THERMAL PERFORMANCE CALCULATION

Façade Engineering and Analysis
Services Limited.

Analysis undertaken and report prepared on behalf of XXXXX Limited for

XXXXX

DOCUMENT REF :- XXX/TP/XXXXX Rev 01
Document title :- Condensation risk analysis of curtain wall XXXX
Date of original issue :- X XXXXX XXXX
Revised issue date :-

Analysis prepared by
XXXXXXXXX
xxxx@feaservices.co.uk

Document prepared by
XXXXXXXXX
XXXX@feaservices.co.uk

Document prepared by
XXXXXXXXX
xxxx@feaservices.co.uk

Façade Engineering and Analysis Services Limited.
Suite 8, Tradmark House, Hyssop Close, Cannock, Staffordshire, WS11 7FA.
Tel. 01543 898150 : email. enquiries@feaservices.co.uk : web. www.feaservices.co.uk

Revisions

Rev 01	Initial issue of calculations	x xxxx xxxx

This document provides an assessment of the thermal performance only and does not indicate or contain assessments of the façade suitability regarding any other aspects, including but not limited to, structural and fire resistance. These must be assessed by the client and their specialist engineers

Contents

Summary

This calculation document has been compiled to demonstrate the thermal performance of the EWS101 curtain wall to be installed at the XXXXXXX project with regard to condensation risk.

The calculation has been undertaken on behalf of XXXXXXXX

The screens examined are as shown on drawings XXXXXXXX

Environmental conditions for analysis are advised by XXXXXX as:

External air temperature = -5°C

Internal air temperature = 20 °C

Internal Relative Humidity = 40%

This equates to a dew point temperature of 6.01^{0}C.

The below results indicate the Relative Humidity at which surface condensation may occur when examined at the temperatures above.

Detail	Lowest surface temperature @ 20 ^{0}C	Equivalent RH at which condensation may occur
Head detail – 1 1404 (1407 similar)	8.23 ^{0}C	46 %
Head detail – 1 1413 (1411, 1421 similar)	8.99 ^{0}C	49 %
Head detail – 1 1418 (1419, 1420 similar)	13.40 ^{0}C	66 %
Head detail (door) – 1 1415	8.99 ^{0}C	49 %
Floor slab interface detail – 1 1406 (1408 similar)	13.07 ^{0}C	64 %
Cill detail – 1 1412 (1405, 1410, 1417 similar)	14.11 ^{0}C	69 %
Door threshold detail – 1 1414 (1401, 1402 similar)	11.83 ^{0}C	59 %
Mullion (glass zone) – 1 1425	13.97 ^{0}C	68 %
Mullion (facet glass zone) – 1 1424	12.84 ^{0}C	63 %
Mullion (panel zone) – 1 1442	15.52 ^{0}C	75 %
Mullion (door jamb) – 1 1426	11.97 ^{0}C	60 %
Int corner 1 1427	14.73 ^{0}C	72 %
Ext corner 1 1429	14.71 ^{0}C	72 %
Jamb 1 1428	11.83 ^{0}C	59 %
Jamb 1-1434	14.66 ^{0}C	71 %

The calculated surface temperatures are above the target dew point level and surface condensation will not occur within the conditions examined.

The head details return lowest surface temperatures at the upper transom. Provided details do not include ceiling finishes etc and these my affect the temperatures at that location.

Temperature factor

The following table provides temperature factor information for the details.

Results are provided for both the lowest surface temperature on the glass or frame and, where applicable a 2nd value at interfaces with finishes that might be absorbent.

The 2nd values being applicable if assess for any potential for mould growth.
It is common for the glass/frame temperature factor to below the 0.75 f_{CRSi} for avoiding mould growth but this may not a critical factor on those materials.

Limited details include internal finishes

Detail	f_{Rsi} value	f_{Rsi} value at absorbent surfaces
Head detail – 1 1404 (1407 similar)	0.529	-
Head detail – 1 1413 (1411, 1421 similar)	-	-
Head detail – 1 1418 (1419, 1420 similar)	0.736	-
Head detail (door) – 1 1415	0.560	-
Floor slab interface detail – 1 1406 (1408 similar)	0.723	0.825
Cill detail – 1 1412 (1405, 1410, 1417 similar)	0.764	-
Door threshold detail – 1 1414 (1401, 1402 similar)	0.673	-
Mullion (glass zone) – 1 1425	0.759	-
Mullion (facet glass zone) – 1 1424	0.714	-
Mullion (panel zone) – 1 1442	0.821	-
Mullion (door jamb) – 1 1426	0.679	-
Int corner 1 1427	0.789	-
Ext corner 1 1429	0.789	-
Jamb 1 1428	0.673	0.690
Jamb 1-1434	0.786	-

The f_{Rsi} at absorbent surfaces is above 0.75 for the floor interface but below for the jamb. This is due to heat flow through the adjacent concrete and should be reviewed by the relevant contractor

Interstitial condensation

The dew point isotherm falls in the insulation backing the panels and spandrels. The sealed internal liner will alleviate an interstitial condensation risk in those details.

2D analysis method.

The following thermal analysis was undertaken using "FLIXO ver 8.1" 2-dimensional Finite Elemental Analysis software.

This software has been developed by Infomind for 2-dimensional steady state thermal simulation and this produces constant and reliable analysis of constructions generating thermal performance data and frame U-values according to EN ISO 10077-2.

FLIXO is a thermal analysis program for steady state heat transfer in two-dimensional objects consisting of different materials and submitted to different boundary conditions. The geometry is defined by association of the colours with the physical properties of materials and defining boundary conditions.
FLIXO calculates a triangulation for the material colours. The system nodes are located in the triangle vertices. The temperatures in the nodes are calculated, from which all heat flows can be derived.
FLIXO allows calculation of thermal quantities as defined by European standards: including temperature factor, linear thermal transmittance, thermal transmittance of a window frame psi values, UF's and UTJ values.

These simulations benefit from incorporation of Infomind's radiation module for additional accuracy in analysis by calculating infrared radiation and convection in a more realistic manner than FLIXO alone.

Material properties such as thermal conductivity (λ values) used in these calculations have been taken from EN 10456:2007, BS EN ISO 10077-2:2017 or directly from the Infomind material database.

In addition specific product thermal conductivity values may be taken from suppliers' own literature in the case of the material not being specifically included in the British or EN Standards.

The equivalent thermal conductivities of ventilated and unventilated air cavities are calculated by the software in alignment with the applicable direction of heat flow in accordance with BS EN ISO 10077-2:2017 applying anisotropic values in accordance with clause 6.4.3. This method models air cavities using the real heat flow direction to calculate the convection, and radiation from the boundary materials with the aim of giving more realistic calculation of the air cavity and radiation between the surfaces.

The analyses assume steady state heat flow and therefore any thermal mass effect of any adjacent construction or building component has not been considered.

Glazing thermal models were analysed using the 'single assessment' method as outlined in BS EN ISO 12631:2017: "Thermal performance of curtain walling. Calculation of thermal transmittance".

Information taken from the resulting software studies and included within the individual analysis includes…..

- Thermal gradient diagrams indicating temperature across the examined assembly indicting minimum internal temperature and RH level at which surface condensation could occur.
- Diagrams indicating assigned thermal conductivity values according to appropriate materials and boundary conditions.
- Energy flux diagrams indicating energy flow through the section.

Glazing edge material thermal conductivity values used within these calculations have been verified to give the same conductivity performance values stated by the manufacturer's simplified 2 box method values when assessed in a thermally broken window frame.

FEASL utilise a fully constructed edge detail rather than the 2 box method for all thermal calculations.

Whilst the 2 box method is allowable for U value calculations they should not be used for condensation risk analysis as stated in ISO 13788

Various simplified methods have been developed to allow the calculation of realistic thermal transmittances of complete windows taking account of multi-dimensional heat flows through the frame and spacer between the panes of double glazing.
While these will give accurate heat flows, surface temperatures will be seriously in error and they should not be used to estimate the risk of condensation.

As such, for consistency, FEASL utilise simulated edge details as "drawn" spacer rather than the simplified 2 box method for all models.

Boundary Conditions

The following surface resistance conditions are applied in accordance with BS EN ISO 13788 for windows and doors

External surface resistance = 0.04 m^2K/W – see note below ref inclusion of elements with ventilated cavities.

In accordance with BR443. If details contain elements with ventilated cavities the model omit the cladding and the external surface resistance is taken as 0.13 m^2K/W (rather than 0.04 m^2K/W) to allow for the sheltering effect of the cladding (see 4.8.6). For further information see CAB/CWCT Guide

Internal surface resistance (horizontal) = 0.13 m^2K/W

Internal surface resistance (upwards) = 0.10 m^2K/W

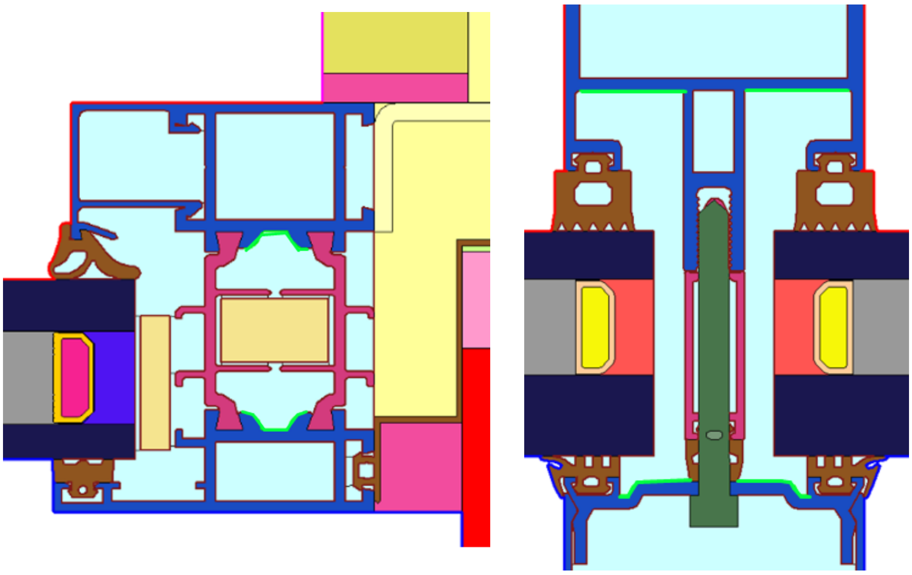
Internal surface resistance (downwards) = 0.17 m^2K/W

Internal finishes surface resistance = 0.25 m^2K/W

Cavity emissivity

Generally, an emissivity coefficient of 0.9 is applied.

Cavities in the areas of thermal breaks are not classed as finished surfaces and not considered to be fully painted. For those cavities, an emissivity coefficient of 0.3 (slightly oxidised aluminium) has been used. e.g. marked green



Analysis output.

- Temperature gradient diagram.
    - Displays temperature distribution through the analysed detail relative the external and internal temperatures applied.
- Material thermal conductivity diagram.
    - Colour coded diagram referencing specific material used in the analysis and list their thermal conductivity (λ) values.
- Heat flux diagram.
    - Illustration of heat flow paths. Concentration of lines demonstrates heat flow. (close lines = greater heat flow)
- Dew point Isotherm diagram
    - Diagram indicating location of dew point isotherm calculated from internal air temperature and Relative Humidity.

Finite element analysis undertaken by Luke Norton

Typical material thermal conductivity values – refer to individual analysis for applicable materials to that simulation

Glazed elements - centre U values.

Manufacturer provided vision centre pane value = **1.0 W/m²K**

Glazing data sheets to be submitted by Vision Arch

Glass spacers are Chromatech Ultra F.

Calculated panel centre pane U value = **0.73 W/m²K** (excludes any backing insulation)

Material	Width (mm)	Thermal Conductivity	Thermal Resistivity	Thermal Resistance	Thermal Resistivity = 1/λ	
External				0.04		
alum	2	160	0.00625	0.0000125		
RW3	41	0.034	29.41176	1.20588235		
alum	2	160	0.00625	0.0000125	Sum of resistance =	1.3759
Internal				0.13	**U Value =**	**0.73 W/m²K**

Condensation risk analysis.

Head detail – 1 1404 (1407 similar)

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Head detail – 1 1404 (1407 similar)

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 46 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 8.23 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

Condensation Analysis Sheet.

Detail. **Head detail – 1 1404 (1407 similar)**

Specification details

Internal temperature = **20** ^oC

External temperature = **-5** ^oC

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **8.23** ^oC

Comments.

By calculation and assessing 8.23 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 46%

Calculations

From BS 5250:2002 Table A.1

Saturated vapour pressure (Es) at 20^oC = 2.337 kPa

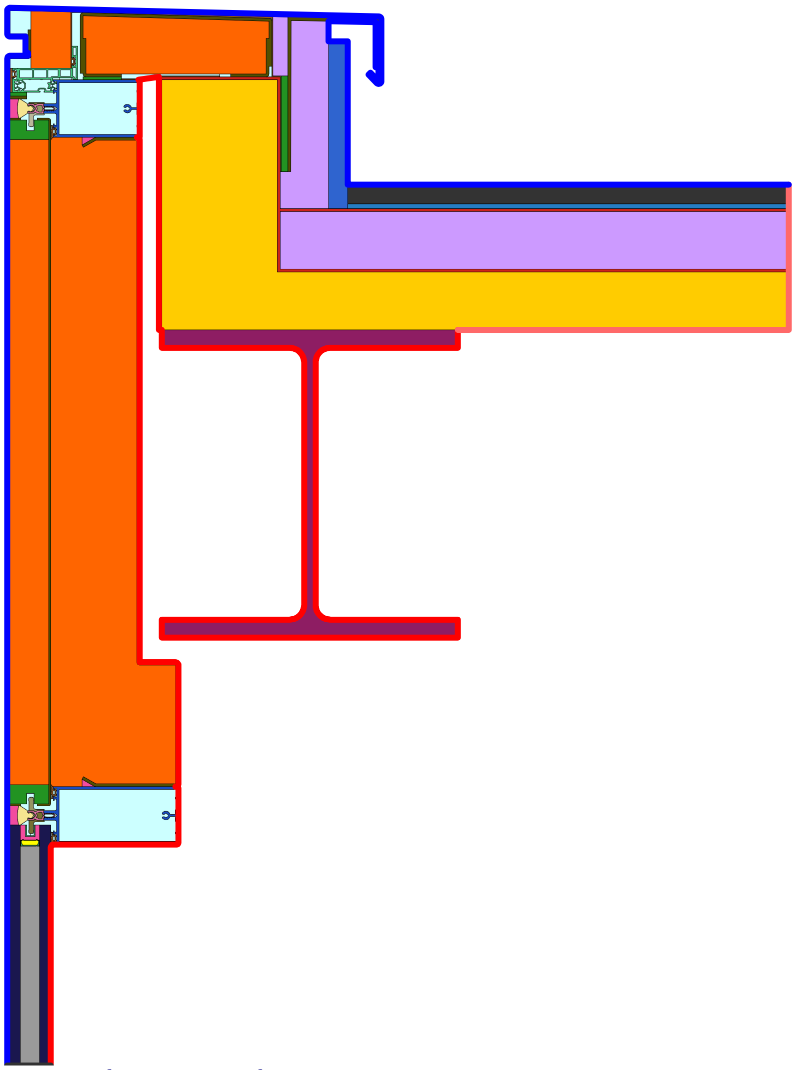
From FEA the internal cold point was shown to be 8.23 deg C

Substituting this temperature into the above gives a vapour pressure of 1.086 kPa

$$RH = \frac{1.086}{2.337} \times 100\% = 46\%$$

Thermal Gradient Diagram

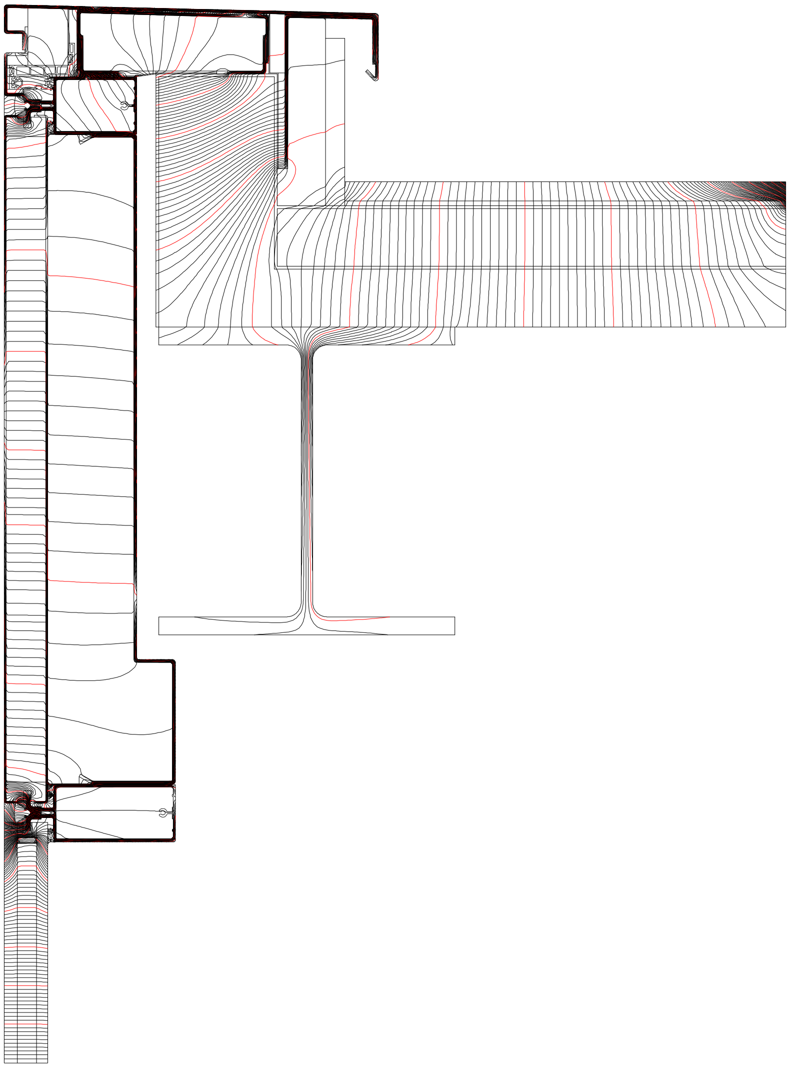
Material Thermal Conductivity Diagram



Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, normal, 20 deg		20.000	0.130		
Interior, upwards, 20 deg		20.000	0.100		
Symmetry/Model section	0.000				

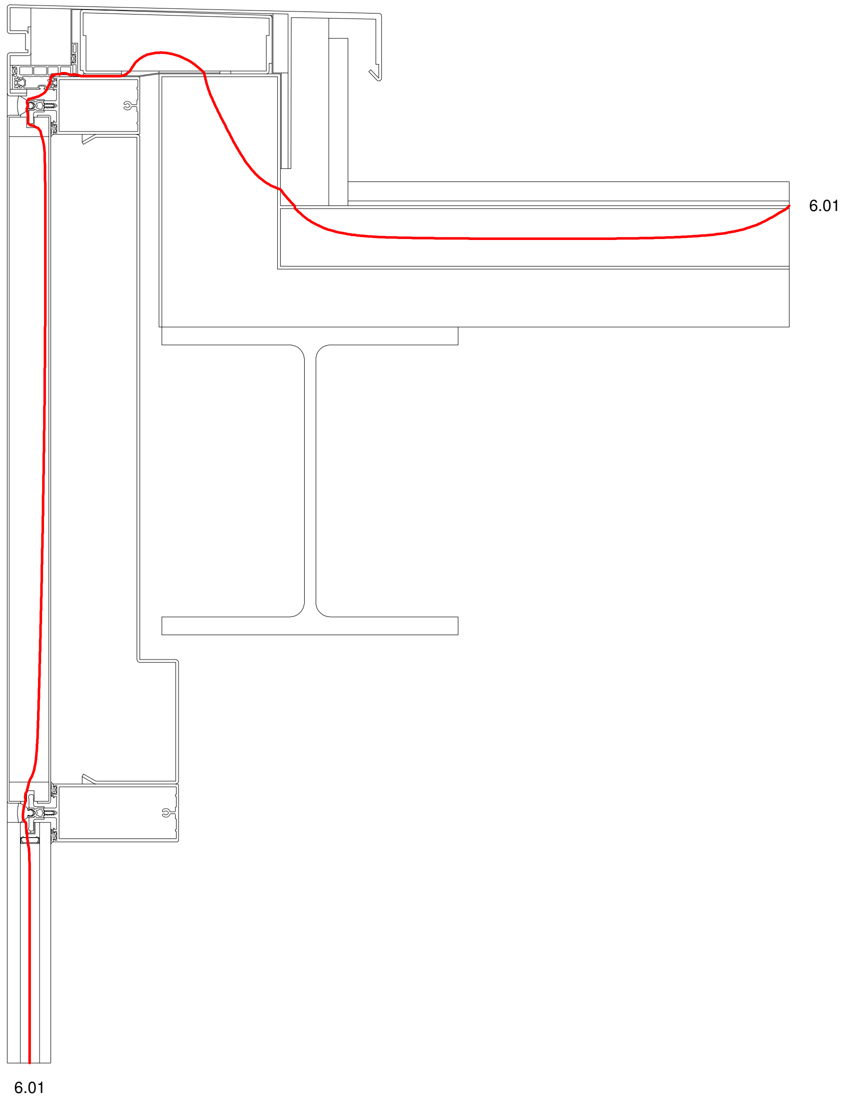
Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy	160.000	0.900	100000000.000
Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	
Aluminium alloy / Foam, 3D equivalent R 25-250(1)	16.045	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250	16.225	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250(1)	16.225	0.900	
Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.085	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R10 25-250	16.043	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.089	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.082	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R4 25-250	16.086	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R5 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R6 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R7 25-250	16.040	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R8 25-250	16.039	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R9 25-250	16.045	0.900	1.000
Bitumen, felt/sheet	0.230	0.900	50000.000
Bitumen, pure	0.170	0.900	50000.000
Butyl rubber, solid/hot melt	0.240	0.900	
EPDM (ethylene propylene diene monomer)	0.250	0.900	
Foam	0.050	0.900	
Gasfillin(1)	0.025	0.900	1.000
Hardwood	0.180	0.900	
PVC-U (polyvinylchloride), rigid	0.170	0.900	
Plastic	0.170	0.900	
Polyamid (nylon)	0.250	0.900	
RW3	0.034	0.900	
Rigid PVC	0.170	0.900	
Roof Insulation	0.035	0.900	
Sand and gravel	2.000	0.900	50.000

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Head detail – 1 1413 (1411, 1421 similar)

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Head detail – 1 1413 (1411, 1421 similar)

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 49 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 8.99 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

Condensation Analysis Sheet.

Detail. **Head detail – 1 1413 (1411, 1421 similar)**

Specification details

Internal temperature = **20** ^{o}C

External temperature = **-5** ^{o}C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **8.99** ^{o}C

Comments.

By calculation and assessing 8.99 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 49%

Calculations

From BS 5250:2002 Table A.1

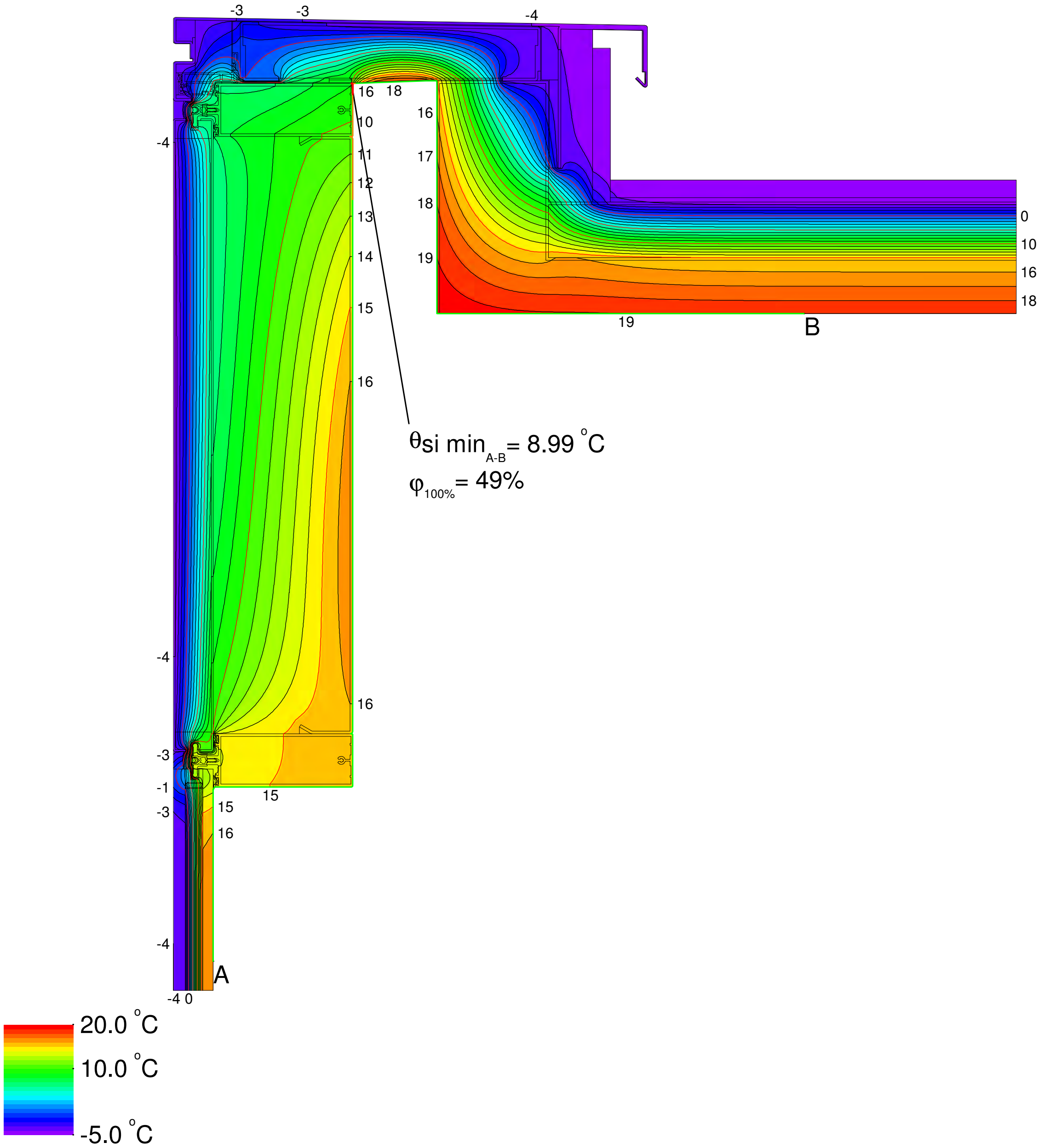
Saturated vapour pressure (Es) at 20^{o}C = 2.337 kPa

