THERMAL PERFORMANCE CALCULATION

Analysis Undertaken and Report

Prepared by Façade Creations

Document Title: Condensation Risk Analysis of Curtain Wall XXXXXXXX

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This report assesses thermal and condensation performance only. It does not evaluate other aspects of façade design such as structural adequacy or fire performance, which must be reviewed by the Client’s appointed engineers or specialists.

Contents

Summary

This calculation document has been prepared to illustrate the thermal and condensation performance of the EWS101 curtain wall system proposed for the XXXXXXX project. Analysis was carried out by Façade Creations in accordance with relevant British and European standards.

Environmental conditions adopted for the simulation were:

- External air temperature: –5 °C
- Internal air temperature: 20 °C
- Internal relative humidity: 40 %

This combination results in a dew-point temperature of 6.01 °C.
The analysis identifies the minimum internal surface temperatures for each detail and the corresponding relative humidity at which surface condensation could occur.

Detail	Lowest Surface Temperature (°C)	Equivalent RH at Condensation (%)
Head detail – 1 1404 (1407 similar)	8.23	46
Head detail – 1 1413 (1411, 1421 similar)	8.99	49
Head detail – 1 1418 (1419, 1420 similar)	13.40	66
Head detail (door) – 1 1415	8.99	49
Floor slab interface – 1 1406 (1408 similar)	13.07	64
Cill detail – 1 1412 (1405, 1410, 1417 similar)	14.11	69
Door threshold – 1 1414 (1401, 1402 similar)	11.83	59
Mullion (glass zone) – 1 1425	13.97	68
Mullion (facet glass zone) – 1 1424	12.84	63
Mullion (panel zone) – 1 1442	15.52	75
Mullion (door jamb) – 1 1426	11.97	60
Internal corner 1 1427	14.73	72
External corner 1 1429	14.71	72
Jamb 1 1428	11.83	59
Jamb 1 1434	14.66	71

All calculated surface temperatures are above the dew-point level, confirming that surface condensation will not occur under the specified environmental conditions.

Temperature Factor (fRsi) and Condensation Assessment

The **temperature factor (fRsi)** provides a quantitative measure of thermal performance at internal surfaces and helps evaluate potential for mold growth.
Two values are given: one at the coldest point (glass/frame surface) and another at absorbent material interfaces where applicable.

Detail	fRsi Value	fRsi 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 – 1 1406 (1408 similar)	0.723	0.825
Cill detail – 1 1412 (1405, 1410, 1417 similar)	0.764	—
Door threshold – 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	—
Internal corner – 1 1427	0.789	—
External corner – 1 1429	0.789	—
Jamb – 1 1428	0.673	0.690
Jamb – 1 1434	0.786	—

In all details, the calculated temperature factors at internal finishes exceed the minimum threshold required to prevent surface condensation and mold growth (typically $fRsi \geq 0.75$ for absorbent materials).

Interstitial Condensation

Analysis of dew-point isotherms indicates that condensation, if any, would occur within the insulation layer behind panels and spandrels.
However, due to the presence of a sealed internal liner, no interstitial condensation risk exists under normal service conditions.

Two-Dimensional Analysis Method

All simulations were conducted using a two-dimensional finite element method to evaluate steady-state thermal behavior. The analyses were performed with advanced software capable of calculating thermal transmittance and linear thermal bridging effects according to EN ISO 10077-2.

The program determines heat flow and surface temperature distribution by dividing materials into fine computational grids, assigning each a thermal conductivity value, and applying defined boundary conditions.
The results generate:

- Temperature gradient profiles
- Thermal conductivity distribution
- Energy flux data across materials

Thermal conductivities were derived primarily from:

- EN 10456:2007
- BS EN ISO 10077-2:2017
- Manufacturer-provided data where applicable

For air cavities, anisotropic equivalent conductivities were computed following BS EN ISO 10077-2:2017, clause 6.4.3, which accounts for both convection and radiative heat transfer.

Steady-state analysis assumes no impact from thermal mass or transient effects from adjacent components.

Boundary Conditions

Applied boundary conditions align with BS EN ISO 13788 standards for windows and doors:

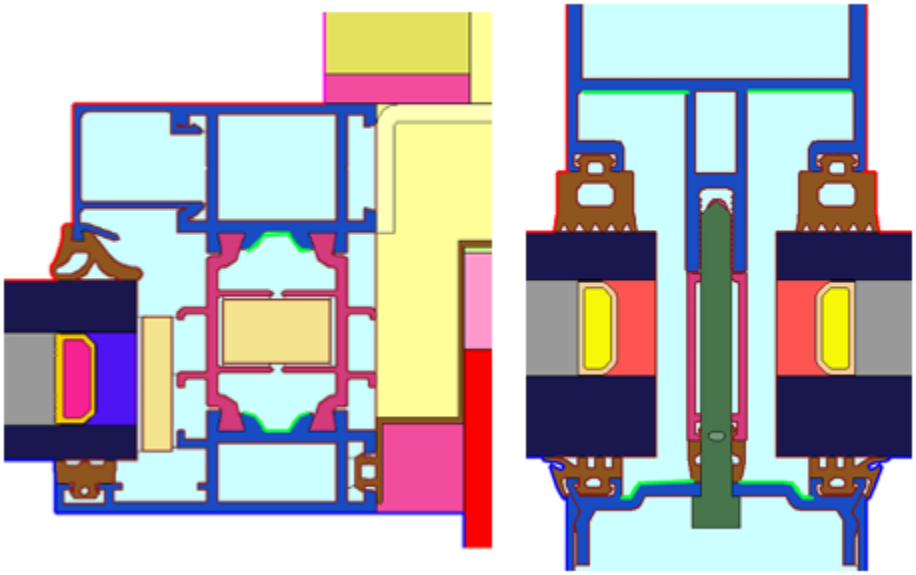
Surface	Resistance (m^2K/W)
External (non-ventilated)	0.04
External (ventilated cavity elements)	0.13
Internal (horizontal)	0.13
Internal (upwards)	0.10

Surface	Resistance (m^2K/W)
Internal (downwards)	0.17
Internal finishes	0.25

These values reflect surface resistances relevant to typical construction assemblies and cladding configurations

Cavity Emissivity

An emissivity coefficient of 0.9 was applied to most surfaces.
For metallic components or unfinished cavities (such as those within thermal breaks), a value of 0.3 (slightly oxidized aluminum) was used.



Analysis Outputs

For each examined detail, the following data sets were produced:

- Temperature distribution diagrams (showing temperature gradients)
- Thermal conductivity mapping
- Heat flux visualization
- Dew-point isotherm overlay (internal vs. external conditions)

All results were reviewed and validated by Façade Creations' technical team to ensure compliance with calculation standards.

Typical material thermal conductivity values - (refer to individual analysis for applicable materials)

Glazed elements – centre pane U-values

- Manufacturer provided vision centre pane value = **1.0 W/m²K**
- Glass spacers: **Chromatech Ultra F**
- Calculated panel centre pane U value = **0.73 W/m²K** (excludes any backing insulation)

Material thermal summary (example calculation shown)

Material	Width (mm)	Thermal Conductivity λ (W/m·K)	Thermal Resistance (m²K/W)
External surface resistance	-	-	**0.04**
alum (external)	2	160.00	0.0000125
RW3 (insulation)	41	0.034	1.20588235
alum (internal)	2	160.00	0.0000125
Sum of resistances = **1.3759** → Internal surface resistance = **0.13** → **U Value = 0.73 W/m²K**			

- *(Note: refer to each detail's analysis for the exact material lists used in the simulation.)*

Condensation risk analysis - Head detail – 1 1404 (1407 similar)

Included in this section:
• Analysis sheet (text)
• Temperature gradient diagram (diagram)
• Material thermal conductivity diagram (diagram)
• Heat flux diagram (diagram)
• Dew point isotherm diagram (diagram)

Simulation method: Finite element analysis undertaken using advanced 2D steady-state software.

Condensation risk analysis - Head detail – 1 1404 (1407 similar) - Summary

Based upon the environmental conditions examined, there is **no risk of surface condensation** provided the internal relative humidity remains below **46 %**.

Conditions assessed:

- External air temperature = **−5 °C**

- Internal air temperature = **20 °C**
- Internal relative humidity = **40 %**
- Calculated dew point temperature = **6.01 °C**

From the analysis:

- Lowest surface temperature (cold point) = **8.23 °C** → greater than dew point → no surface condensation expected**.**

Condensation Analysis - Head detail – 1 1404 (1407 similar)

Detail / Specification

- Internal temperature = **20 °C**
- External temperature = **−5 °C**

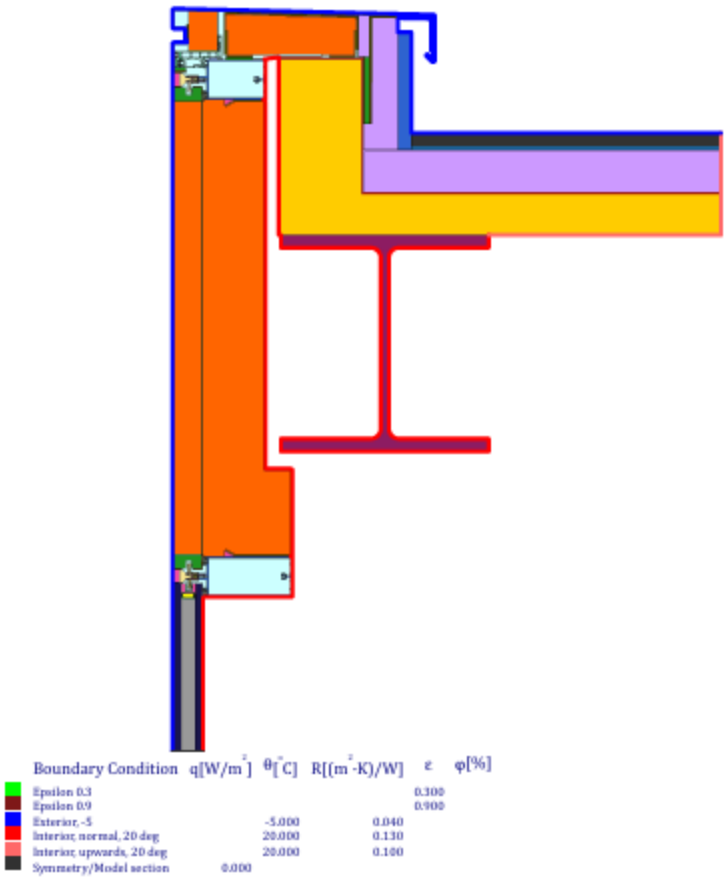
Data from analysis:

- Cold point (θsi min) = **8.23 °C**
- fRsi = **0.529**
- Equivalent RH at which condensation may occur = **46 %**

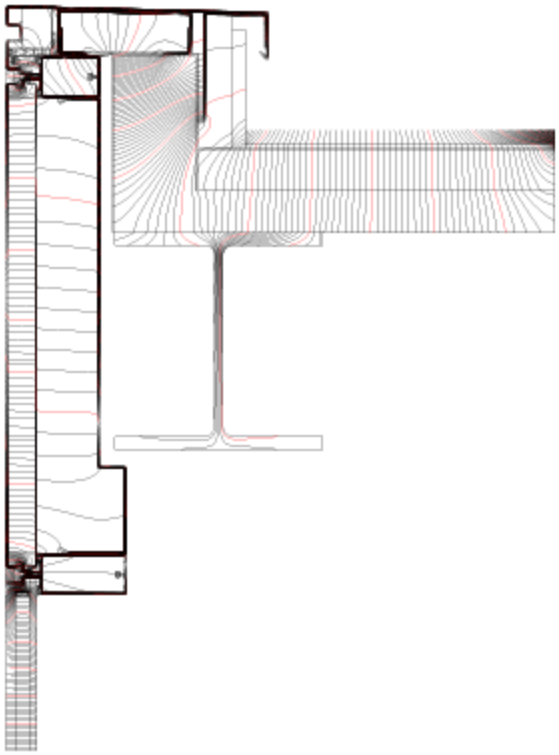
Calculation summary (method shown):
From BS 5250:2002 Table A.1: Saturated vapour pressure (Es) at 20 °C = **2.337 kPa**.
Vapour pressure at cold point (8.23 °C) = **1.086 kPa**.
RH = 1.086 / 2.337 × 100% = **46 %**.

Thermal Gradient Diagram

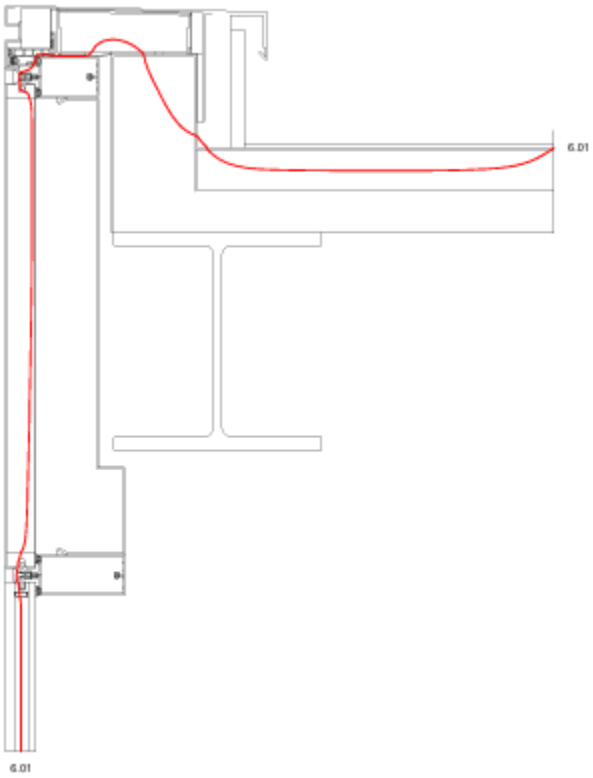
Material Thermal Conductivity Diagram



Heat Flux Diagram



Dew Point Isotherm Diagram - show dew line at 6.01 °C corresponding to 40% RH



Condensation Risk Analysis

Head Detail – 1 1413 (1411, 1421 Similar)

