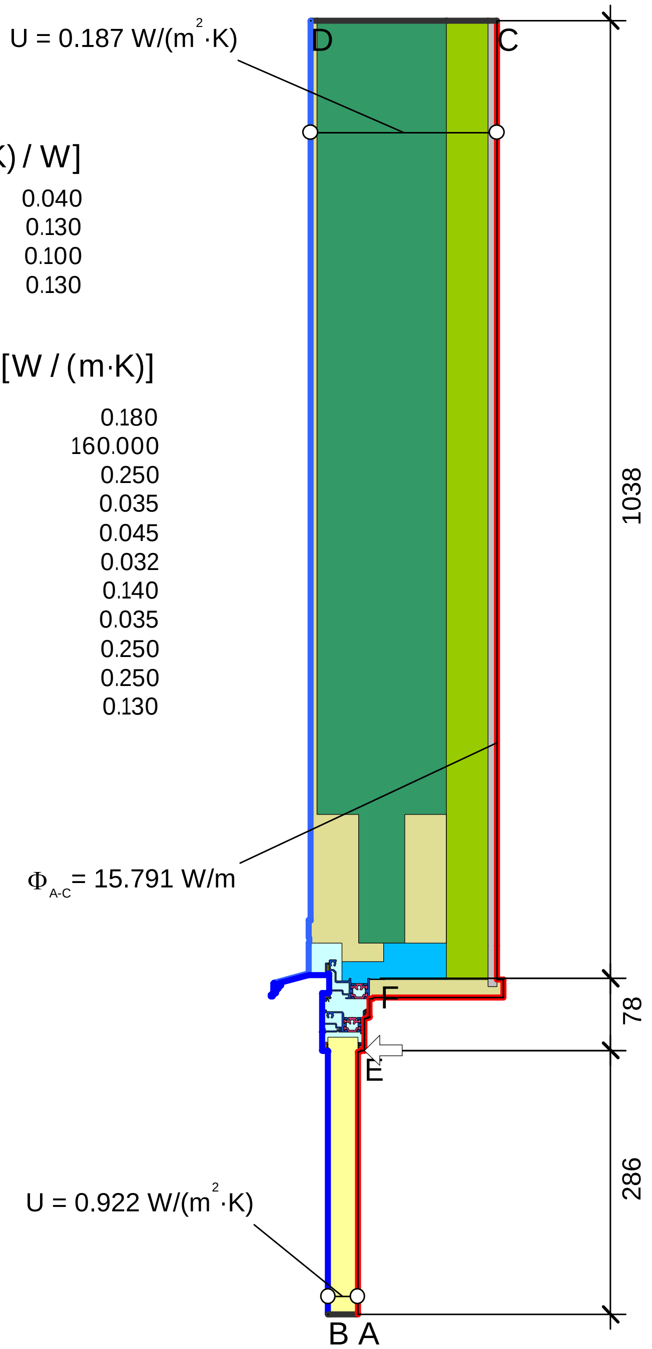
TH_Head_PSI

Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Exterior, Ventilated	0.000	0.130
Interior, heat flux, upwards	20.000	0.100
Interior, normal, horizontal	20.000	0.130
Symmetry/Model section		

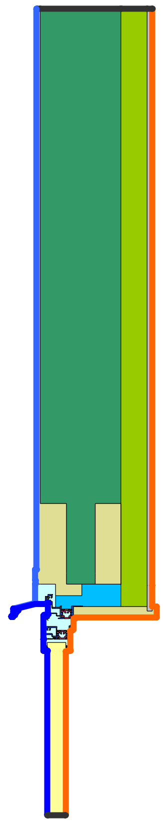
Material	λ[W/(m·K)]
Air34mmU	0.180
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
PUGunFoam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Plasterboard	0.250
Polyamid (nylon)	0.250
Timber (Softwood)	0.130
Unventilated air cavity *	

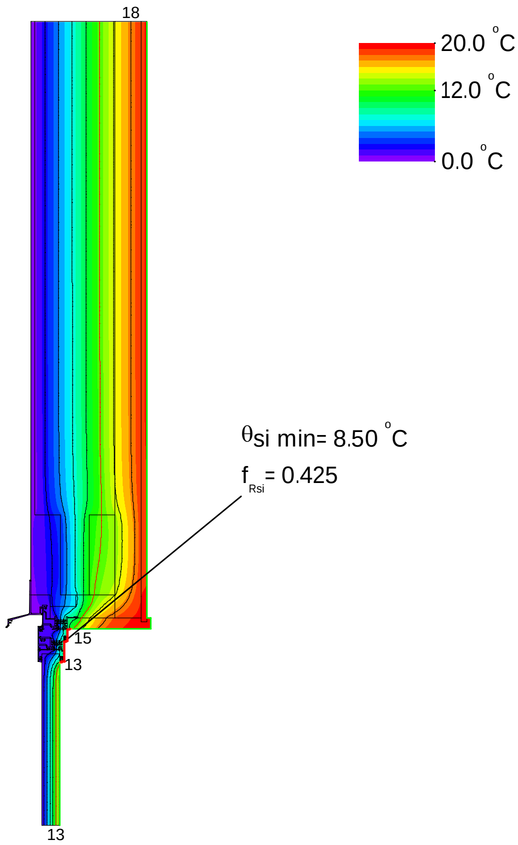
* Simplified approach



$$\psi_{A\text{-}E\text{-}C,*} = \frac{15.791}{20.000} - 0.922 \cdot 0.286 - 3.240 \cdot 0.078 - 0.187 \cdot 1.038 = 0.079 \ W/(m \cdot K)$$

TH_Head_fRSI





Boundary Condition	θ[°C]	R[(m²·K) / W]
Exterior, Normal	0.000	0.040
Exterior, Ventilated	0.000	0.130
Interior, frsi = 0.25	20.000	0.250
Symmetry / Model section		

Material	λ[W / (m·K)]
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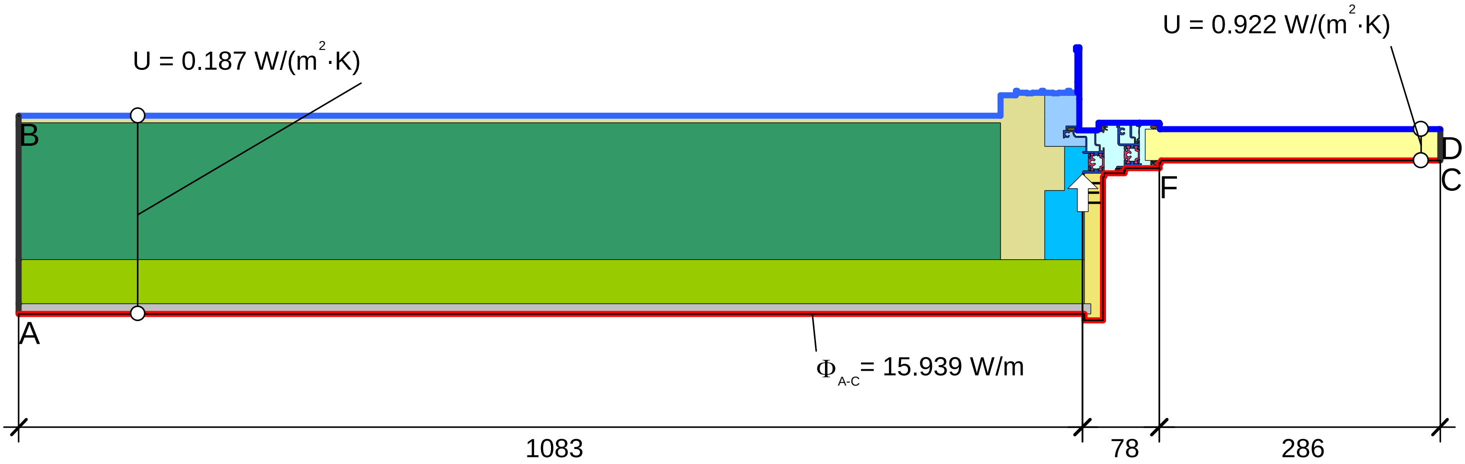
FibreInsulation 0.045	0.045
PUGunFoam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Plasterboard	0.250
Polyamid (nylon)	0.250
Timber (Softwood)	0.130
Unventilated air cavity *	

