[redacted]

From: [redacted]
Sent: 12 November 2020 11:08
To: [redacted]
Subject: FW: Insulation technical query

[redacted],

Thank you for your enquiry. Please see details below for K18 and TP10.

Kooltherm K18

The Core

The core of *Kingspan* **Kool**therm® K18 Insulated Plasterboard is a premium performance fibre–free rigid thermoset phenolic insulant manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).

Fibre-free Core

Thermapitch TP10

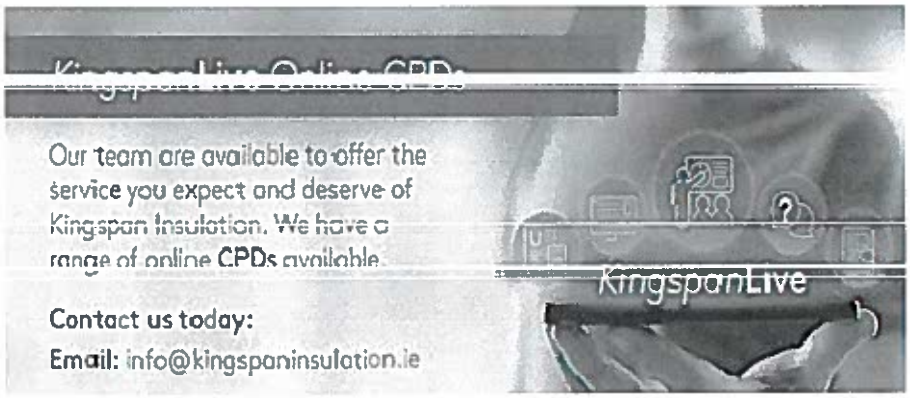
The Core

The core of *Kingspan* **Thermapitch®** TP10 is manufactured with **Nil*flam*®** technology, a high performance rigid thermoset polyisocyanurate (PIR) insulant manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP) and low Global Warming Potential (GWP).

nil flam

zero O.D.P

[redacted]
Technical Advisor – IRL



Kingspan Insulation Limited
Bree Industrial Estate | Castleblayney | Co. Monaghan | A75 X966 | Ireland
T: +353 42 9795000
E: info@kingspaninsulation.ie
www.kingspaninsulation.ie

From: [redacted]
Sent: 10 November 2020 10:50
To: technical.ie@insulation.kingspan.com <technical@kingspaninsulation.ie>
Subject: FW: Insulation technical query

[redacted]
Reception – Kingspan Insulation IRL
T: +353 42 975 4234 |

From: [redacted]
Sent: 10 November 2020 10:40
To: info.ie@insulation.kingspan.com <info@kingspaninsulation.ie>
Subject: Insulation technical query

Hi,

Is the insulation on your **K18 kingspan Insulated plasterboard** a phenolic foam?

Is your TP10 Kingspan insulation a PUR or PIR insulation?

Thanks

[redacted]

[redacted]
Property Services Division
Construction & Procurement Delivery
Ground Floor | Clare House | 303 Airport Road West | Belfast | BT3 9ED
Contact: ✉ [redacted]@finance-ni.gov.uk | ☎ **Tel:** [redacted]

[redacted]

From: Technical Services Enquiries <technical@kingspaninsulation.co.uk>
Sent: 15 June 2017 11:16
To: [redacted]
Subject: TR26 Roof Covering Compatibility
Attachments: Thermaroof-TR26-LPC-FM-pdf.pdf; Thermaroof-TR27-LPC-FM-pdf.pdf

Good Morning [redacted]

Thank you for your enquiry.

Thermaroof TR26 is not the recommended insulation board for a felt roof build-up due to the low emissivity foil facing on both sides which cannot be bonded or adhered to. For this application we would recommend the Thermaroof TR27 insulation board which has a glass tissue facing on both sides which allows adhesion such as with a felt roof build-up.

I have attached the full literature for both products which gives additional guidance on their recommended usage.

I hope this has been of assistance.

Kind regards,

[redacted]

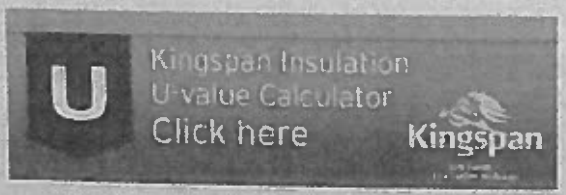
Trainee Technical Advisor

Kingspan Insulation Ltd.