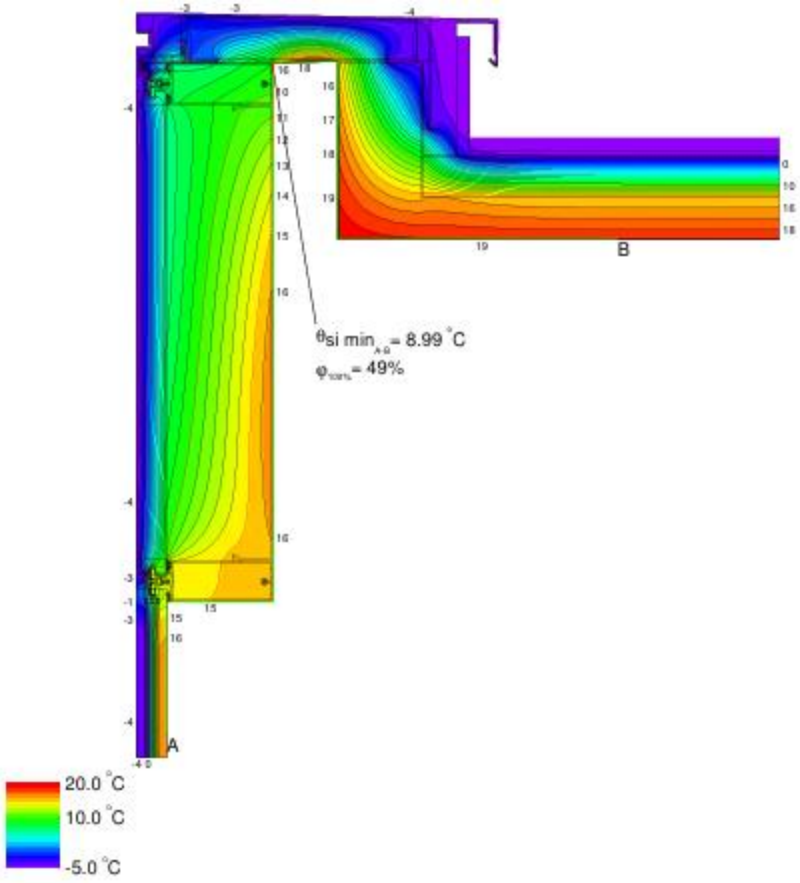
Included in this section:
Analysis sheet (text) • Temperature Gradient Diagram • Material Thermal Conductivity Diagram • Heat Flux Diagram • Dew Point Isotherm Diagram

Summary:
This head configuration features the curtain-wall transom with an external pressure plate and internal mullion connection.
Thermal simulation under design conditions indicates no risk of surface condensation provided the internal relative humidity remains below 49 %**.**

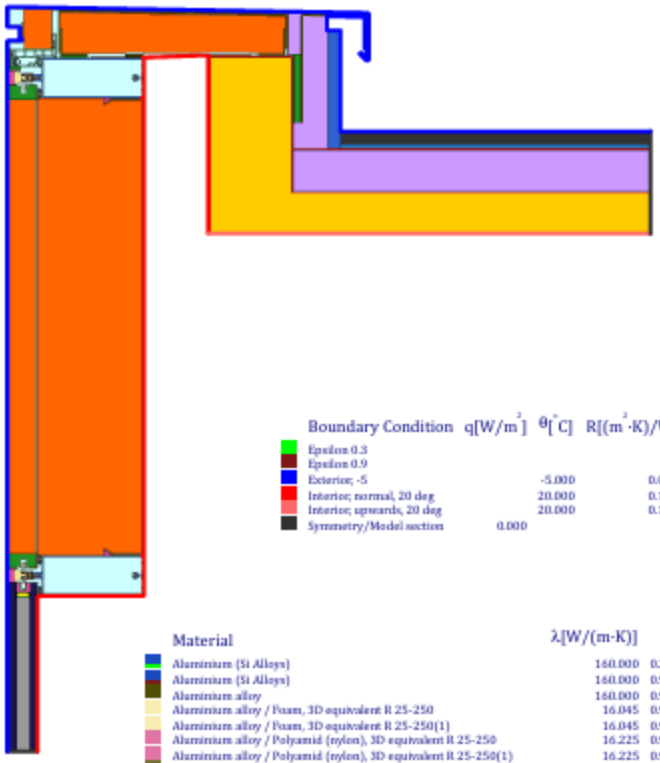
Parameter	Value
External temperature	−5 °C
Internal temperature	20 °C
Internal relative humidity	40 %
Dew-point temperature	6.01 °C
Coldest internal surface temperature (θsi min)	8.99 °C
Temperature factor (fRsi)	≈ 0.56
Equivalent RH at condensation threshold	49 %

Interpretation:
Thermal bridging occurs locally at the screw-fixed pressure plate; however, the internal liner and back-span insulation maintain sufficient resistance to prevent dew-point contact.
The margin between dew-point and internal surface temperature (~3 °C) confirms a low condensation potential even during prolonged cold periods.

Temperature Gradient Diagram



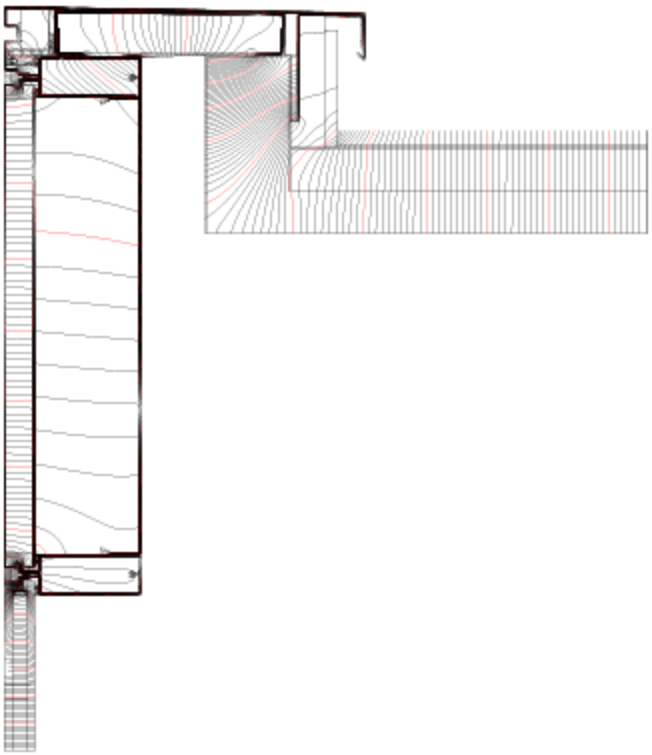
Material Thermal Conductivity Diagram



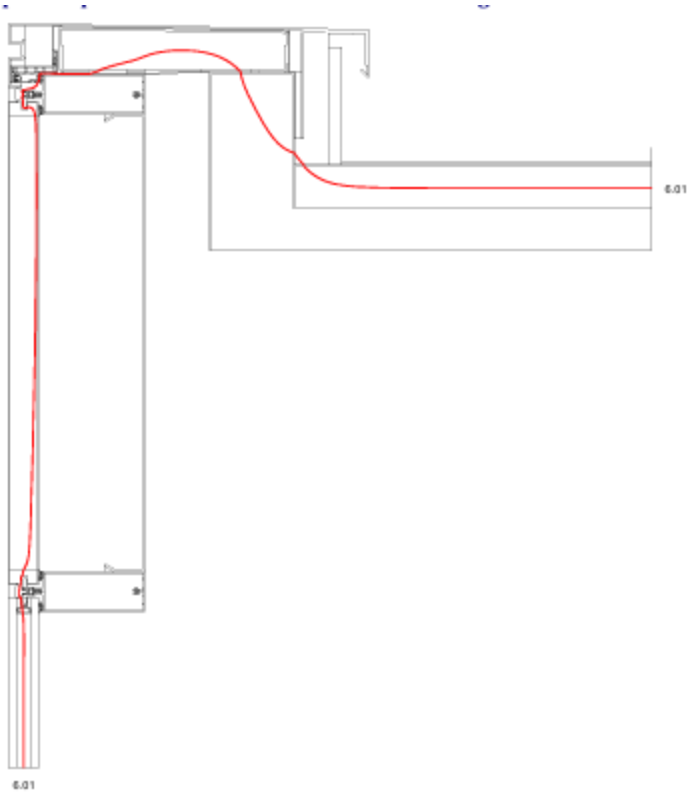
Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior; -5		-5.000	0.040		
Interior; normal, 20 deg		20.000	0.130		
Interior; upwards, 20 deg		20.000	0.100		
Symmetry/Model section	0.000				

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	10000000.000
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	
Gasfilin(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	

Heat Flux Diagram



Dew Point Isotherm Diagram for Head Detail 1 1413 showing the 6.01 °C dew-line and corresponding relative humidity profile through the section



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.
All simulations were performed by **Façade Creations** to evaluate surface-temperature distribution and condensation potential in accordance with BS EN ISO 10077-2:2017 and BS EN ISO 13788:2012**.**

Condensation Risk Analysis – Head Detail 1 1418 (1419, 1420 Similar)

Environmental conditions applied:

- External air temperature: −5 °C
- Internal air temperature: 20 °C
- Internal relative humidity: 40 %
- Resulting dew-point temperature: 6.01 °C

From analysis:

- Minimum internal surface temperature (θsi min): 13.40 °C
- Temperature factor (fRsi): 0.736
- Equivalent RH at condensation threshold: 66 %

Summary:
At the interface of the transom and backpan insulation, the calculated surface temperature remains **7 °C above the dew-point**, confirming that **no surface condensation** will occur under the design scenario.
Thermal continuity of the pressure-equalized cavity and the aluminum thermal break reduces localized flux concentration.
To maintain this performance, ensure:

- Air-seal integrity along the internal liner.
- Correct placement of thermal isolators between metal components.

Condensation Analysis Sheet

Head Detail – 1 1418 (1419, 1420 Similar)

Specification Details
Internal temperature = 20 °C
External temperature = −5 °C

Data from analysis by Façade Creations (using Flixo v 8.1)
Coldest internal surface point = 13.4 °C

Comments:
Based on the calculated surface temperature of 13.4 °C and the saturation curve, there is no predicted risk of surface condensation as long as the indoor relative humidity remains below 66 %.

Calculations
According to BS 5250:2002 (Table A.1):

- Saturated vapor pressure (Es) at 20 °C = 2.337 kPa
- Internal cold point temperature = 13.4 °C
- Corresponding vapor pressure = 1.537 kPa

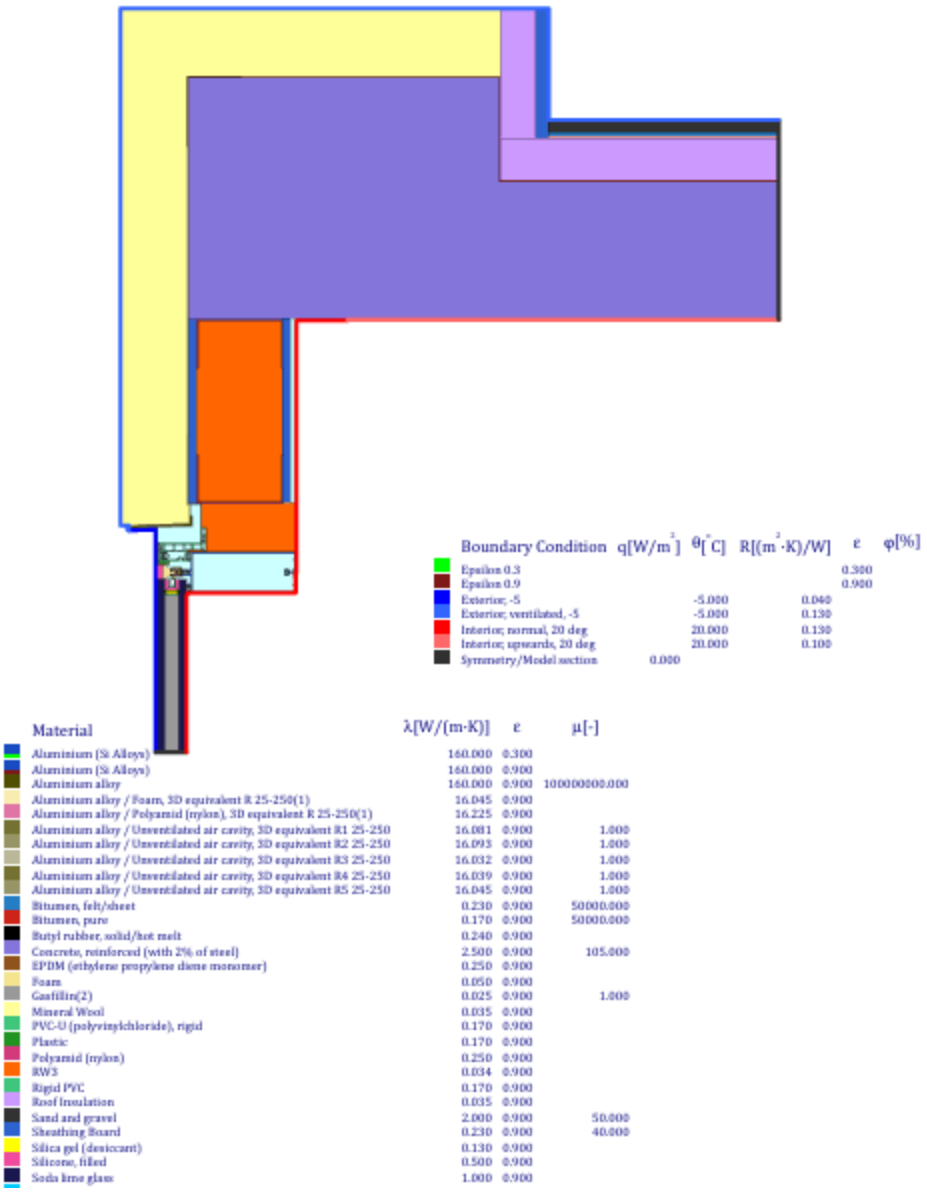
Relative Humidity (RH) = (1.537 / 2.337) × 100 = **66 %**

Therefore, no surface condensation is expected under the examined environmental conditions.

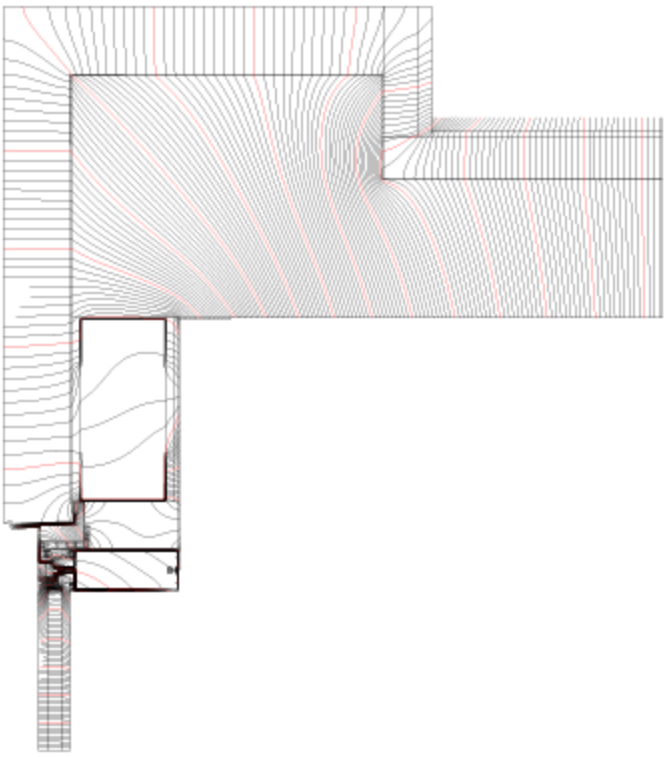
(This analysis was conducted by Façade Creations using Flixo software to verify the thermal performance of the curtain wall head assembly.)