* Simplified approach

TH_Jamb_PSI



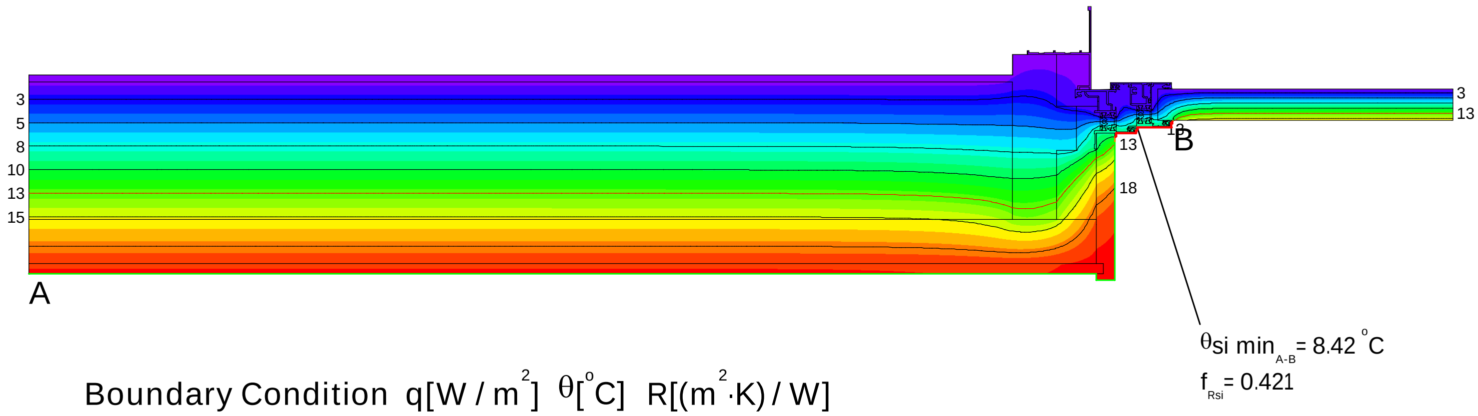
$$\psi_{A\text{-}E\text{-}C,*} = \frac{15.939}{20.000} - 0.187 \cdot 1.083 - 3.240 \cdot 0.078 - 0.922 \cdot 0.286 = 0.078\ W/(m \cdot K)$$

Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Exterior, Ventilated	0.000	0.130
Interior, normal, horizontal	20.000	0.130
Symmetry/Model section		

Material	λ[W/(m·K)]
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
PUGunFoam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Plasterboard	0.250
Polyamid (nylon)	0.250
Softwood 500, typical construction timber	0.130
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

TH_Jamb_fRSI



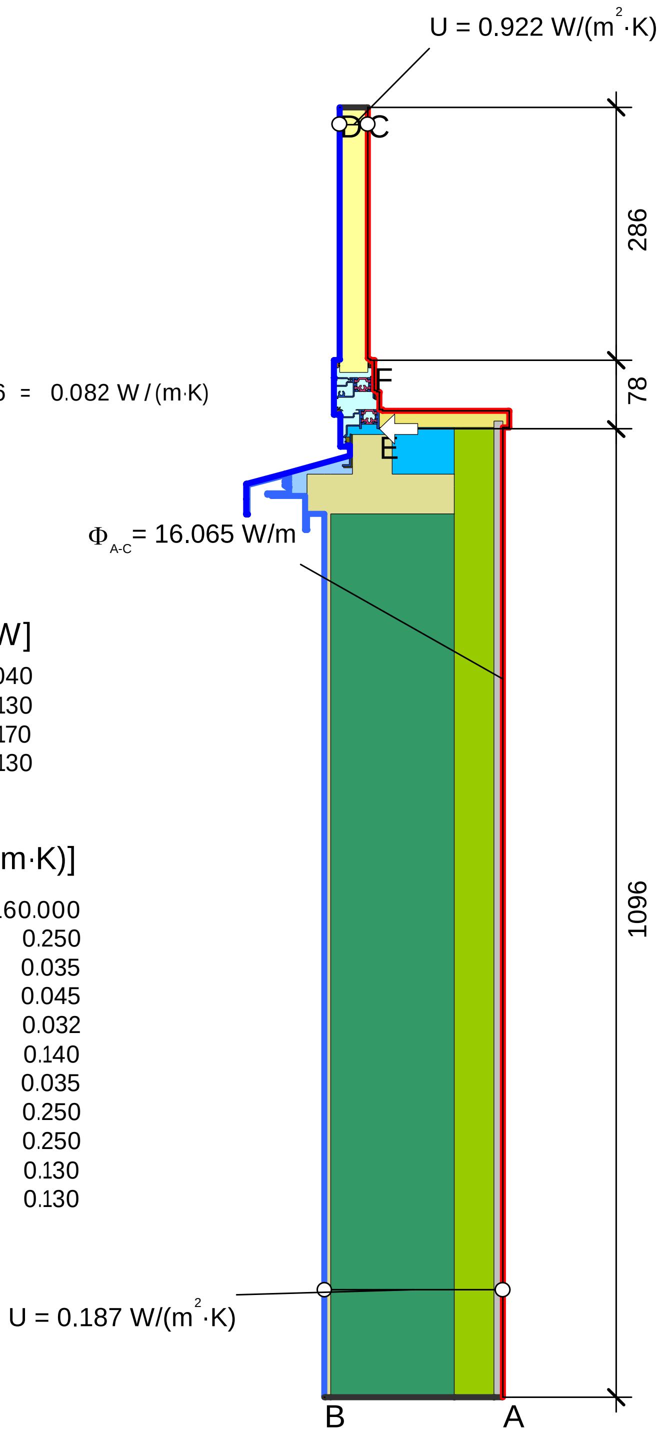
Boundary Condition	$q[W/m^2]$	$\theta[^\circ C]$	$R[(m^2\cdot K)/W]$
Exterior, Normal		0.000	0.040
Exterior, Ventilated		0.000	0.130
Interior, frsi = 0.25		20.000	0.250
Symmetry/Model section	0.000		

Material	$\lambda[W/(m\cdot K)]$
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
PUGunFoam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Plasterboard	0.250
Polyamid (nylon)	0.250
Softwood 500, typical construction timber	0.130
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

TH_WSill_psi

$$\psi_{A\text{-}E\text{-}C,*} = \frac{16.065}{20.000} - 0.187\cdot1.096 - 3.240\cdot0.078 - 0.922\cdot0.286 = 0.082 \text{ W/(m·K)}$$

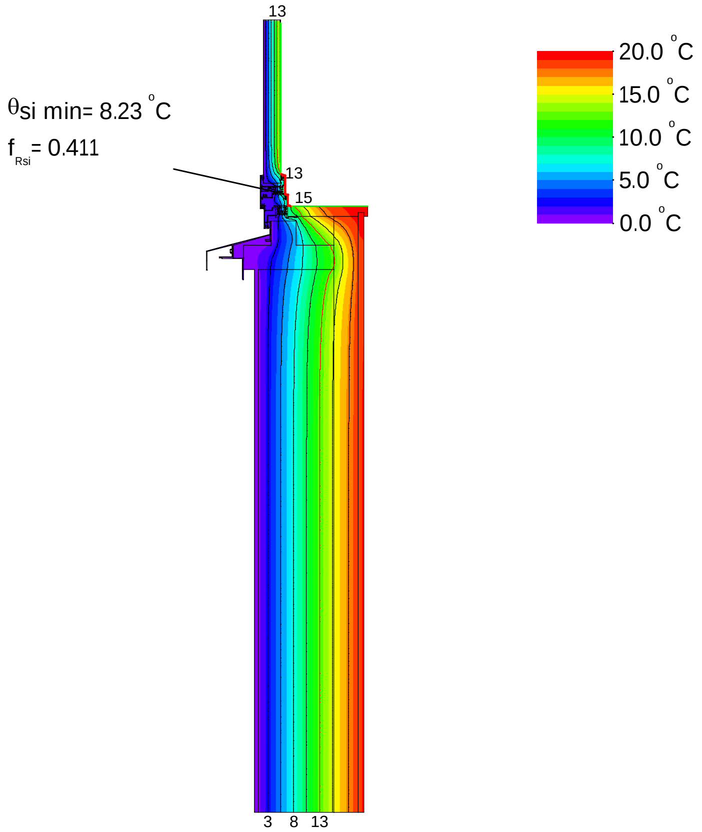


Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Exterior, Ventilated	0.000	0.130
Interior, heat flux, downwards	20.000	0.170
Interior, normal, horizontal	20.000	0.130
Symmetry/Model section		

Material	λ[W/(m·K)]
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
PUGunFoam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Plasterboard	0.250
Polyamid (nylon)	0.250
Softwood 500, typical construction timber	0.130
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

TH_WSill_frsi

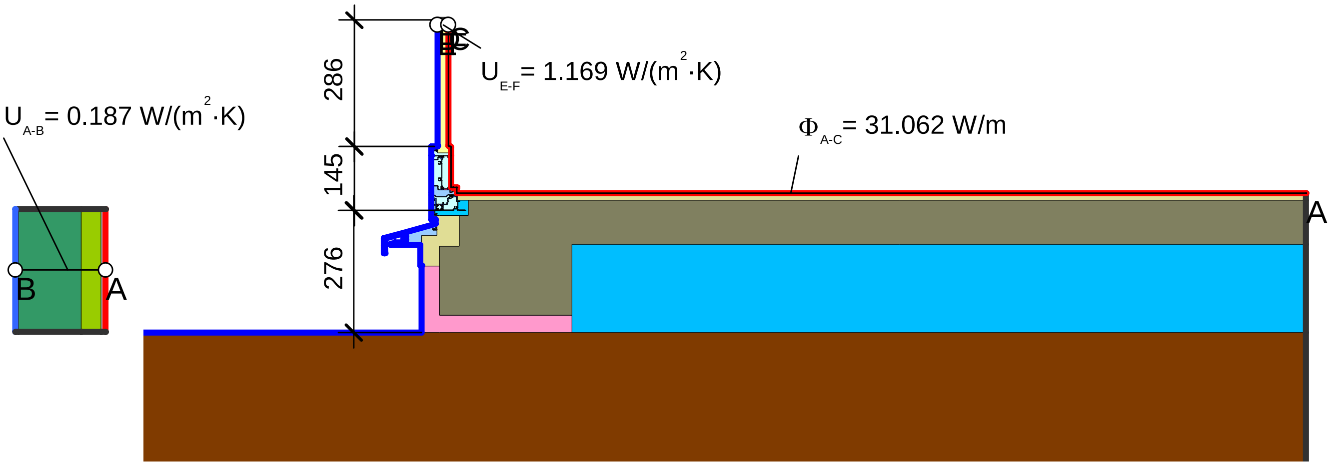


Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Exterior, Ventilated	0.000	0.130
Interior, frsi = 0.25	20.000	0.250
Symmetry/Model section		