From FEA the internal cold point was shown to be 8.99 deg C

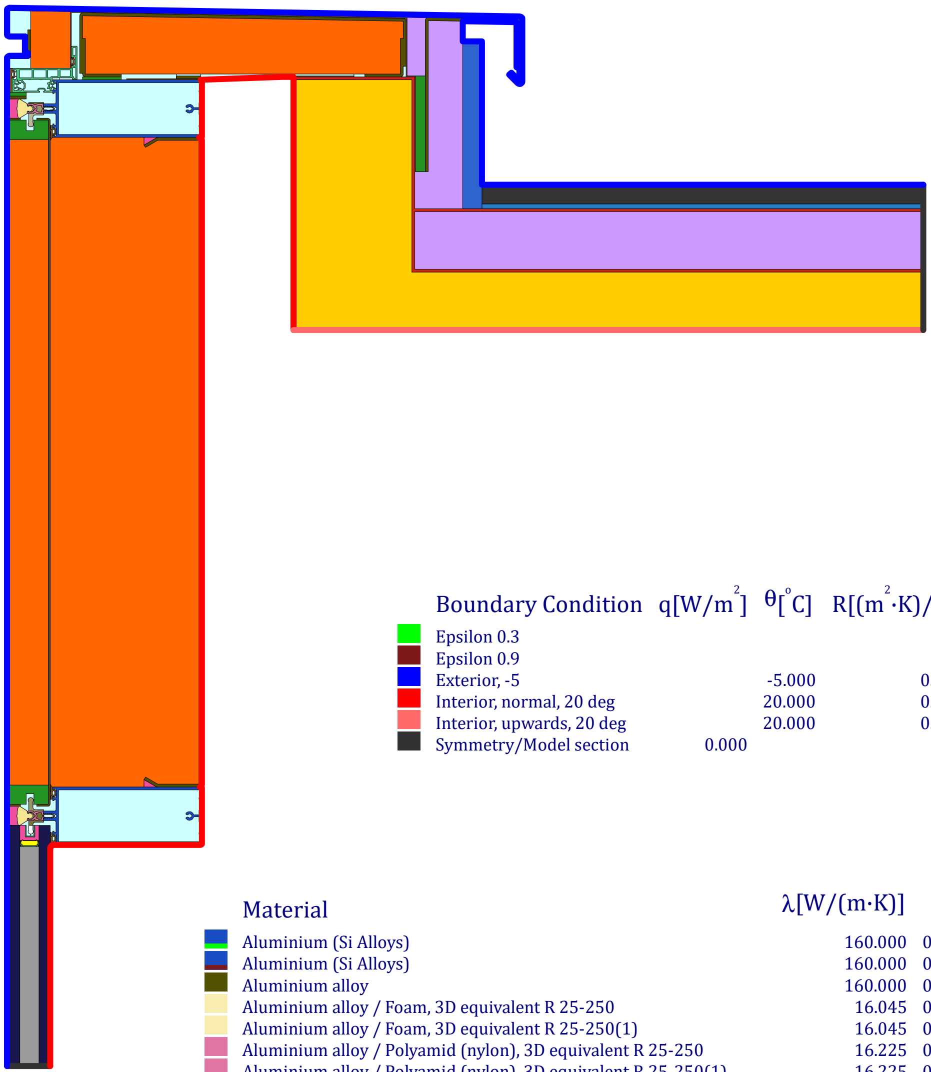
Substituting this temperature into the above gives a vapour pressure of 1.149 kPa

$$RH = \frac{1.149}{2.337} \times 100\% = 49\%$$

Thermal Gradient Diagram



Material Thermal Conductivity Diagram

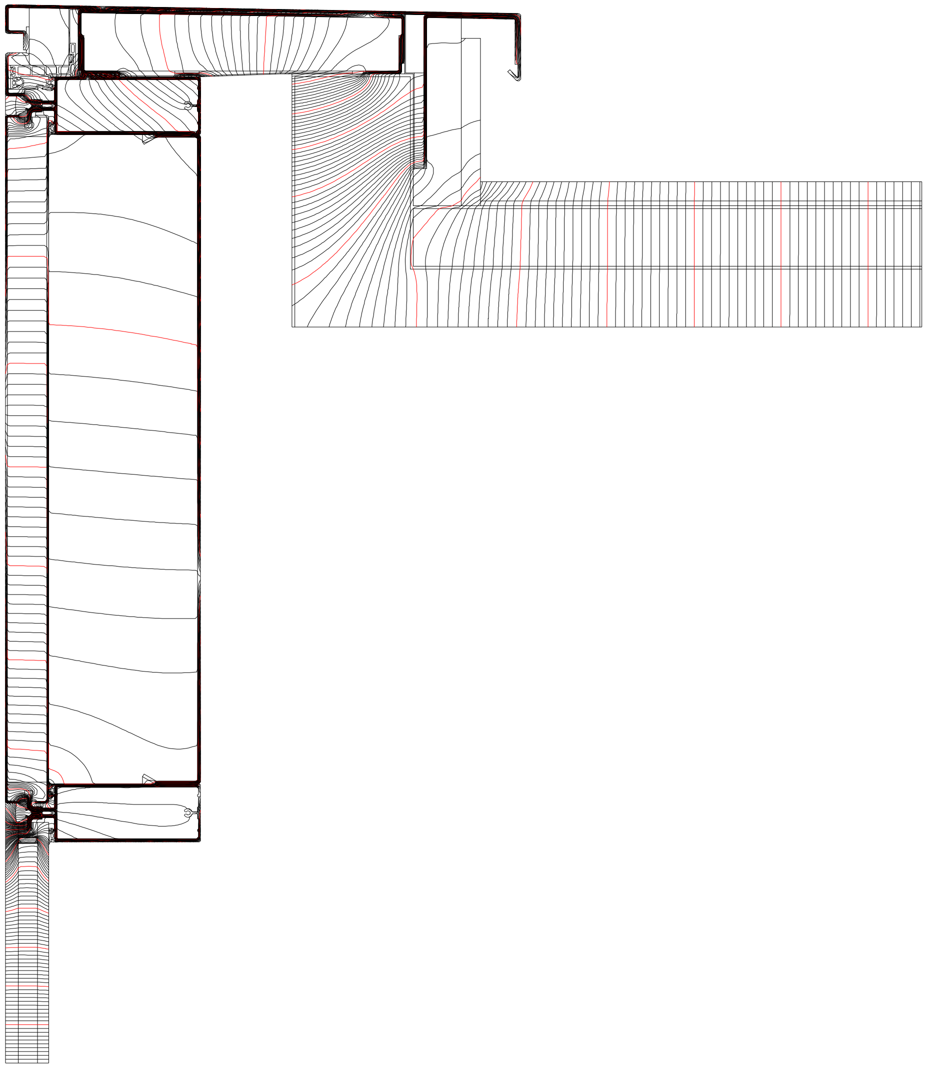


Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, normal, 20 deg		20.000	0.130		
Interior, upwards, 20 deg		20.000	0.100		
Symmetry/Model section	0.000				

Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy	160.000	0.900	100000000.000
Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	
Aluminium alloy / Foam, 3D equivalent R 25-250(1)	16.045	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250	16.225	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250(1)	16.225	0.900	
Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.084	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R10 25-250	16.043	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.090	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.082	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R4 25-250	16.085	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R5 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R6 25-250	16.031	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R7 25-250	16.040	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R8 25-250	16.038	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R9 25-250	16.045	0.900	1.000
Bitumen, felt/sheet	0.230	0.900	50000.000
Bitumen, pure	0.170	0.900	50000.000
Butyl rubber, solid/hot melt	0.240	0.900	
EPDM (ethylene propylene diene monomer)	0.250	0.900	
Foam	0.050	0.900	
Gasfillin(1)	0.025	0.900	1.000
Hardwood	0.180	0.900	
PVC-U (polyvinylchloride), rigid	0.170	0.900	
Plastic	0.170	0.900	
Polyamid (nylon)	0.250	0.900	
RW3	0.034	0.900	
Rigid PVC	0.170	0.900	
Roof Insulation	0.035	0.900	
Sand and gravel	2.000	0.900	50.000
Sheathing Board	0.230	0.900	40.000
Silica gel (desiccant)	0.130	0.900	
Silicone, filled	0.500	0.900	
Soda lime glass	1.000	0.900	
Stainless steel	15.000	0.900	
Unventilated air cavity *			1.000

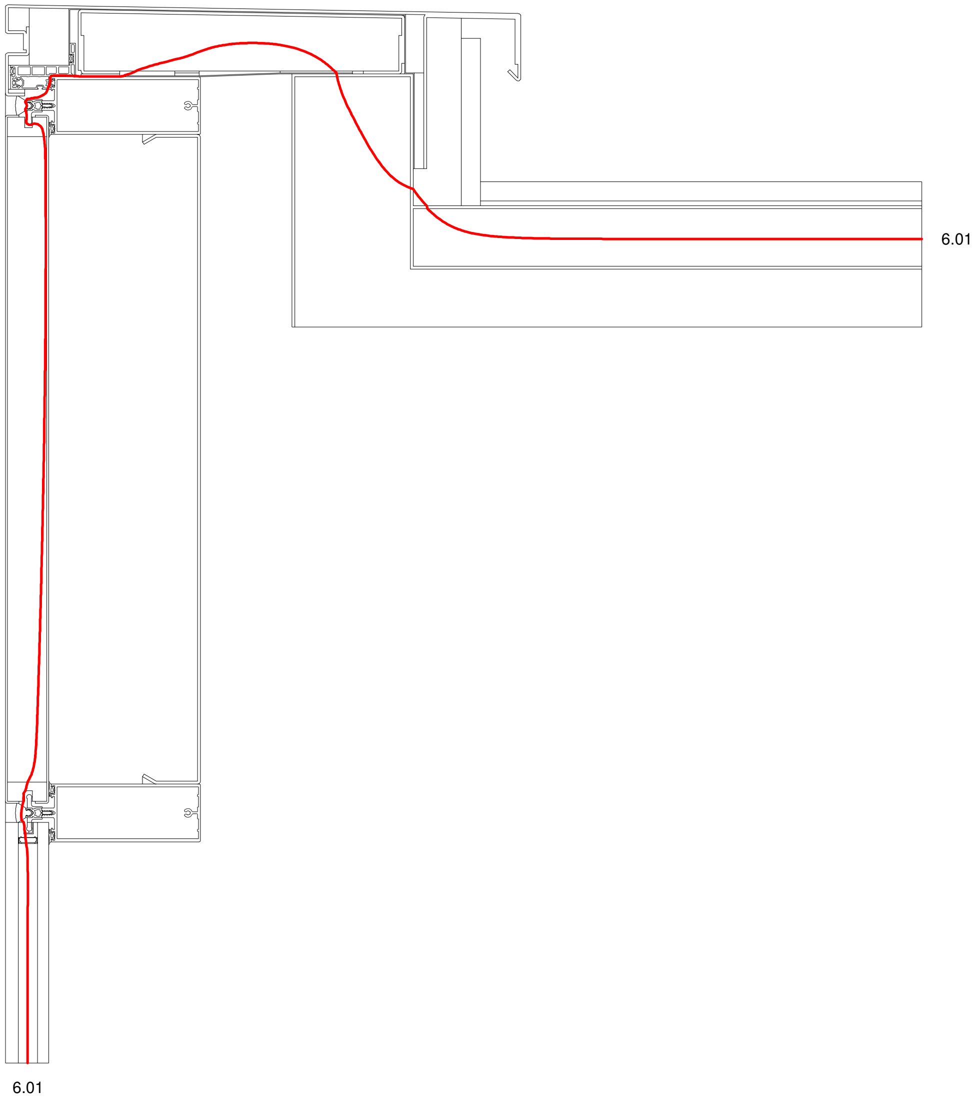
* EN ISO 10077-2:2017, 6.4.3/anisotrop

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Head detail – 1 1418 (1419, 1420 similar)

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Head detail – 1 1418 (1419, 1420 similar)

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 66 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 13.40 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

Condensation Analysis Sheet.

Detail. **Head detail – 1 1418 (1419, 1420 similar)**

Specification details

Internal temperature = **20** ^{o}C

External temperature = **-5** ^{o}C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **13.4** ^{o}C

Comments.

By calculation and assessing 13.4 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 66%

Calculations

From BS 5250:2002 Table A.1

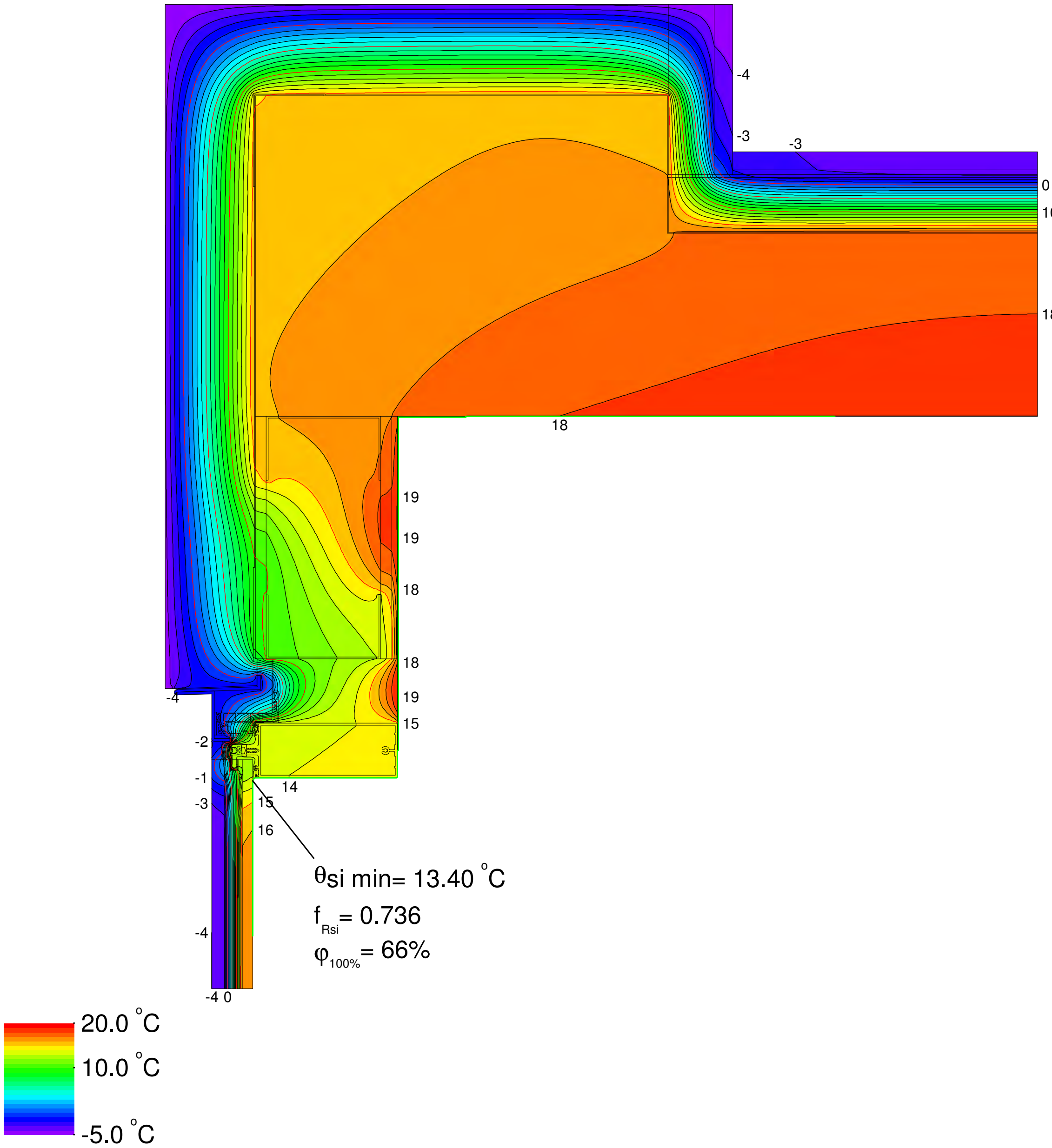
Saturated vapour pressure (Es) at 20^{o}C = 2.337 kPa

From FEA the internal cold point was shown to be 13.4 deg C

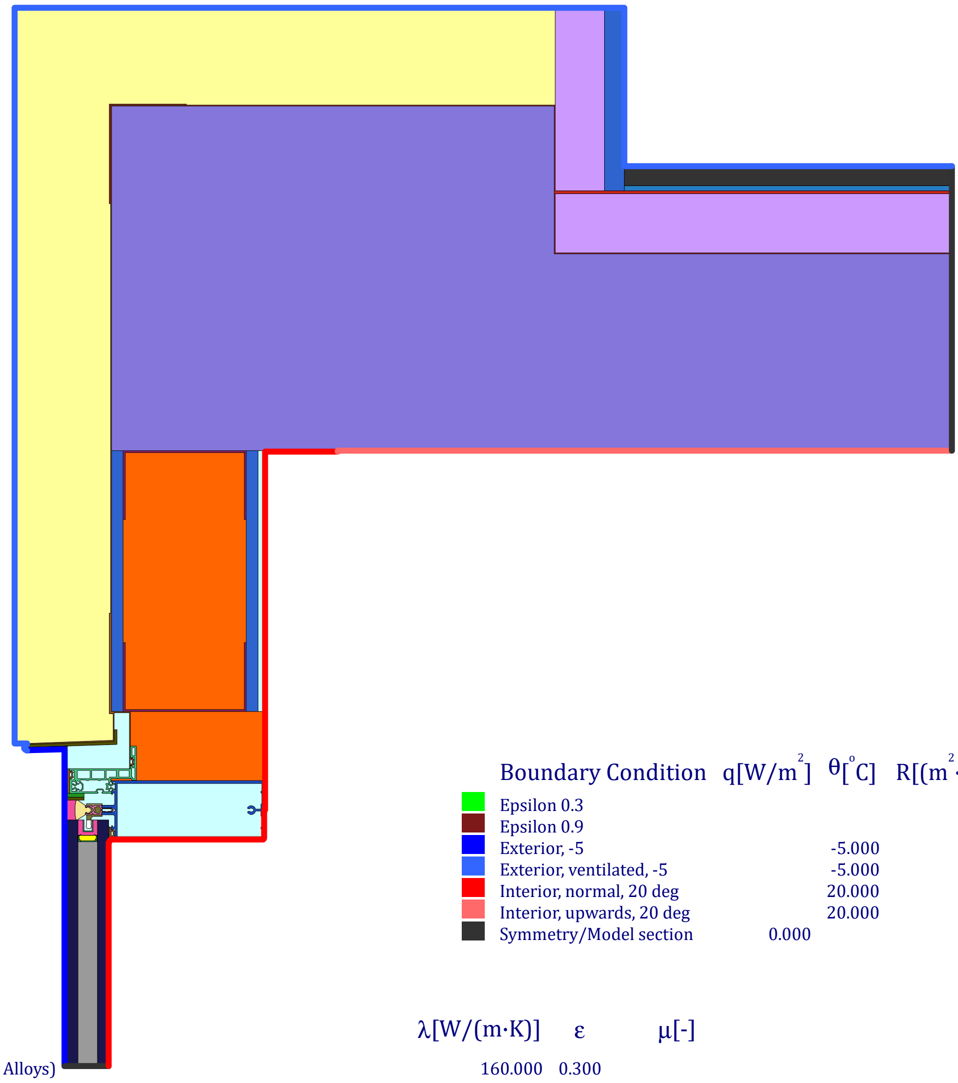
Substituting this temperature into the above gives a vapour pressure of 1.537 kPa

$$RH = \frac{1.537}{2.337} \times 100\% = 66\%$$

Thermal Gradient Diagram



Material Thermal Conductivity Diagram

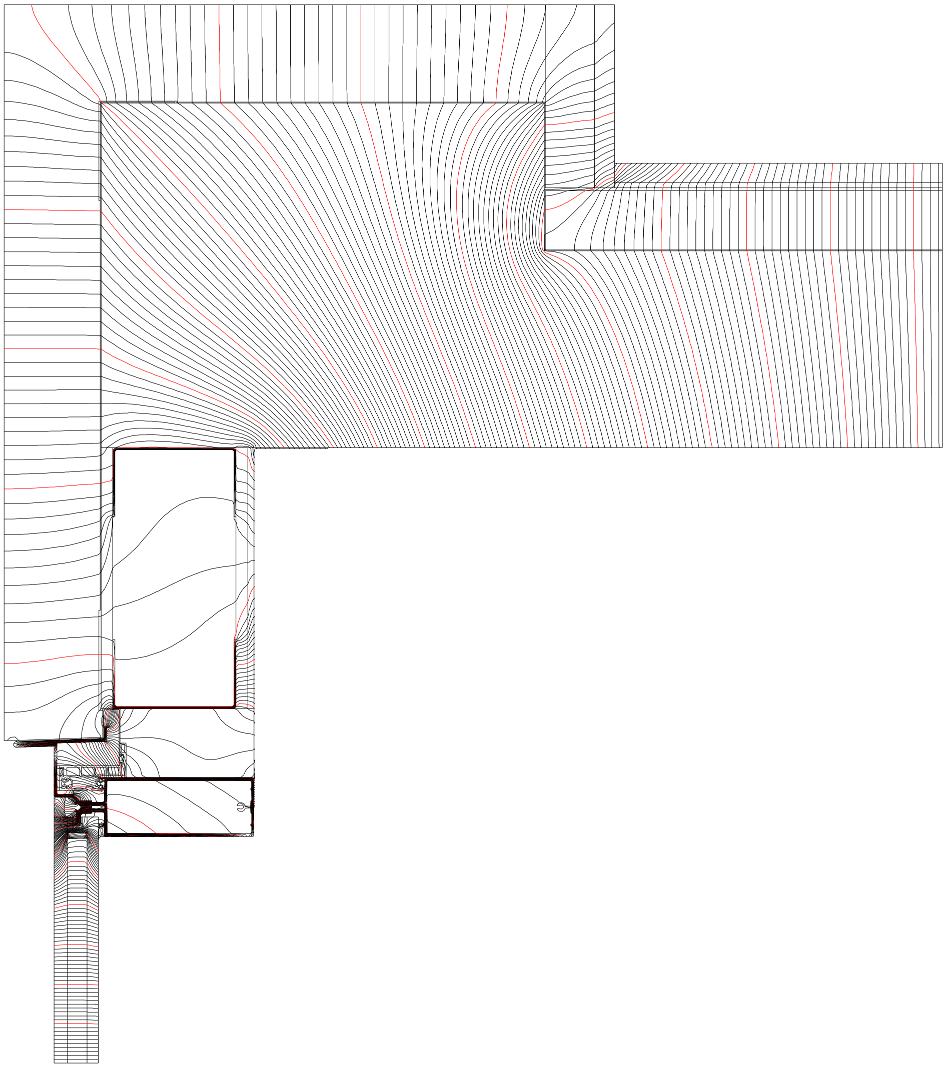


Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Exterior, ventilated, -5		-5.000	0.130		
Interior, normal, 20 deg		20.000	0.130		
Interior, upwards, 20 deg		20.000	0.100		
Symmetry/Model section	0.000				

Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy	160.000	0.900	100000000.000
Aluminium alloy / Foam, 3D equivalent R 25-250(1)	16.045	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250(1)	16.225	0.900	
Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.081	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.093	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R4 25-250	16.039	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R5 25-250	16.045	0.900	1.000
Bitumen, felt/sheet	0.230	0.900	50000.000
Bitumen, pure	0.170	0.900	50000.000
Butyl rubber, solid/hot melt	0.240	0.900	
Concrete, reinforced (with 2% of steel)	2.500	0.900	105.000
EPDM (ethylene propylene diene monomer)	0.250	0.900	
Foam	0.050	0.900	
Gasfillin(2)	0.025	0.900	1.000
Mineral Wool	0.035	0.900	
PVC-U (polyvinylchloride), rigid	0.170	0.900	
Plastic	0.170	0.900	
Polyamid (nylon)	0.250	0.900	
RW3	0.034	0.900	
Rigid PVC	0.170	0.900	
Roof Insulation	0.035	0.900	
Sand and gravel	2.000	0.900	50.000
Sheathing Board	0.230	0.900	40.000
Silica gel (desiccant)	0.130	0.900	
Silicone, filled	0.500	0.900	
Soda lime glass	1.000	0.900	
Stainless steel	15.000	0.900	
Steel	50.000	0.900	100000000.000
Unventilated air cavity *			1.000
VCL	0.500	0.900	

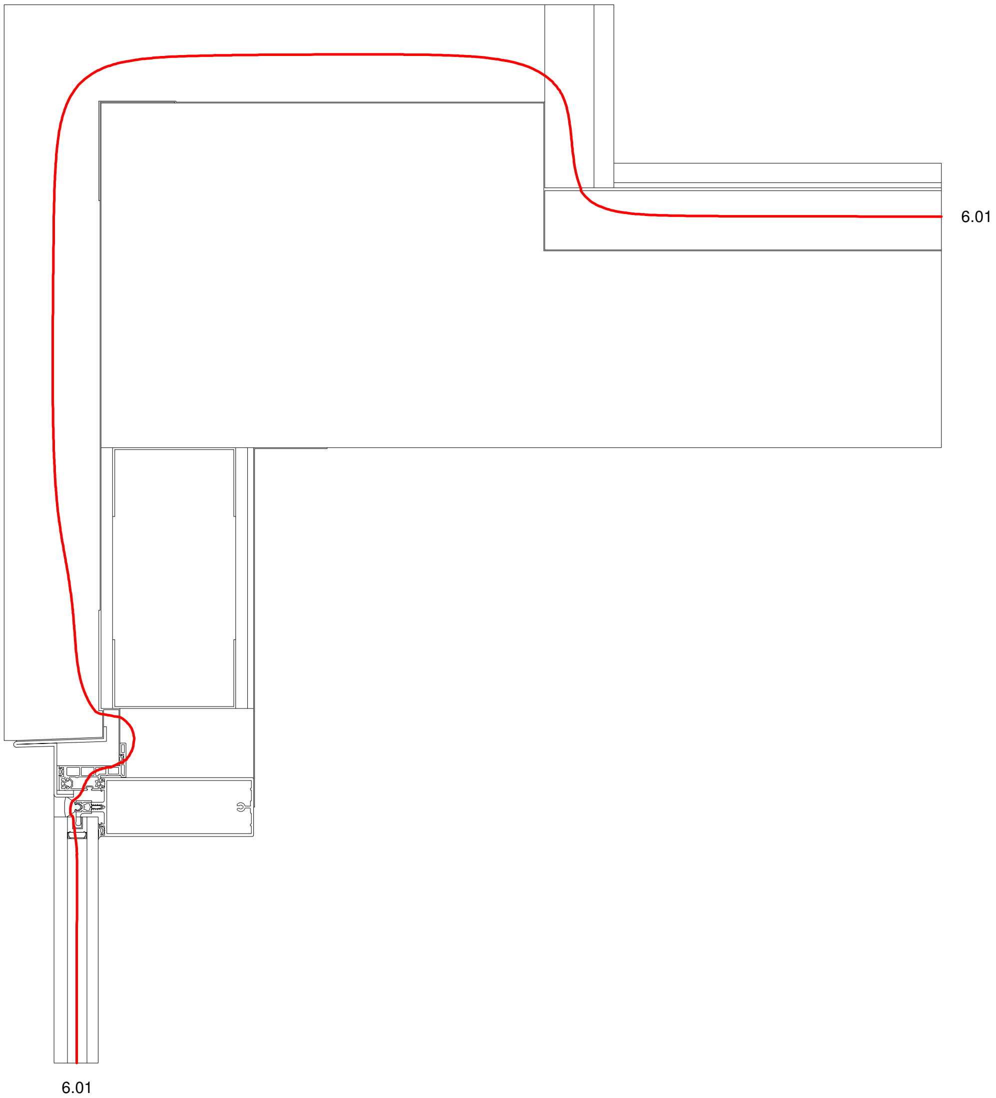
* EN ISO 10077-2:2017, 6.4.3/anisotrop

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Head detail (door) – 1 1415

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Head detail (door) – 1 1415

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 49 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 8.99 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

FEA

Condensation Analysis Sheet.