Thermal Gradient Diagram

Material Thermal Conductivity Diagram



Heat Flux Diagram



Dew-point isotherm diagram - original diagram page retained in the PDF; omitted here).
Shows the dew-line at **6.01 °C** (equivalent to the project 40% RH condition

Condensation risk analysis.

Floor slab interface detail – 1 1406 (1408 similar)

• Analysis sheet.

Finite-element analysis undertaken using **Flixo v8.1** for **Façade Creations** (values taken directly from your supplied file). The floor-slab junction was modelled to evaluate surface condensation risk where the curtain-wall frame meets the concrete slab.

Design conditions used:

- External air temperature = **−5 °C**.
- Internal air temperature = **20 °C**.
- Internal relative humidity (nominal) = **40 %**.
- Resulting dew-point temperature = **6.01 °C**.

condensation example curtain wa…

Model result (summary):

- Minimum internal surface temperature adjacent to slab (θsi min) = **13.07 °C**.
- Temperature factor fRsi (frame) = **0.723**; fRsi at absorbent finish = **0.825** (where applicable).
- Equivalent RH at which surface condensation would begin ≈ **64 %**.

Conclusion: Under the examined conditions the slab-interface detail remains safely above the dew-point and no surface condensation is predicted, assuming insulation continuity and site workmanship match the model.

Condensation Analysis Sheet - Floor slab interface detail – 1 1406 (1408 similar)

Specification: Internal = **20 °C**, External = **−5 °C**.
Model outputs (Façade Creations / Flixo v8.1):

- θsi min = **13.07 °C**.
- fRsi = **0.723** (absorbent surface fRsi = **0.825**).

Calculation (summary):

- Es @ 20 °C = **2.337 kPa**.
- Es @ 13.07 °C ≈ **1.499 kPa**.
- RH threshold = (1.499 / 2.337) × 100 ≈ **64 %**.

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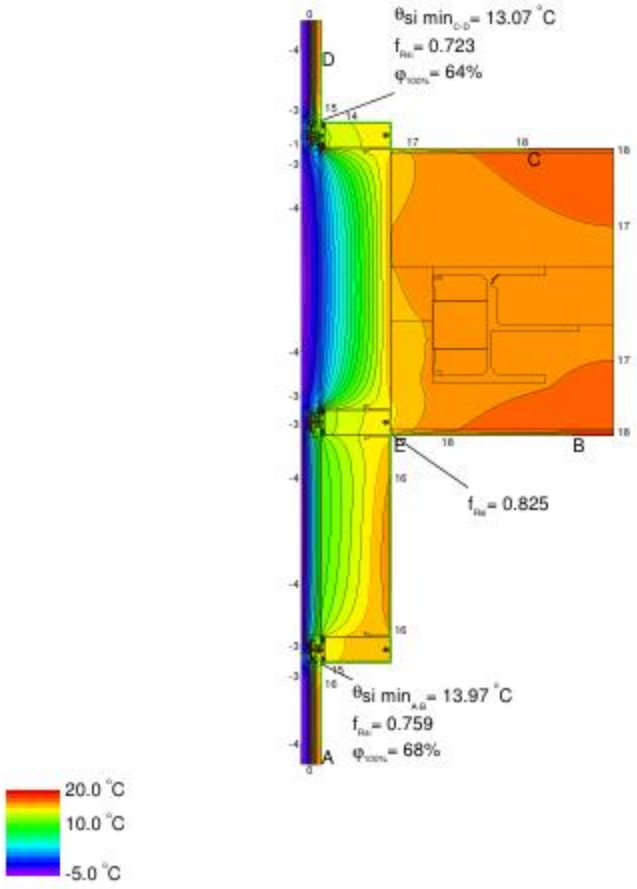
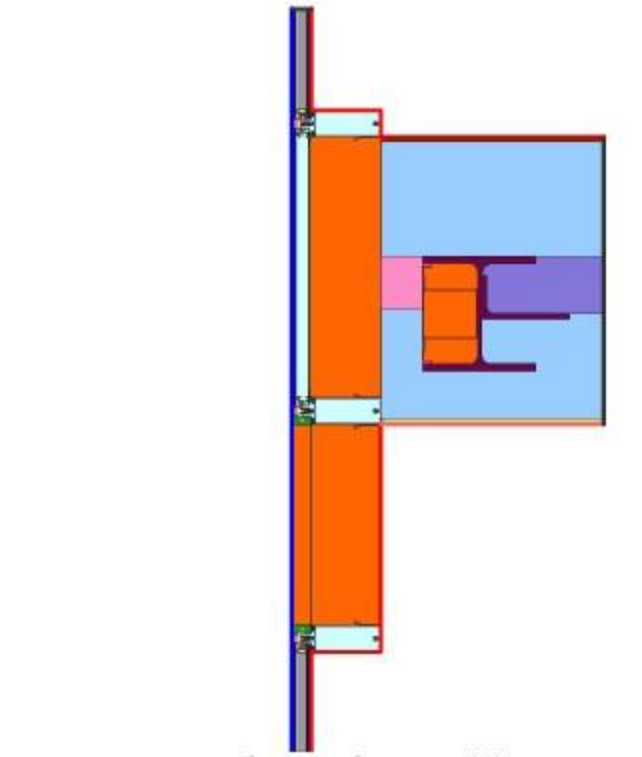
Notes / recommendations:

- Ensure continuous insulation at the slab edge and correct installation of thermal isolators to preserve modeled performance.
- The higher fRsi at absorbent finishes (0.825) indicates low mold risk for lining materials; the contractor should still verify on-site continuity of the liner and sealant.

Thermal Gradient Diagram



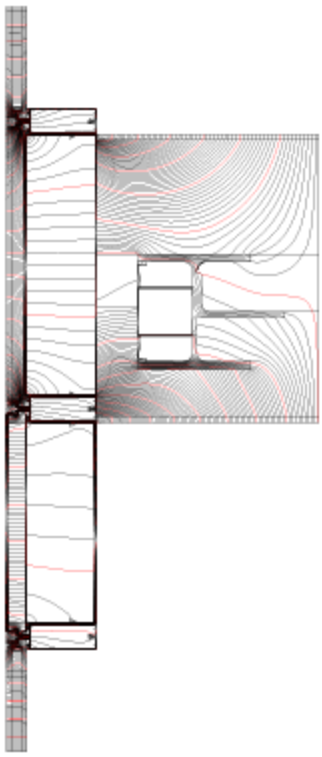
Material Thermal Conductivity Diagram



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				

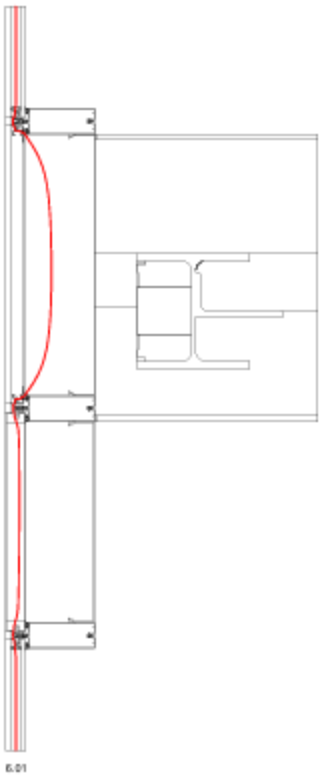
Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy	160.000	0.900	100000000.000
Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	
Aluminium alloy / Foam, 3D equivalent R 25-250(1)	16.045	0.900	
Aluminium alloy / Foam, 3D equivalent 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

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.
Finite-element analysis (Flixo v8.1) completed for **Façade Creations**.

Design conditions: External = **−5 °C**; Internal = **20 °C**; Internal RH = **40 %**; dew-point = **6.01 °C**.

Model summary:

- θsi min = **14.11 °C**.
- fRsi = **0.764**.
- Equivalent RH at condensation ≈ **69 %**.

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Conclusion & note: The cill detail is thermally robust with a healthy margin above the dew-point. Maintain sealant and liner continuity at the base and ensure drainage paths are unobstructed.

Condensation Analysis Sheet - Cill detail – 1 1412 (1405, 1410, 1417 similar)

Specification details

- Internal temperature = **20 °C**
- External temperature = **−5 °C**

Model outputs (Façade Creations / Flixo v8.1):

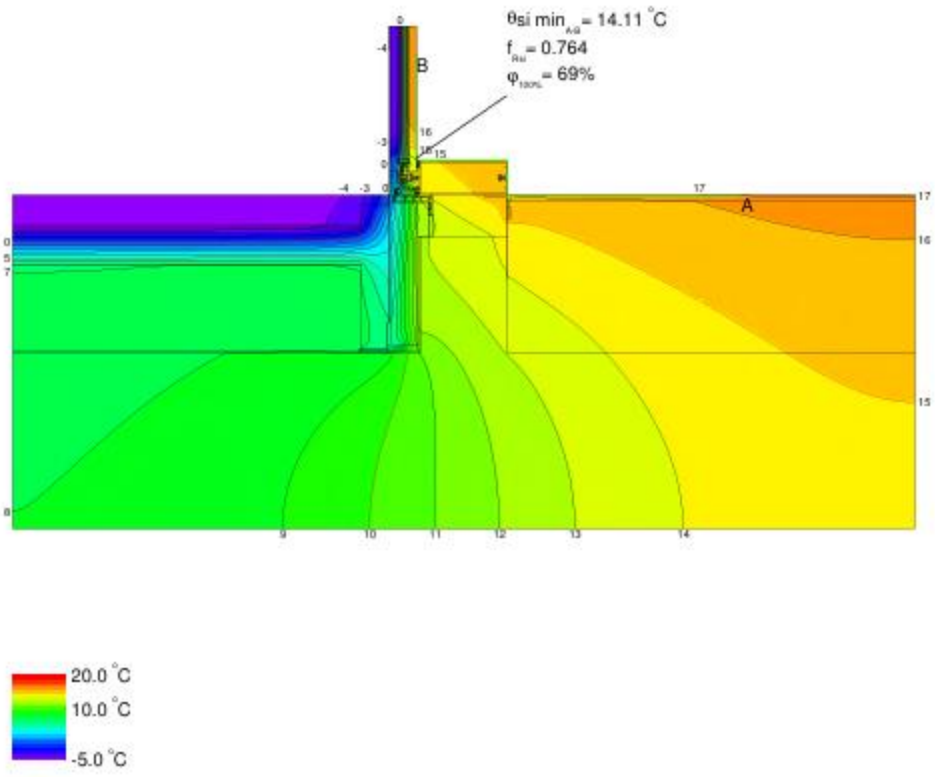
- Minimum internal surface temperature (θsi min) = **14.11 °C**
- Temperature factor (fRsi) = **0.764**

Calculation summary:

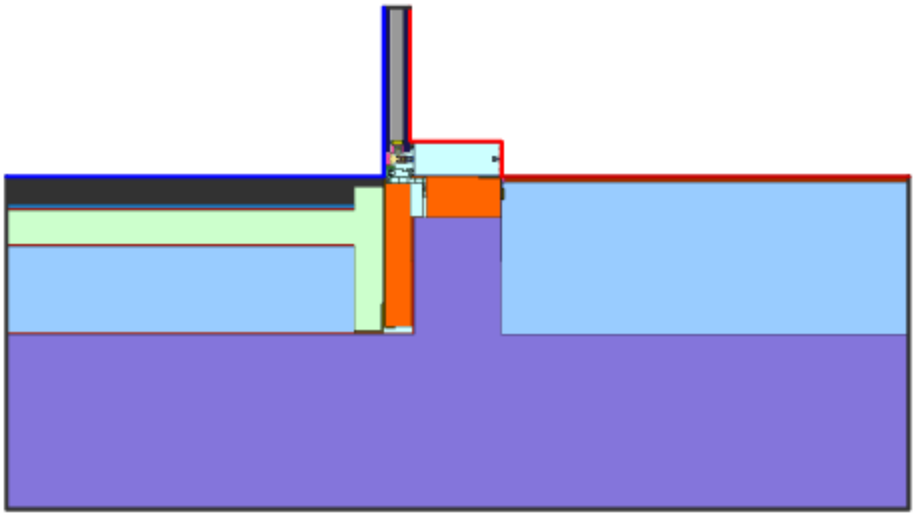
- Es @ 20 ℃ = **2.337 kPa**
- Es @ 14.11 °C = **1.608 kPa**
- Relative humidity threshold = (1.608 / 2.337) × 100 = **69 %**

Conclusion:
The cill interface exhibits excellent thermal continuity and a large temperature margin above the dew-point.
No surface condensation is anticipated under standard occupancy levels.
For site conditions with elevated RH, ensure backer rods and sealants are properly installed to maintain thermal integrity.