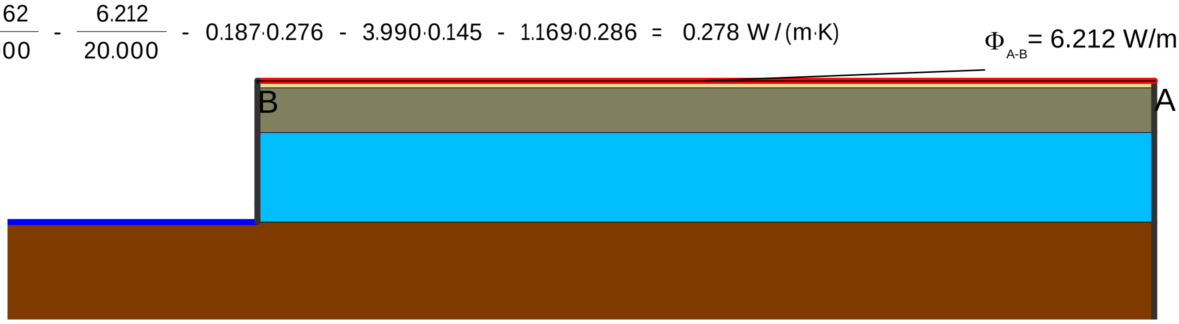
Material	λ[W/(m·K)]
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
PUGunFoam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Plasterboard	0.250
Polyamid (nylon)	0.250
Softwood 500, typical construction timber	0.130
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

TH_DoorSill_PSI



$$\psi_{A\text{--}C,*} = \frac{31.062}{20.000} - \frac{6.212}{20.000} - 0.187 \cdot 0.276 - 3.990 \cdot 0.145 - 1.169 \cdot 0.286 = 0.278\ W/(m \cdot K)$$



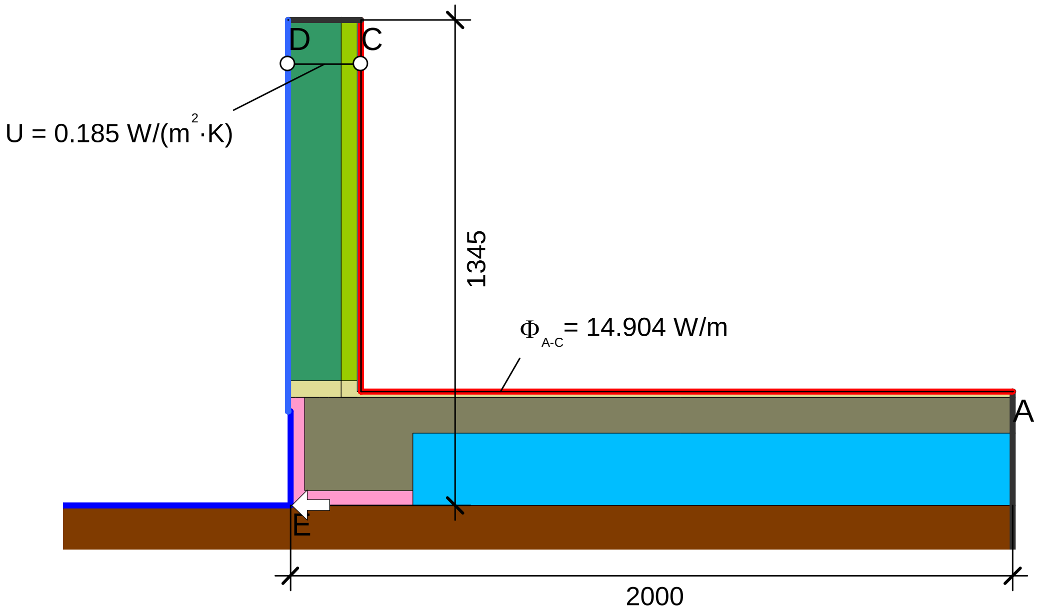
PSI_WITH=PSI_FSEW+WITH - PSI_FSEW = 0.278 - 0.185 = 0.093

Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Interior, heat flux, downwards	20.000	0.170
Interior, normal, horizontal	20.000	0.130
Symmetry/Model section		

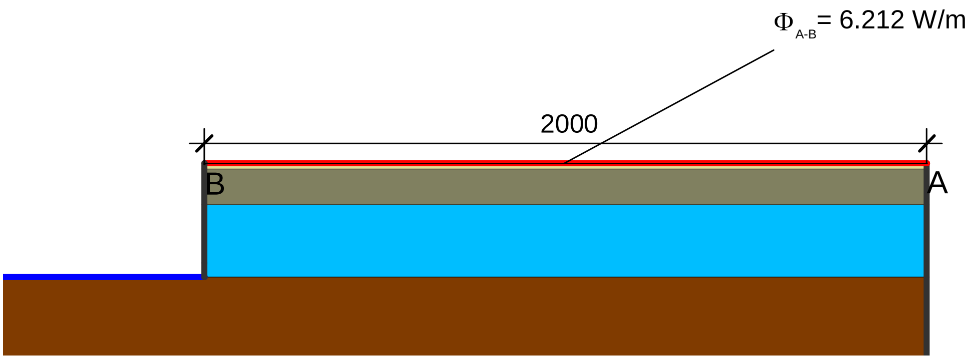
Material	λ[W/(m·K)]
Aluminium (Si Alloys)	160.000
Concrete	2.100
EPDM (ethylene propylene diene monomer)	0.250
Ground	2.000
PU gun foam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Polyamid (nylon)	0.250
RigidInsulation 0.028	0.028
RigidInsulation 0.038	0.038
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

SlabEdge_PSI



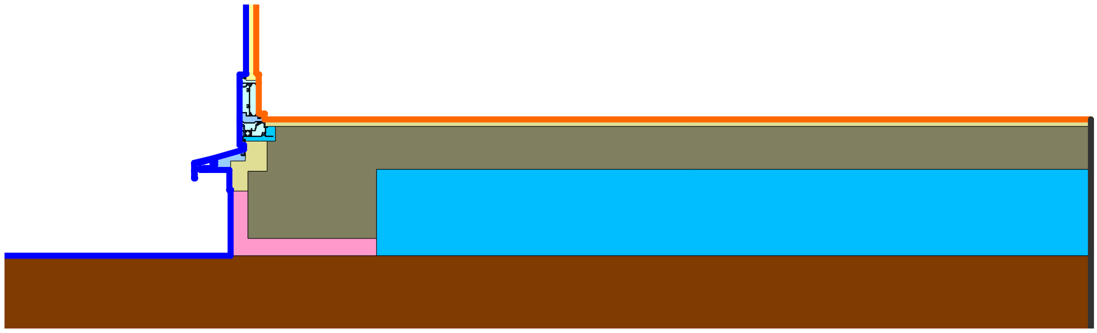
$$\psi_{A\text{-}E\text{-}C,*} = \frac{14.904}{20.000} - \frac{6.212}{20.000} - 0.185 \cdot 1.345 = 0.185 \text{ W/(m·K)}$$

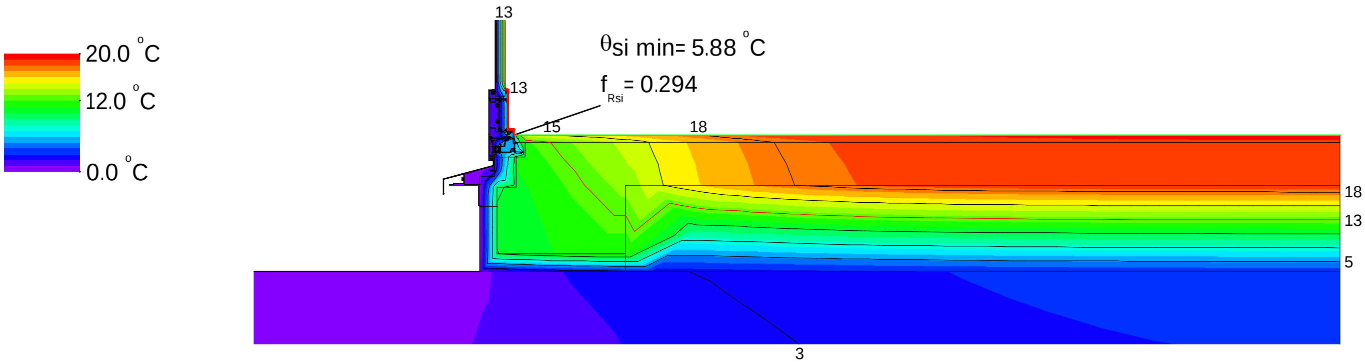


Material	λ[W/(m·K)]
Concrete	2.100
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
Ground	2.000
Plasterboard	0.250
RigidInsulation 0.028	0.028
RigidInsulation 0.038	0.038
Timber (Softwood)	0.130

Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Exterior, Ventilated	0.000	0.130
Interior, heat flux, downwards	20.000	0.170
Symmetry/Model section		

TH_DoorSill_fRSI



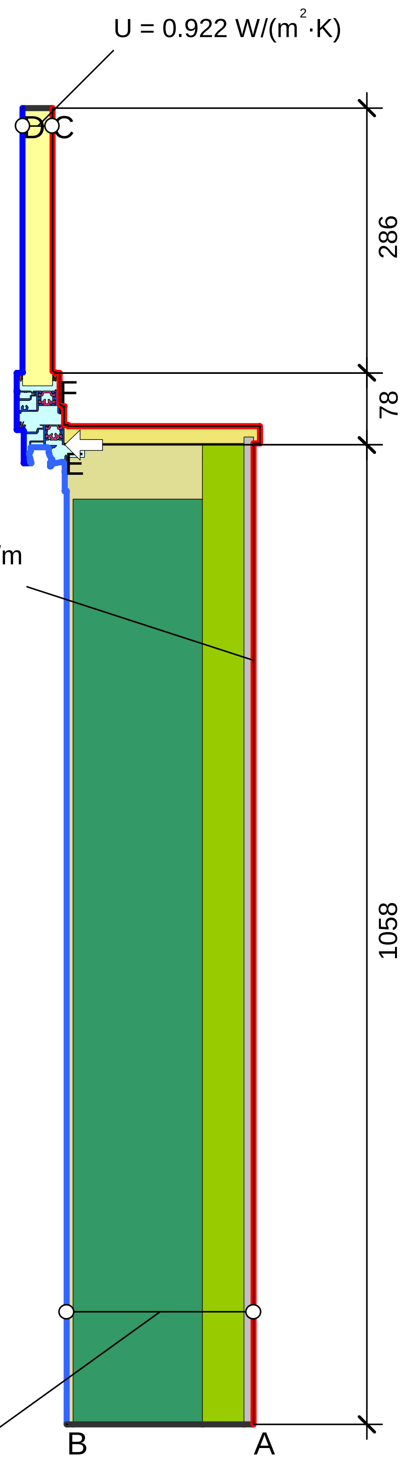


Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]
Exterior, Normal		0.000	0.040
Interior, frsi = 0.25		20.000	0.250
Symmetry/Model section	0.000		

Material	λ[W/(m·K)]
Aluminium (Si Alloys)	160.000
Concrete	2.100
EPDM (ethylene propylene diene monomer)	0.250
Ground	2.000
PU gun foam	0.032
PVC, flexible (PVC-P) 40% softener	0.140
Panel	0.035
Polyamid (nylon)	0.250
RigidInsulation 0.028	0.028
RigidInsulation 0.038	0.038
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

NZ_TH_Sill_PSI



$$\psi_{A\text{-}E\text{-}C,*} = \frac{17.768}{20.000} - 0.187 \cdot 1.058 - 3.240 \cdot 0.078 - 0.922 \cdot 0.286 = 0.174\ \mathrm{W/(m \cdot K)}$$

$\Phi_{A\text{-}C}$ = 17.768 W/m

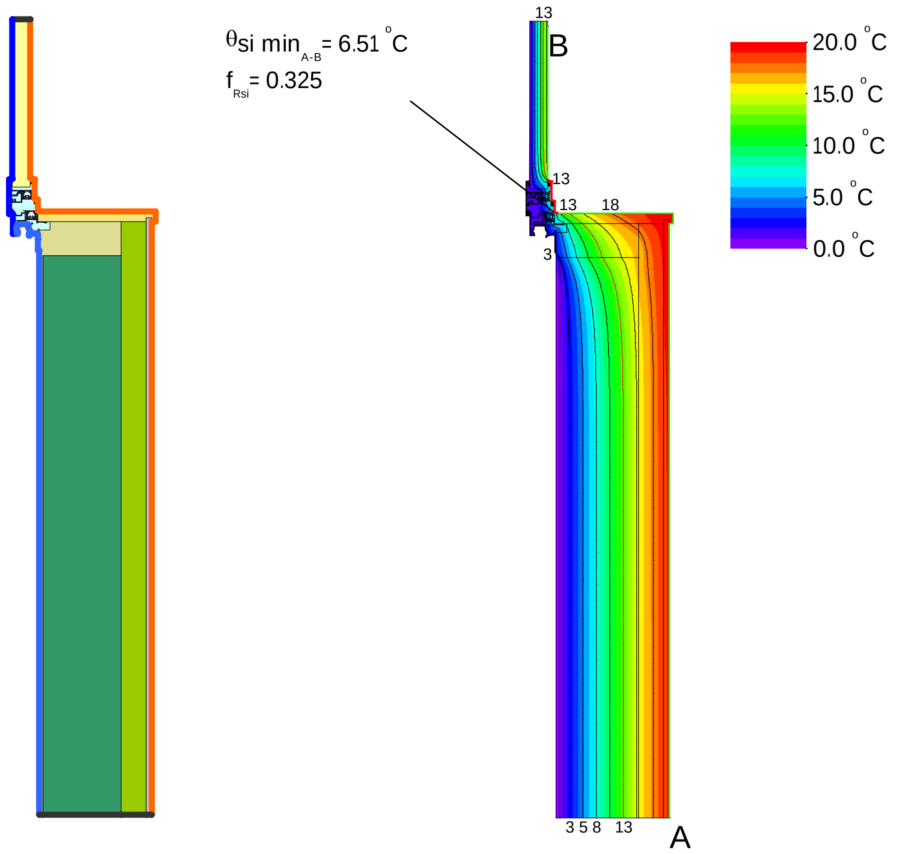
Boundary Condition	θ[°C]	R[(m²·K) / W]
Exterior, Normal	0.000	0.040
Exterior, Ventilated	0.000	0.130
Interior, heat flux, downwards	20.000	0.170
Interior, normal, horizontal	20.000	0.130
Symmetry / Model section		

Material	λ[W / (m·K)]
Air36.5mmU	0.200
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
Panel	0.035
Plasterboard	0.250
Polyamid (nylon)	0.250
Softwood 500, typical construction timber	0.130
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

U = 0.187 W/(m²·K)

NZ_TH_Sill_fRSI



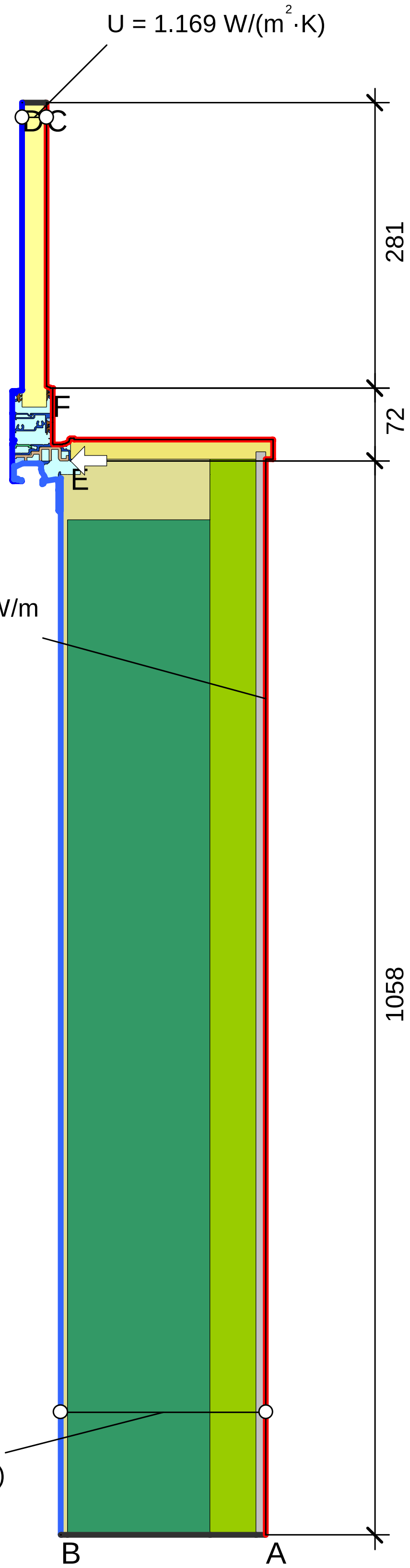
Boundary Condition	θ[°C]	R[(m²·K)/W]
Exterior, Normal	0.000	0.040
Exterior, Ventilated	0.000	0.130
Interior, frsi = 0.25	20.000	0.250
Symmetry/Model section		

Material	λ[W/(m·K)]
Air36.5mmU	0.200
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
Panel	0.035
Plasterboard	0.250
Polyamid (nylon)	0.250
Softwood 500, typical construction timber	0.130
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

NZ_SolidAlumSill_PSI

$$\psi_{A\text{-}E\text{-}C,*} = \frac{23.263}{20.000} - 0.187 \cdot 1.058 - 6.090 \cdot 0.072 - 1.169 \cdot 0.281 = 0.200\ W/(m \cdot K)$$