Detail. **Head detail (door) – 1 1415**

Specification details

Internal temperature = **20** ^{o}C

External temperature = **-5** ^{o}C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **8.99** ^{o}C

Comments.

By calculation and assessing 8.99 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 49%

Calculations

From BS 5250:2002 Table A.1

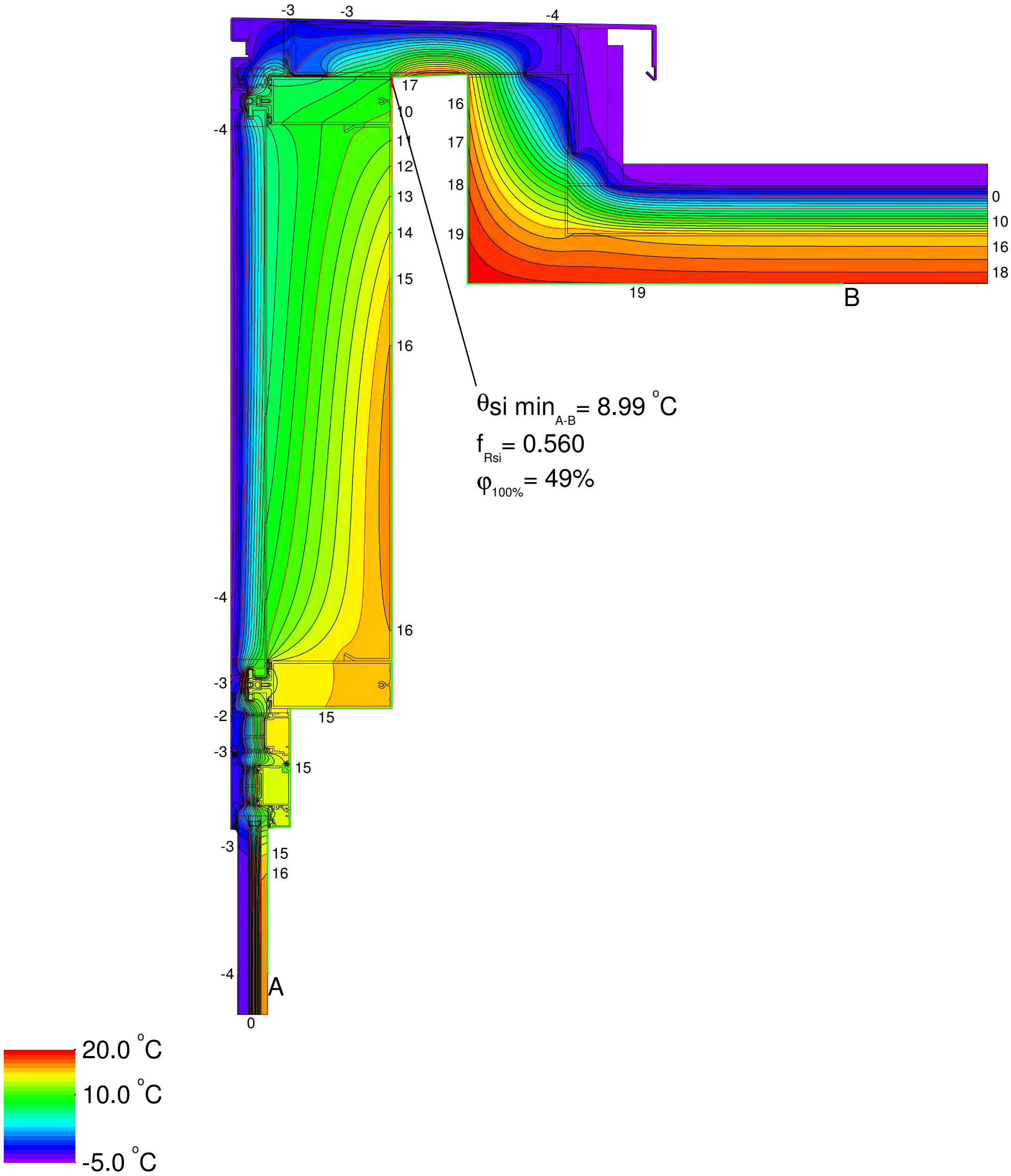
Saturated vapour pressure (Es) at 20^{o}C = 2.337 kPa

From FEA the internal cold point was shown to be 8.99 deg C

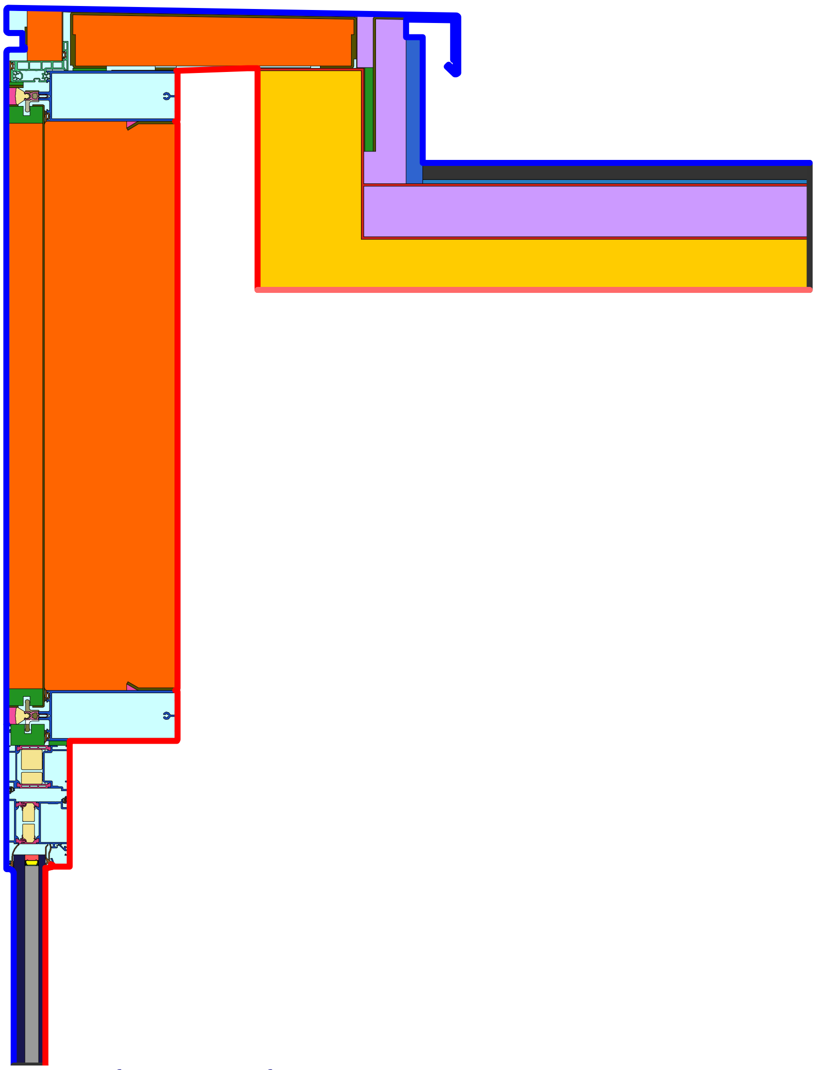
Substituting this temperature into the above gives a vapour pressure of 1.149 kPa

$$RH = \frac{1.149}{2.337} \times 100\% = 49\%$$

Thermal Gradient Diagram



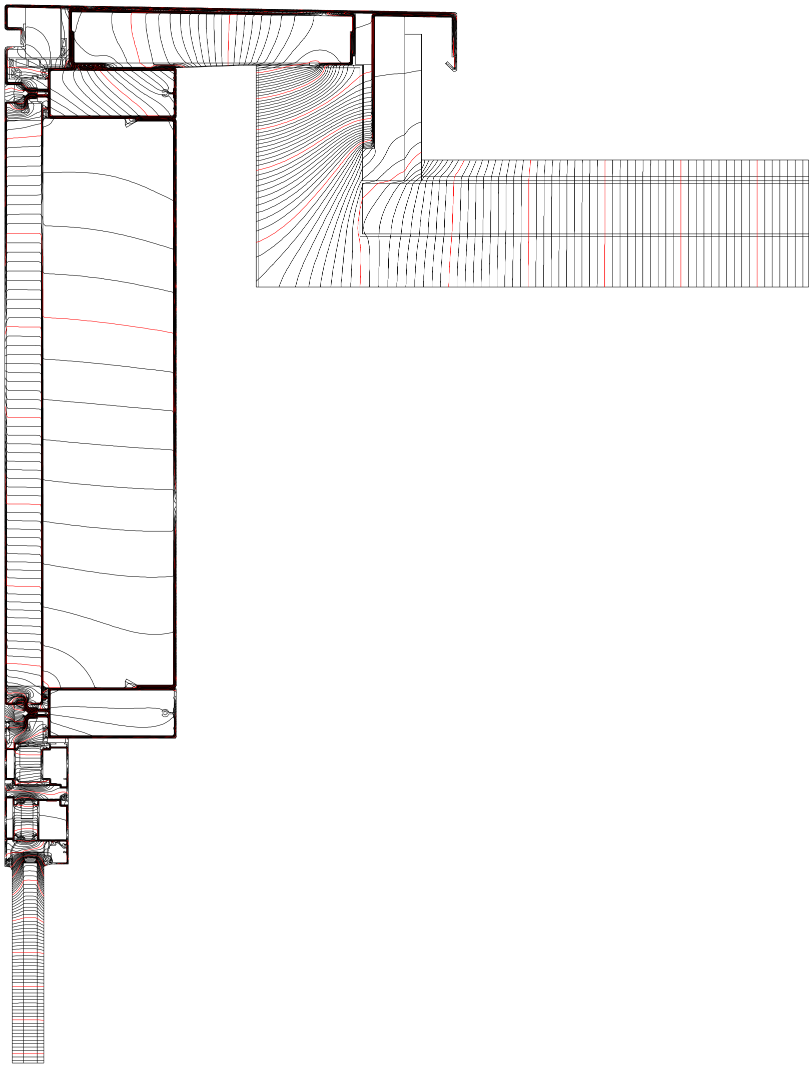
Material Thermal Conductivity Diagram



Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, normal, 20 deg		20.000	0.130		
Interior, upwards, 20 deg		20.000	0.100		
Symmetry/Model section	0.000				

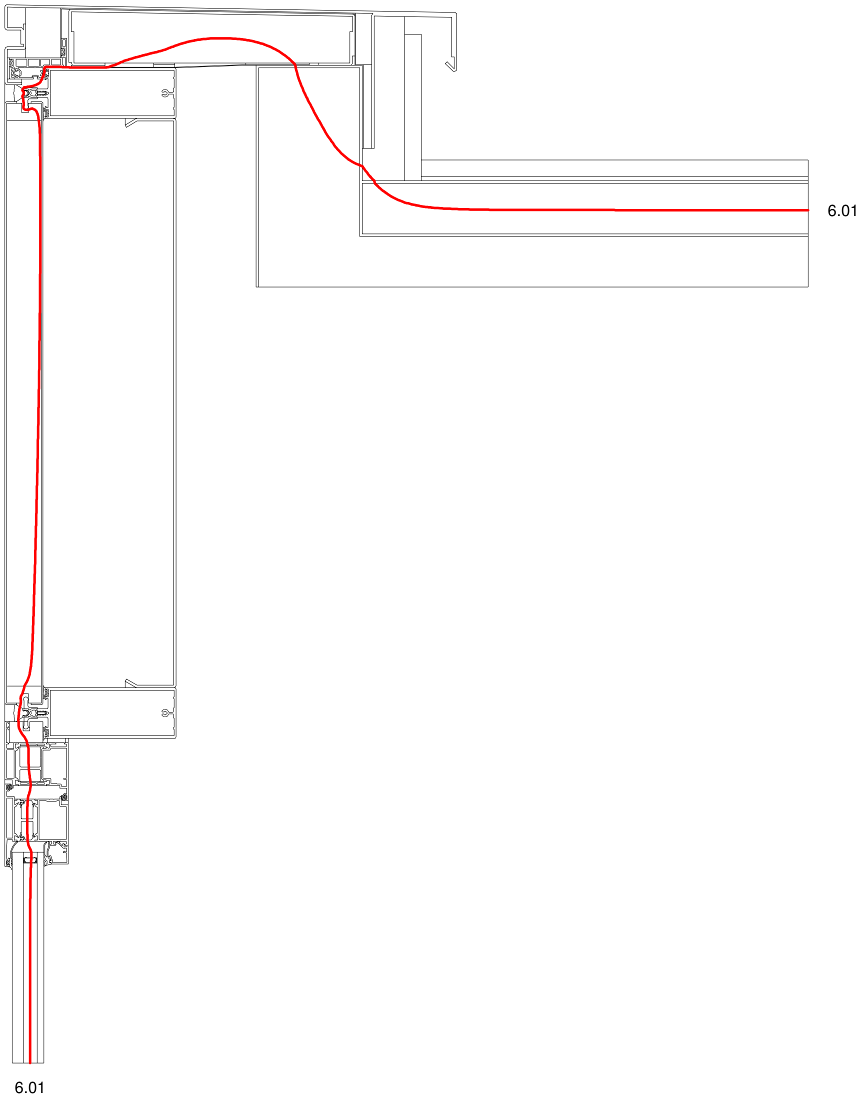
Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy	160.000	0.900	100000000.000
Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	1.000
Aluminium alloy / Foam, 3D equivalent R 25-250(2)	16.045	0.900	1.000
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250	16.225	0.900	1.000
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250(2)	16.225	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.083	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R10 25-250	16.043	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.090	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.082	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R4 25-250	16.085	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R5 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R6 25-250	16.031	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R7 25-250	16.040	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R8 25-250	16.038	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R9 25-250	16.045	0.900	1.000
Bitumen, felt/sheet	0.230	0.900	50000.000
Bitumen, pure	0.170	0.900	50000.000
Butyl rubber, solid/hot melt	0.240	0.900	
EPDM (ethylene propylene diene monomer)	0.250	0.900	
Foam	0.050	0.900	
Gasfillin(2)	0.020	0.900	1.000
Hardwood	0.180	0.900	
PVC-U (polyvinylchloride), rigid	0.170	0.900	
Plastic	0.170	0.900	
Polyamid (nylon)	0.250	0.900	
Polysulfide	0.400	0.900	
RW3	0.034	0.900	
Rigid PVC	0.170	0.900	
Roof Insulation	0.035	0.900	

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Floor slab interface detail – 1 1406 (1408 similar)

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Floor slab interface detail – 1 1406 (1408 similar)

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 64 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 13.07 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

Condensation Analysis Sheet.

Detail. **Floor slab interface detail – 1 1406 (1408 similar)**

Specification details

Internal temperature = **20** ^{o}C

External temperature = **-5** ^{o}C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **13.07** ^{o}C

Comments.

By calculation and assessing 13.07 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 64%

Calculations

From BS 5250:2002 Table A.1

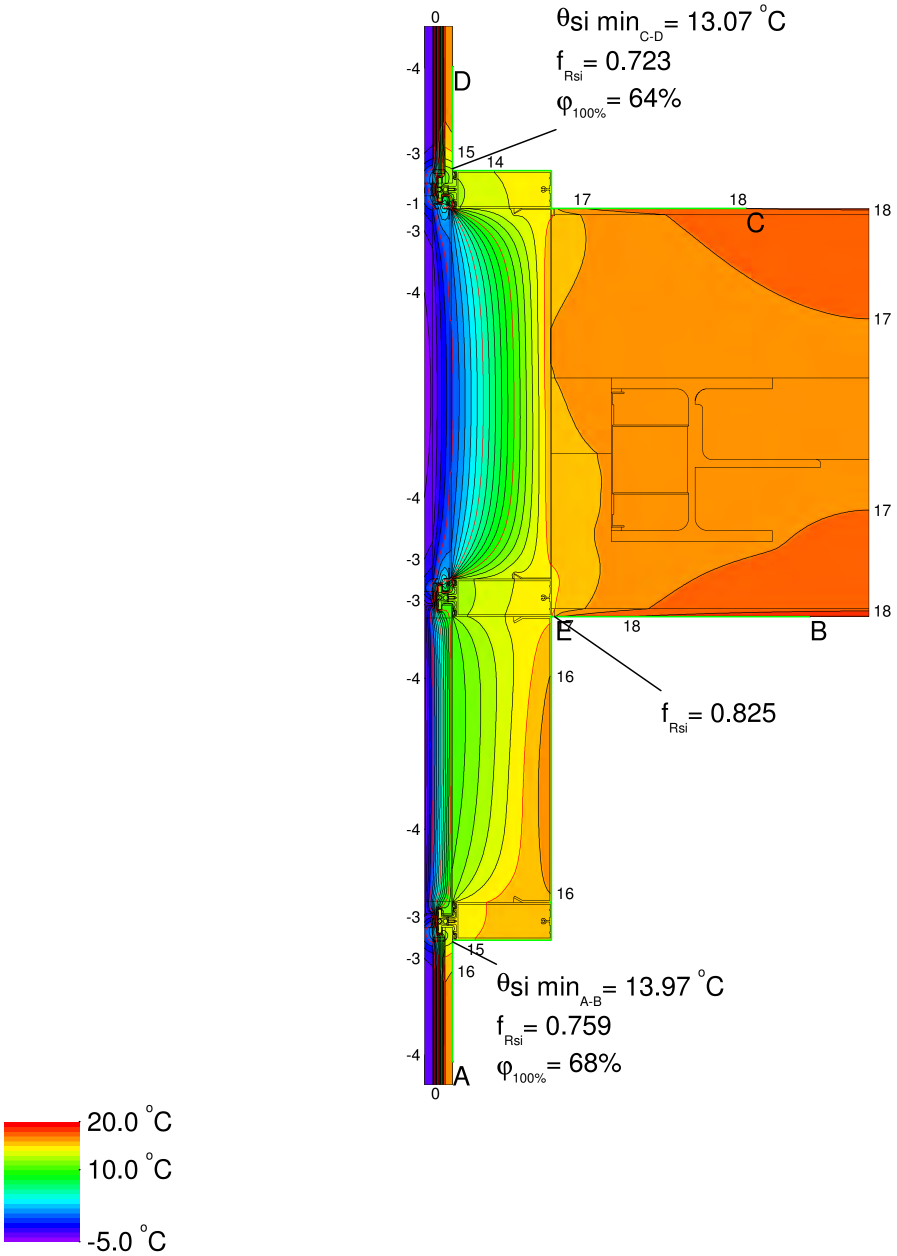
Saturated vapour pressure (Es) at 20^{o}C = 2.337 kPa

From FEA the internal cold point was shown to be 13.07 deg C

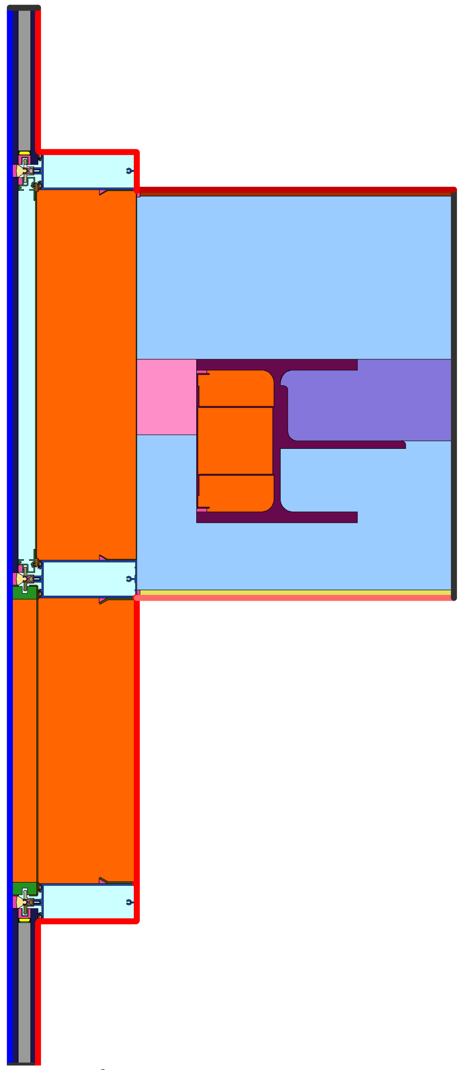
Substituting this temperature into the above gives a vapour pressure of 1.5 kPa

$$RH = \frac{1.5}{2.337} \times 100\% = 64\%$$

Thermal Gradient Diagram



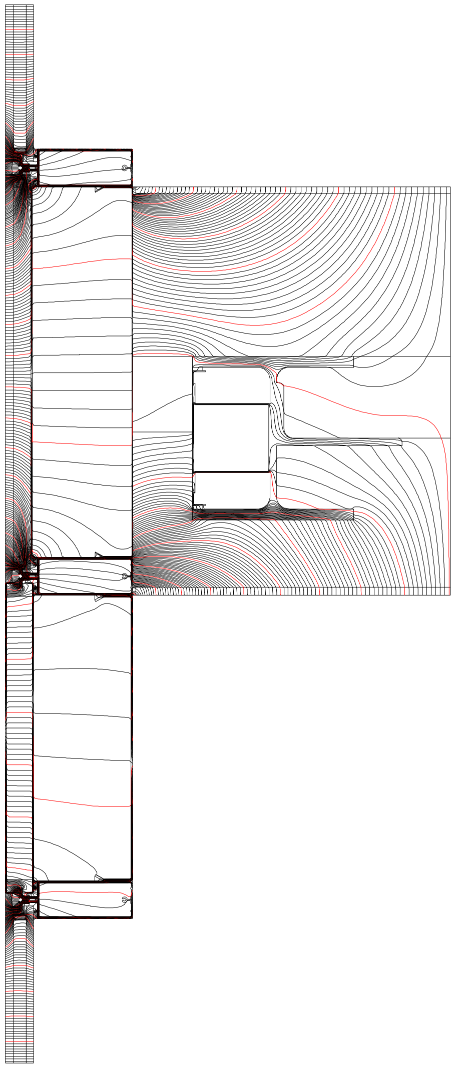
Material Thermal Conductivity Diagram



Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, downwards, 20 deg		20.000	0.170		
Interior, normal, 20 deg		20.000	0.130		
Interior, upwards, 20 deg		20.000	0.100		
Symmetry/Model section	0.000				

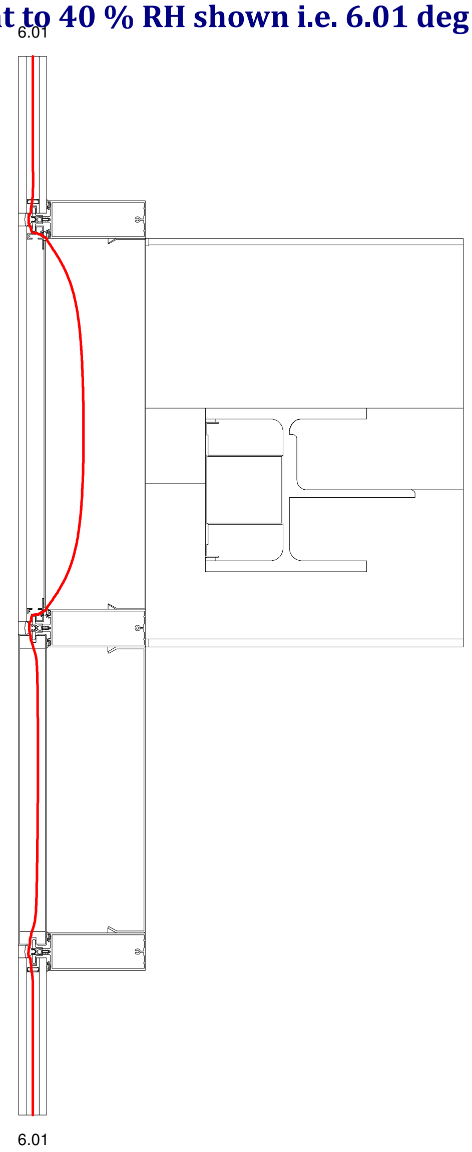
Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy	160.000	0.900	100000000.000
Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	
Aluminium alloy / Foam, 3D equivalent R 25-250(1)	16.045	0.900	
Aluminium alloy / Foam, 3D equivalent R 25-250(2)	16.045	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250	16.225	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250(1)	16.225	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250(2)	16.225	0.900	
Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.084	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R10 25-250	16.040	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R11 25-250	16.039	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R12 25-250	16.039	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R13 25-250	16.045	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R14 25-250	16.044	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R15 25-250	16.044	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.082	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.091	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R4 25-250	16.088	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R5 25-250	16.088	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R6 25-250	16.087	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R7 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R8 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R9 25-250	16.032	0.900	1.000
Butyl rubber, solid/hot melt	0.240	0.900	
Concrete, reinforced (with 2% of steel)	2.500	0.900	105.000
EPDM (ethylene propylene diene monomer)	0.250	0.900	
Floor	0.180	0.900	
Foam	0.050	0.900	
Gasfillin(1)	0.025	0.900	1.000
Gasfillin(2)	0.025	0.900	1.000

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Cill detail – 1 1412 (1405, 1410, 1417 similar)

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Cill detail – 1 1412 (1405, 1410, 1417 similar)

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 69 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 14.11 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

FEA

Condensation Analysis Sheet.

Detail. **Cill detail – 1 1412 (1405, 1410, 1417 similar)**

Specification details

Internal temperature = **20** °C

External temperature = **-5** °C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **14.11** °C

Comments.