Thermal Gradient Diagram



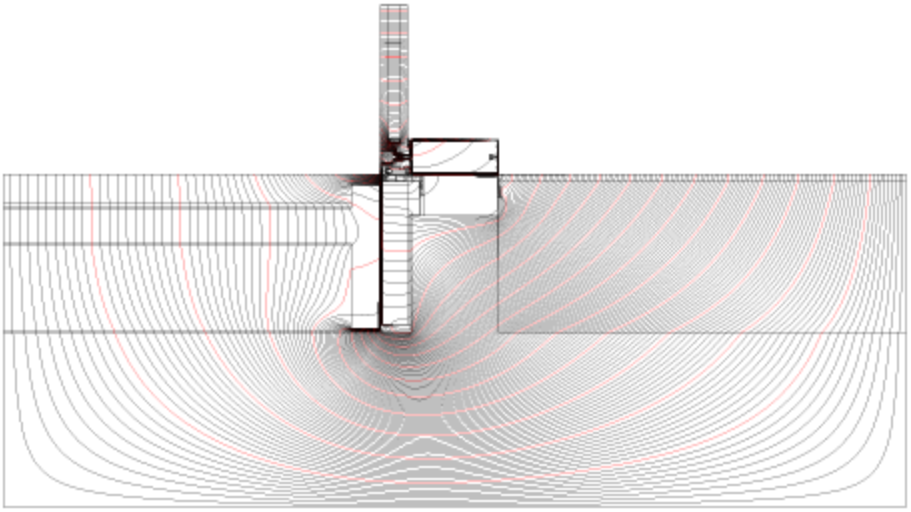
Material Thermal Conductivity Diagram



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				

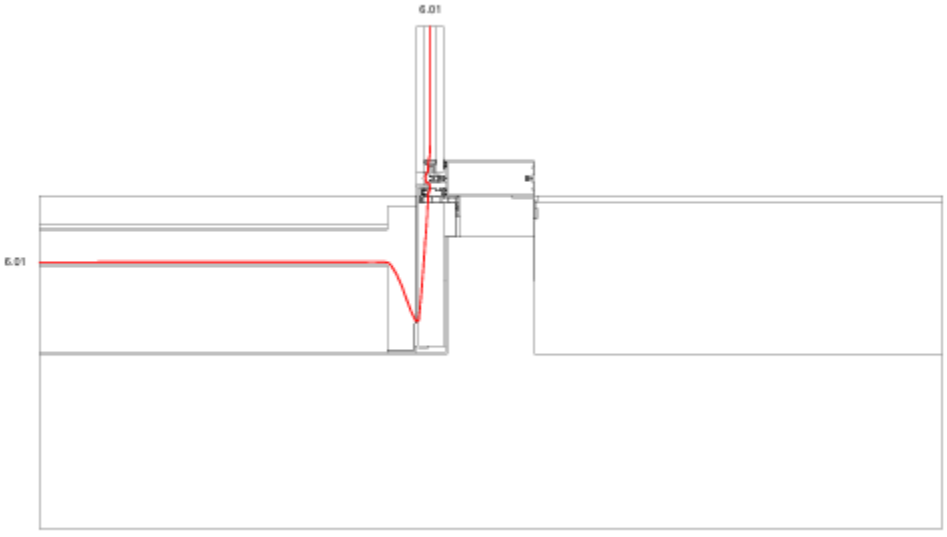
Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy	160.000	0.900	10000000.000
Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250	16.225	0.900	
Aluminium alloy / Unventilated 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	
Gedämmstoff(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	

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.

Finite-element analysis undertaken using **Flixo v8.1** for **Façade Creations**.

Design conditions used:

- External air temperature = **−5 °C**
- Internal air temperature = **20 °C**
- Internal relative humidity = **40 %**
- Dew-point temperature = **6.01 °C**

Results summary:

- Minimum surface temperature (θsi min) = **11.83 °C**
- Temperature factor (fRsi) = **0.673**
- Equivalent RH at condensation threshold = **59 %**

Interpretation:
Door thresholds remain safely above dew-point level. Localized condensation could only occur if indoor humidity exceeds 59 % or if drainage openings are blocked.
Ensure gasket compression and sill drainage are maintained to prevent vapor build-up under cold conditions.

Condensation Analysis Sheet - Door threshold detail – 1 1414 (1401, 1402 similar)

Specification details

- Internal temperature = **20 °C**
- External temperature = **−5 °C**

Model outputs (Façade Creations / Flixo v8.1):

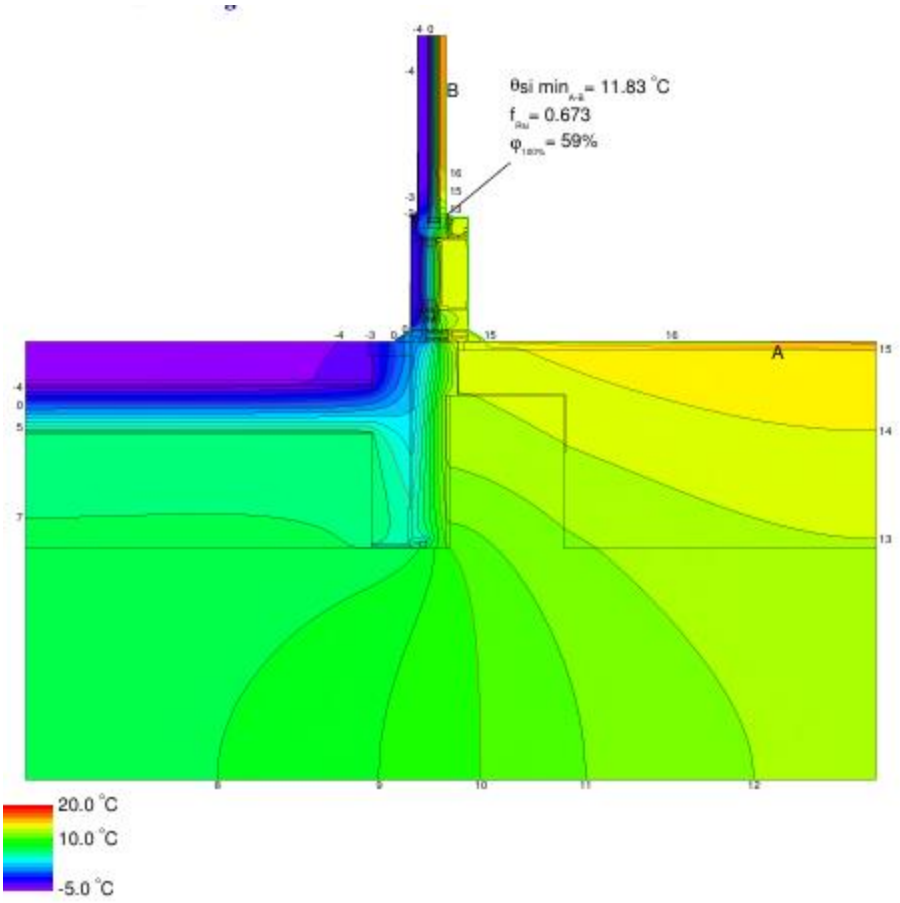
- Cold point (θsi min) = **11.83 °C**
- fRsi = **0.673**

Calculation summary:

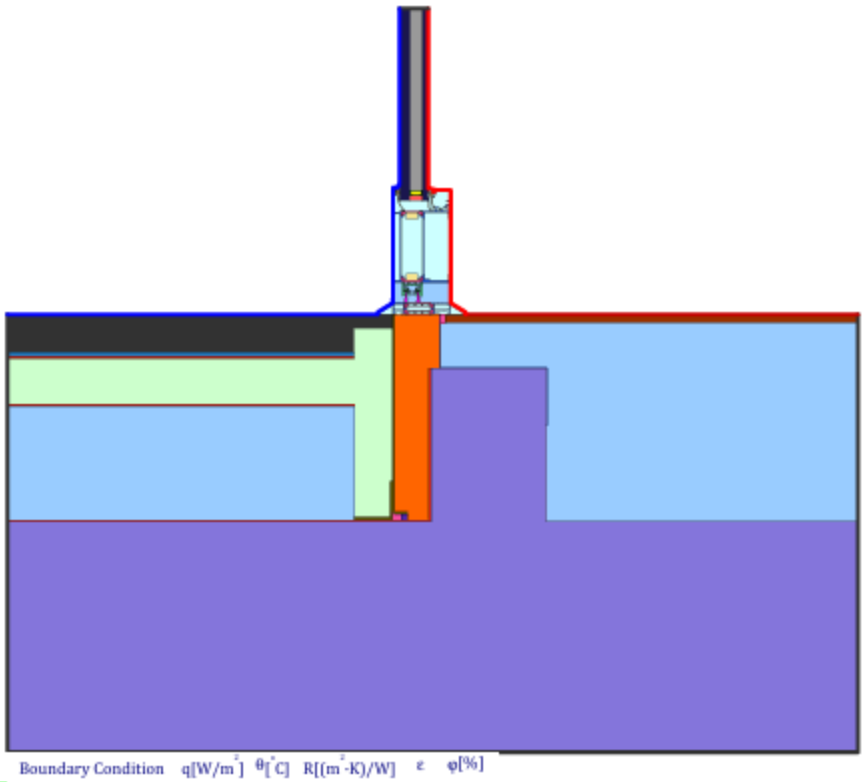
- Es @ 20 °C = **2.337 kPa**
- Es @ 11.83 °C = **1.375 kPa**
- RH threshold = (1.375 / 2.337) × 100 = **59 %**

Conclusion:
No condensation expected under design conditions.
Regular inspection of sealant lines and sub-sill drainage recommended to maintain long-term thermal performance.

Thermal Gradient Diagram



Material Thermal Conductivity Diagram

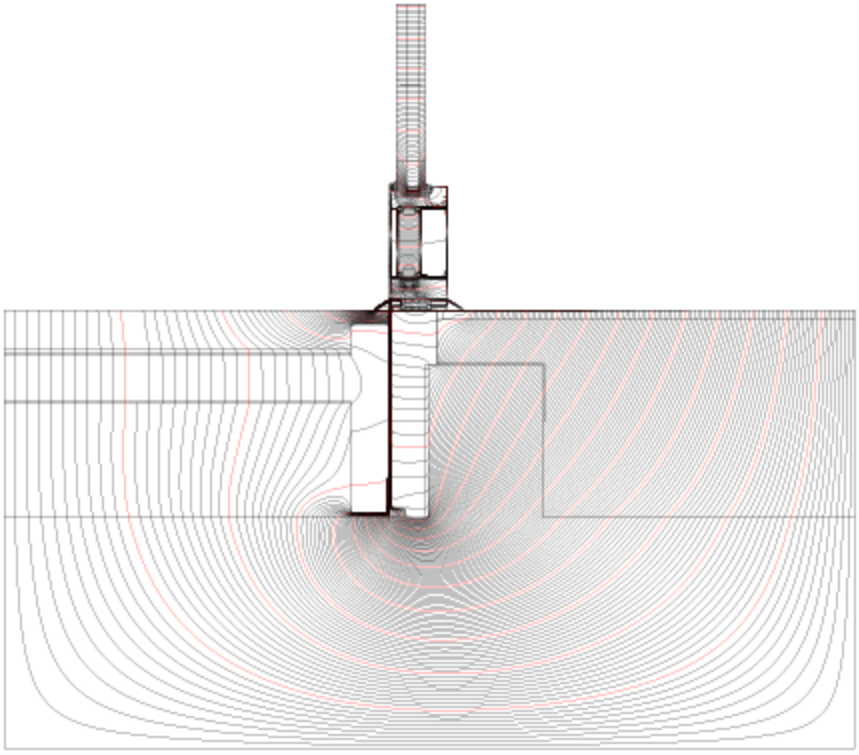


Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, downwards, 20 deg		20.000	0.170		
Interior, normal, 20 deg		20.000	0.130		
Symmetry/Model section	0.000				

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	
Gasfilit(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	
RWS	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	

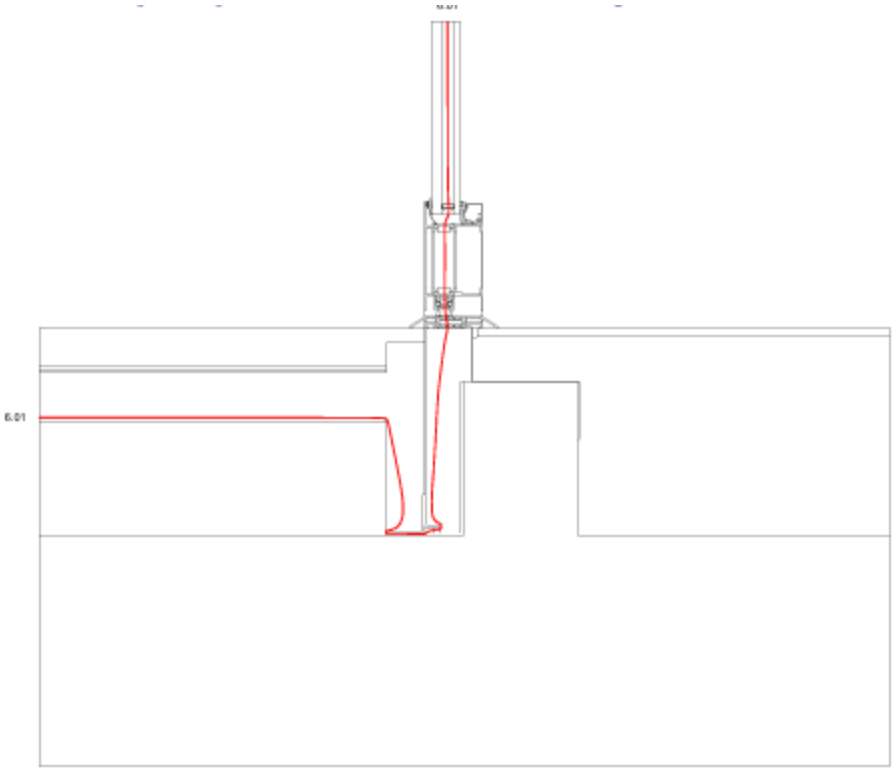
* EN ISO 10077-2:2017, 6.4.3/anisotrop

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.

Finite-element analysis conducted using **Flixo v8.1** for **Façade Creations**.

Design conditions used:

- External air temperature = **−5 °C**
- Internal air temperature = **20 °C**
- Internal relative humidity = **40 %**
- Dew-point temperature = **6.01 °C**

Results summary:

- θsi min = **13.97 °C**
- fRsi = **0.759**
- Equivalent RH threshold = **68 %**

Conclusion:
The glass-zone mullion demonstrates excellent thermal behavior with stable temperature

gradients across the interface.
Condensation is not expected; ensure internal seals remain airtight to maintain modeled performance.