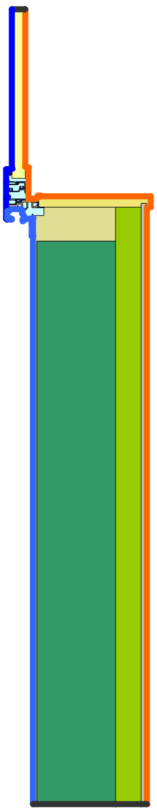


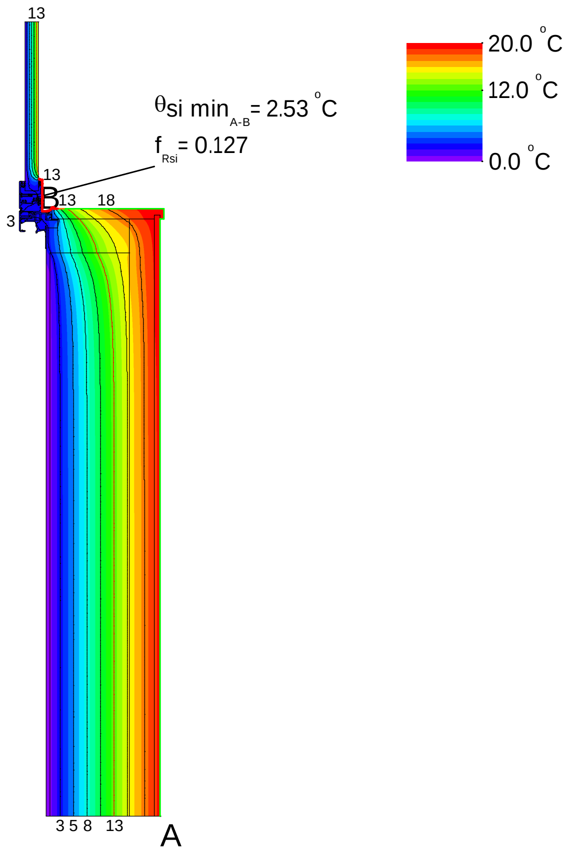
Boundary Condition	$q[W/m^2]$	$\theta[°C]$	$R[(m^2 \cdot K)/W]$
Exterior, Normal		0.000	0.040
Exterior, Ventilated		0.000	0.130
Interior, heat flux, downwards		20.000	0.170
Interior, normal, horizontal		20.000	0.130
Symmetry/Model section	0.000		

Material	$\lambda[W/(m \cdot K)]$
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
PVC-U (polyvinylchloride), rigid	0.170
Panel	0.035
Plasterboard	0.250
Polyethylene HD, high density	0.500
Softwood 500, typical construction timber	0.130
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

NZ_SolidAlumSill_fRSI



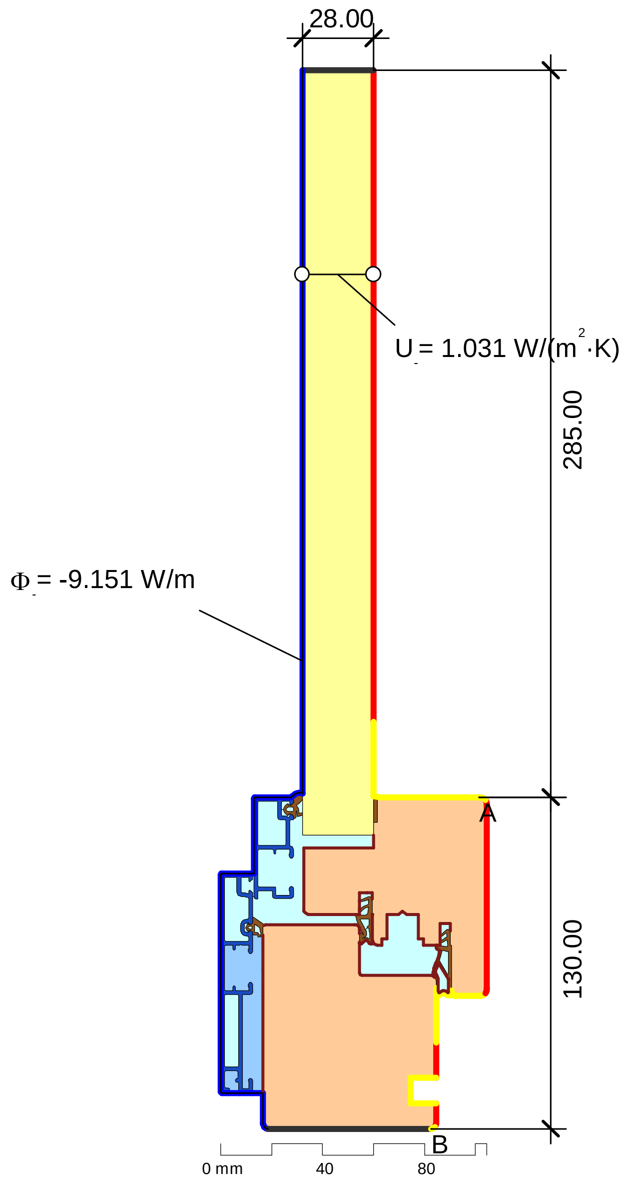


Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]
Exterior, Normal		0.000	0.040
Exterior, Ventilated		0.000	0.130
Interior, frsi = 0.25		20.000	0.250
Symmetry/Model section	0.000		

Material	λ[W/(m·K)]
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
FibreInsulation 0.035	0.035
FibreInsulation 0.045	0.045
PVC-U (polyvinylchloride), rigid	0.170
Panel	0.035
Plasterboard	0.250
Polyethylene HD, high density	0.500
Softwood 500, typical construction timber	0.130
Timber (Softwood)	0.130
Slightly ventilated air cavity *	
Unventilated air cavity *	

* Simplified approach

Reference frame values these are not ISO10077-2 reports and may not be used separately from the remainder of the report.



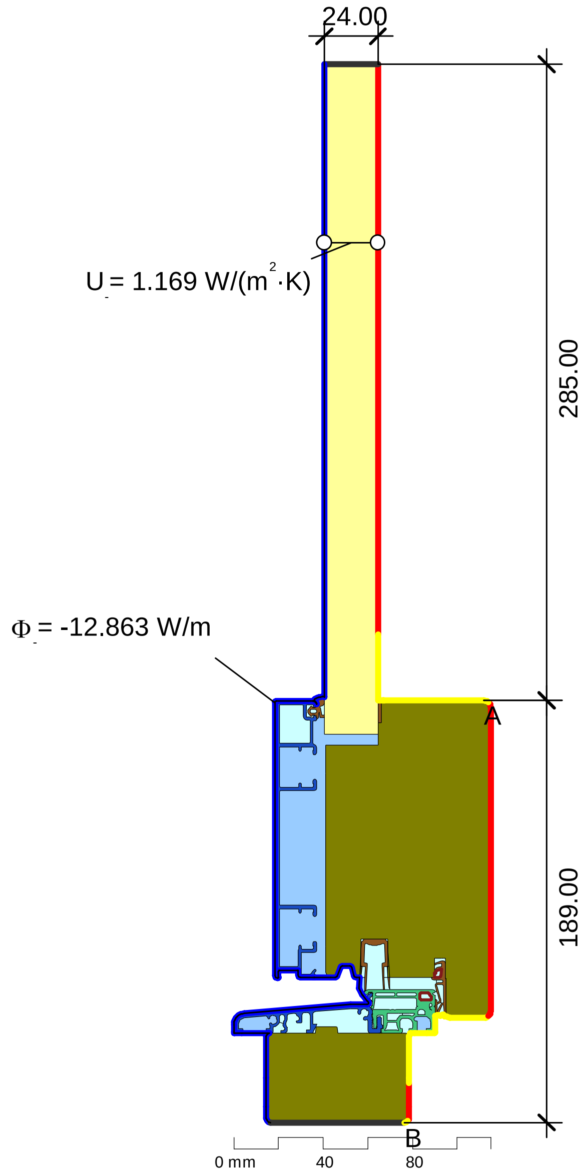
$$U_{f\,A,B} = \frac{\frac{9.151}{20.000} - 1.031 \cdot 0.285}{0.130} = 1.26\ \mathrm{W/(m^2 \cdot K)}$$

Material	λ[W/(m·K)]
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
Larch	0.110
Panel	0.035
Slightly ventilated air cavity *	
Unventilated air cavity *	

* EN ISO 10077-2:2017, 6.4.3/anisotrop

Boundary Condition	$q[W/m^2]$	$\theta[^\circ C]$
Exterior, frame		0.000
Interior, frame, normal		20.000
Interior, frame, reduced		20.000
Symmetry/Model section	0.000	

Reference frame values these are not ISO10077-2 reports and may not be used separately from the remainder of the report.