Direct tel: +44 (0) [redacted]

Kingspan

Kingspan Insulation Limited
Pembridge, Leominster, Herefordshire, HR6 9LA, UK
www.kingspaninsulation.co.uk



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fax: +44 (0) 1544 388 888
www.kingspaninsulation.co.uk

[redacted]

From: [redacted]
Sent: 07 October 2015 09:09
To: [redacted]
Cc:
Subject: FW: Stormount Cottages
Attachments: 2U12A571CC.PDF

[redacted] detailed calculation attached.
Loads as below.
Can we proceed for costs
Thanks
[redacted]

From: [redacted]@kingspan.com]
Sent: 05 October 2015 16:26
To: [redacted]
Cc: [redacted]
Subject: Stormount Cottages

[redacted]

Please find calculation as discussed.

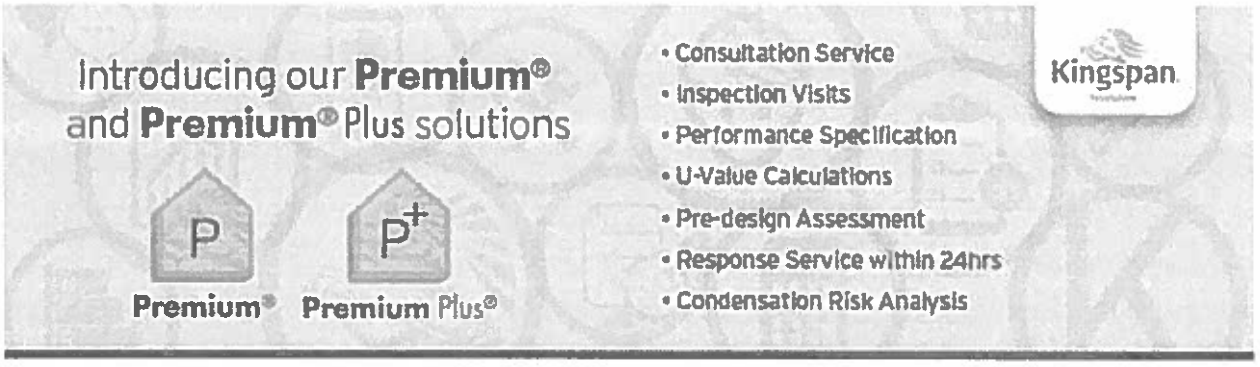
2U12A571CC – 90mm K7 between rafters at 400mm centres & 50mm K7 fixed to the underside of the rafters achieves a U-value of 0.18 W/m²K

90mm K7 weighs 3.47kg/m²
50mm K7 weighs 1.93kg/m²

Should you require any further information, please do not hesitate to contact me.

Regards
[redacted]
Technical Advisor

Direct Tel: [redacted]
Direct Fax: [redacted]



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Kingspan
Kingspan Insulation Ltd

Client : Properties Division - Ryan McIlroy
Project ID : Stormount Cottages
Structure element : Pitched or mansard roof, ceiling at line of pitch
Description : Pitched Roof - Unvented
File reference : 2U12A571CC.FCF

Calculated 'U' value = 0.18W/m²K (Calculated in accordance with BS EN ISO 6946:2007)

Detail as per Client

Element Description	Element Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m²K/W)	Vapour Resistivity (MNs/gm)	Vapour Resistance (MNs/g)	Mean T (K)	Delta T (K)
Outside surface resistance	-	-	0.040	-	-	76.95	0.09
TILES / SLATES ON BATTENS ; PITCHED ROOF.	30.0	0.000	0.000	0.00	0.00	76.99	0.00
BREATHABLE MEMBRANE	0.5	-	0.006	-	0.20	77.00	0.01
KOOLTHERM K7 16.9% roof timber - 47mm @ 300mm ctrs + 1% for noggins + loft hatches (90.0mm)	90.0	0.020	4.500	-	100.00	82.12	0.23
KOOLTHERM K7	50.0	0.020	2.500	-	100.00	90.08	5.68
1000 GAUGE 0.25mm POLYTHENE VAPOUR CONTROL LAYER	0.3	-	0.001	-	500.00	92.92	0.00
CEILING AT LOWER LEVEL	12.5	0.000	0.000	0.00	0.00	92.92	0.00
Inside surface resistance	-	-	0.100	-	-	93.04	0.23