By calculation and assessing 14.11 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 69%

Calculations

From BS 5250:2002 Table A.1

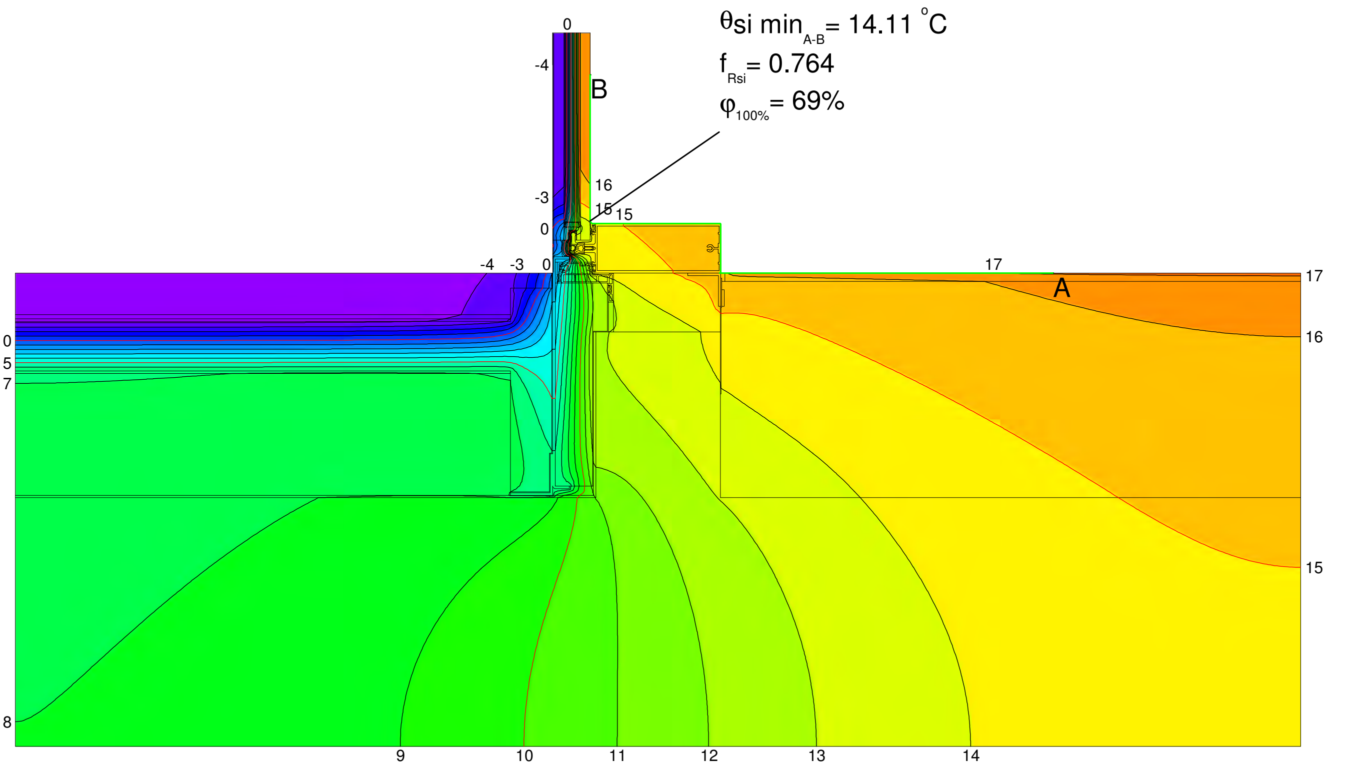
Saturated vapour pressure (Es) at 20°C = 2.337 kPa

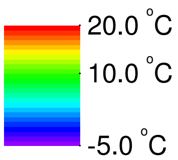
From FEA the internal cold point was shown to be 14.11 deg C

Substituting this temperature into the above gives a vapour pressure of 1.609 kPa

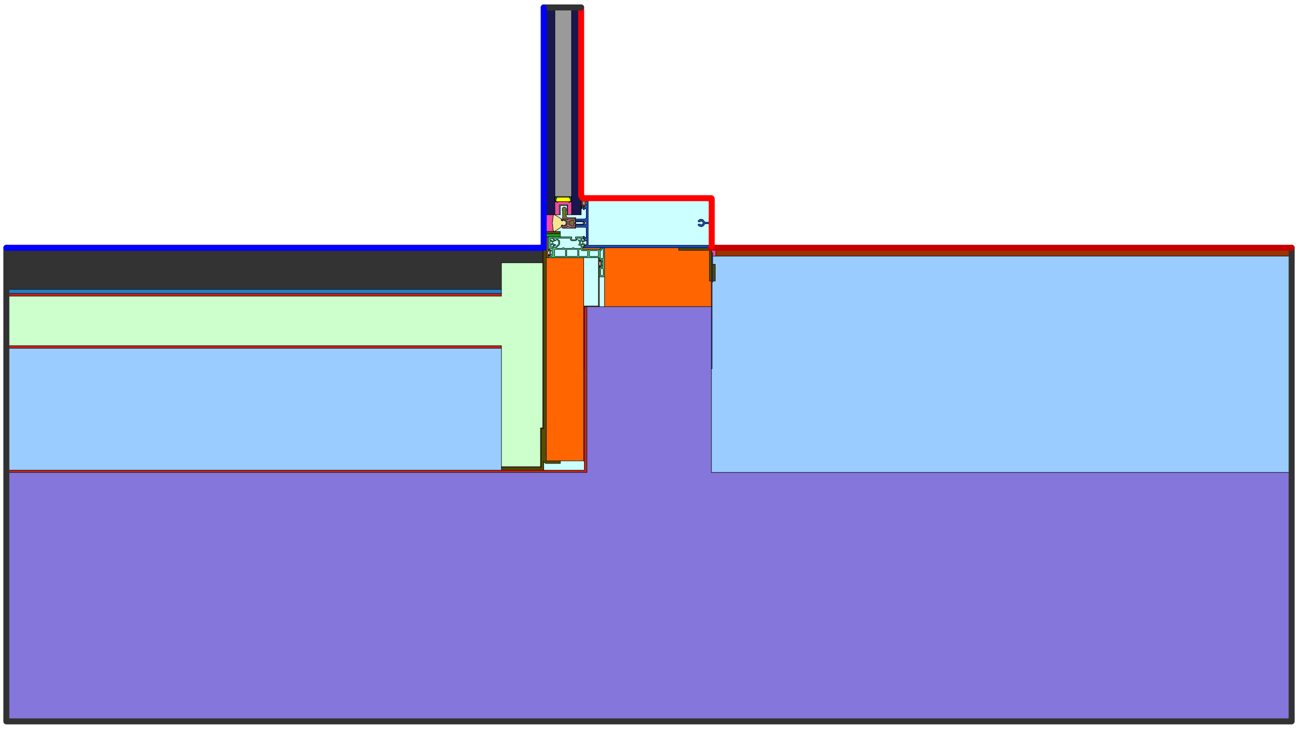
$$RH = \frac{1.609}{2.337} \times 100\% = 69\%$$

Thermal Gradient Diagram





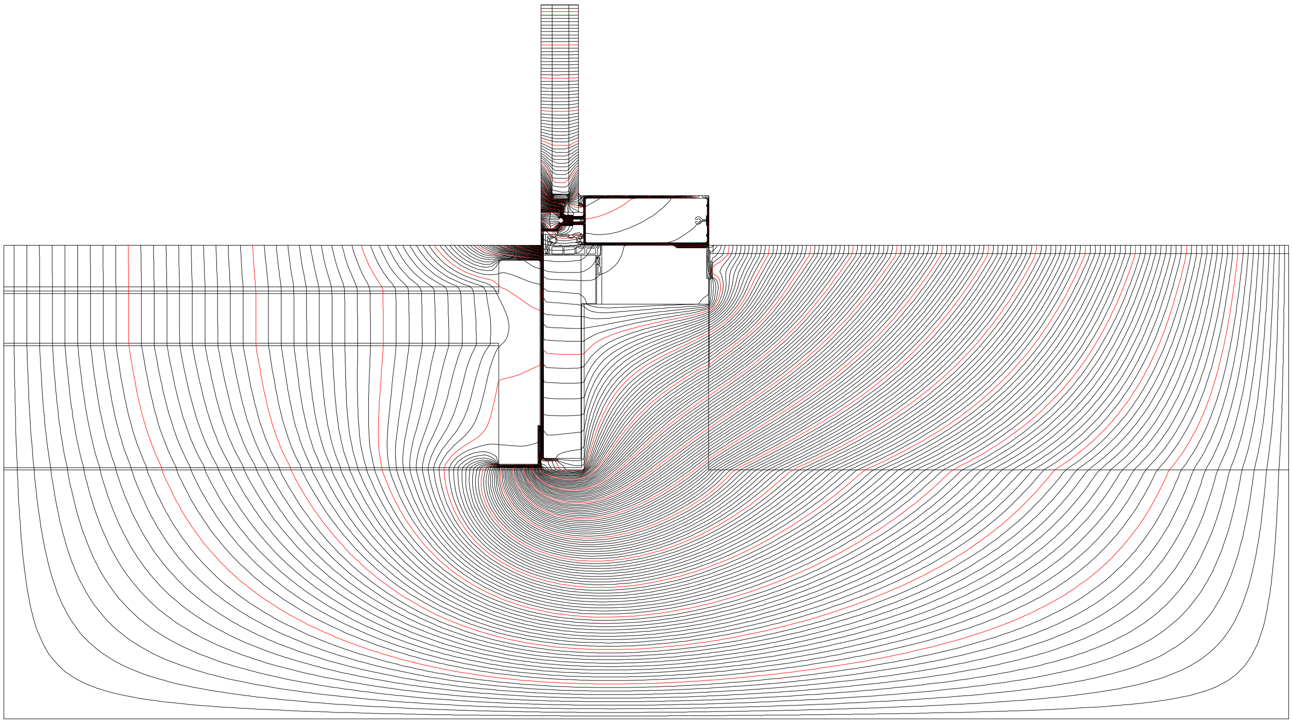
Material Thermal Conductivity Diagram



Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, downwards, 20 deg		20.000	0.170		
Interior, normal, 20 deg		20.000	0.130		
Symmetry/Model section	0.000				

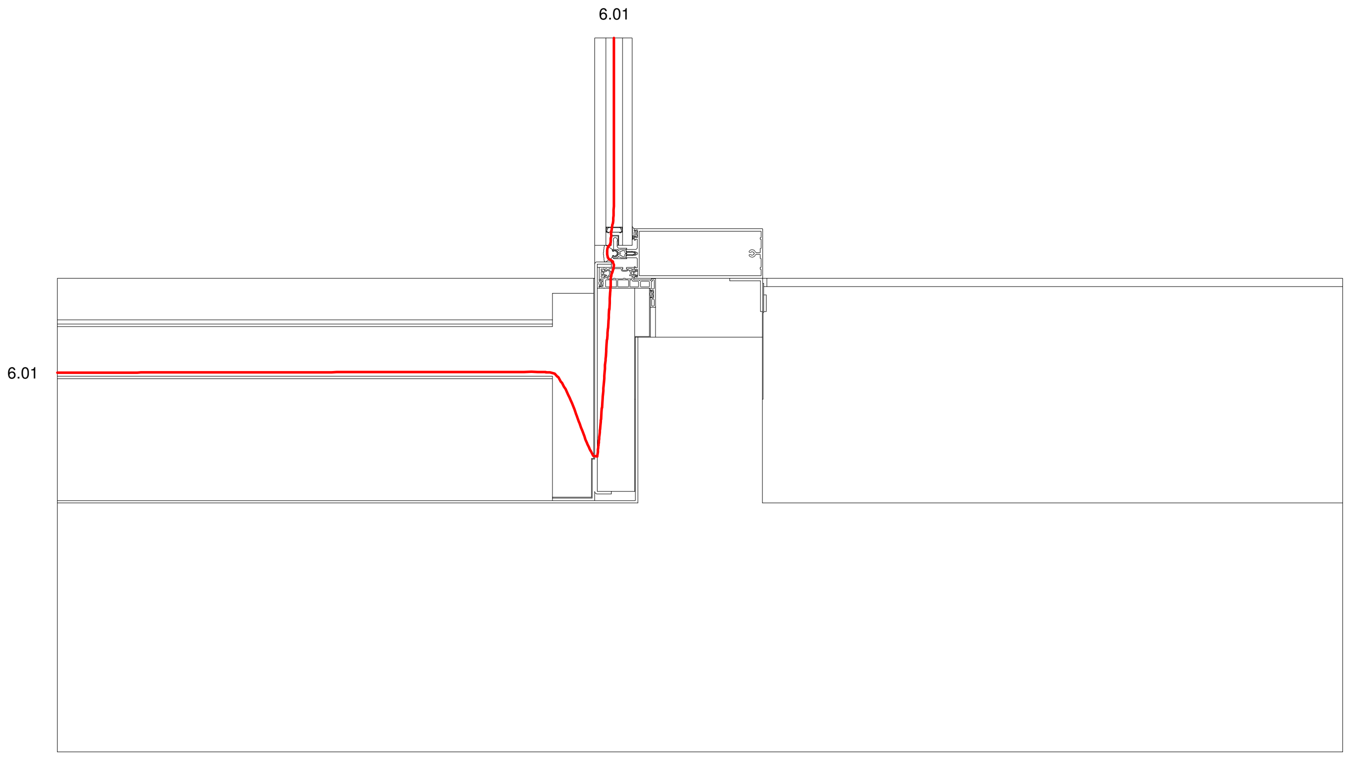
Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy	160.000	0.900	100000000.000
Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250	16.225	0.900	
Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.083	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.089	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R4 25-250	16.040	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R5 25-250	16.045	0.900	1.000
Bitumen, felt/sheet	0.230	0.900	50000.000
Bitumen, pure	0.170	0.900	50000.000
Butyl rubber, solid/hot melt	0.240	0.900	
Concrete, reinforced (with 2% of steel)	2.500	0.900	105.000
EPDM (ethylene propylene diene monomer)	0.250	0.900	
Floor	0.180	0.900	
Floor Insulation	0.035	0.900	
Foam	0.050	0.900	
Gasfillin(1)	0.025	0.900	1.000
PVC-U (polyvinylchloride), rigid	0.170	0.900	
Plastic	0.170	0.900	
Polyamid (nylon)	0.250	0.900	
RW3	0.034	0.900	
Rigid PVC	0.170	0.900	
Sand and gravel	2.000	0.900	50.000
Silica gel (desiccant)	0.130	0.900	
Silicone, filled	0.500	0.900	
Slightly ventilated air cavity *			1.000
Soda lime glass	1.000	0.900	
Stainless steel	15.000	0.900	
Unventilated air cavity *			1.000

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Door threshold detail – 1 1414 (1401, 1402 similar)

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Door threshold detail – 1 1414 (1401, 1402 similar)

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 59 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 11.83 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

Condensation Analysis Sheet.

Detail. **Door threshold detail – 1 1414 (1401, 1402 similar)**

Specification details

Internal temperature = **20** ^{o}C

External temperature = **-5** ^{o}C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **11.83** ^{o}C

Comments.

By calculation and assessing 11.83 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 59%

Calculations

From BS 5250:2002 Table A.1

Saturated vapour pressure (Es) at 20^{o}C = 2.337 kPa

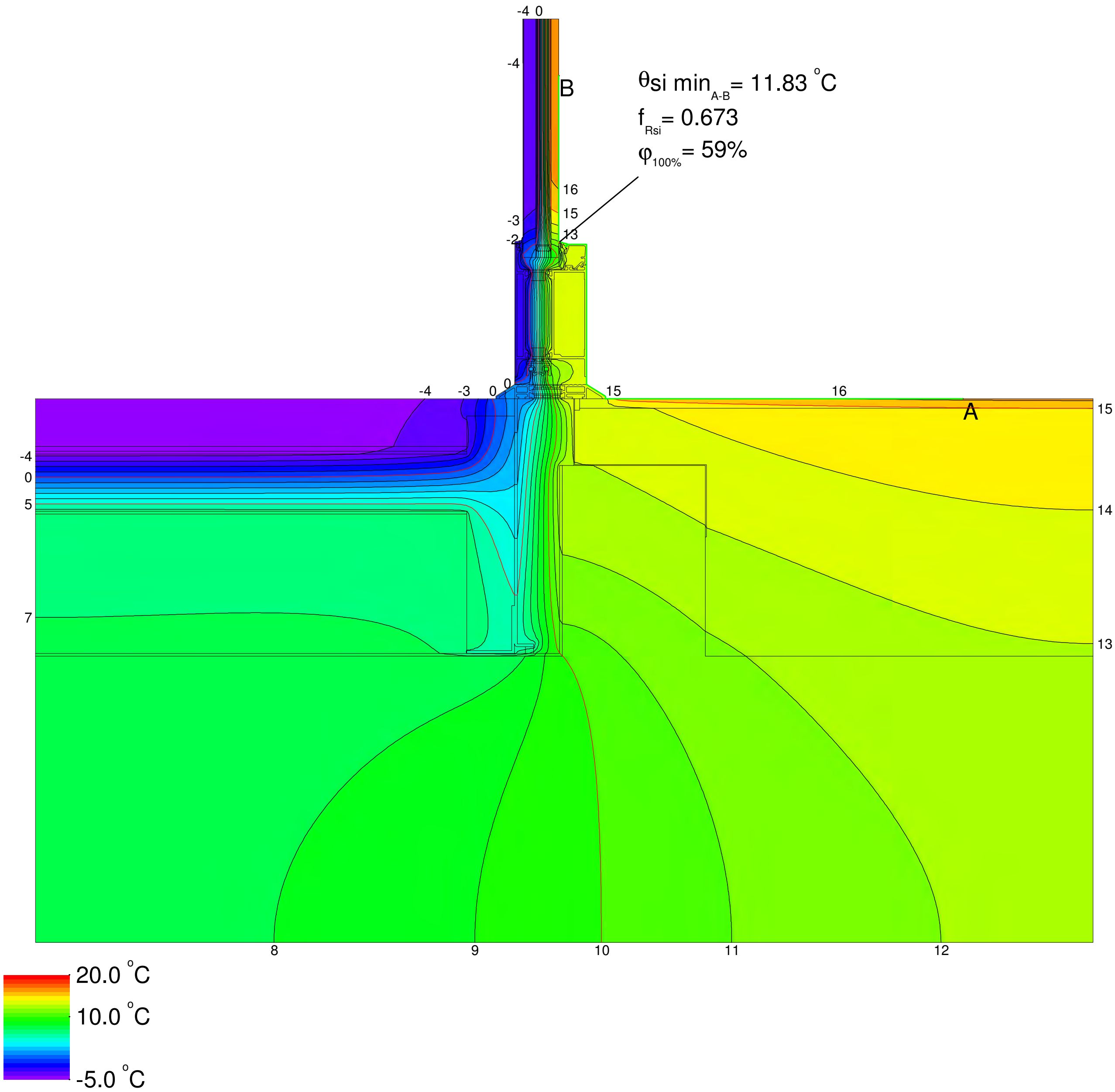
From FEA the internal cold point was shown to be 11.83 deg C

Substituting this temperature into the above gives a vapour pressure of 1.386 kPa

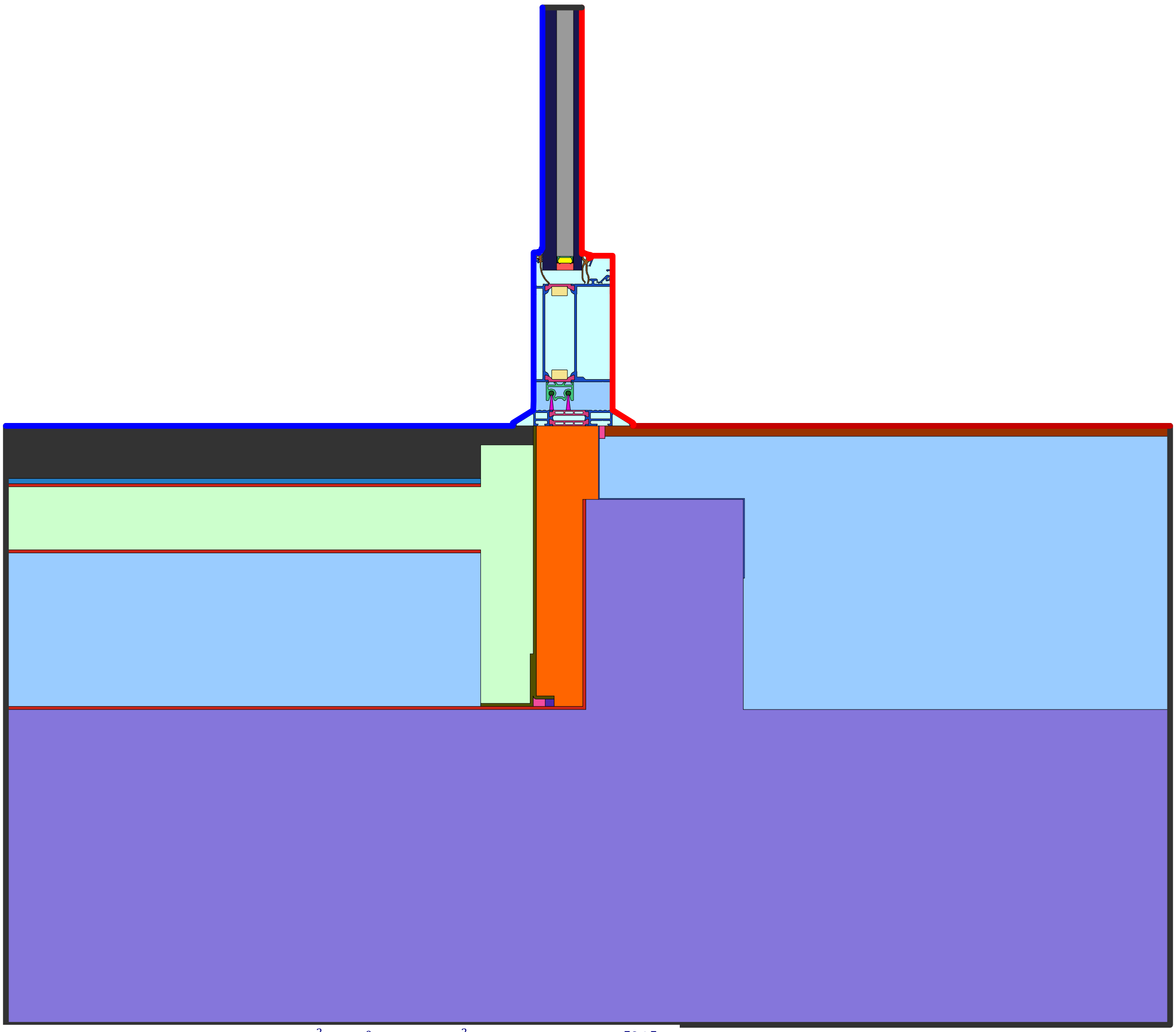
$$RH = \frac{1.386}{2.337} \times 100\% = 59\%$$

FEA

Thermal Gradient Diagram



Material Thermal Conductivity Diagram

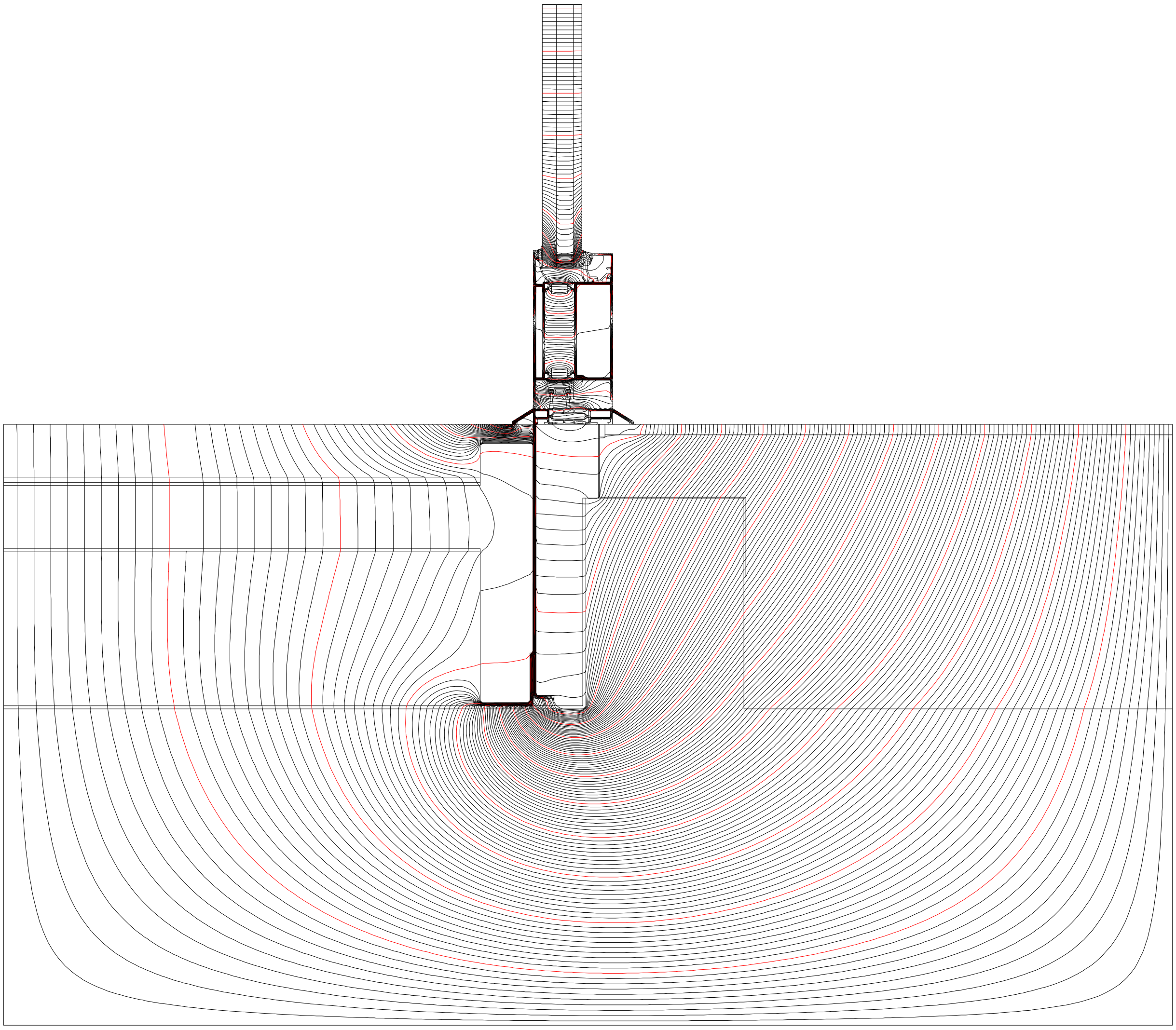


Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, downwards, 20 deg		20.000	0.170		
Interior, normal, 20 deg		20.000	0.130		
Symmetry/Model section	0.000				

Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy	160.000	0.900	100000000.000
Bitumen, felt/sheet	0.230	0.900	50000.000
Bitumen, pure	0.170	0.900	50000.000
Butyl rubber, solid/hot melt	0.240	0.900	
Concrete, reinforced (with 2% of steel)	2.500	0.900	105.000
EPDM (ethylene propylene diene monomer)	0.250	0.900	
Floor	0.180	0.900	
Floor Insulation	0.035	0.900	
Foam	0.050	0.900	
Gasfillin(1)	0.020	0.900	1.000
PVC-U (polyvinylchloride), rigid	0.170	0.900	
Pile weather stripping (polyester mohair)	0.140	0.900	
Polyamid (nylon)	0.250	0.900	
Polyethylene/polythene, low density	0.330	0.900	100000.000
Polysulfide	0.400	0.900	
RW3	0.034	0.900	
Rigid PVC	0.170	0.900	
Sand and gravel	2.000	0.900	50.000
Silica gel (desiccant)	0.130	0.900	
Silicone, filled	0.500	0.900	
Slightly ventilated air cavity *			1.000
Soda lime glass	1.000	0.900	
Stainless steel	15.000	0.900	
Stainless steel, austenitic or austenitic-ferritic	17.000	0.900	
Unventilated air cavity *			1.000
VCL	0.500	0.900	

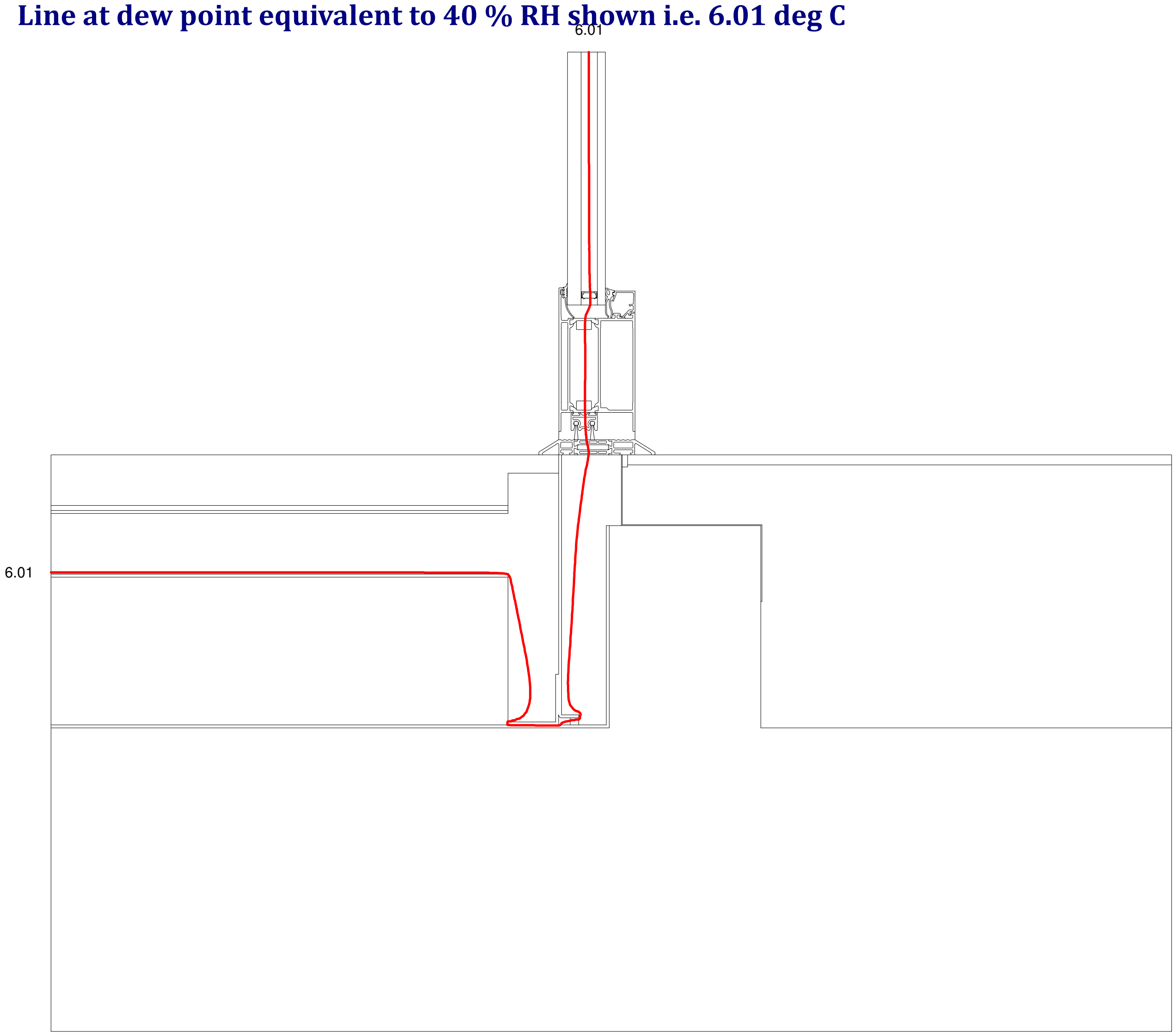
* EN ISO 10077-2:2017, 6.4.3/anisotrop

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Mullion (glass zone) – 1 1425

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Mullion (glass zone) – 1 1425

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 68 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 13.97 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

Condensation Analysis Sheet.