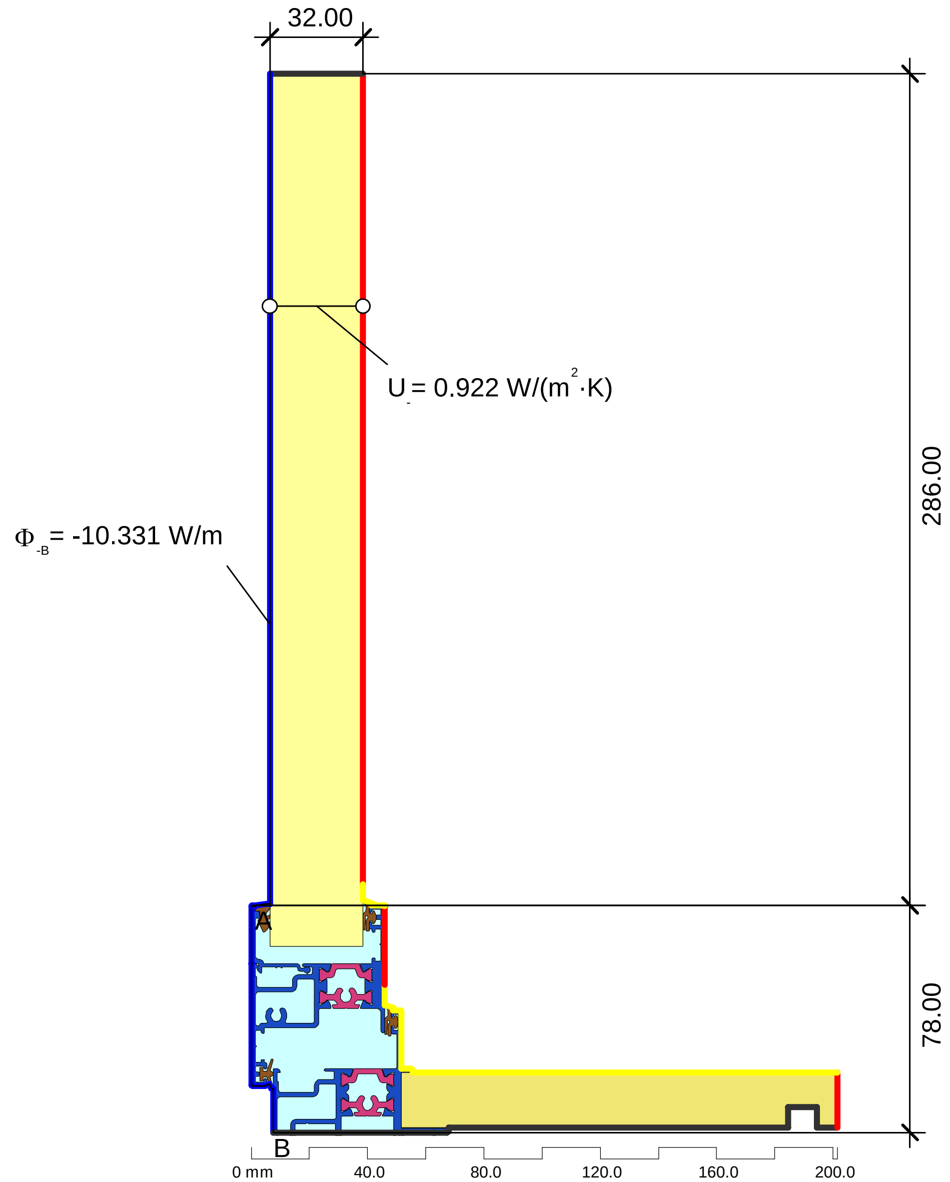
$$U_{f\,A,B} = \frac{\frac{12.863}{20.000} - 1.169 \cdot 0.285}{0.189} = 1.64\ W/(m^2 \cdot K)$$

Material	λ[W/(m·K)]
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
Larch	0.110
Larch (1)	0.110
Larch (2)	0.110
Larch (3)	0.110
Larch (4)	0.110
Larch (5)	0.110
Larch (6)	0.110
PVC-U (polyvinylchloride), rigid	0.170
Panel	0.035
Slightly ventilated air cavity *	
Unventilated air cavity *	

* EN ISO 10077-2:2017, 6.4.3/anisotrop

Boundary Condition	q[W/m²]	θ[°C]
Exterior, frame		0.000
Interior, frame, normal		20.000
Interior, frame, reduced		20.000
Symmetry/Model section	0.000	

Reference frame values these are not ISO10077-2 reports and may not be used separately from the remainder of the report.



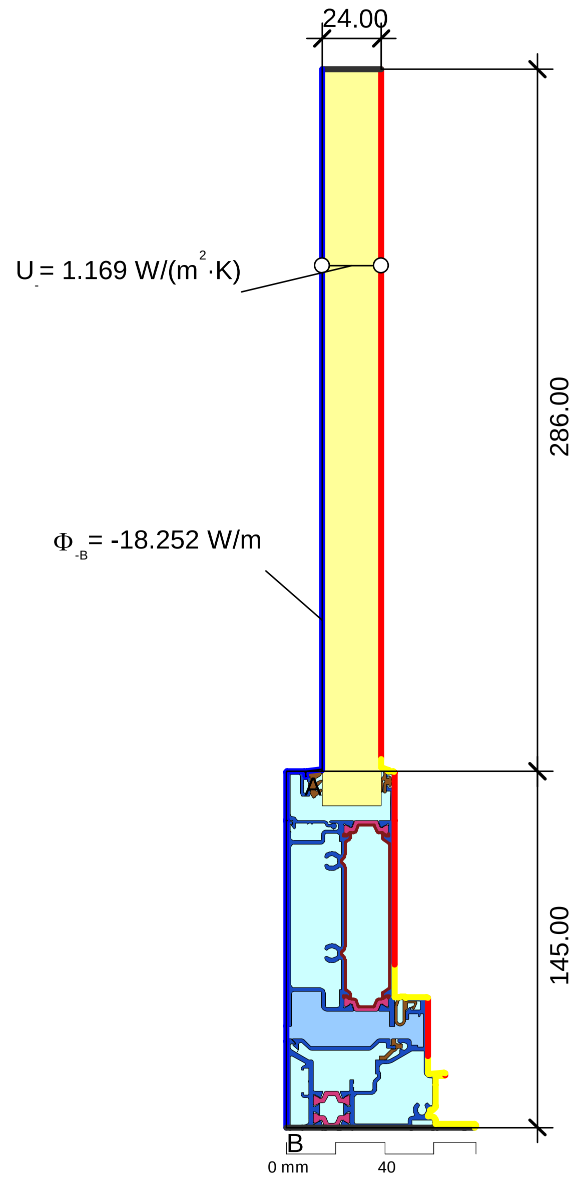
$$U_{f\,A,B} = \frac{\frac{10.331}{20.000} - 0.922\cdot 0.286}{0.078} = 3.24\ W/(m^2\cdot K)$$

Material	λ[W/(m·K)]
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
Panel	0.035
Polyamid (nylon)	0.250
Softwood 500, typical construction timber	0.130
Unventilated air cavity *	

* EN ISO 10077-2:2017, 6.4.3/anisotrop

Boundary Condition	q[W/m²]	θ[°C]
Exterior, frame		0.000
Interior, frame, normal		20.000
Interior, frame, reduced		20.000
Symmetry/Model section	0.000	

Reference frame values these are not ISO10077-2 reports and may not be used separately from the remainder of the report.



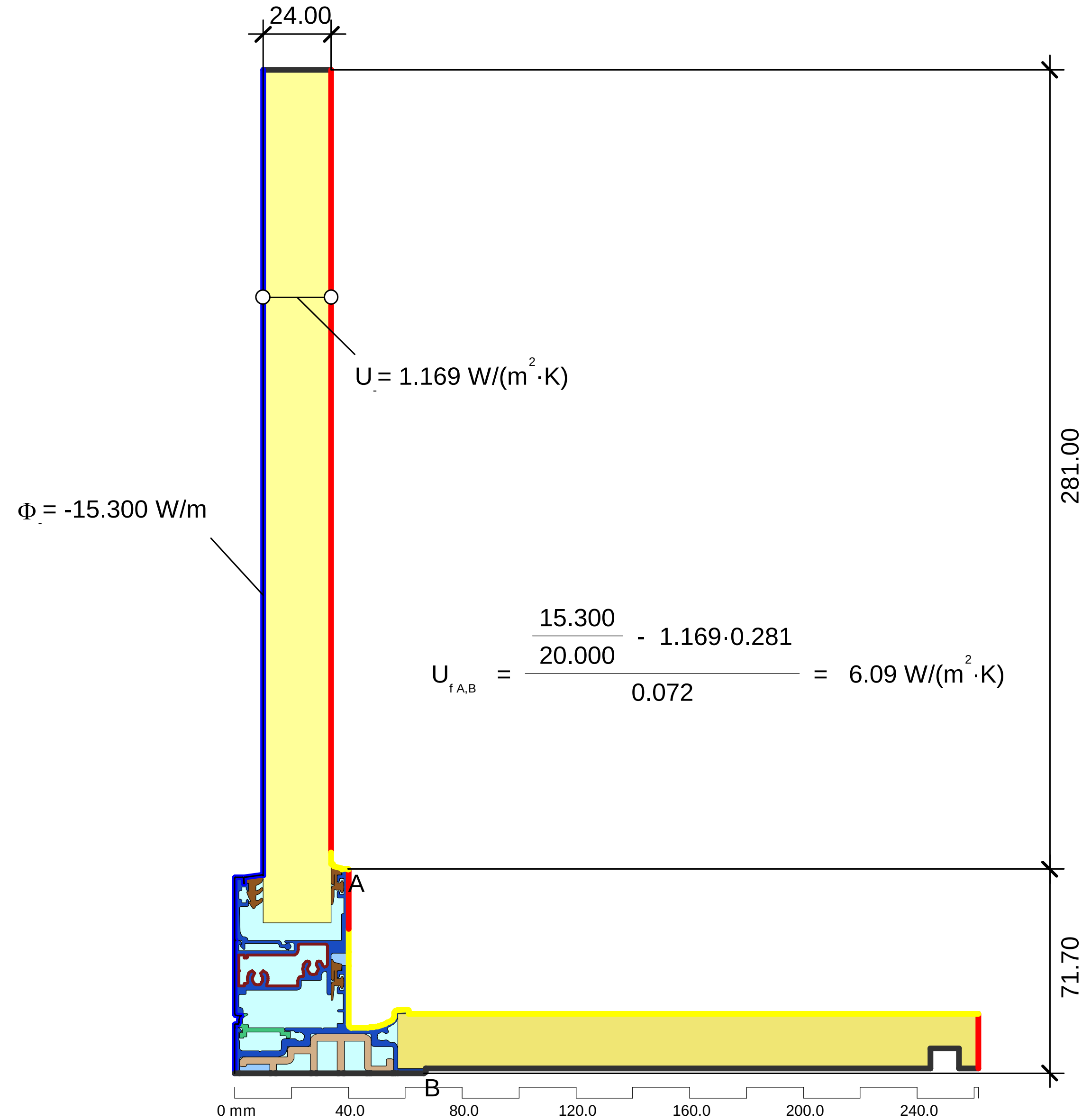
$$U_{f\,A,B} = \frac{\frac{18.252}{20.000} - 1.169 \cdot 0.286}{0.145} = 3.99\ \mathrm{W/(m^2 \cdot K)}$$