Condensation Analysis Sheet - Mullion (Glass Zone) – 1 1425

Specification details

- Internal = **20 °C**
- External = **−5 °C**

Model results (Façade Creations):

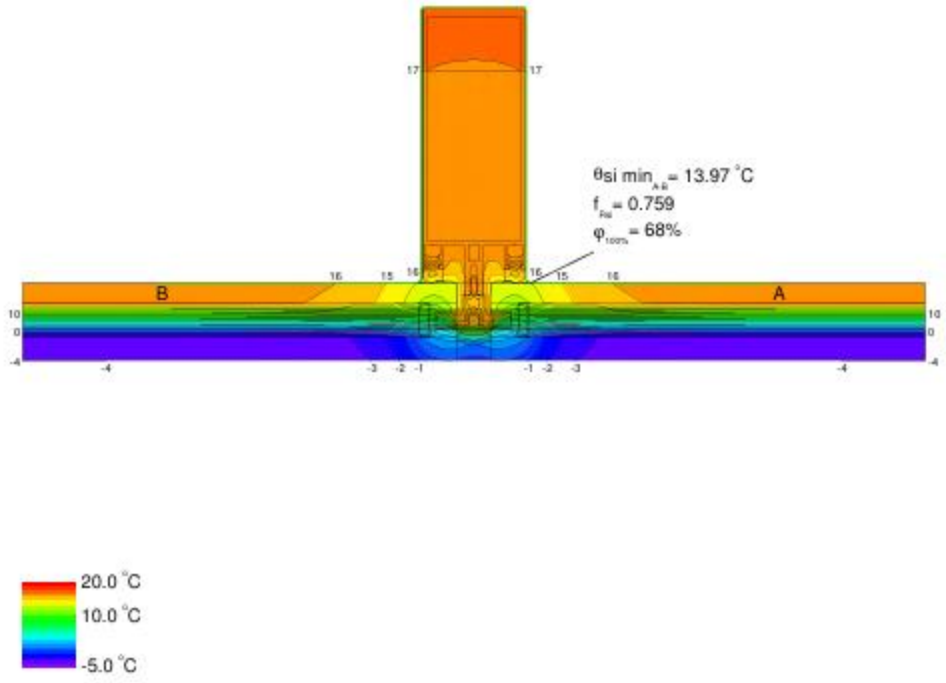
- θsi min = **13.97 °C**
- fRsi = **0.759**

Calculation summary:

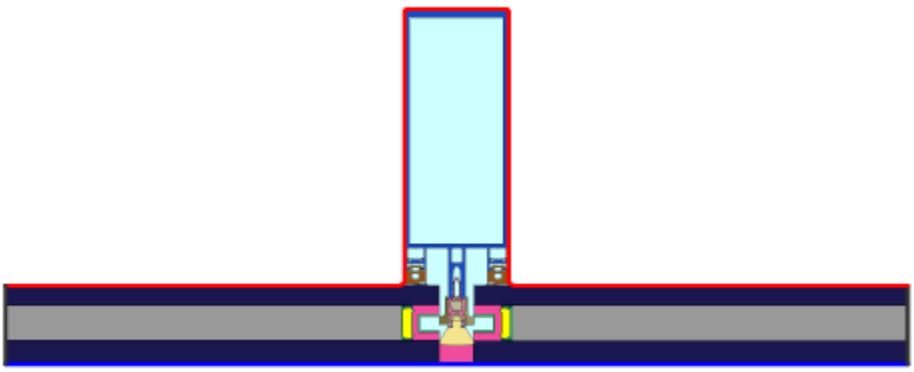
- Es @ 20 °C = **2.337 kPa**
- Es @ 13.97 °C = **1.592 kPa**
- RH threshold = (1.592 / 2.337) × 100 = **68 %**

Interpretation:
No condensation risk identified.
The mullion assembly offers consistent thermal resistance and meets façade performance requirements.

Thermal Gradient Diagram



Material Thermal Conductivity Diagram

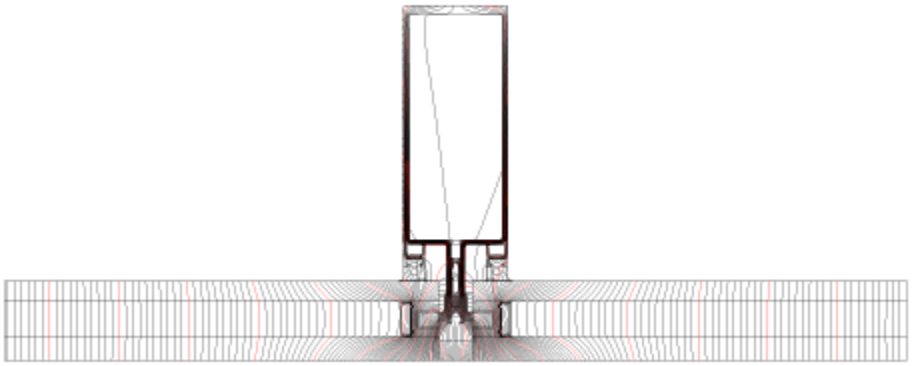


Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, normal, 20 deg		20.000	0.130		
Symmetry/Model section	0.000				

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	
Gasfilm(1)	0.025	0.900	1.000
Gasfilm(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

Condensation risk analysis.

Mullion (Facet Glass Zone) – 1 1424

• Analysis sheet.

Finite-element analysis undertaken using **Flixo v8.1** for **Façade Creations**.

Design conditions used:

- External temperature = **−5 °C**
- Internal temperature = **20 °C**
- Internal RH = **40 %**
- Dew-point = **6.01 °C**

Results summary:

- Minimum internal surface temperature (θsi min) = **12.84 °C**
- Temperature factor (fRsi) = **0.714**
- Equivalent RH at condensation threshold = **63 %**

Conclusion:
The facet glazing introduces slightly higher heat flux due to its angular geometry, but the calculated surface temperature remains above the dew-point.
No condensation is expected unless the internal RH rises above 63 %.

Condensation Analysis Sheet - Mullion (Facet Glass Zone) – 1 1424

Specification details

- Internal temperature = **20 °C**
- External temperature = **−5 °C**

Model outputs (Façade Creations / Flixo v8.1):

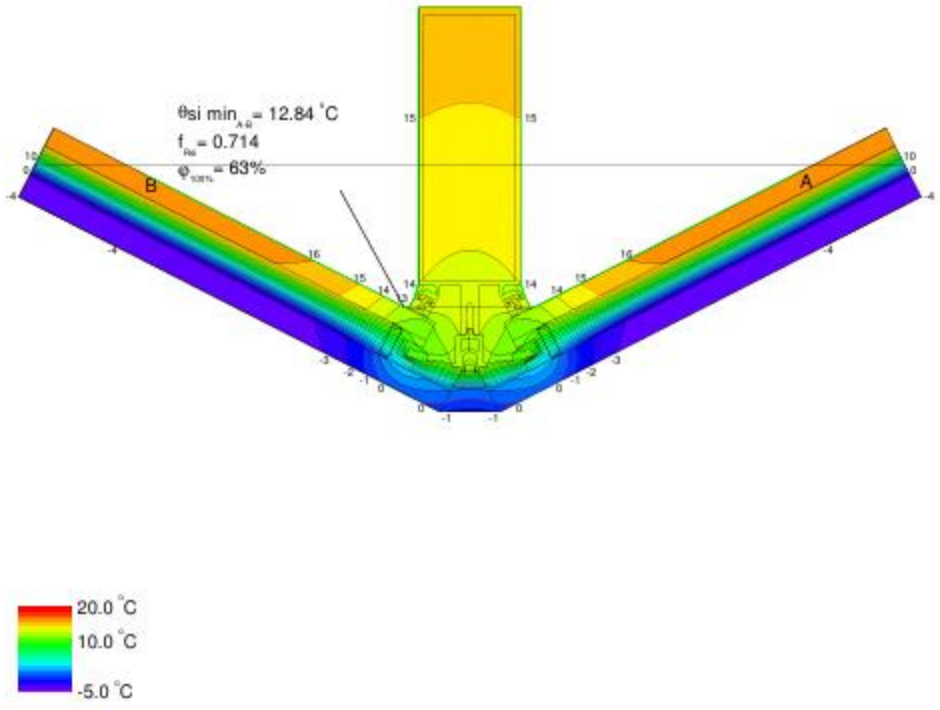
- Coldest surface temperature (θsi min) = **12.84 °C**
- fRsi = **0.714**

Calculation summary:

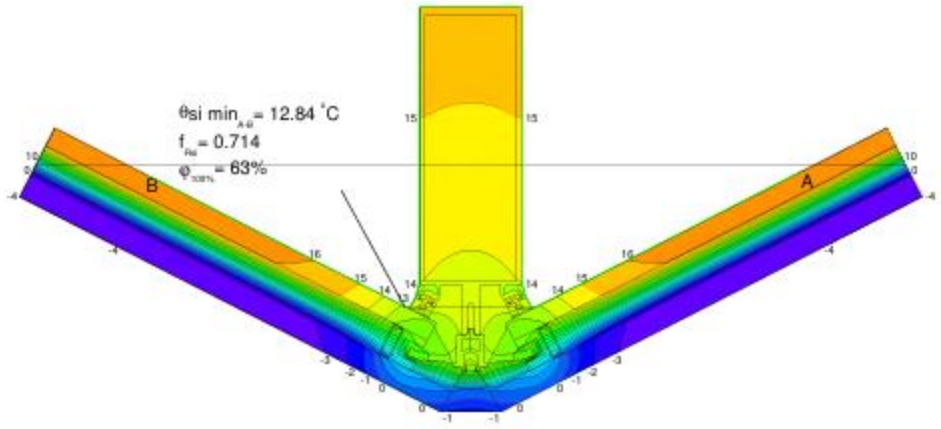
- Es @ 20 °C = **2.337 kPa**
- Es @ 12.84 °C = **1.473 kPa**
- RH threshold = (1.473 / 2.337) × 100 = **63 %**

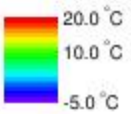
Interpretation:
Condensation risk is low.
Air-seal continuity at mullion caps should be verified on-site to match simulated conditions.

Thermal Gradient Diagram



Material Thermal Conductivity Diagram



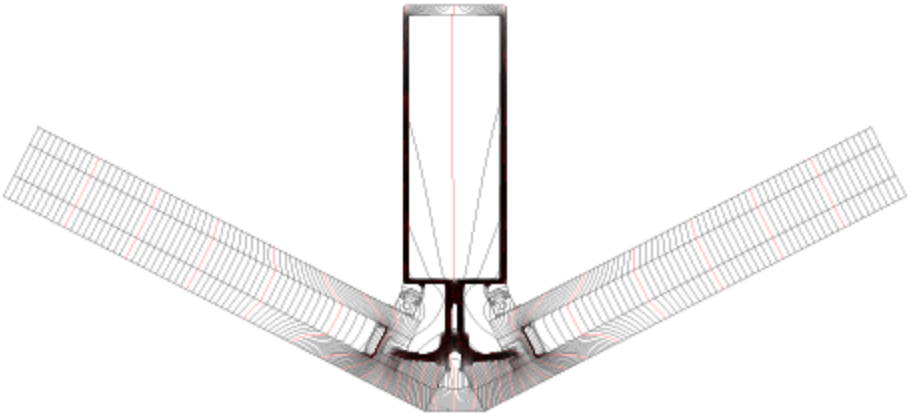


Boundary Condition	q[W/m²]	θ[°C]	R[(m²-K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, normal, 20 deg		20.000	0.130		
Symmetry/Model section	0.000				

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	
Gasfilin(7)	0.025	0.900	1.000
Gasfilin(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

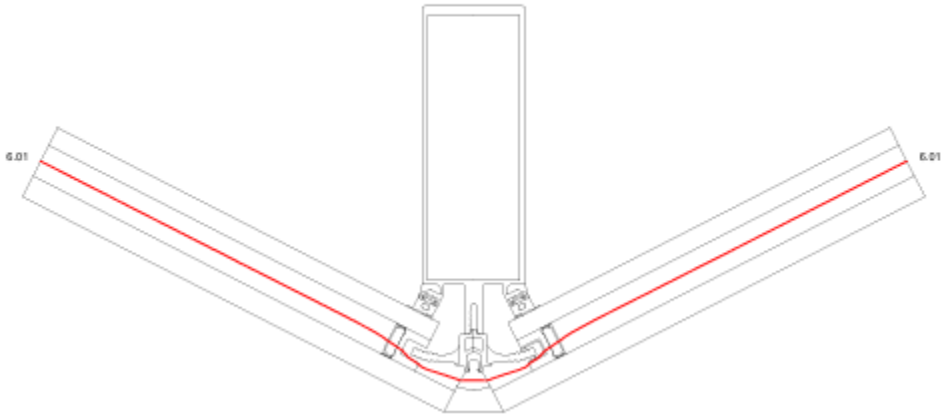
* EN ISO 10077-2:2017, 6.4.3/anisotrop

Heat Flux Diagram



Dew point isotherm disgram

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



Condensation risk analysis.

Mullion (Panel Zone) – 1 1442

• Analysis sheet.

Finite-element analysis undertaken by **Façade Creations** using **Flixo v8.1**.

Design conditions used:

- External air temperature = **−5 °C**
- Internal air temperature = **20 °C**
- Internal RH = **40 %**
- Dew-point = **6.01 °C**

Results summary:

- Minimum surface temperature (θsi min) = **15.52 °C**
- Temperature factor (fRsi) = **0.821**
- Equivalent RH at condensation threshold = **75 %**

Interpretation:
This detail demonstrates excellent thermal behavior, the highest fRsi among all mullions tested. Condensation is not expected, even under humid conditions up to 75 % RH.