Detail. **Mullion (glass zone) – 1 1425**

Specification details

Internal temperature = **20** ^{o}C

External temperature = **-5** ^{o}C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **13.97** ^{o}C

Comments.

By calculation and assessing 13.97 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 68%

Calculations

From BS 5250:2002 Table A.1

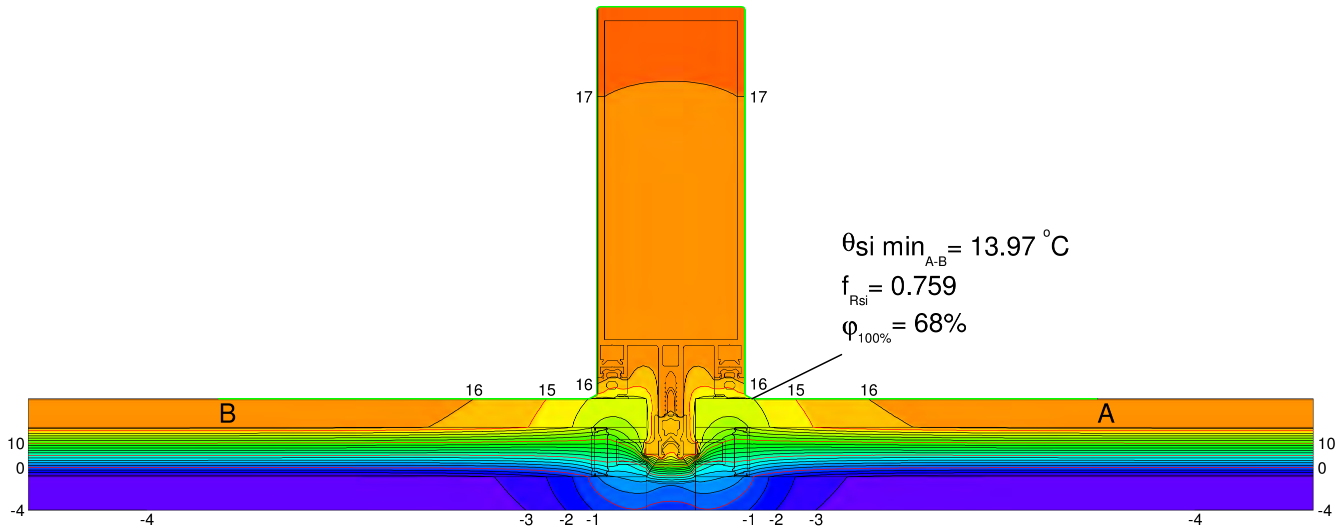
Saturated vapour pressure (Es) at 20^{o}C = 2.337 kPa

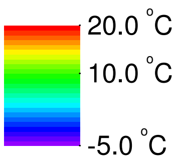
From FEA the internal cold point was shown to be 13.97 deg C

Substituting this temperature into the above gives a vapour pressure of 1.594 kPa

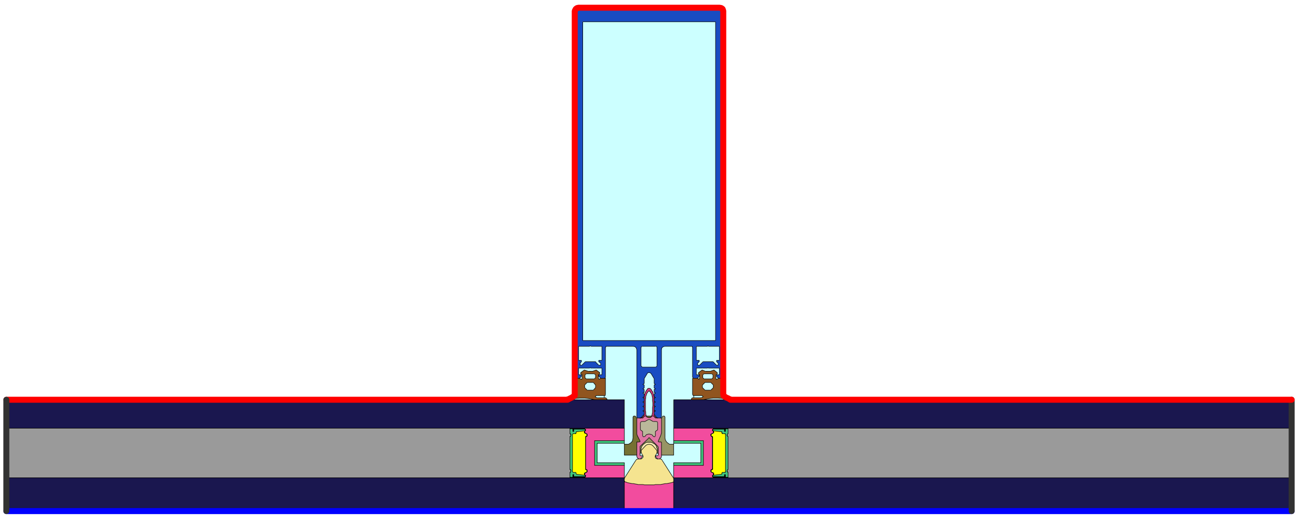
$$RH = \frac{1.594}{2.337} \times 100\% = 68\%$$

Thermal Gradient Diagram





Material Thermal Conductivity Diagram

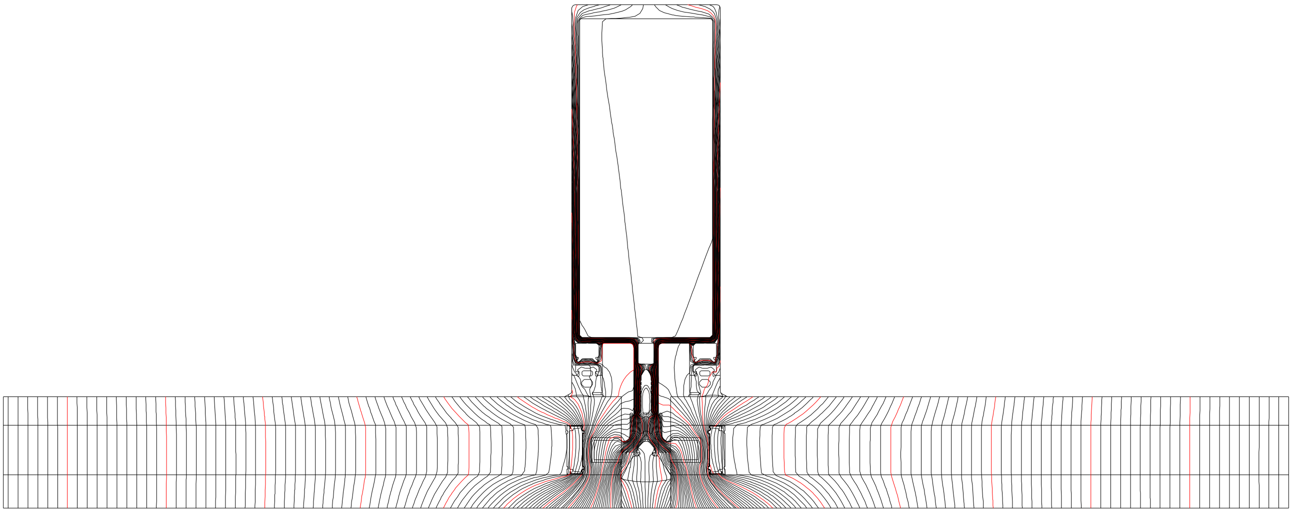


Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, normal, 20 deg		20.000	0.130		
Symmetry/Model section	0.000				

Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250	16.225	0.900	
Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.127	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.040	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R4 25-250	16.045	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R5 25-250	16.127	0.900	1.000
Butyl rubber, solid/hot melt	0.240	0.900	
EPDM (ethylene propylene diene monomer)	0.250	0.900	
Foam	0.050	0.900	
Gasfillin(1)	0.025	0.900	1.000
Gasfillin(2)	0.025	0.900	1.000
PVC-U (polyvinylchloride), rigid	0.170	0.900	
Polyamid (nylon)	0.250	0.900	
Rigid PVC	0.170	0.900	
Silica gel (desiccant)	0.130	0.900	
Silicone, filled	0.500	0.900	
Soda lime glass	1.000	0.900	
Stainless steel	17.000	0.900	
Unventilated air cavity *			1.000

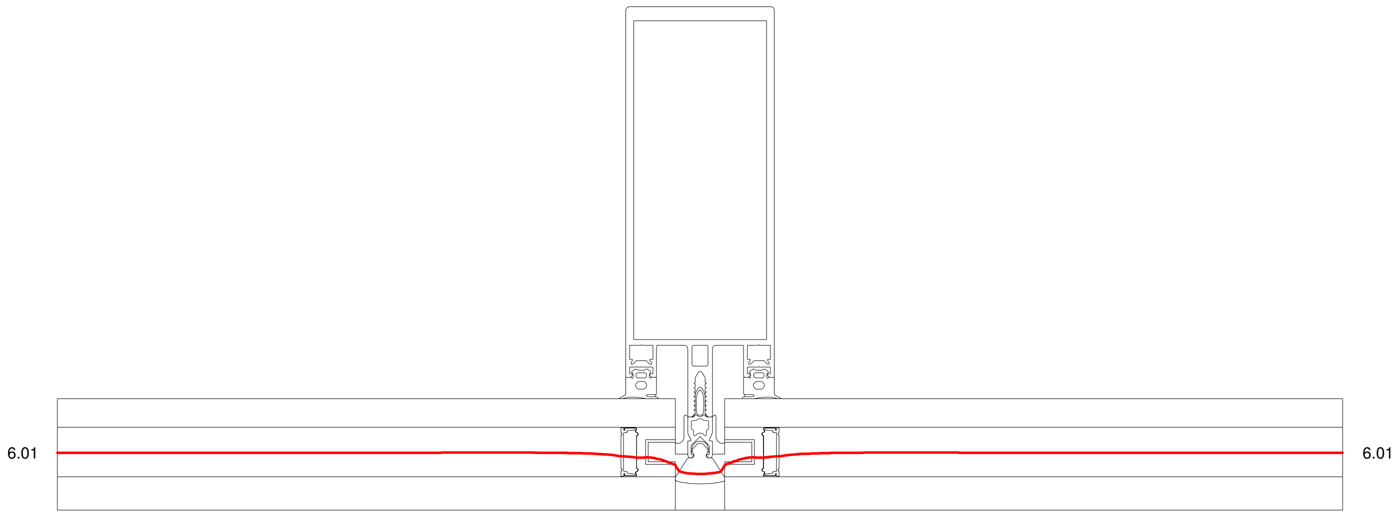
* EN ISO 10077-2:2017, 6.4.3/anisotrop

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Mullion (facet glass zone) – 1 1424

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Mullion (facet glass zone) – 1 1424

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 63 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 12.84 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

FEA

Condensation Analysis Sheet.

Detail. **Mullion (facet glass zone) – 1 1424**

Specification details

Internal temperature = **20** °C

External temperature = **-5** °C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **12.84** °C

Comments.

By calculation and assessing 12.84 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 63%

Calculations

From BS 5250:2002 Table A.1

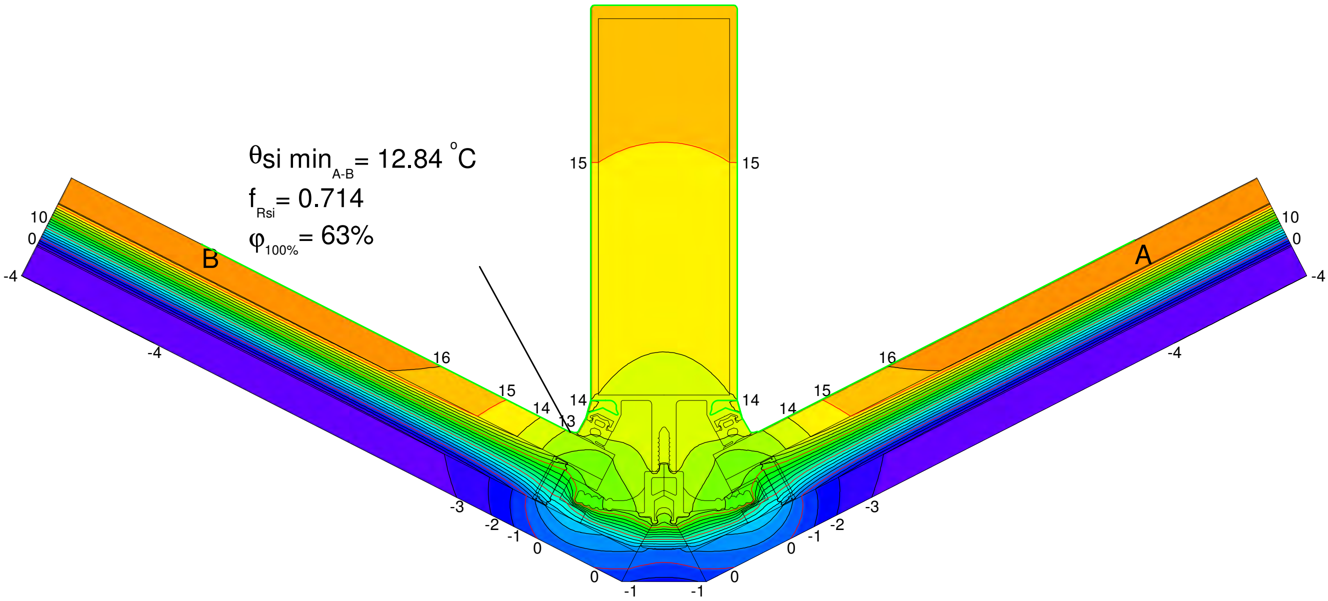
Saturated vapour pressure (Es) at 20°C = 2.337 kPa

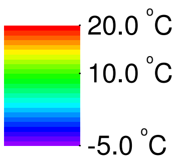
From FEA the internal cold point was shown to be 12.84 deg C

Substituting this temperature into the above gives a vapour pressure of 1.481 kPa

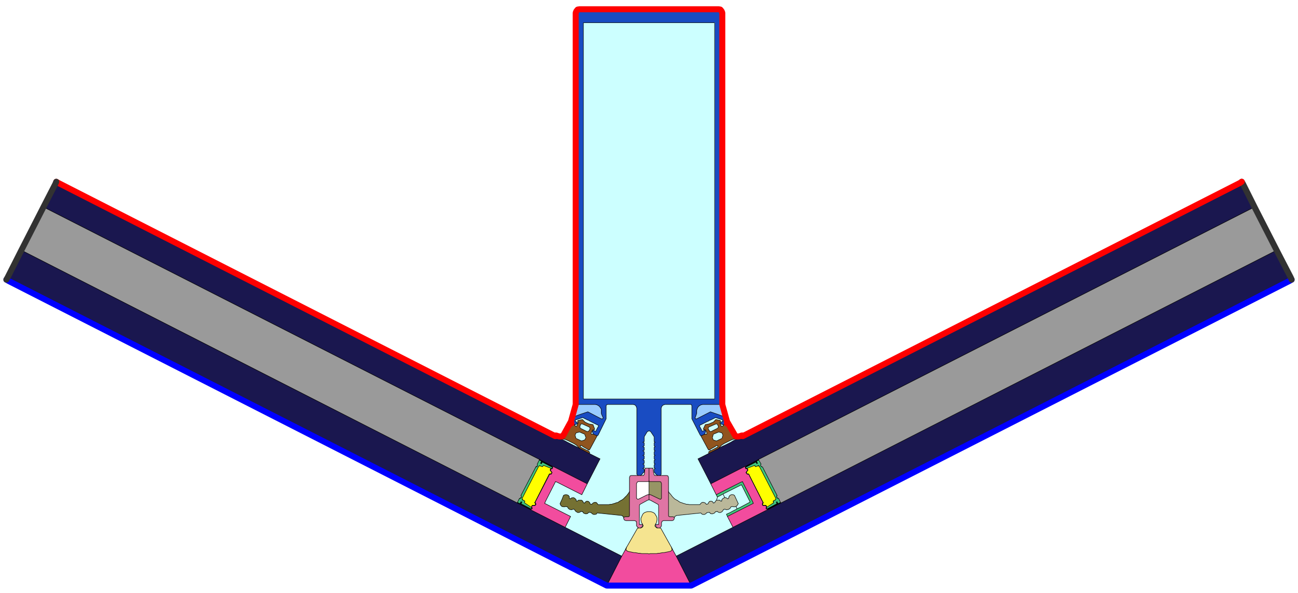
$$RH = \frac{1.481}{2.337} \times 100\% = 63\%$$

Thermal Gradient Diagram





Material Thermal Conductivity Diagram

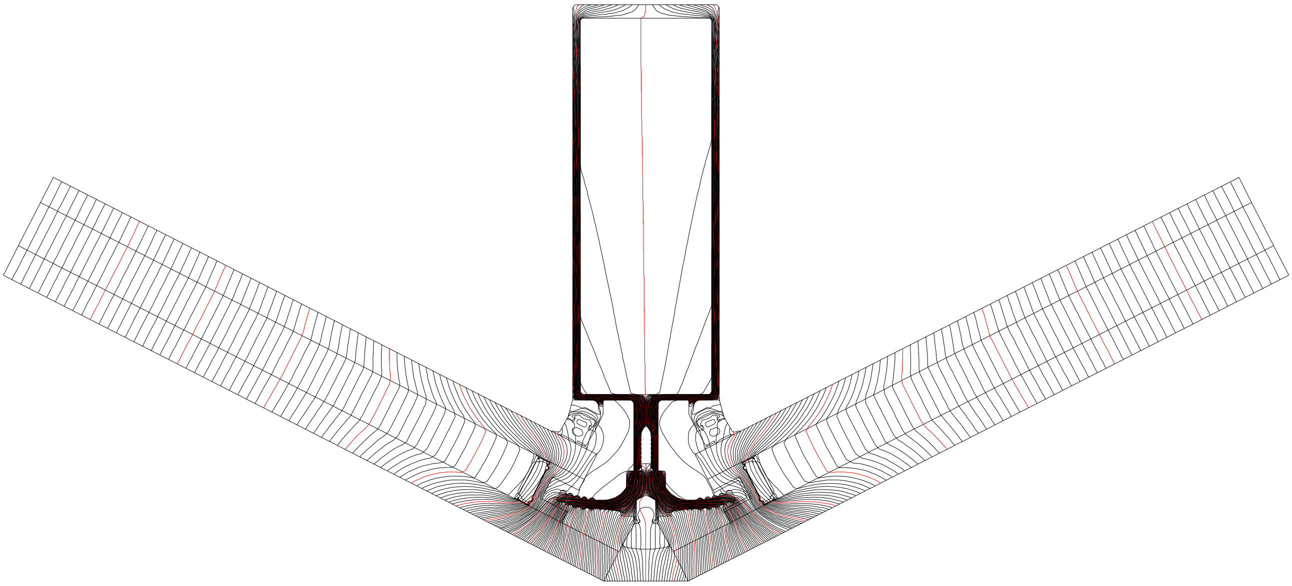


	Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
	Epsilon 0.3				0.300	
	Epsilon 0.9				0.900	
	Exterior, -5		-5.000	0.040		
	Interior, normal, 20 deg		20.000	0.130		
	Symmetry/Model section	0.000				

	Material	λ[W/(m·K)]	ε	μ[-]
	Aluminium (Si Alloys)	160.000	0.300	
	Aluminium (Si Alloys)	160.000	0.900	
	Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250(5)	16.225	0.900	1.000
	Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250(6)	16.225	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.162	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.040	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.163	0.900	1.000
	Butyl rubber, solid/hot melt	0.240	0.900	
	EPDM (ethylene propylene diene monomer)	0.250	0.900	
	Elastomeric foam, flexible	0.050	0.900	
	Gasfillin(7)	0.025	0.900	1.000
	Gasfillin(8)	0.025	0.900	1.000
	PVC-U (polyvinylchloride), rigid	0.170	0.900	
	Rigid PVC	0.170	0.900	
	Silica gel (desiccant)	0.130	0.900	
	Silicone, filled	0.500	0.900	
	Slightly ventilated air cavity *			1.000
	Soda lime glass	1.000	0.900	
	Stainless steel	17.000	0.900	
	Unventilated air cavity *			1.000

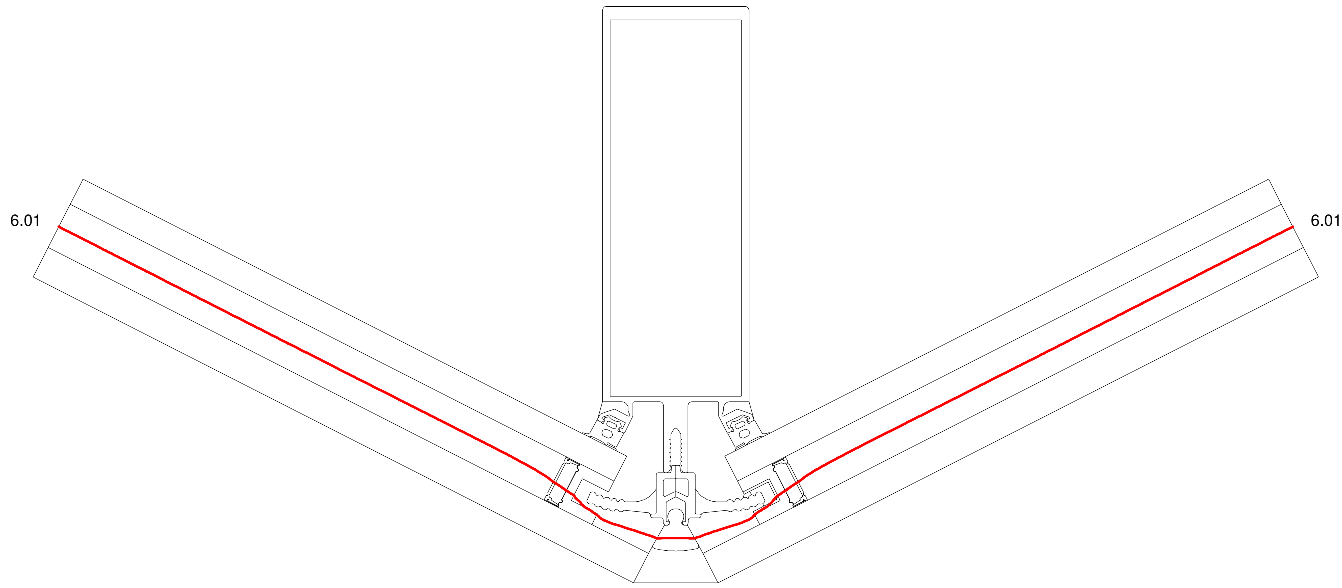
* EN ISO 10077-2:2017, 6.4.3/anisotrop

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Mullion (panel zone) – 1 1442

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Mullion (panel zone) – 1 1442

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 75 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 15.52 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

FEA

Condensation Analysis Sheet.

Detail. **Mullion (panel zone) – 1 1442**

Specification details

Internal temperature = **20** ^{o}C

External temperature = **-5** ^{o}C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **15.52** ^{o}C

Comments.