Material	λ[W/(m·K)]
Aluminium (Si Alloys)	160.000
EPDM (ethylene propylene diene monomer)	0.250
Panel	0.035
Polyamid (nylon)	0.250
Slightly ventilated air cavity *	
Unventilated air cavity *	

* EN ISO 10077-2:2017, 6.4.3/anisotrop

Boundary Condition	q[W/m²]	θ[°C]
Exterior, frame		0.000
Interior, frame, normal		20.000
Interior, frame, reduced		20.000
Symmetry/Model section	0.000	

Reference frame values these are not ISO10077-2 reports and may not be used separately from the remainder of the report.

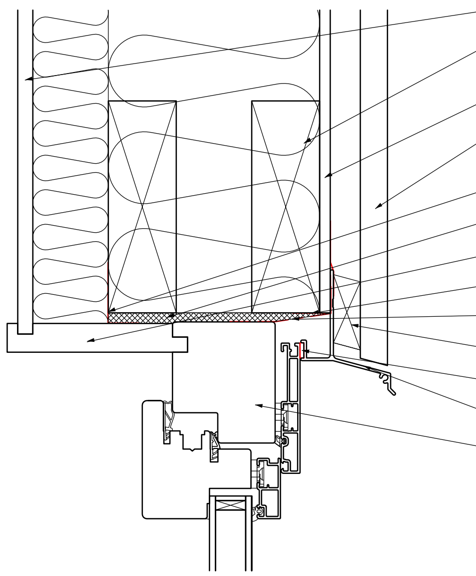


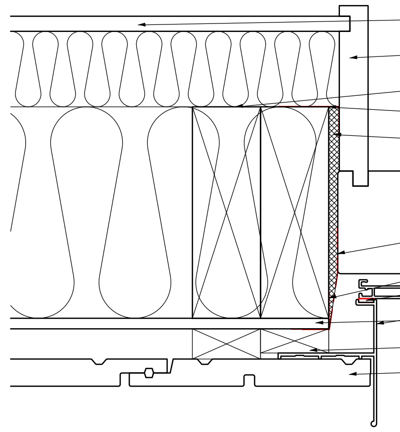
$$U_{f\,A,B} = \frac{\frac{15.300}{20.000} - 1.169 \cdot 0.281}{0.072} = 6.09\ \text{W/(m}^2\cdot\text{K)}$$

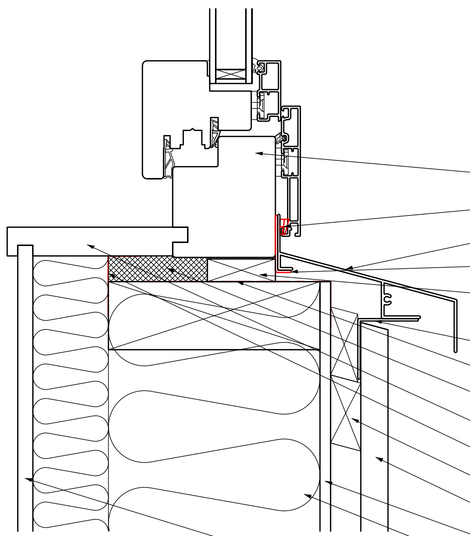
Material	λ[W/(m·K)]	ε
Aluminium (Si Alloys)	160.000	0.900
EPDM (ethylene propylene diene monomer)	0.250	
PVC-U (polyvinylchloride), rigid	0.170	
Panel	0.035	
Polyethylene HD, high density	0.500	
Slightly ventilated air cavity *		
Softwood 500, typical construction timber	0.130	
Unventilated air cavity *		

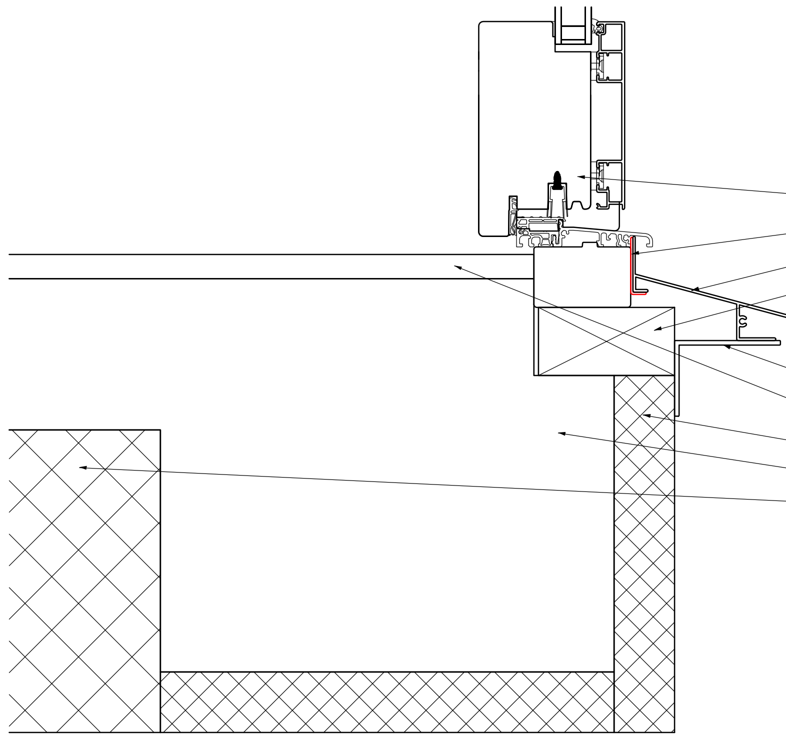
* EN ISO 10077-2:2017, 6.4.3/anisotrop

Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε
Epsilon 0.9				0.900
Exterior, frame		0.000	0.040	
Interior, frame, normal		20.000	0.130	
Interior, frame, reduced		20.000	0.200	
Symmetry/Model section	0.000			