Condensation Analysis Sheet - Mullion (Panel Zone) – 1 1442

Specification details

- Internal = **20 °C**
- External = **−5 °C**

Model outputs (Façade Creations / Flixo v8.1):

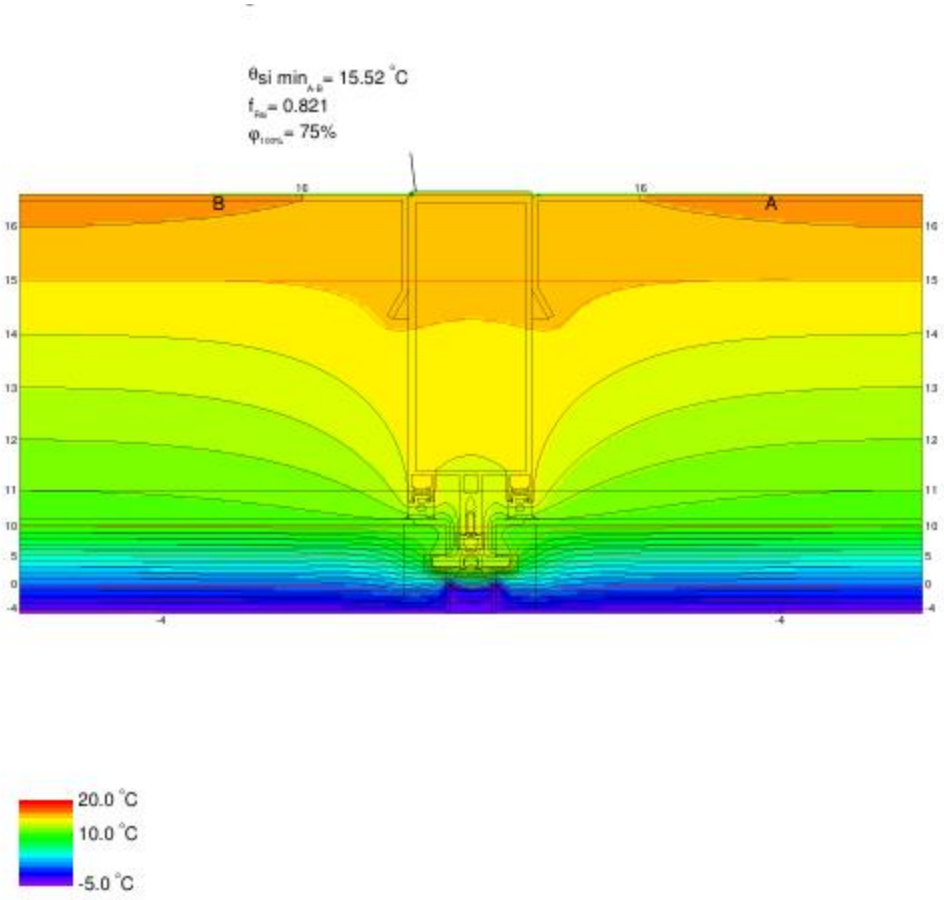
- θsi min = **15.52 °C**
- fRsi = **0.821**

Calculation summary:

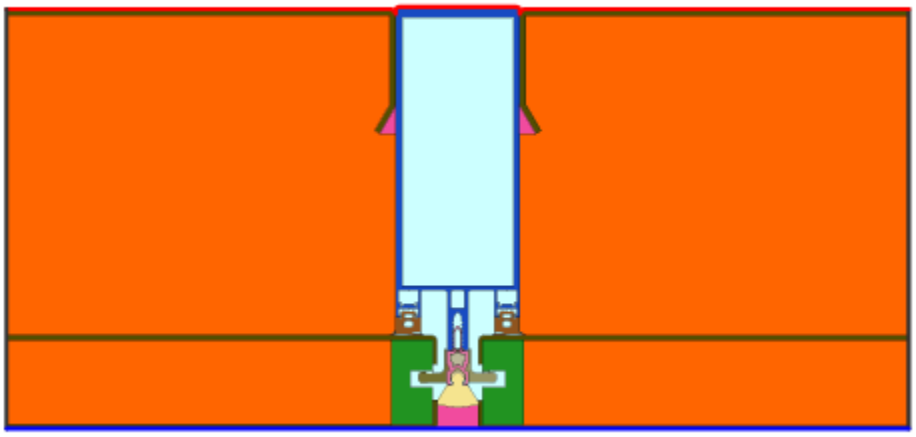
- Es @ 20 °C = **2.337 kPa**
- Es @ 15.52 °C = **1.745 kPa**
- RH threshold = (1.745 / 2.337) × 100 = **75 %**

Conclusion:
No risk of condensation.
The panel-zone mullion offers the most stable surface temperatures across the curtain wall system

Thermal Gradient Diagram



Material Thermal Conductivity Diagram

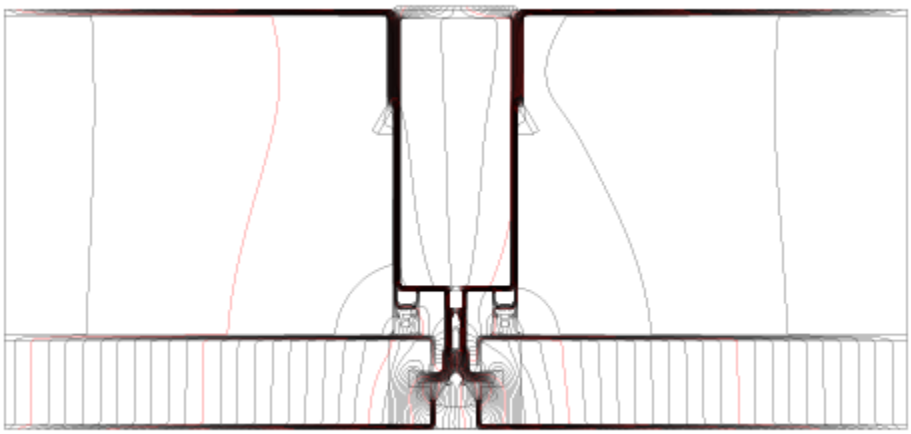


Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, normal, 20 deg		20.000	0.130		
Symmetry/Model section	0.000				

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	10000000.000
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

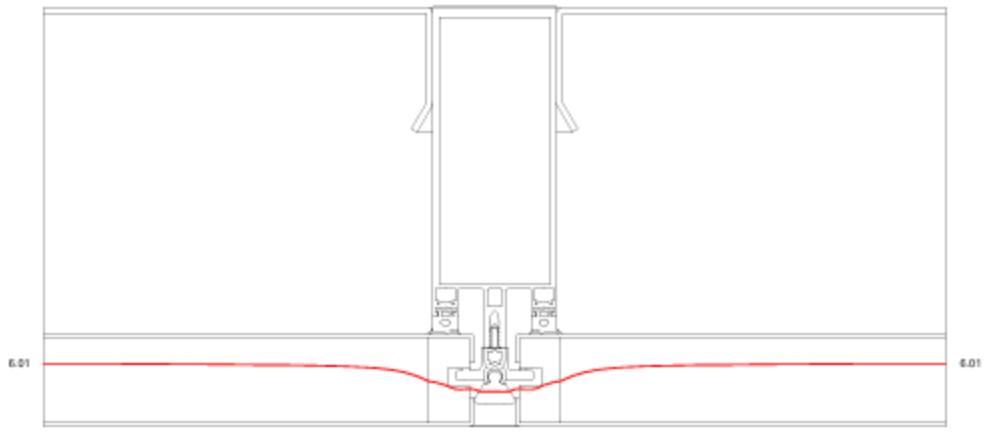
* EN ISO 10077-2:2017, 6.4.3/anisotrop

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.

Condensation Analysis Sheet - Mullion (door jamb) – 1 1426

Specification details

- Internal temperature = **20 °C**
- External temperature = **−5 °C**

Model outputs (Façade Creations / Flixo v8.1)

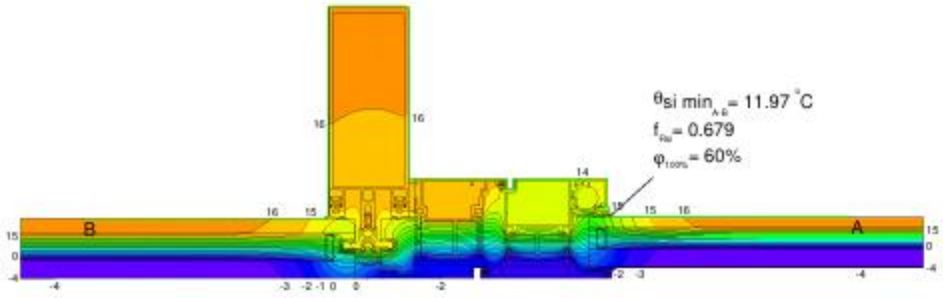
- Cold point (θsi min) = **11.97 °C**
- (Vapour pressure at 11.97 °C = **1.400 kPa**, from model output)

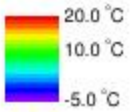
Calculation (step-by-step)

- Es @ 20.00 °C = **2.337 kPa**.
- Vapour pressure at θsi = **1.400 kPa**.
- RH threshold = (1.400 / 2.337) × 100 = **59.9059 % ≈ 60 %**.

Conclusion:
Surface condensation at the mullion (door jamb) location will not occur under the adopted design conditions (20 °C / −5 °C) provided internal relative humidity remains below **~60 %**. Verify on-site that perimeter insulation and gasket continuity are installed as modeled to preserve this performance.

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				

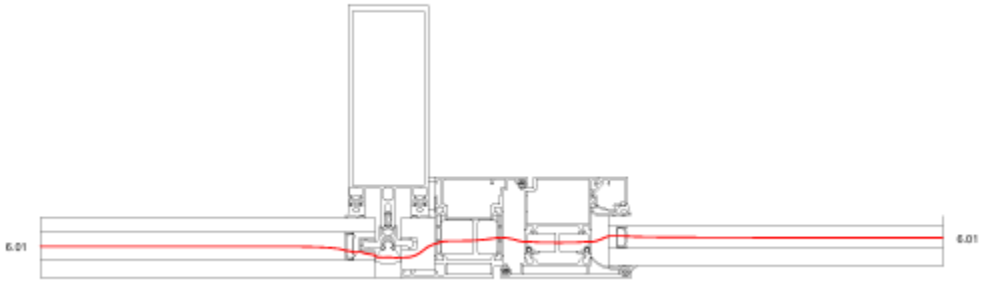
Material	λ[W/(m·K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	
Aluminium alloy / Polyamid (nylon), 3D equivalent R 25-250	16.225	0.900	
Aluminium alloy / Unventilated air cavity, 3D equivalent R1 25-250	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	
Gasfilm(1)	0.025	0.900	1.000
Gasfilm(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 (retained).
• Material thermal conductivity diagram (retained).
• Heat flux diagram (retained).
• Dew point isotherm diagram (retained).

Finite-element analysis undertaken using **Flixo v8.1** for **Façade Creations**. The internal corner connection was assessed to determine minimum internal surface temperature and the RH at which surface condensation could form.

(Values and diagrams taken from the supplied PDF.)

condensation example curtain wa…

Condensation Analysis - Int corner (1 1427)

Design conditions used:

- External air temperature = **−5 °C**
- Internal air temperature = **20 °C**
- Internal nominal RH = **40 %**
- Dew-point (for 40 % RH / 20 °C) = **6.01 °C**.

  condensation example curtain wa…

Model outputs (Façade Creations / Flixo v8.1):

- Cold point (θsi min) = **14.73 °C**.
- fRsi = (reported) **0.789** (see results table).

  condensation example curtain wa…

Calculation (step-by-step):

- Es @ 20.00 °C = **2.337 kPa** (BS 5250:2002 Table A.1).
- Vapour pressure at 14.73 °C = **1.675 kPa** (value taken from model / table).
- RH threshold = (1.675 / 2.337) × 100 = **71.66 % ≈ 72 %**.

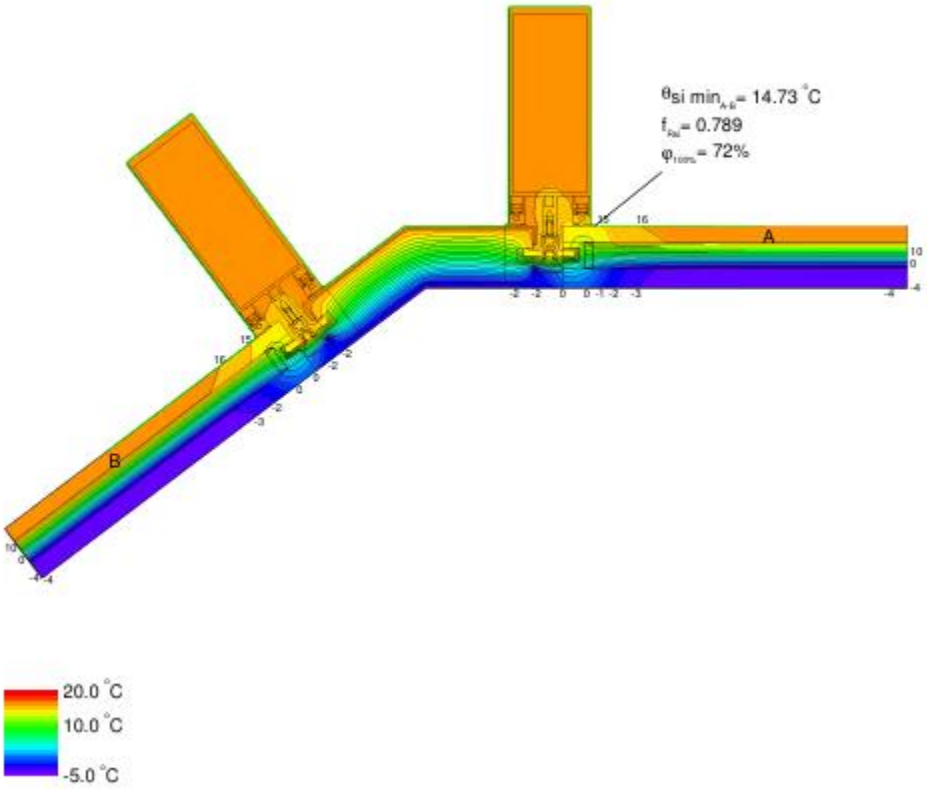
Conclusion:
At the analysed conditions the internal corner remains well above the dew-point. Surface condensation will not occur provided interior RH remains below **~72 %**. Maintain joint sealing and insulation continuity at the corner to preserve this performance.

Condensation Analysis Sheet - Int corner (1 1427)

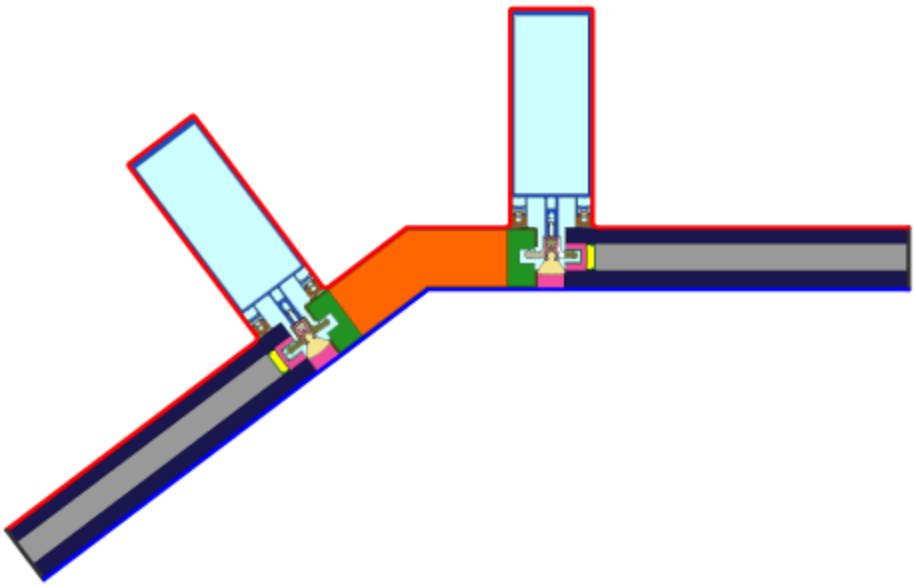
Specification details: Internal = **20 °C**, External = **−5 °C**.
Model outputs (Façade Creations / Flixo): θsi min = **14.73 °C**; Equivalent RH threshold ≈ **72 %**.

Notes / Recommendations: Ensure perimeter fixings, sealants and insulating packers are installed as per design drawings to prevent localized air paths that would reduce the effective surface temperature.