By calculation and assessing 15.52 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 75%

Calculations

From BS 5250:2002 Table A.1

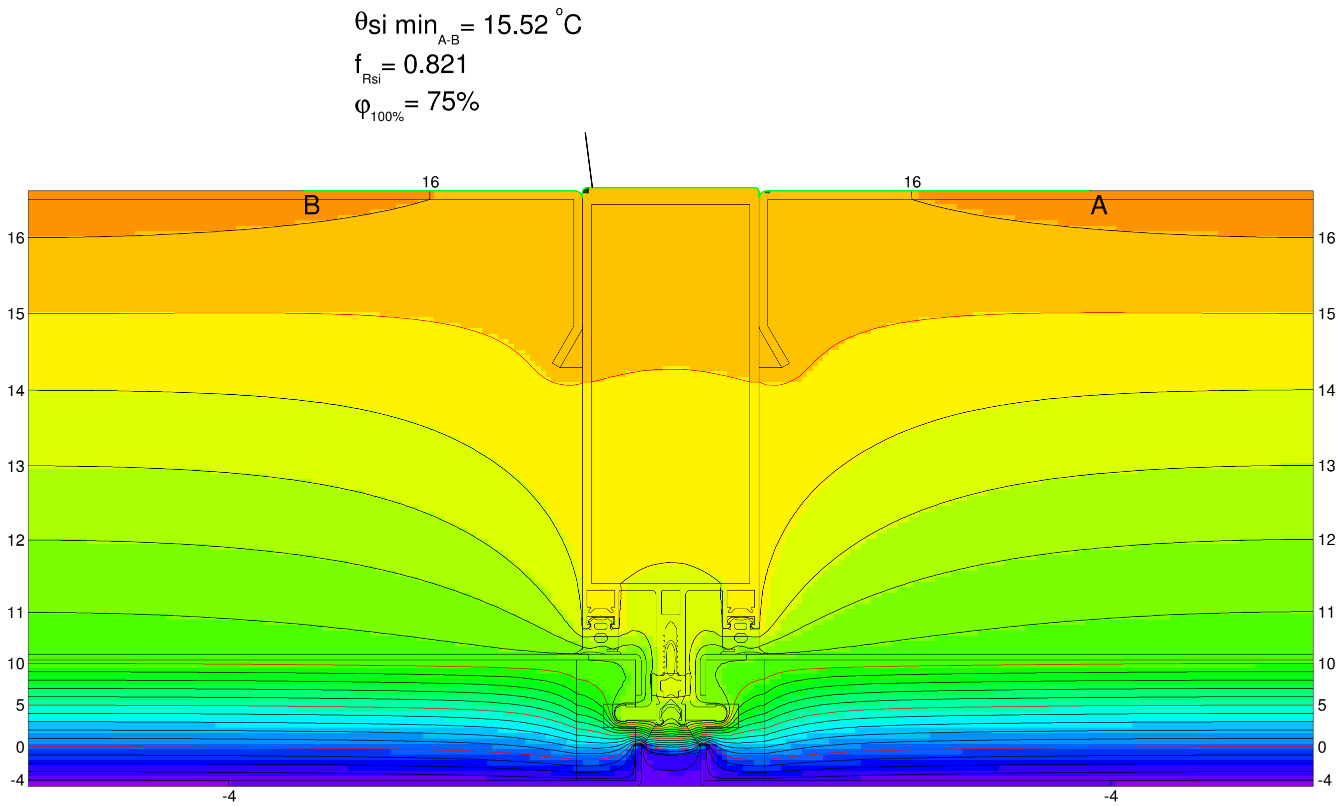
Saturated vapour pressure (Es) at 20^{o}C = 2.337 kPa

From FEA the internal cold point was shown to be 15.52 deg C

Substituting this temperature into the above gives a vapour pressure of 1.762 kPa

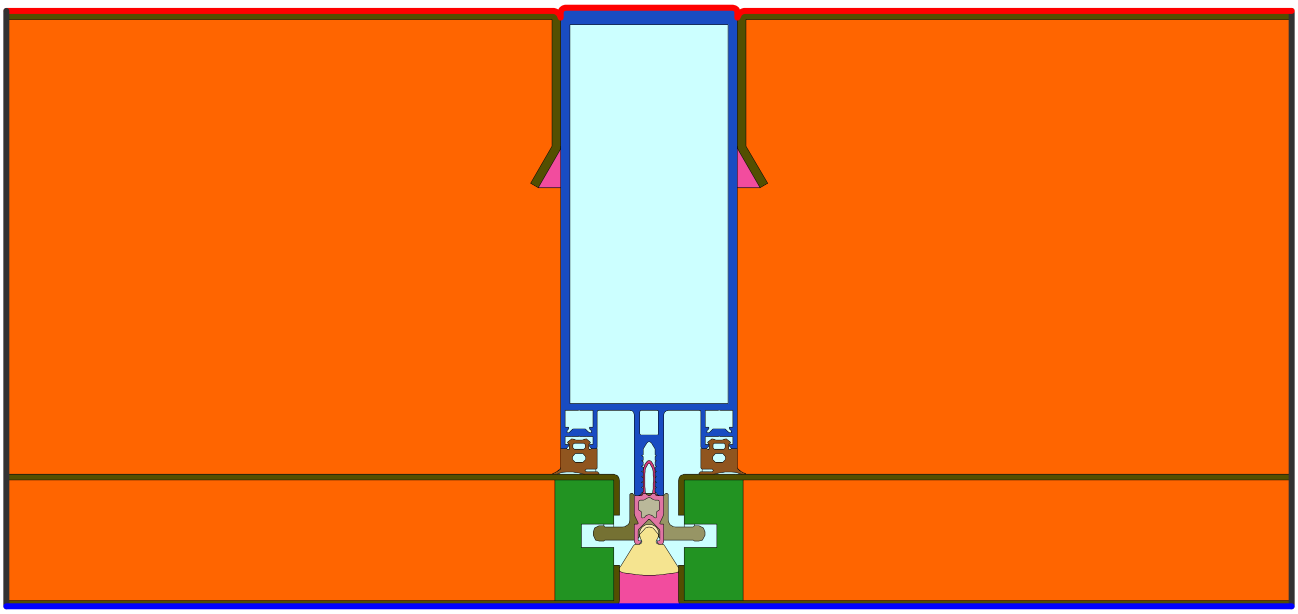
$$RH = \frac{1.762}{2.337} \times 100\% = 75\%$$

Thermal Gradient Diagram



20.0 °C
10.0 °C
-5.0 °C

Material Thermal Conductivity Diagram

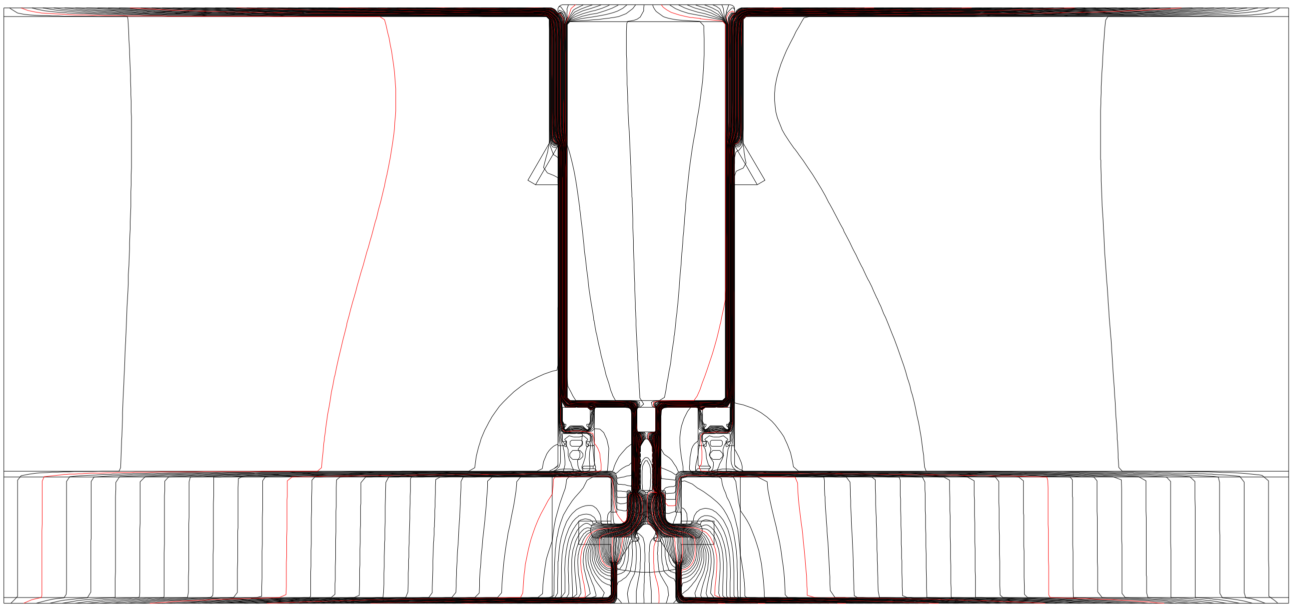


	Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
	Epsilon 0.3				0.300	
	Epsilon 0.9				0.900	
	Exterior, -5		-5.000	0.040		
	Interior, normal, 20 deg		20.000	0.130		
	Symmetry/Model section	0.000				

	Material	λ[W/(m·K)]	ε	μ[-]
	Aluminium (Si Alloys)	160.000	0.300	
	Aluminium (Si Alloys)	160.000	0.900	
	Aluminium alloy	160.000	0.900	100000000.000
	Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	
	Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250	16.225	0.900	
	Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.133	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.032	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.039	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R4 25-250	16.045	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R5 25-250	16.132	0.900	1.000
	EPDM (ethylene propylene diene monomer)	0.250	0.900	
	Foam	0.050	0.900	
	Plastic	0.170	0.900	
	Polyamid (nylon)	0.250	0.900	
	RW3	0.034	0.900	
	Silicone, filled	0.500	0.900	
	Unventilated air cavity *			1.000

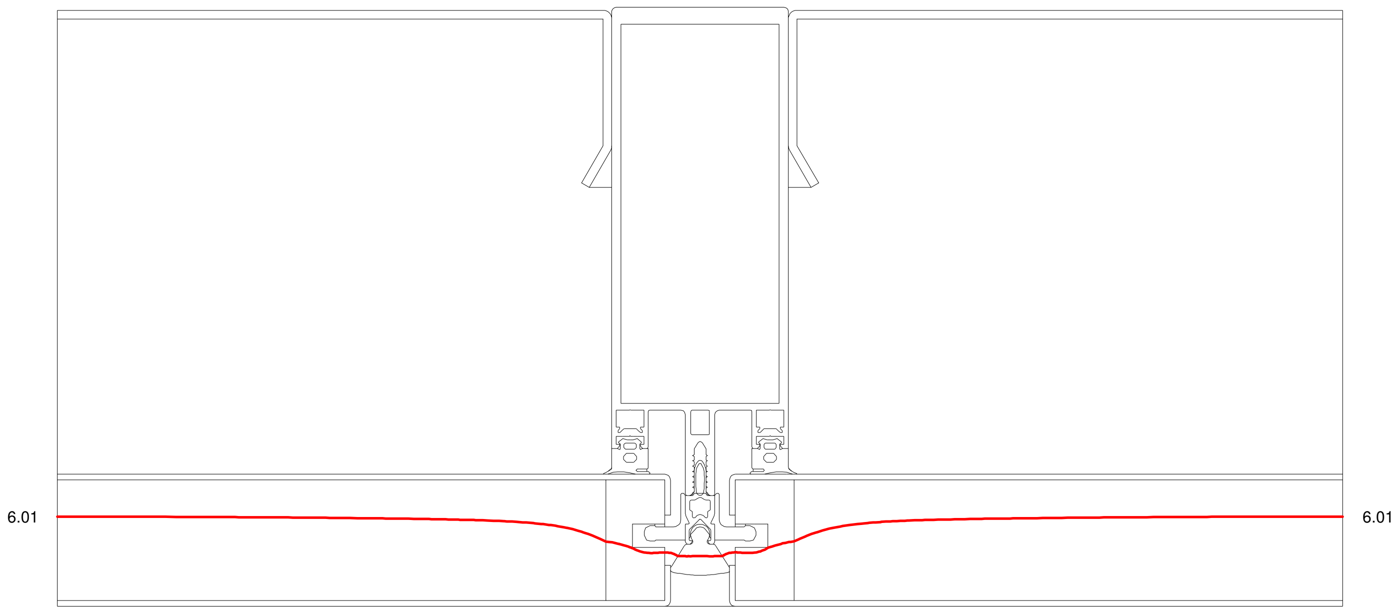
* EN ISO 10077-2:2017, 6.4.3/anisotrop

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Mullion (door jamb) – 1 1426

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Mullion (door jamb) – 1 1426

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 60 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 11.97 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

Condensation Analysis Sheet.

Detail. **Mullion (door jamb) – 1 1426**

Specification details

Internal temperature = **20** ^{o}C

External temperature = **-5** ^{o}C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **11.97** ^{o}C

Comments.

By calculation and assessing 11.97 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 60%

Calculations

From BS 5250:2002 Table A.1

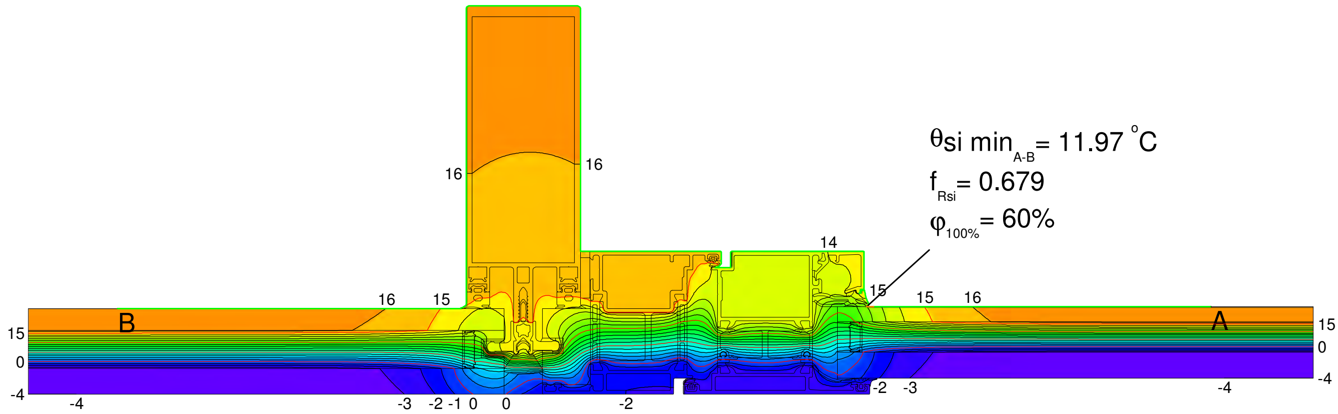
Saturated vapour pressure (Es) at 20^{o}C = 2.337 kPa

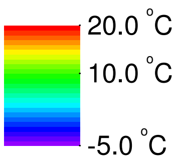
From FEA the internal cold point was shown to be 11.97 deg C

Substituting this temperature into the above gives a vapour pressure of 1.4 kPa

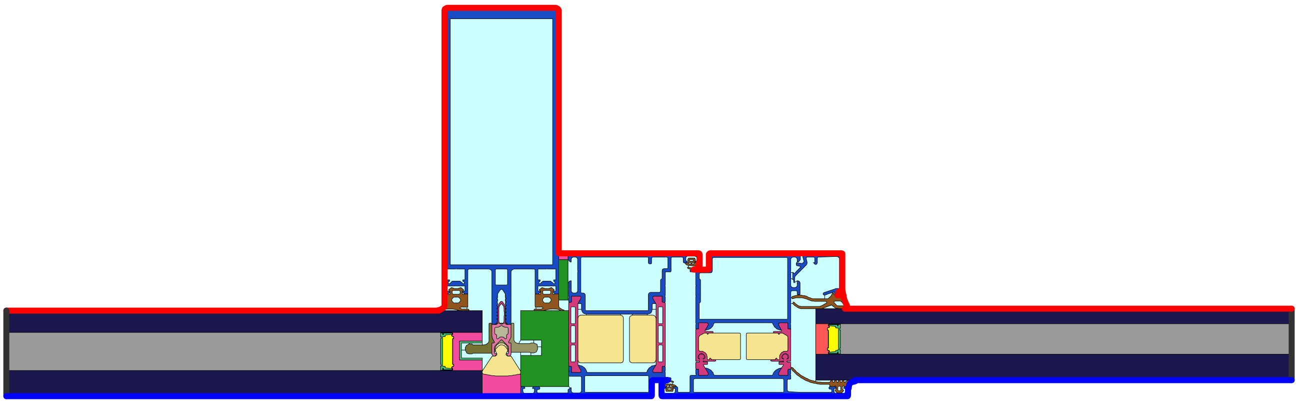
$$RH = \frac{1.4}{2.337} \times 100\% = 60\%$$

Thermal Gradient Diagram





Material Thermal Conductivity Diagram

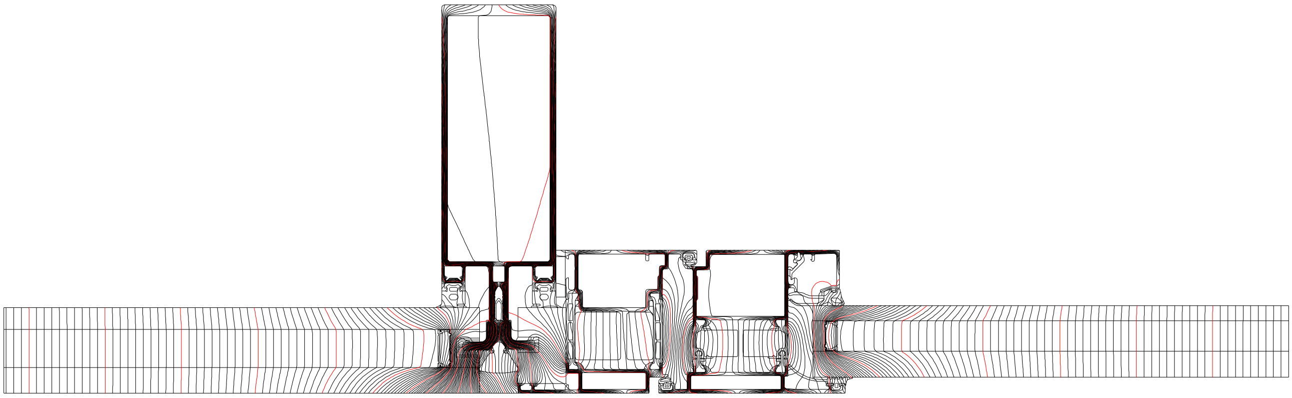


Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, normal, 20 deg		20.000	0.130		
Symmetry/Model section	0.000				

Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250	16.225	0.900	
Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.129	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.040	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R4 25-250	16.045	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R5 25-250	16.128	0.900	1.000
Butyl rubber, solid/hot melt	0.240	0.900	
EPDM (ethylene propylene diene monomer)	0.250	0.900	
Foam	0.050	0.900	
Gasfillin(1)	0.025	0.900	1.000
Gasfillin(2)	0.020	0.900	1.000
PVC-U (polyvinylchloride), rigid	0.170	0.900	
Plastic	0.170	0.900	
Polyamid (nylon)	0.250	0.900	
Polysulfide	0.400	0.900	
Rigid PVC	0.170	0.900	
Silica gel (desiccant)	0.130	0.900	
Silicone, filled	0.500	0.900	
Soda lime glass	1.000	0.900	
Stainless steel	15.000	0.900	
Unventilated air cavity *			1.000

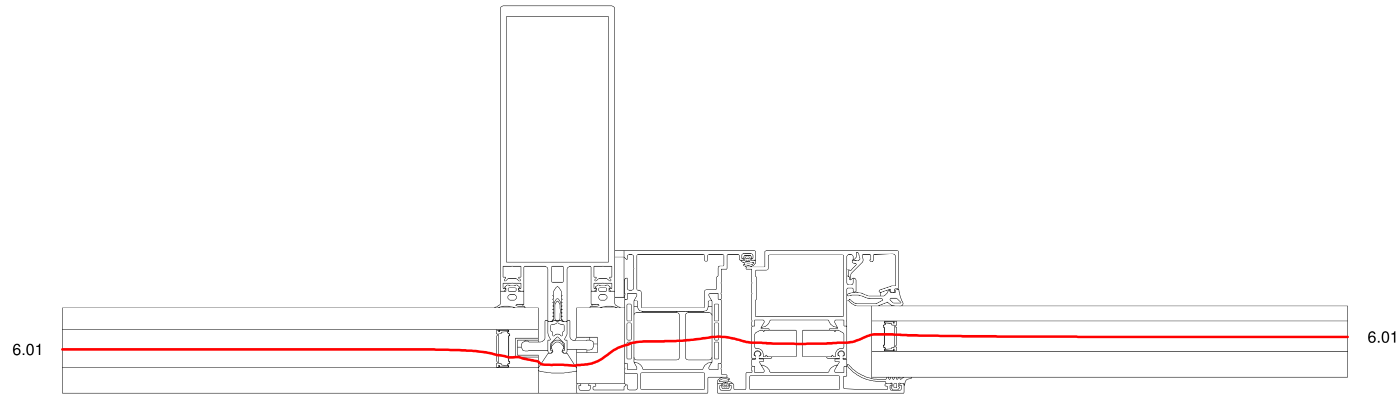
* EN ISO 10077-2:2017, 6.4.3/anisotrop

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Int corner 1 1427

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Int corner 1 1427

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 72 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 14.73 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

Condensation Analysis Sheet.

Detail. **Int corner 1 1427**

Specification details

Internal temperature = **20** °C

External temperature = **-5** °C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **14.73** °C

Comments.

By calculation and assessing 14.73 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 72%

Calculations

From BS 5250:2002 Table A.1

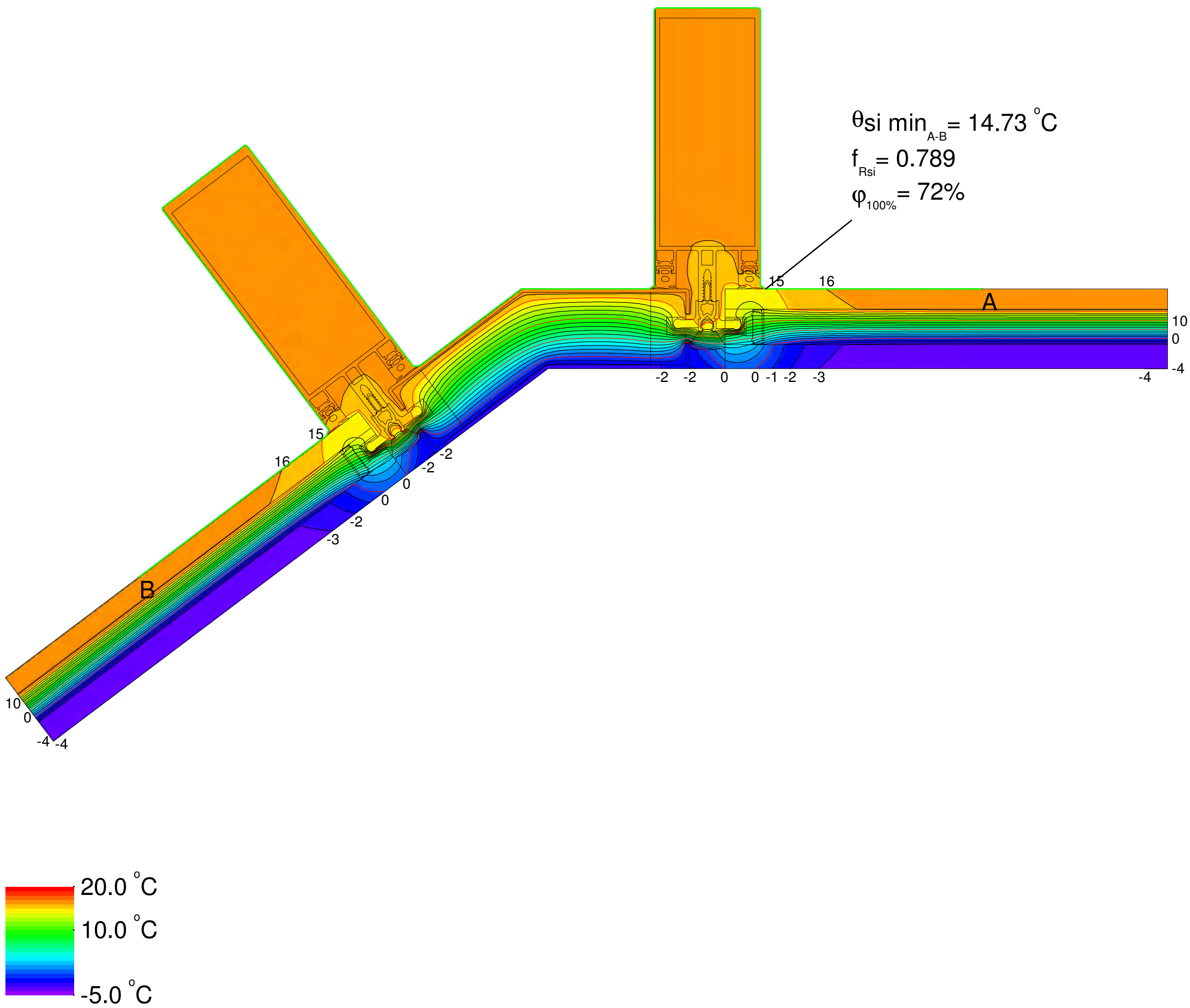
Saturated vapour pressure (Es) at 20°C = 2.337 kPa