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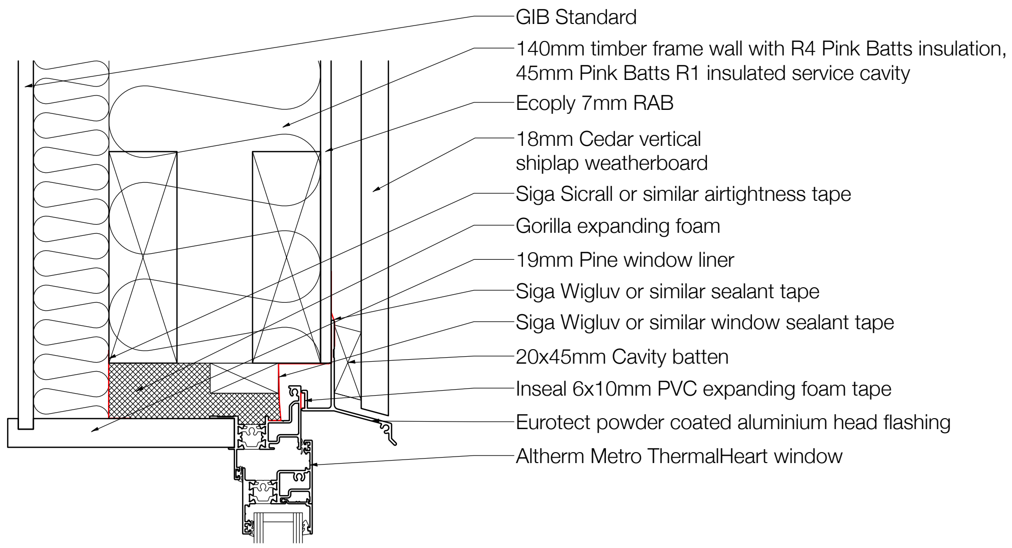
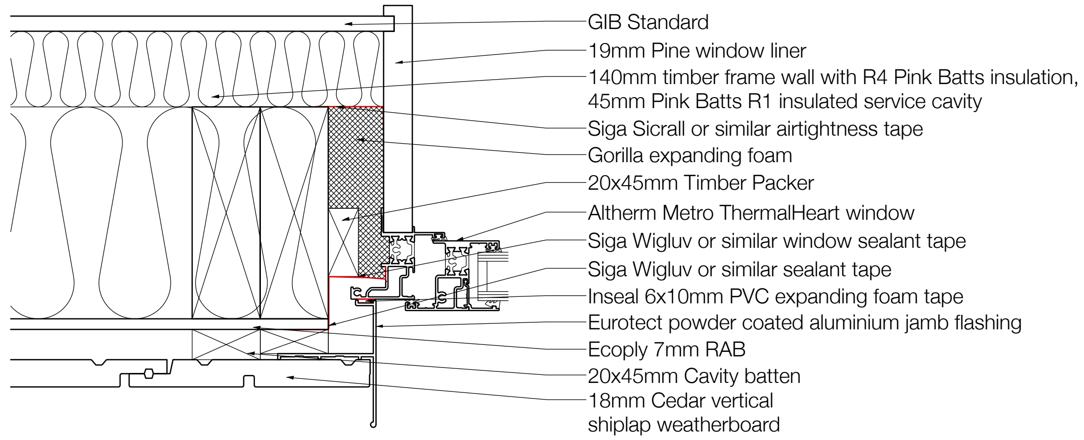
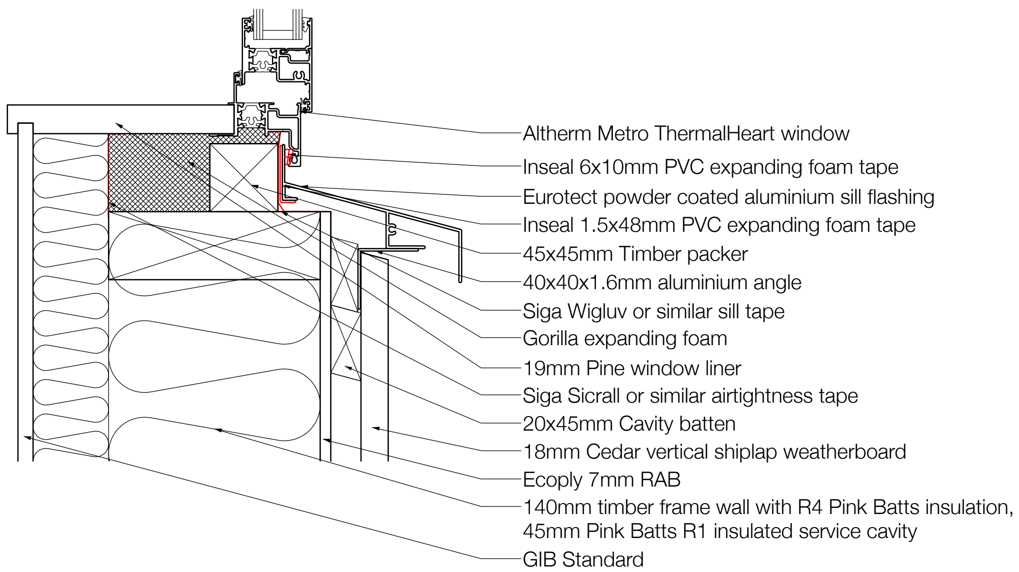
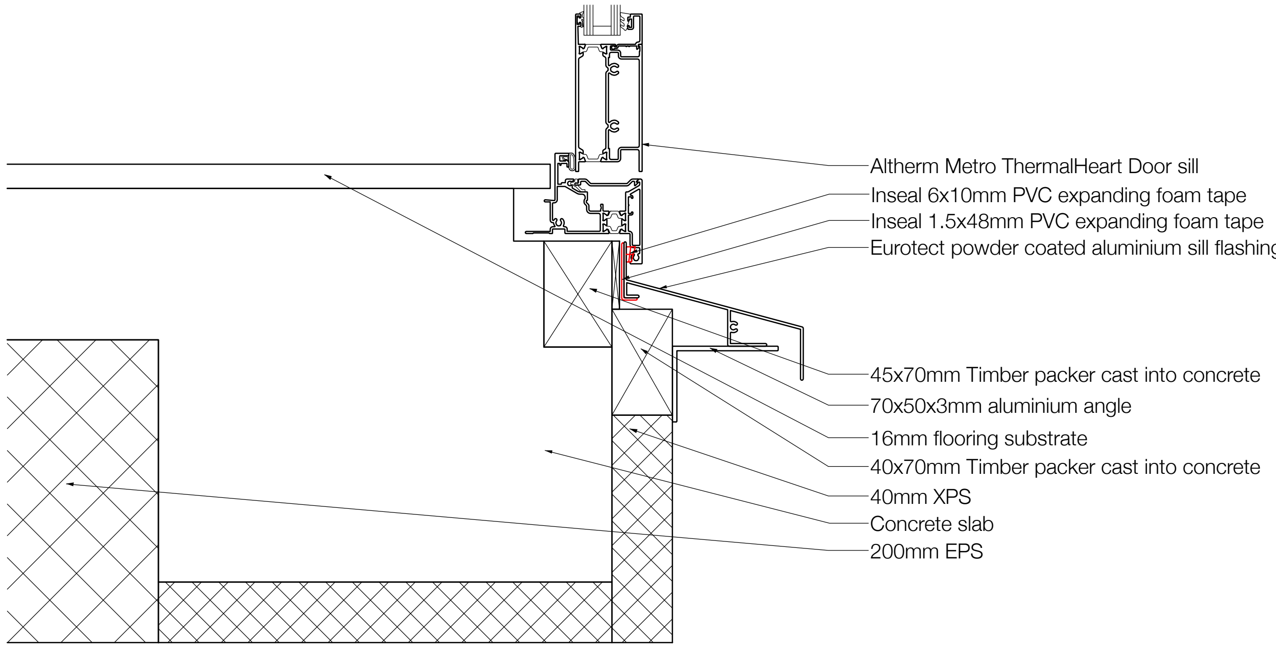
PROJECT	EUROTECT SYSTEM THERMAL ANALYSIS	REF	-	DATE	2020 08 12
		ISSUE	-	DRAWN	HB
				SHEET	A01
TITLE	WOODALU DETAILS			REV	-









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PROJECT EUROTECT SYSTEM THERMAL ANALYSIS	REF -	DATE 2020 08 13
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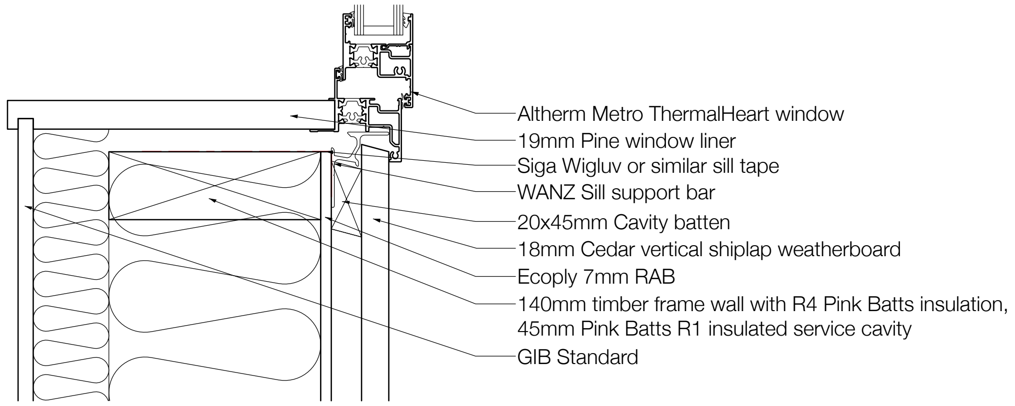

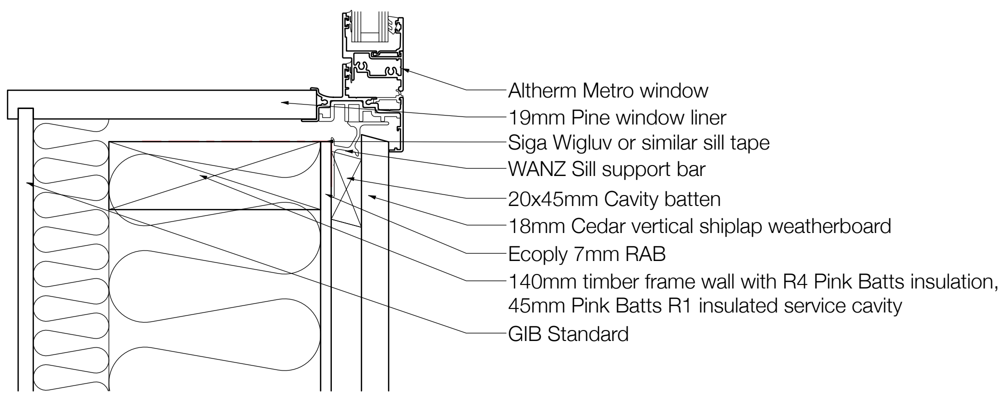

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PROJECT EUROTECT SYSTEM THERMAL ANALYSIS	REF -	DATE 2020 08 13
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