Thermal Gradient Diagram



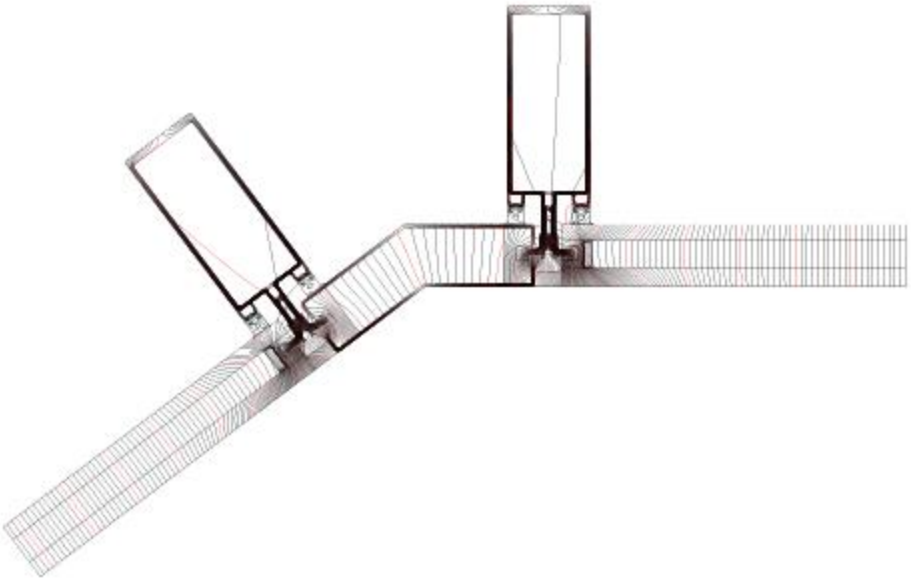
Material Thermal Conductivity Diagram



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				

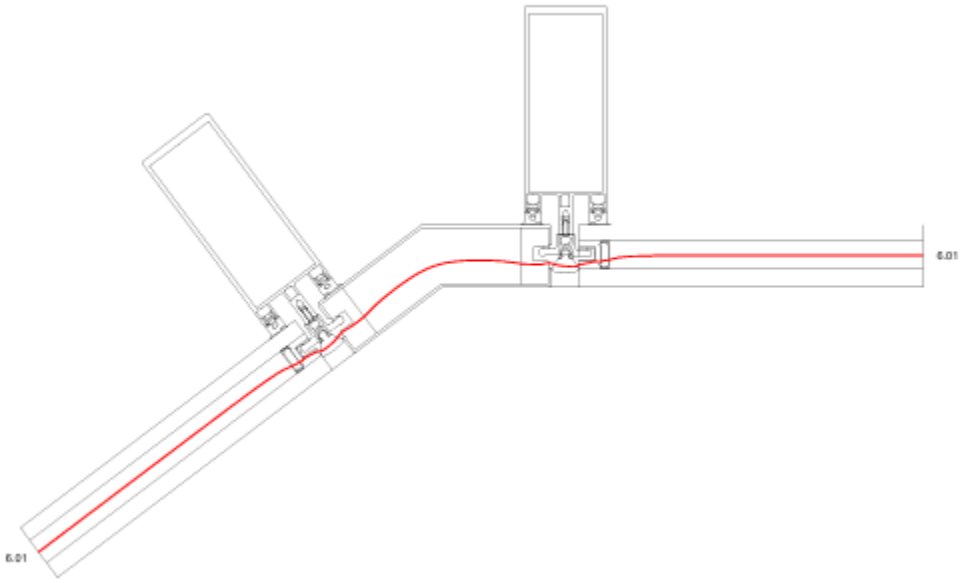
Material	λ[W/(m-K)]	ε	μ[-]
Aluminium (Si Alloys)	160.000	0.300	
Aluminium (Si Alloys)	160.000	0.900	
Aluminium alloy	160.000	0.900	100000000.000
Aluminium alloy / Foam, 3D equivalent R 25-250	16.045	0.900	
Aluminium alloy / Foam, 3D equivalent R 25-250(1)	16.045	0.900	
Aluminium alloy / Polyamid (nylon), 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	16.058	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	
Gasfilin(1)	0.025	0.900	1.000
Gasfilin(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	

Heat Flux Diagram



Dew point isotherm disgram

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



Condensation risk analysis.

Ext corner – 1 1429

• Analysis sheet.
• Temperature gradient diagram (retained).
• Material thermal conductivity diagram (retained).
• Heat flux diagram (retained).
• Dew point isotherm diagram (retained).

Finite-element analysis undertaken using **Flixo v8.1** for **Façade Creations**. This exterior corner was modelled to check lowest surface temperatures and condensation threshold.

condensation example curtain wa…

Condensation Analysis - Ext corner (1 1429)

Design conditions used:

- External air temperature = **−5 °C**
- Internal air temperature = **20 °C**
- Internal nominal RH = **40 %**
- Dew-point = **6.01 °C**.

  condensation example curtain wa…

Model outputs (Façade Creations / Flixo v8.1):

- Cold point (θsi min) = **14.71 °C**.
- Reported equivalent RH threshold = **72 %**.

Calculation (step-by-step):

- Es @ 20.00 °C = **2.337 kPa**.
- Vapour pressure at 14.71 °C ≈ **1.673 kPa** (from model / table).
- RH threshold = (1.673 / 2.337) × 100 = **71.57 % ≈ 72 %**.

Conclusion:
The external corner detail shows a strong margin above dew-point. No surface condensation is expected under the analysed conditions so long as the internal RH remains below **~72 %**. Maintain correct sealing and flashing at the external corner to avoid moisture ingress paths.

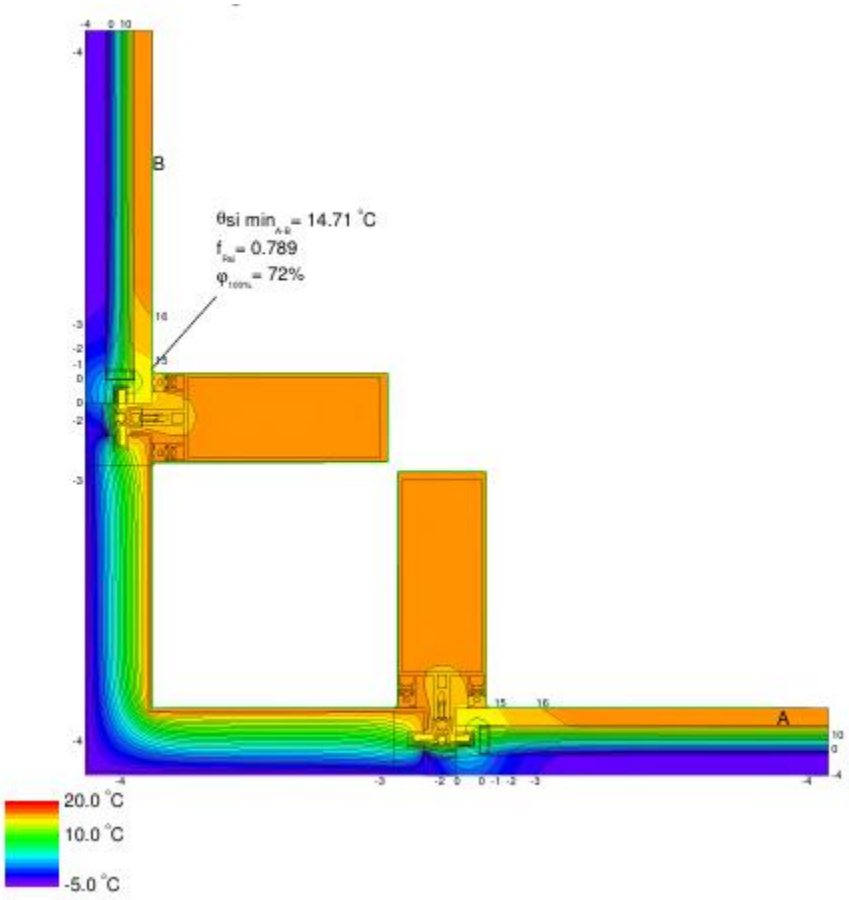
condensation example curtain wa…

Condensation Analysis Sheet - Ext corner (1 1429)

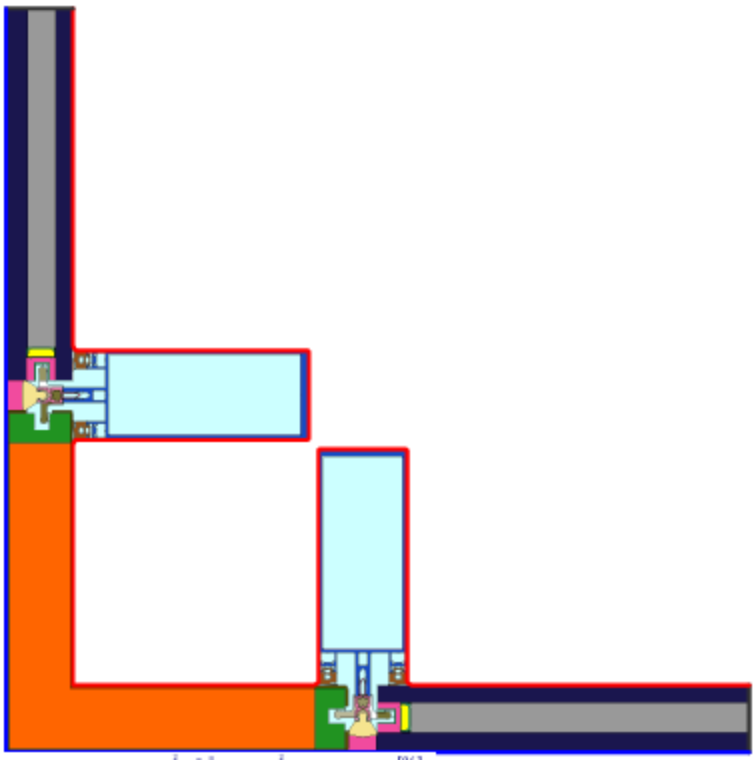
Specification details: Internal = **20 °C**, External = **−5 °C**.
Model outputs (Façade Creations / Flixo): θsi min = **14.71 °C**; Equivalent RH threshold ≈ **72 %**.

Notes: Verify cavity drainage and ensure cladding interface does not shelter moisture against the frame - correct detailing maintains the modeled thermal margin.

Thermal Gradient Diagram



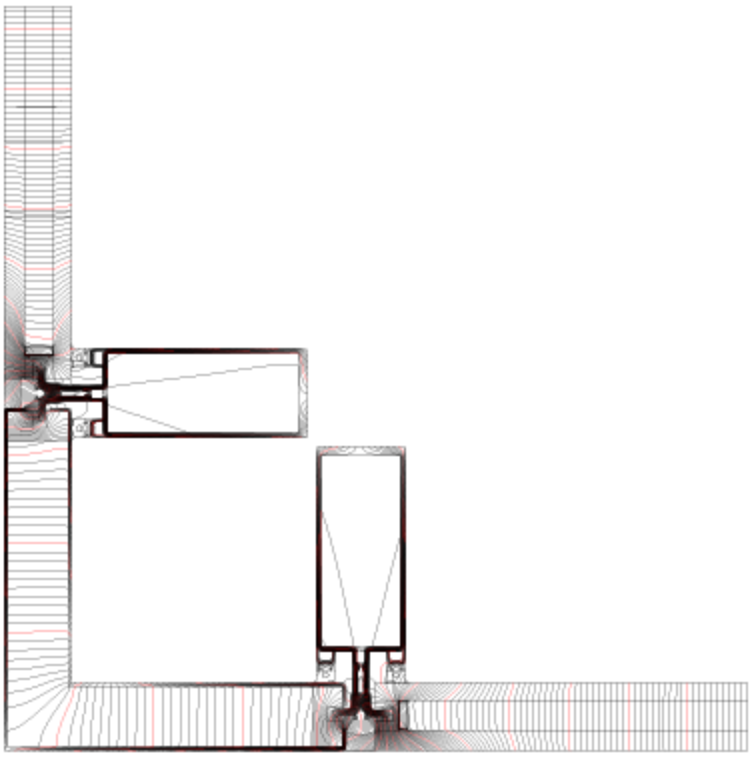
Material Thermal Conductivity Diagram



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				

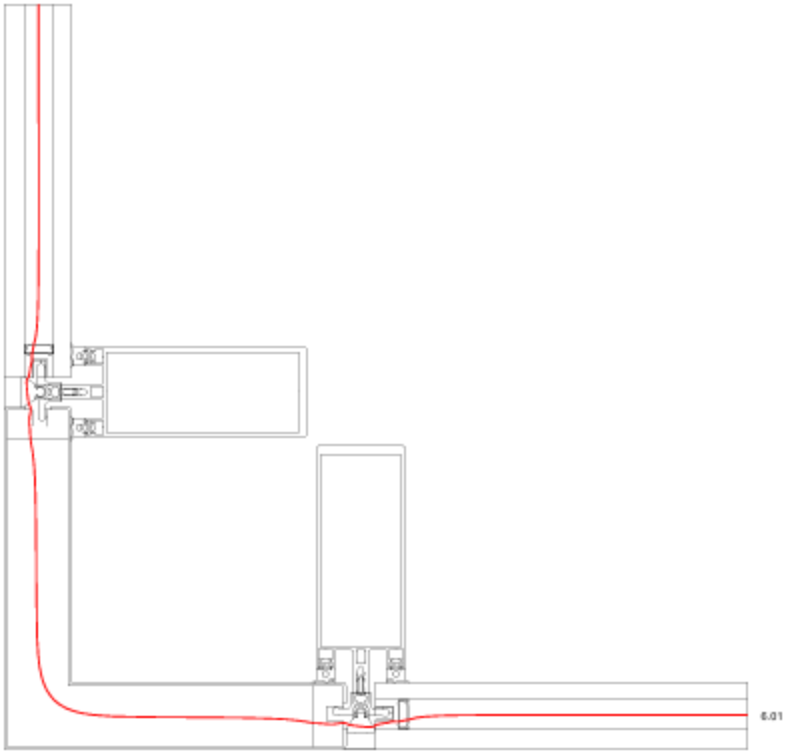
Material	λ[W/(m-K)]	ε	μ[-]	
Aluminium (Si Alloys)	160.000	0.300		
Aluminium (Si Alloys)	160.000	0.900		
Aluminium alloy	160.000	0.900	100000000.000	
Aluminium alloy / Foam, 3D equivalent R 25-250(1)	16.045	0.900		
Aluminium alloy / Foam, 3D equivalent R 25-250(2)	16.045	0.900		
Aluminium alloy / Polyamid (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		
Gasfilm(2)	0.025	0.900	1.000	
Gasfilm(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		

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 for **Façade Creations**.