From FEA the internal cold point was shown to be 14.73 deg C

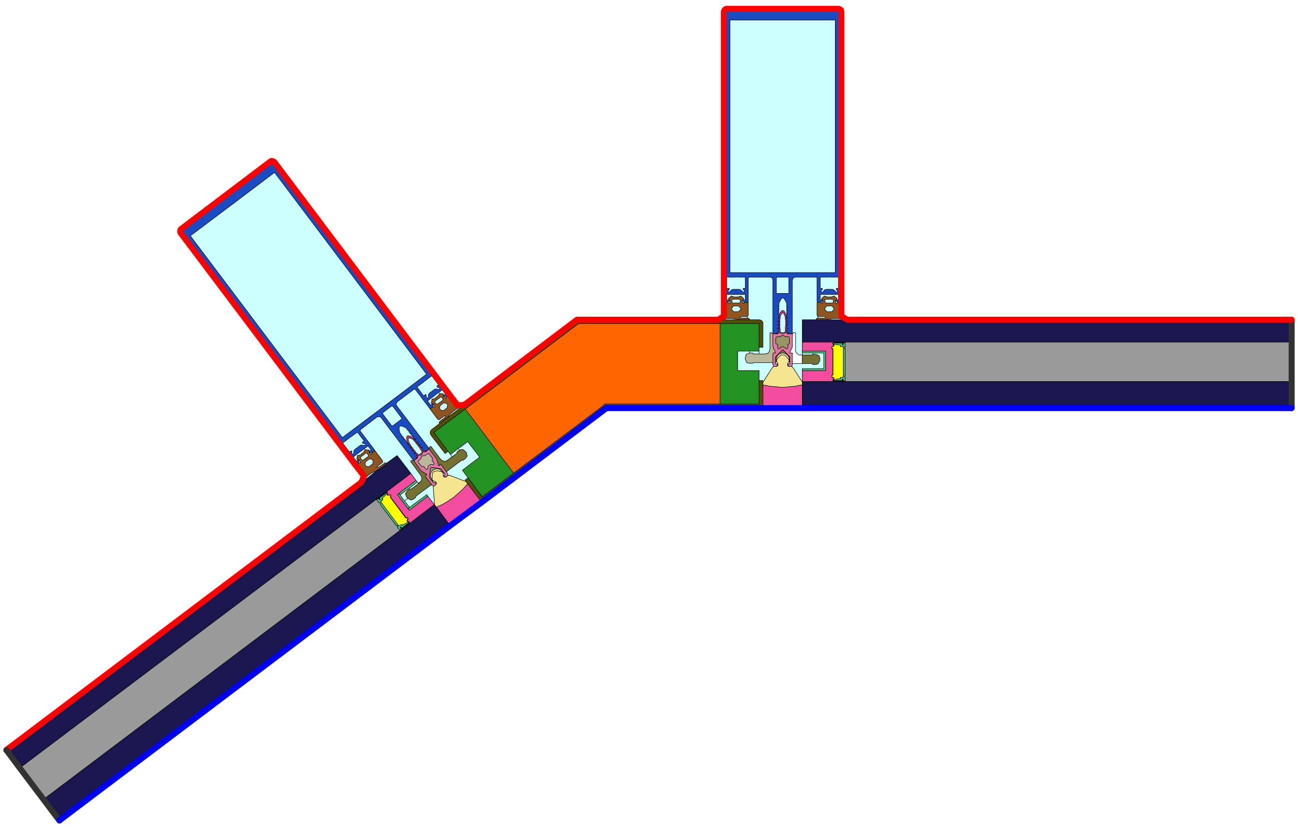
Substituting this temperature into the above gives a vapour pressure of 1.675 kPa

$$RH = \frac{1.675}{2.337} \times 100\% = 72\%$$

Thermal Gradient Diagram



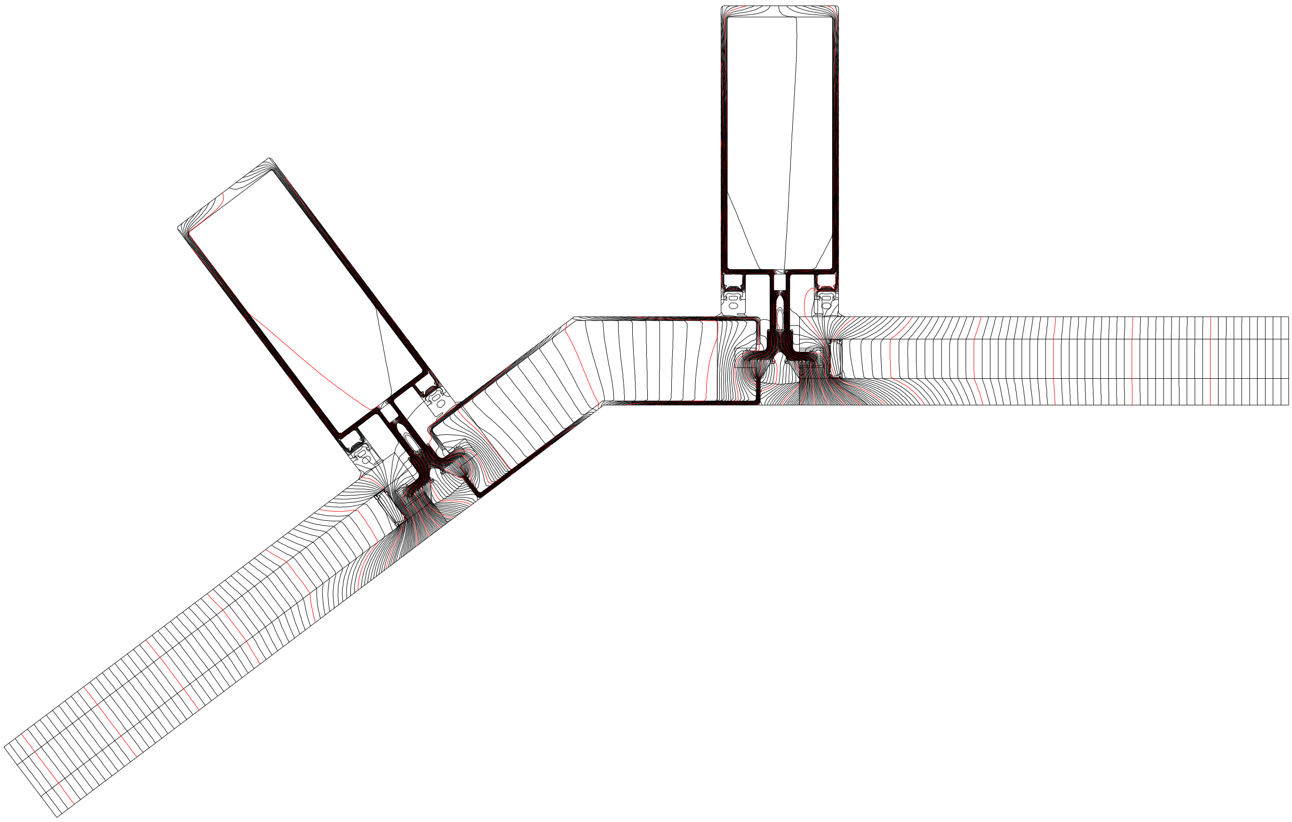
Material Thermal Conductivity Diagram



	Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
	Epsilon 0.3				0.300	
	Epsilon 0.9				0.900	
	Exterior, -5		-5.000	0.040		
	Interior, normal, 20 deg		20.000	0.130		
	Symmetry/Model section	0.000				

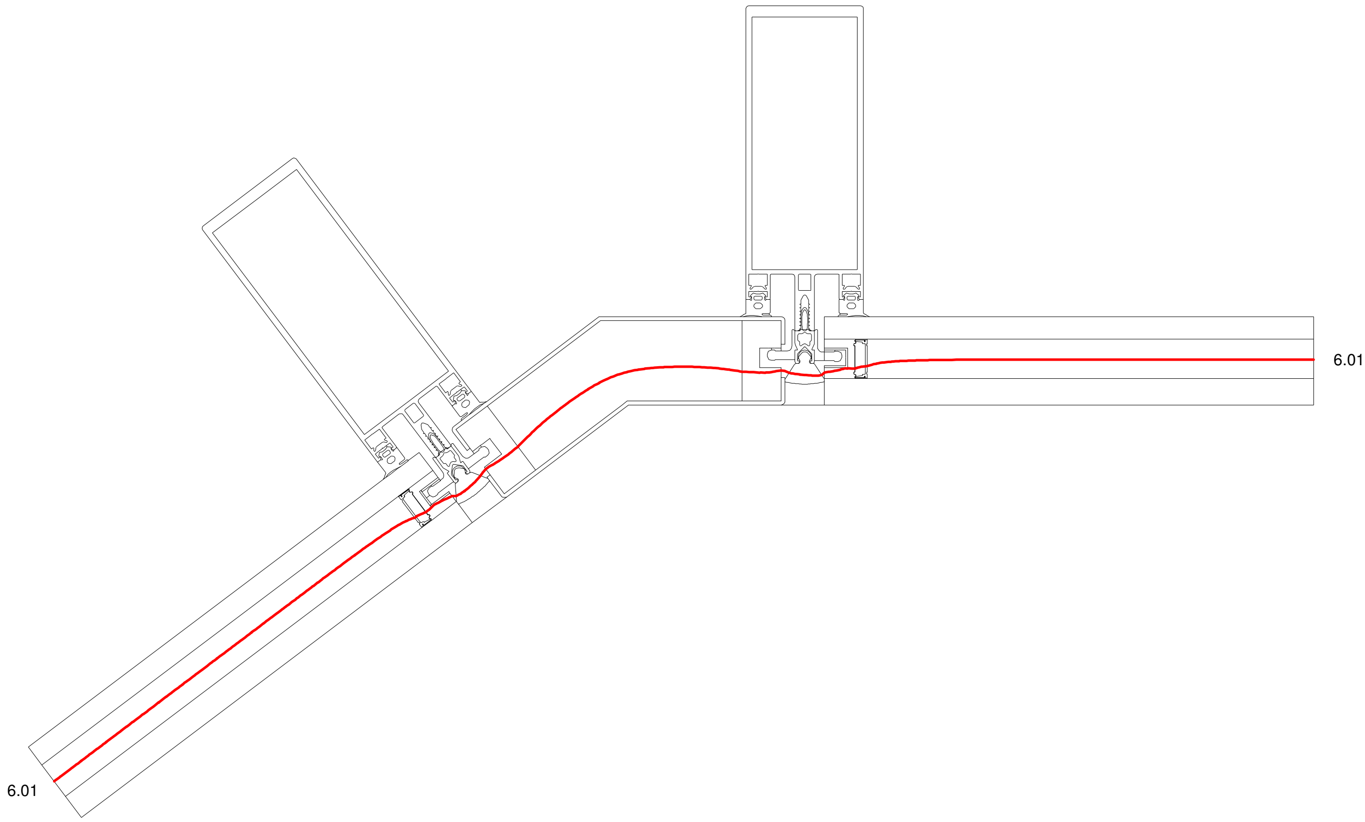
	Material	λ[W/(m·K)]	ε	μ[-]
	Aluminium (Si Alloys)	160.000	0.300	
	Aluminium (Si Alloys)	160.000	0.900	
	Aluminium alloy	160.000	0.900	100000000.000
	Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	
	Aluminium alloy / Foam, 3D equivalent R 25-250(1)	16.045	0.900	
	Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250	16.225	0.900	
	Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250(1)	16.225	0.900	
	Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.098	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R10 25-250	16.128	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.038	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.040	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R4 25-250	16.106	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R5 25-250	16.032	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R6 25-250	16.139	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R7 25-250	16.032	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R8 25-250	16.040	0.900	1.000
	Aluminium alloy / Unventilated air cavity, 3D equivalent R9 25-250	16.045	0.900	1.000
	Butyl rubber, solid/hot melt	0.240	0.900	
	EPDM (ethylene propylene diene monomer)	0.250	0.900	
	Foam	0.050	0.900	
	Gasfillin(1)	0.025	0.900	1.000
	Gasfillin(2)	0.025	0.900	1.000
	PVC-U (polyvinylchloride), rigid	0.170	0.900	
	Plastic	0.170	0.900	
	Polyamid (nylon)	0.250	0.900	
	RW3	0.034	0.900	
	Rigid PVC	0.170	0.900	
	Silica gel (desiccant)	0.130	0.900	
	Silicone, filled	0.500	0.900	
	Soda lime glass	1.000	0.900	
	Stainless steel	15.000	0.900	

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Ext corner 1 1429

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Ext corner 1 1429

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 72 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 14.71 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

FEA

Condensation Analysis Sheet.

Detail. **Ext corner 1 1429**

Specification details

Internal temperature = **20** °C

External temperature = **-5** °C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **14.71** °C

Comments.

By calculation and assessing 14.71 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 72%

Calculations

From BS 5250:2002 Table A.1

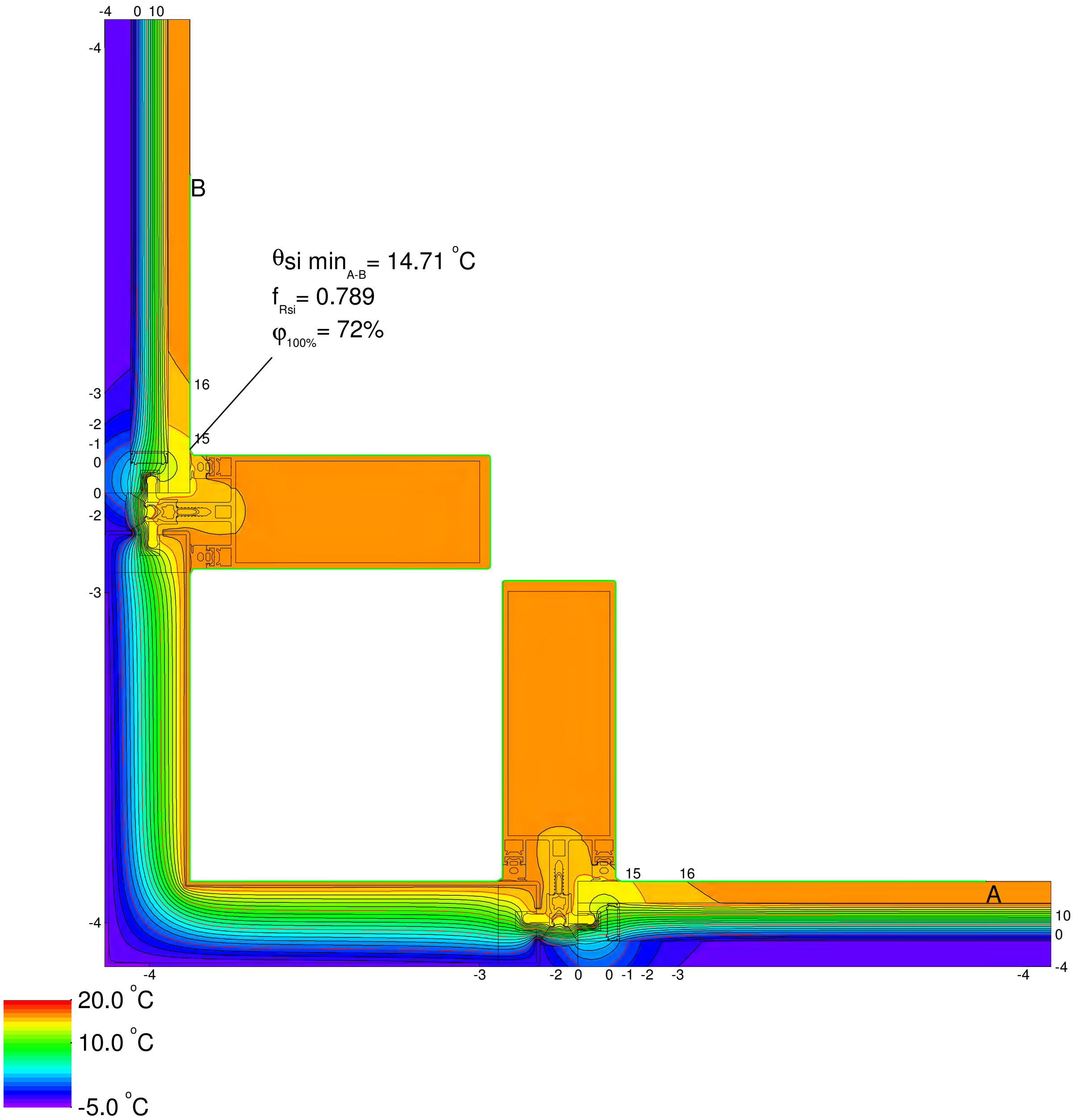
Saturated vapour pressure (Es) at 20°C = 2.337 kPa

From FEA the internal cold point was shown to be 14.71 deg C

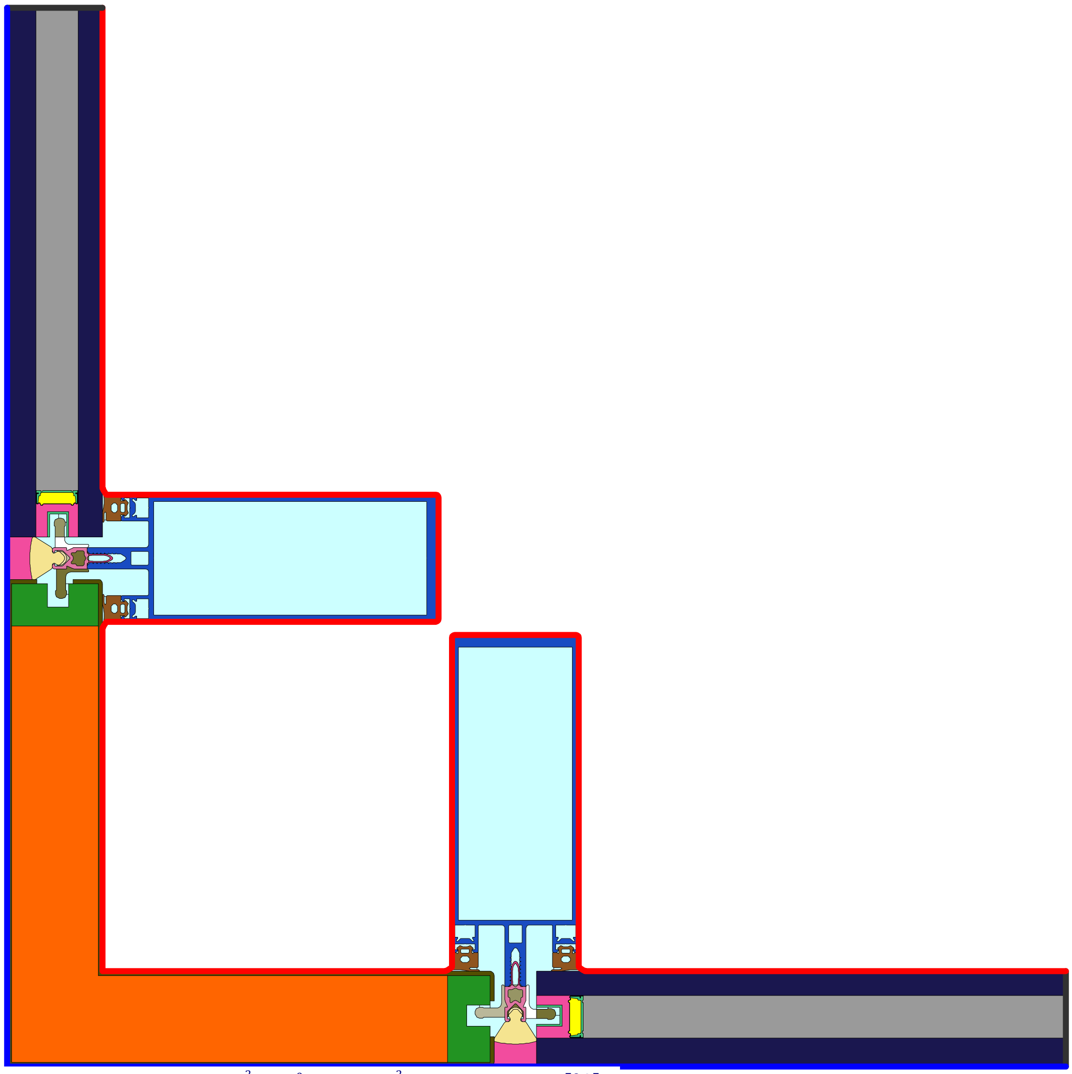
Substituting this temperature into the above gives a vapour pressure of 1.673 kPa

$$RH = \frac{1.673}{2.337} \times 100\% = 72\%$$

Thermal Gradient Diagram



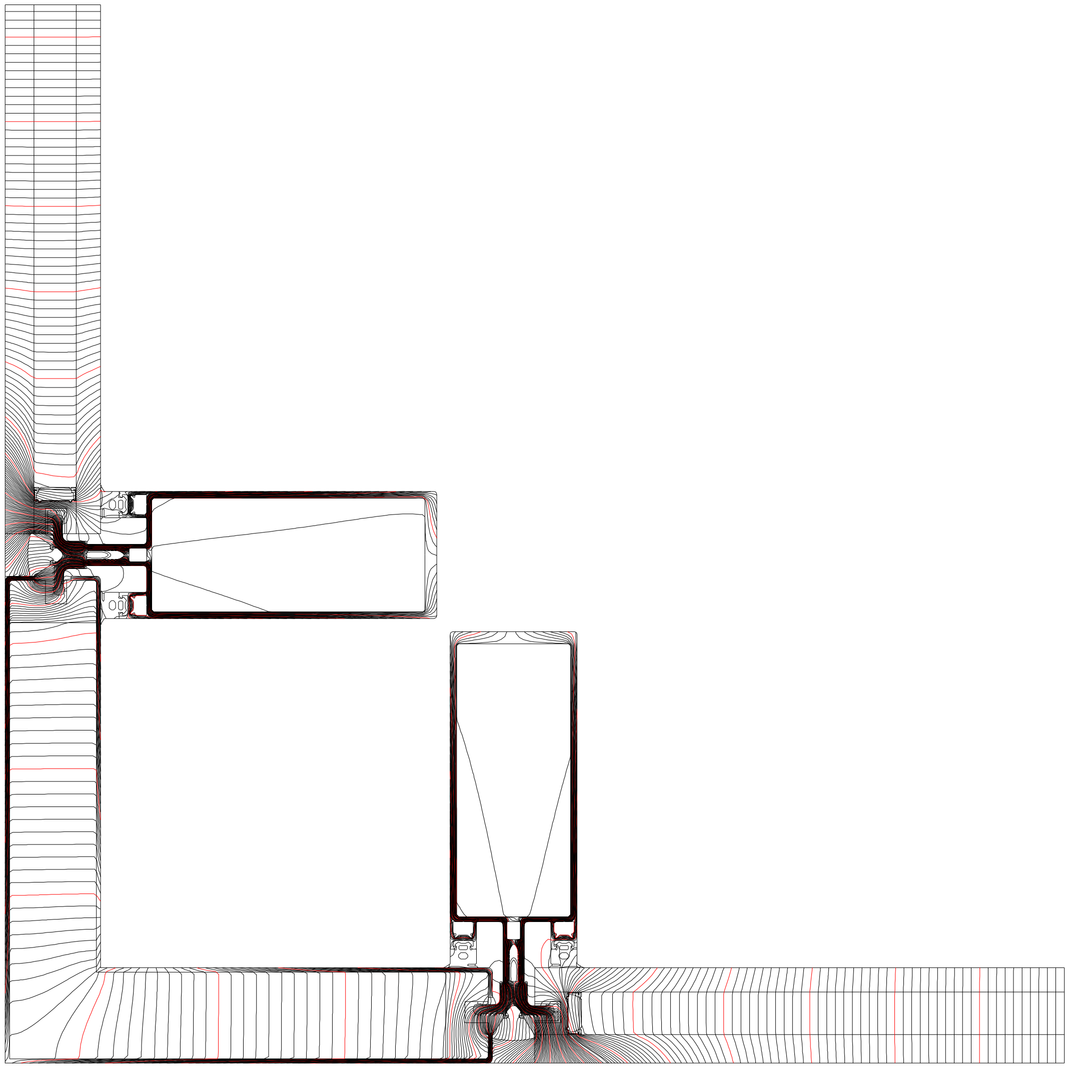
Material Thermal Conductivity Diagram



Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, normal, 20 deg		20.000	0.130		
Symmetry/Model section	0.000				

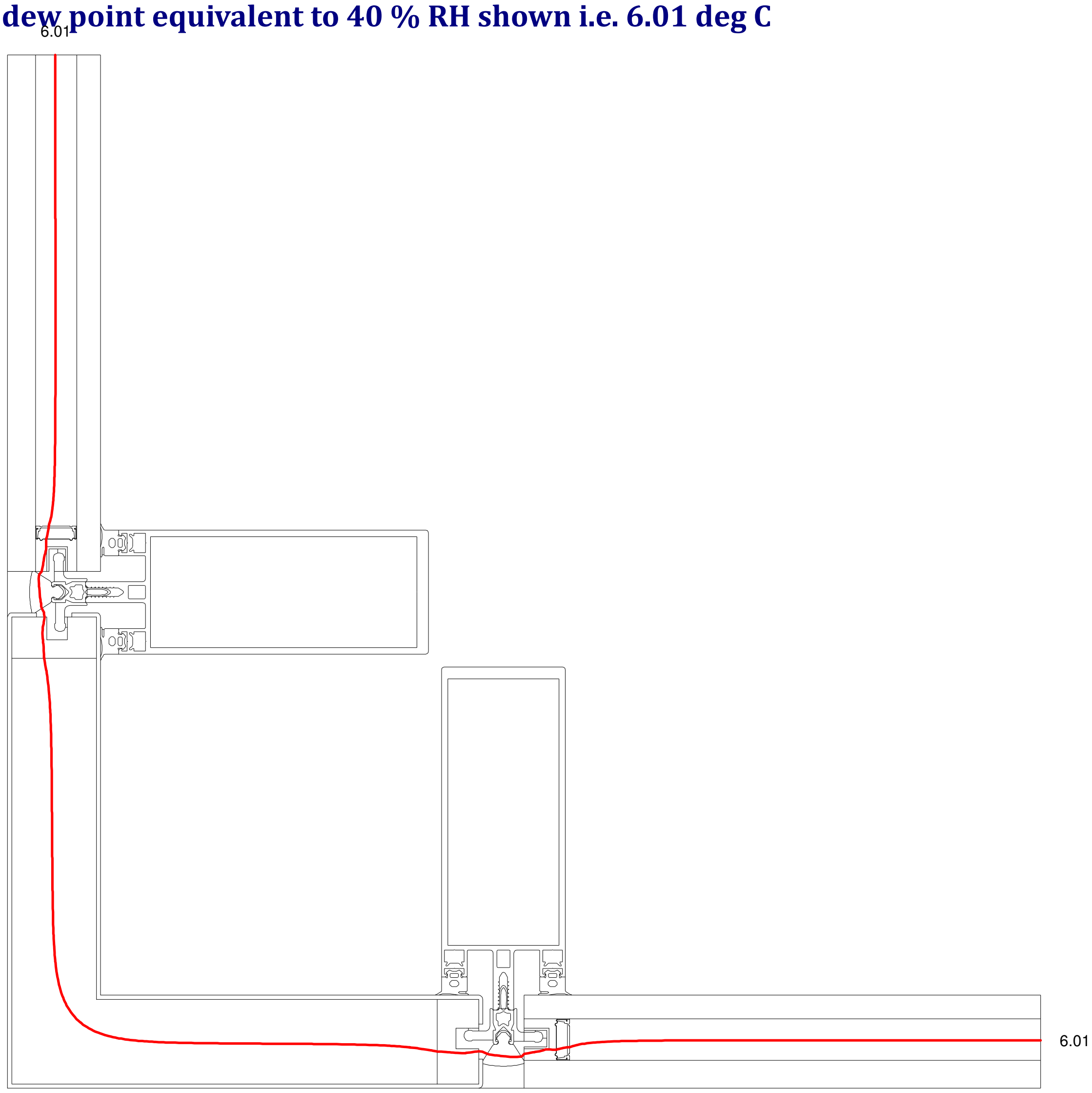
Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy	160.000	0.900	100000000.000
Aluminium alloy / Foam, 3D equivalent R 25-250(1)	16.045	0.900	
Aluminium alloy / Foam, 3D equivalent R 25-250(2)	16.045	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250(1)	16.225	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250(2)	16.225	0.900	
Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.140	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R10 25-250	16.130	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.130	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R4 25-250	16.040	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R5 25-250	16.045	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R6 25-250	16.138	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R7 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R8 25-250	16.040	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R9 25-250	16.045	0.900	1.000
Butyl rubber, solid/hot melt	0.240	0.900	
EPDM (ethylene propylene diene monomer)	0.250	0.900	
Foam	0.050	0.900	
Gasfillin(2)	0.025	0.900	1.000
Gasfillin(3)	0.025	0.900	1.000
PVC-U (polyvinylchloride), rigid	0.170	0.900	
Plastic	0.170	0.900	
Polyamid (nylon)	0.250	0.900	
RW3	0.034	0.900	
Rigid PVC	0.170	0.900	
Silica gel (desiccant)	0.130	0.900	
Silicone, filled	0.500	0.900	
Soda lime glass	1.000	0.900	
Stainless steel	15.000	0.900	

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Jamb 1 1428

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Jamb 1 1428

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 59 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 11.83 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

FEA

Condensation Analysis Sheet.

Detail. **Jamb 1 1428**

Specification details

Internal temperature = **20** ^{o}C

External temperature = **-5** ^{o}C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **11.83** ^{o}C

Comments.

By calculation and assessing 11.83 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 59%

Calculations

From BS 5250:2002 Table A.1

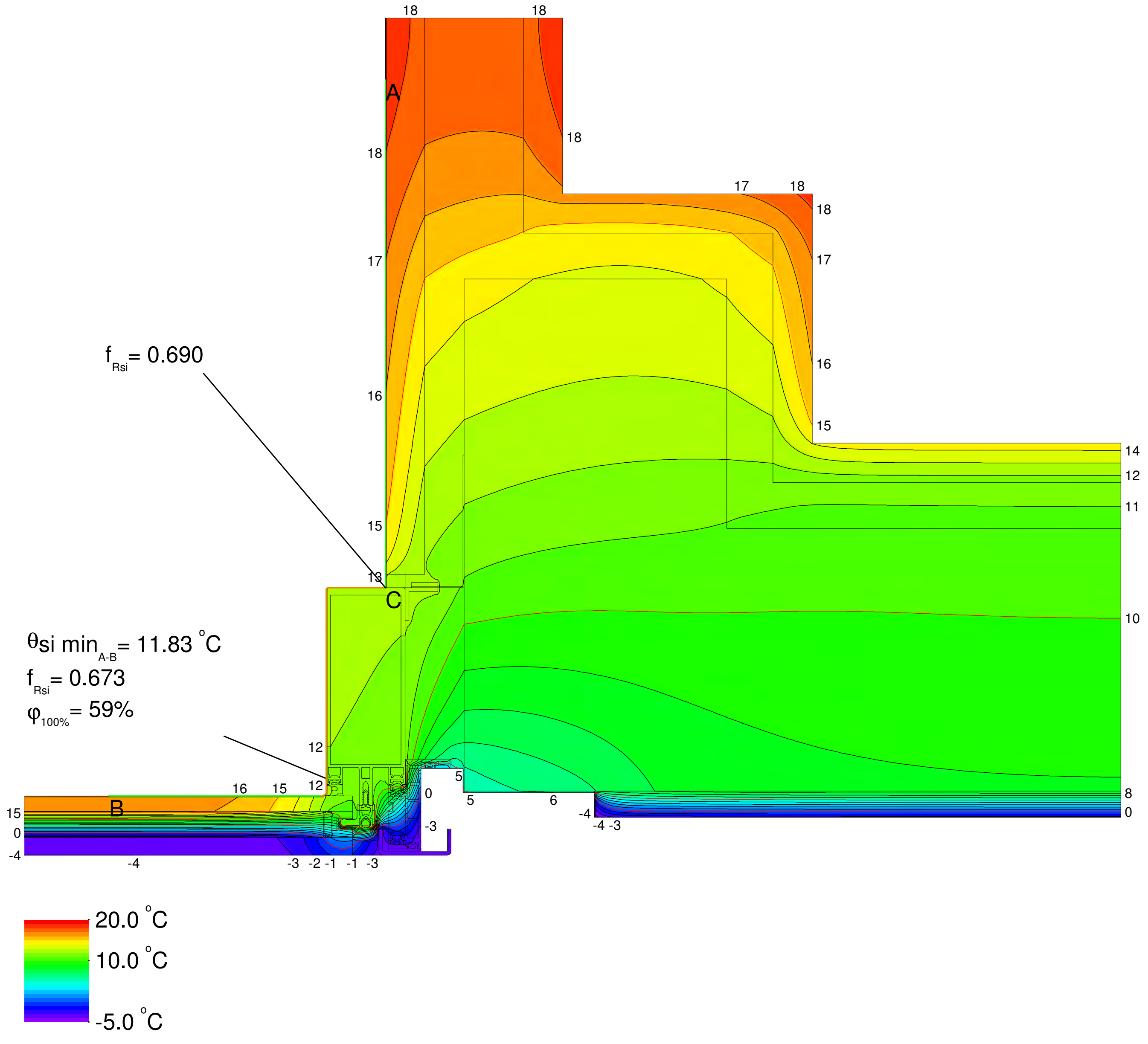
Saturated vapour pressure (Es) at 20^{o}C = 2.337 kPa

From FEA the internal cold point was shown to be 11.83 deg C

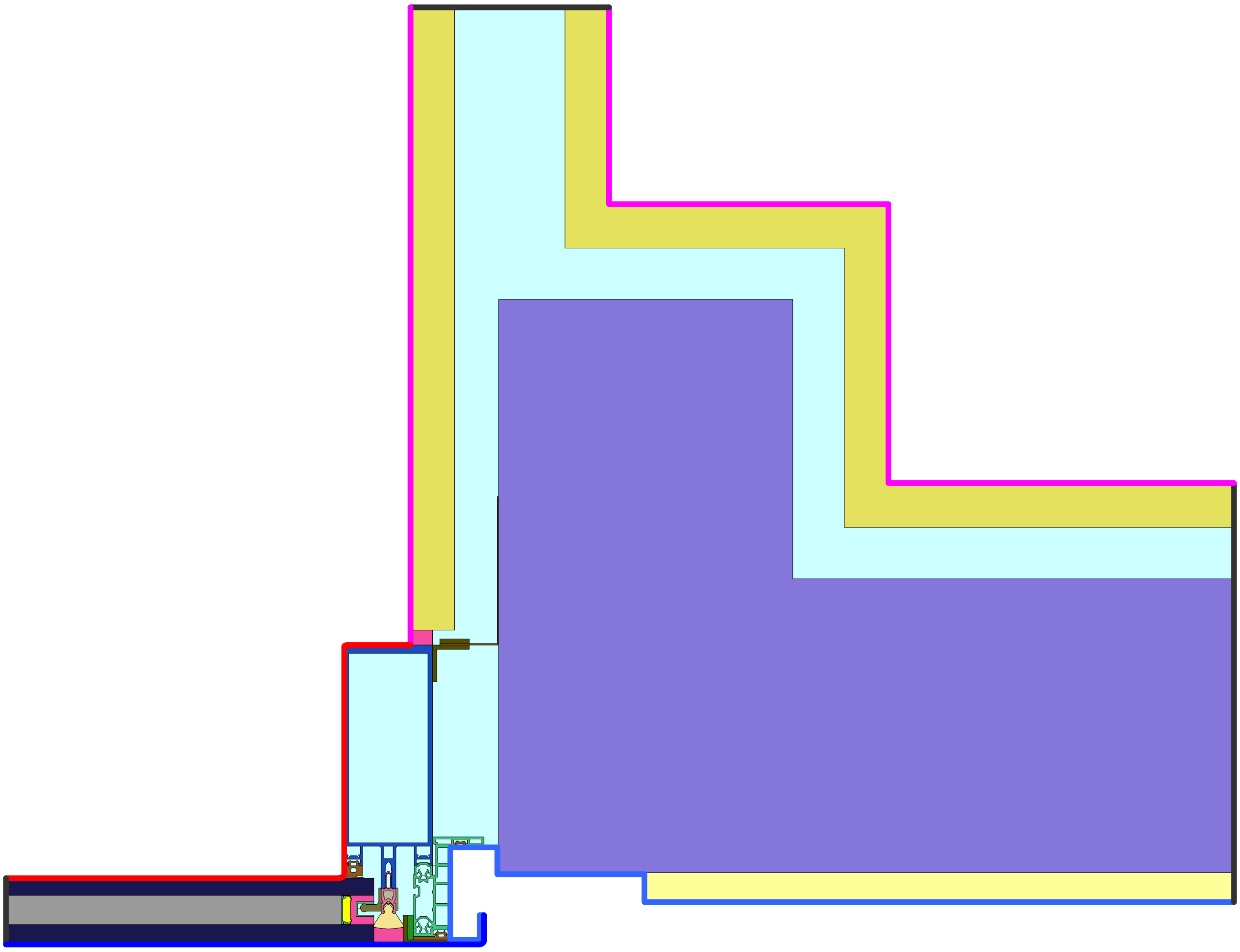
Substituting this temperature into the above gives a vapour pressure of 1.386 kPa

$$RH = \frac{1.386}{2.337} \times 100\% = 59\%$$

Thermal Gradient Diagram



Material Thermal Conductivity Diagram

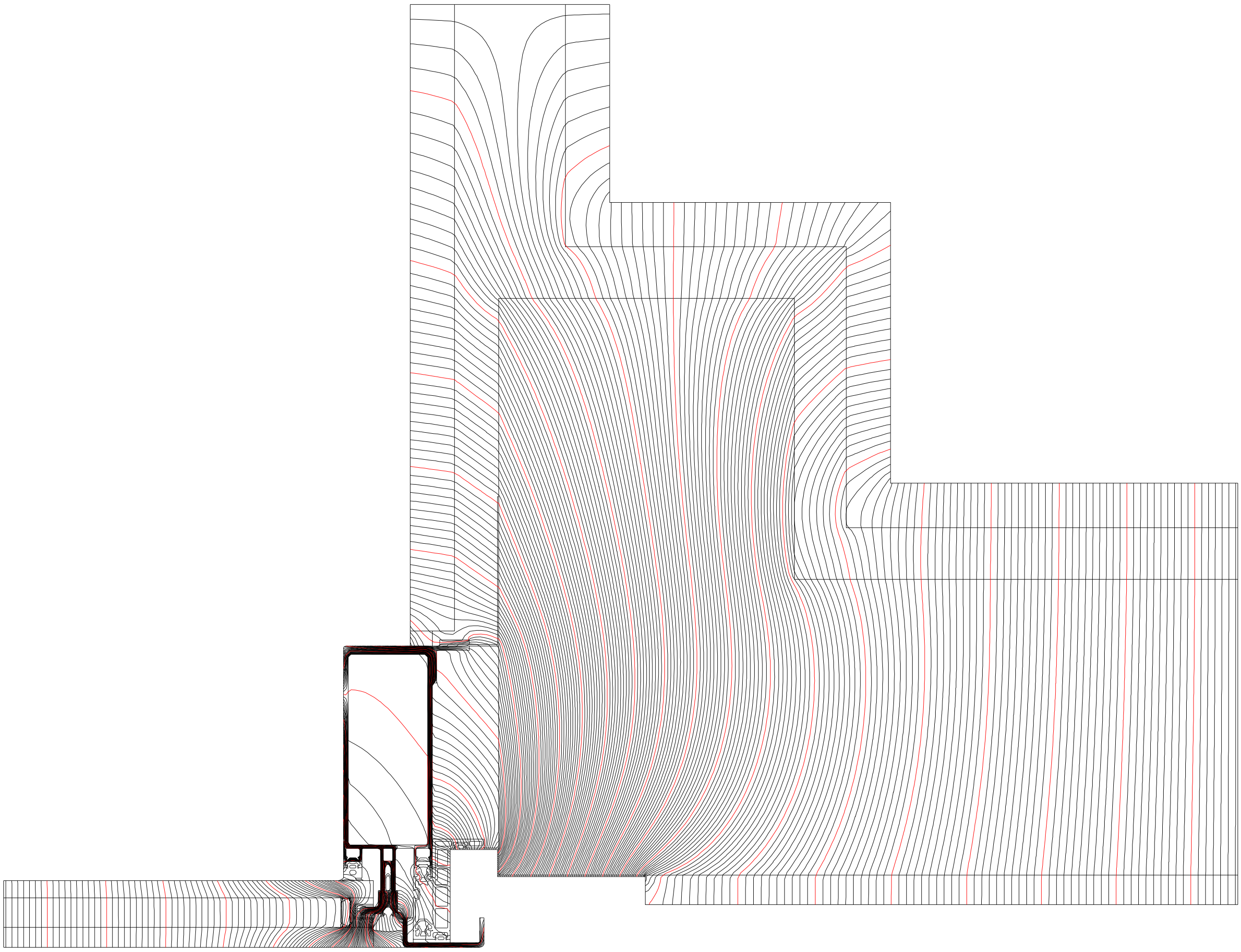


Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Exterior, ventilated, -5		-5.000	0.130		
Interior, finishes, 20 deg		20.000	0.250		
Interior, normal, 20 deg		20.000	0.130		
Symmetry/Model section	0.000				

Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy	160.000	0.900	100000000.000
Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250	16.225	0.900	
Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.123	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.039	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R4 25-250	16.044	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R5 25-250	16.128	0.900	1.000
Butyl rubber, solid/hot melt	0.240	0.900	
Concrete, reinforced (with 2% of steel)	2.500	0.900	105.000
EPDM (ethylene propylene diene monomer)	0.250	0.900	
Foam	0.050	0.900	
Gasfillin(1)	0.025	0.900	1.000
Gypsum plasterboard	0.210	0.900	7.000
Mineral Wool	0.035	0.900	
PVC-U (polyvinylchloride), rigid	0.170	0.900	
Plastic	0.170	0.900	
Polyamid (nylon)	0.250	0.900	
Rigid PVC	0.170	0.900	
Silica gel (desiccant)	0.130	0.900	
Silicone, filled	0.500	0.900	
Soda lime glass	1.000	0.900	
Stainless steel	15.000	0.900	
Unventilated air cavity *			1.000

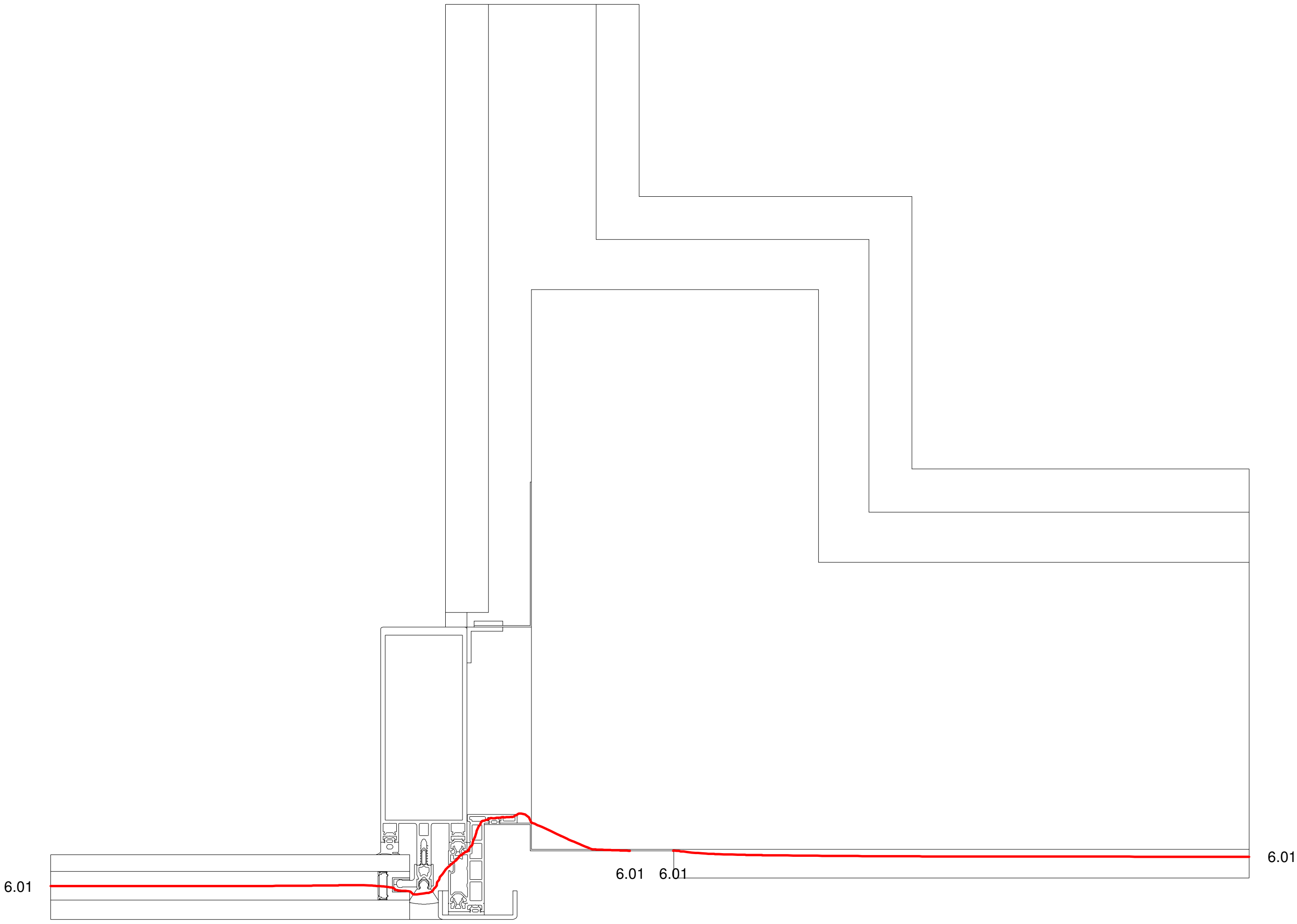
* EN ISO 10077-2:2017, 6.4.3/anisotrop

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C



Condensation risk analysis.

Jamb 1-1434

- Analysis sheet.
- Temperature gradient diagram.
- Material thermal conductivity diagram.
- Heat flux diagram.
- Dew point Isotherm diagram

Finite element analysis undertaken using Flixo version 8.1 software.

Condensation risk analysis.

Jamb 1-1434

Based upon environmental conditions examined there is no risk of surface condensation occurring providing the internal Relative Humidity remains below 71 %.

Conditions assessed are taken from project specification.

External air temperature -5 ^{0}C

Internal air temperature 20 ^{0}C

Internal Relative Humidity is 40 %

Calculated dew point temperature is 6.01 ^{0}C

From Finite Element Analysis the lowest surface temperature is 14.66 ˚C and is greater than the specified dew point temperature therefore surface condensation will not occur within the extremes of conditions examined.

Condensation Analysis Sheet.

Detail. **Jamb 1-1434**

Specification details

Internal temperature = **20** ^{o}C

External temperature = **-5** ^{o}C

Data from FEA of detail. (Using FLIXO ver.8w)

"Cold" point = **14.66** ^{o}C

Comments.

By calculation and assessing 14.66 deg C at saturation point there is no predicted risk of condensation when the internal Relative Humidity is below 71%

Calculations

From BS 5250:2002 Table A.1

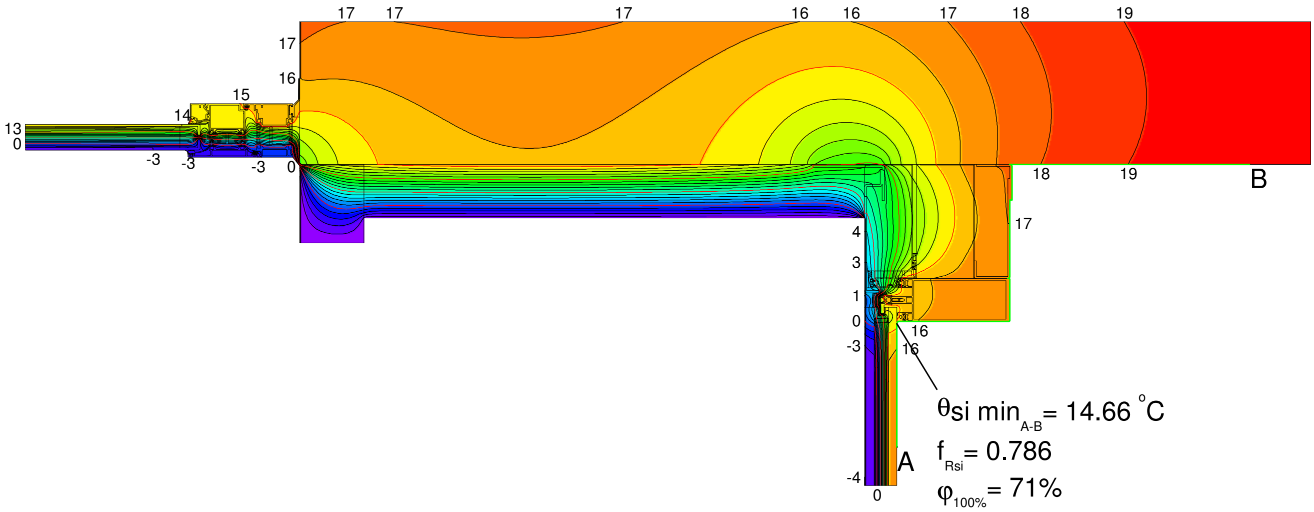
Saturated vapour pressure (Es) at 20^{o}C = 2.337 kPa

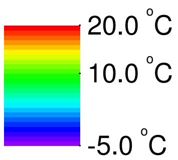
From FEA the internal cold point was shown to be 14.66 deg C

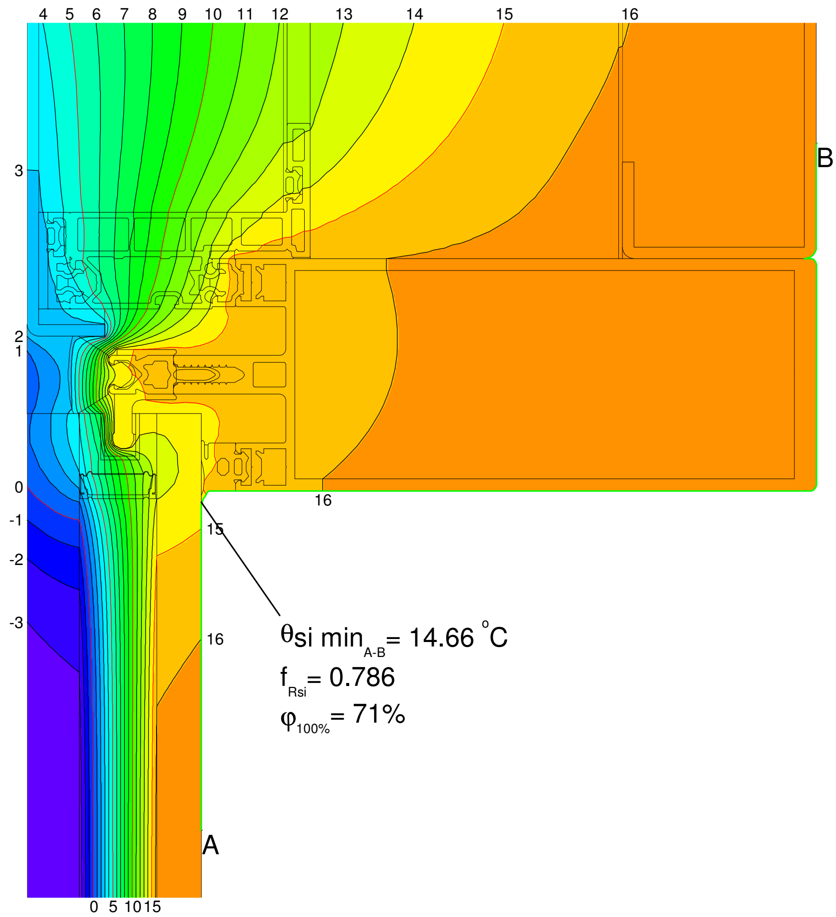
Substituting this temperature into the above gives a vapour pressure of 1.667 kPa

$$RH = \frac{1.667}{2.337} \times 100\% = 71\%$$

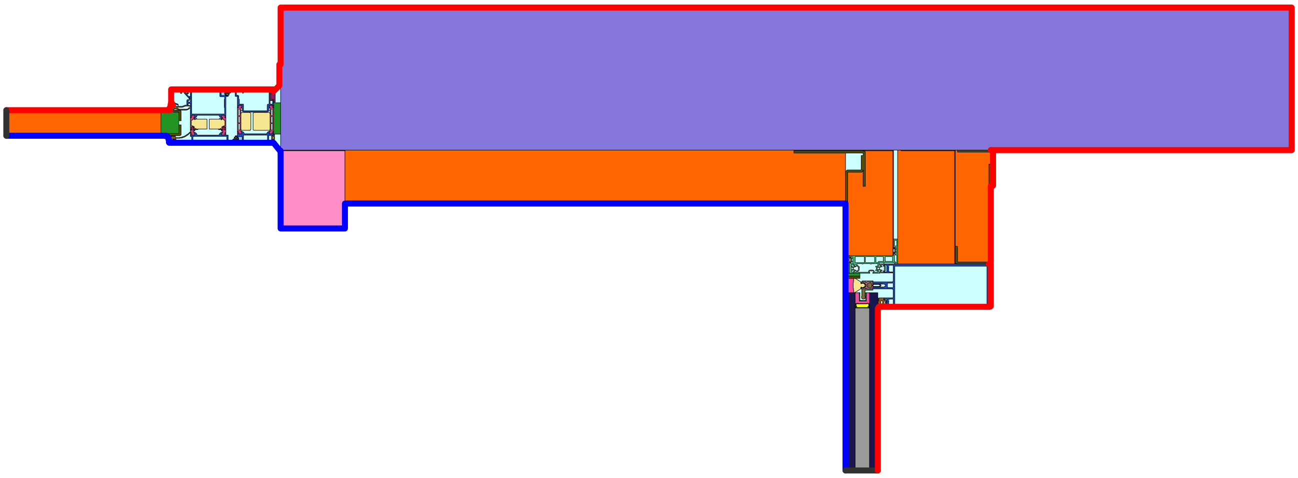
Thermal Gradient Diagram







Material Thermal Conductivity Diagram

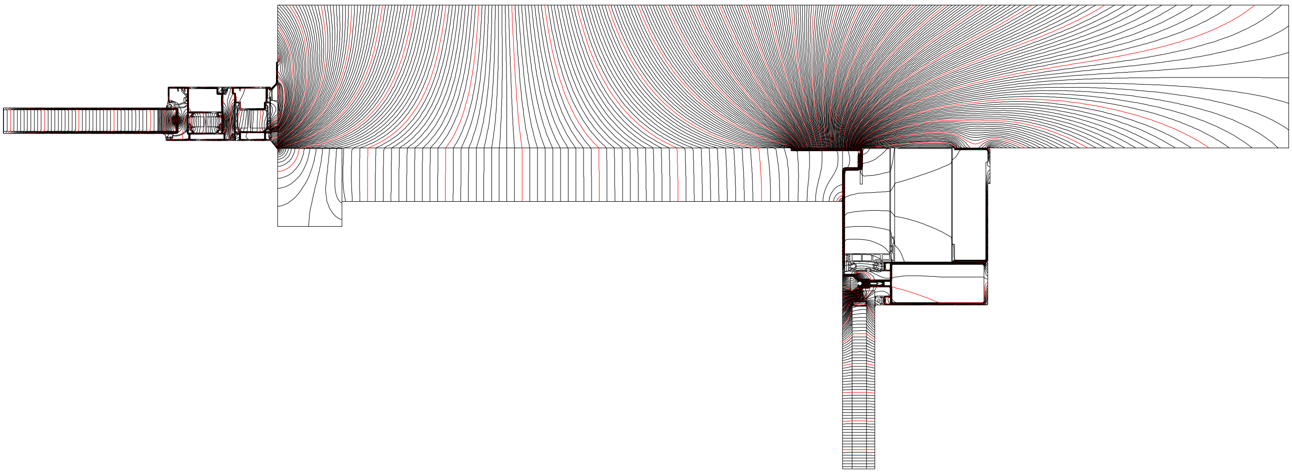


Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, normal, 20 deg		20.000	0.130		
Symmetry/Model section	0.000				

Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy	160.000	0.900	100000000.000
Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	1.000
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250	16.225	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	16.126	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R2 25-250	16.129	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R3 25-250	16.032	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R4 25-250	16.040	0.900	1.000
Aluminium alloy / Unventilated air cavity, 3D equivalent R5 25-250	16.045	0.900	1.000
Butyl rubber, solid/hot melt	0.240	0.900	
Concrete, reinforced (with 2% of steel)	2.500	0.900	105.000
EPDM (ethylene propylene diene monomer)	0.250	0.900	
Foam	0.050	0.900	
Gasfillin(1)	0.025	0.900	1.000
PVC-U (polyvinylchloride), rigid	0.170	0.900	
Plastic	0.170	0.900	
Polyamid (nylon)	0.250	0.900	
RW3	0.034	0.900	
Rigid PVC	0.170	0.900	
Siderise Fire Barrier	0.038	0.900	
Silica gel (desiccant)	0.130	0.900	
Silicone, filled	0.500	0.900	
Slightly ventilated air cavity *			1.000
Soda lime glass	1.000	0.900	
Stainless steel	15.000	0.900	
Steel	50.000	0.900	100000000.000
Unventilated air cavity *			1.000

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

Heat Flux Diagram



Dew point isotherm disgram

Line at dew point equivalent to 40 % RH shown i.e. 6.01 deg C