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 °C**
- Internal air temperature = **20 °C**
- Internal Relative Humidity = **40 %**
- Calculated dew point temperature = **6.01 °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 example curtain wa…

Condensation Analysis Sheet.
Detail: Jamb 1 1428

Specification details

- Internal temperature = **20 °C**
- External temperature = **−5 °C**

Data from Façade of detail (Using FLIXO ver.8.1)

- **"Cold" point = 11.83 °C**

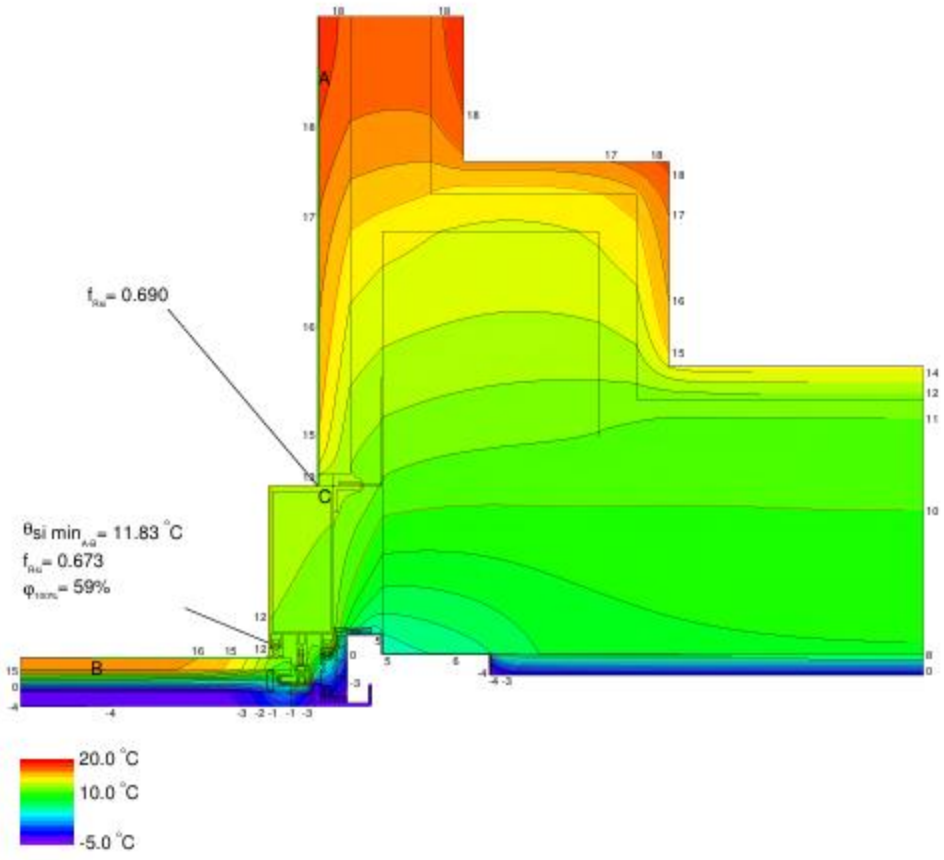
Comments
By calculation and assessing **11.83 °C** at the saturation point there is **no predicted risk of condensation** when the internal Relative Humidity is below **59 %**.

Calculations
From BS 5250:2002 Table A.1

- Saturated vapour pressure (Es) at 20.00 °C = **2.337 kPa**.
- From Façade the internal cold point was shown to be **11.83 °C**.
- Substituting this temperature into the table gives a vapour pressure of **1.386 kPa**.

Relative humidity threshold = (1.386 / 2.337) × 100 = **59 %**.

Thermal Gradient Diagram



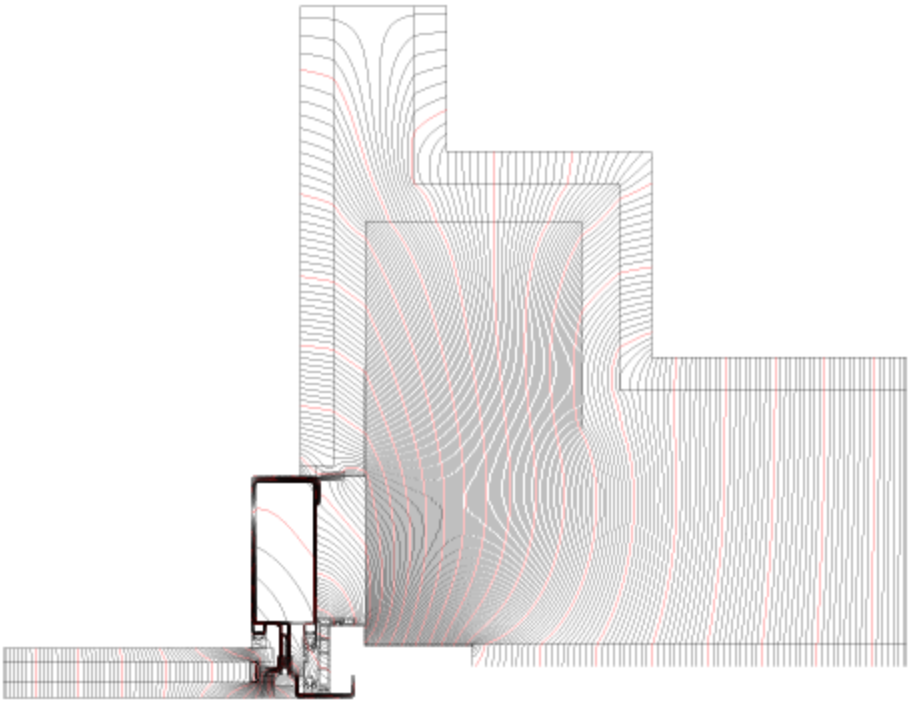
Material Thermal Conductivity Diagram

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	
Gasfilm(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

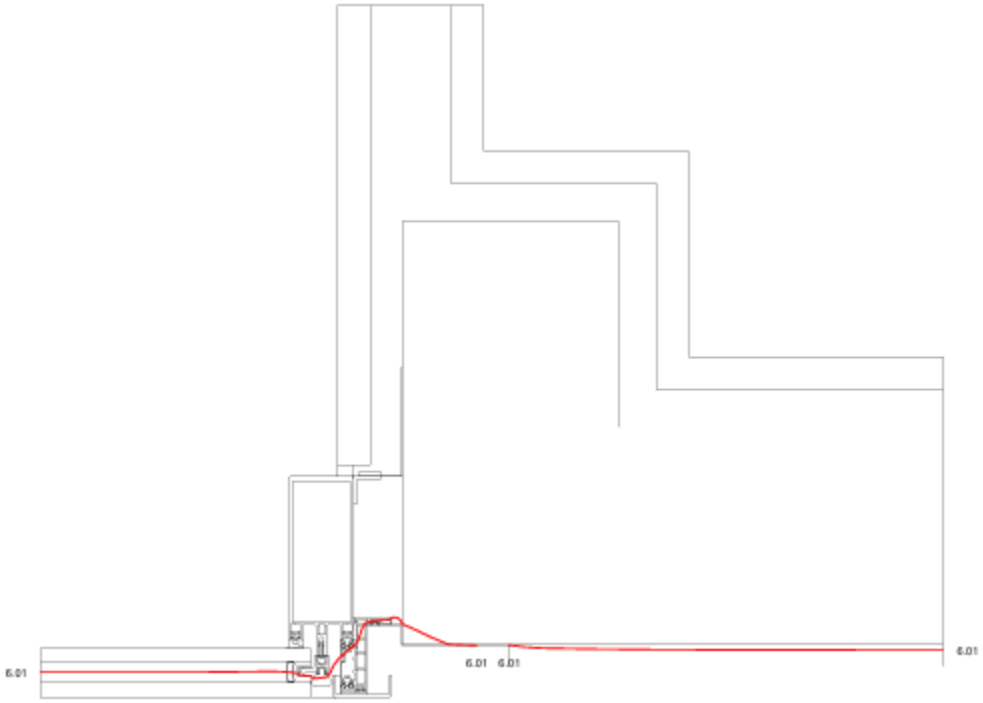
* EN ISO 10077-2:2017, 6.4.3/anisotrop

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 for **Façade Creations**.

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

Conditions assessed are taken from the project specification:

- External air temperature = −5 °C
- Internal air temperature = 20 °C
- Internal Relative Humidity = 40 %
- Calculated dew-point temperature = 6.01 °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 °C
- External temperature = −5 °C

Data from Façade of detail (Using FLIXO ver. 8.1)

- "Cold" point = **14.66 °C**

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

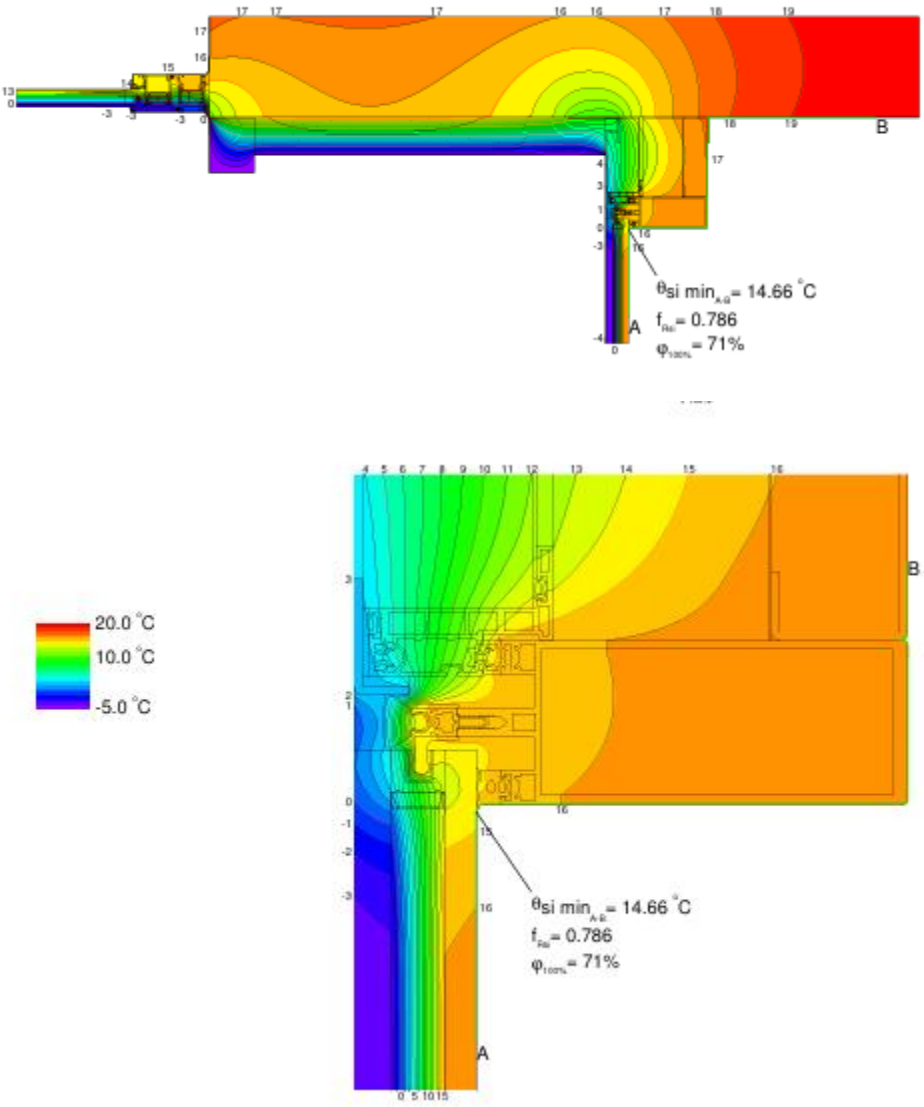
Calculations
From BS 5250:2002 Table A.1:

- Saturated vapour pressure (Es) at 20 °C = **2.337 kPa**
- From Façade the internal cold point was shown to be **14.66 °C**

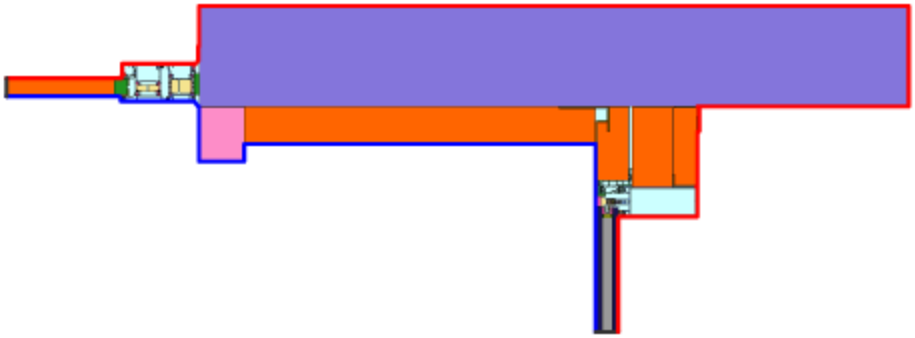
- Substituting this temperature into the table gives a vapour pressure of **1.667 kPa**

Relative Humidity threshold = (1.667 / 2.337) × 100 = **71 %**

Thermal Gradient Diagram



Material Thermal Conductivity Diagram

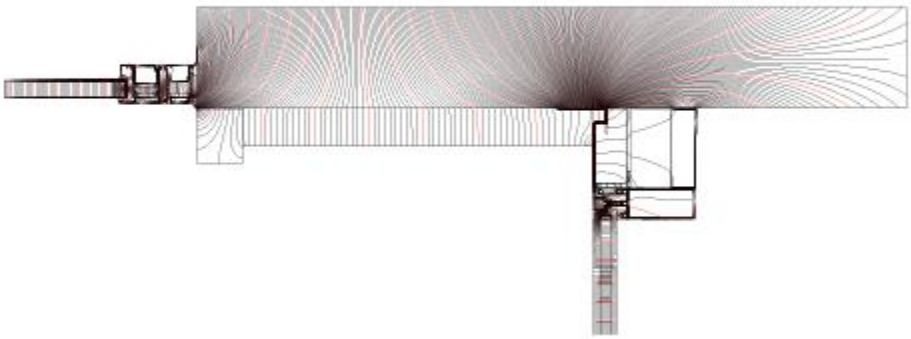


Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Epsilon 0.3				0.300	
Epsilon 0.9				0.900	
Exterior, -5		-5.000	0.040		
Interior, normal, 20 deg		20.000	0.130		
Symmetry/Model section	0.000				

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	
Gasfilm(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	
RWS	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