Detailed U-value Calculation Results

Kingspan
Kingspan Insulation Ltd

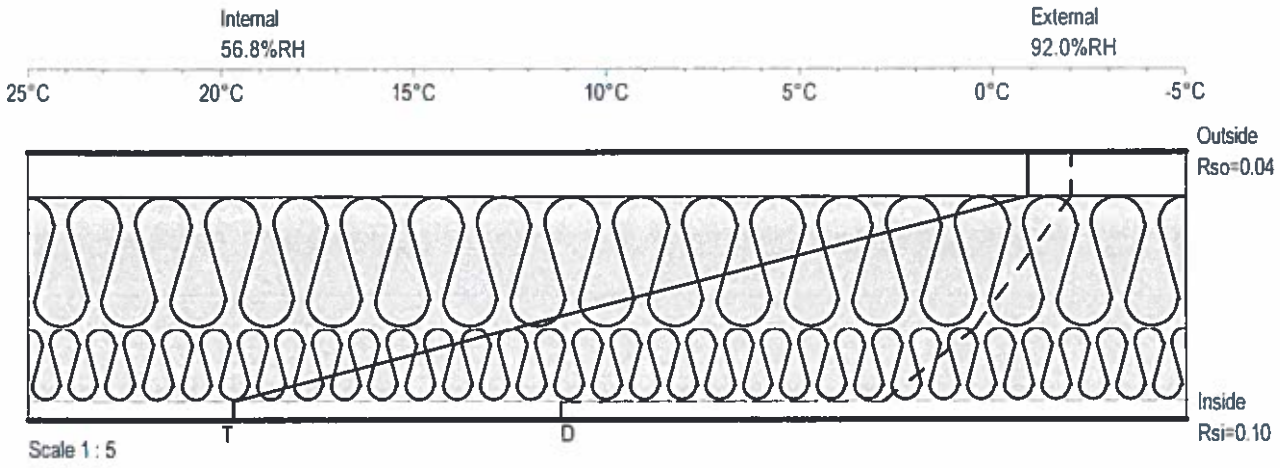
Client : Properties Division - Ryan McIlroy
Project ID : Stormount Cottages
Structure element : Pitched or mansard roof, ceiling at line of pitch
Description : Pitched Roof - Unvented
File reference : 2U12A571CC.FCF
Humidity Class: 3 - Dwellings with low occupancy
Location: Europe - Republic of Ireland - Dublin (Mean min)

Condensation calculations performed in accordance with BS 5250: 2011

Month	Int (°C)	Int (%RH)	Ext (°C)	Ext (%RH)	Prediction of mould growth	Prediction of surface condensation
Jan	20.0	56.8	-1.0	92.0	No	No
Feb	20.0	58.2	0.0	90.0	No	No
Mar	20.0	60.4	1.0	86.0	No	No
Apr	20.0	58.5	2.0	80.0	No	No
May	20.0	58.0	4.0	79.0	No	No
Jun	20.0	59.1	7.0	80.0	No	No
Jul	20.0	61.2	9.0	82.0	No	No
Aug	20.0	62.2	9.0	84.0	No	No
Sep	20.0	62.1	7.0	87.0	No	No
Oct	20.0	61.5	4.0	89.0	No	No
Nov	20.0	62.1	2.0	92.0	No	No
Dec	20.0	62.1	1.0	92.0	No	No

fRsi for mould growth = 0.982
fRsi,max for mould growth = 0.788
fRsi,max for surface condensation = 0.618
Gc = Monthly moisture accumulation per area at an interface
Ma = Accumulated moisture content per area at an interface

Peak accumulated moisture content per area at interface (Ma) = 0.00 Kg/m²
Annual moisture accumulation (Ma) = 0.00 Kg/m²



From: READCTED kingspan.com>
Sent: 16 December 2020 10:52
To: REDACTED@finance-ni.gov.uk>
Cc: KIL - CB Spec Team <CBSpecTeam@kingspan.com>
Subject: Ulster Folk & Transport museum - Changing places

REDACTED,

Thanks for your recent enquiry, see attached detailed u value calculations as requested.

REDACTED Technical Advisor – IRL
T: +353 42 975 4297

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U-Value Calculation and Condensation Risk Assesment

Project Information

Construction: Solid Ground Floor

Construction Type: Solid Ground Floor

File reference: 2-WA-201216-095546-535

Calculated U-value = $0.16 \mathrm{W/m^2K}$

Selected Build-Up

Description	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m²K/W)	Thermal Bridging	Vapour Resistivity (MNs/gm)	Vapour Resistance (MNs/g)	
Inside Surface			0.17				
SAND CEMENT SCREED	100	1.4	0.071		100	10	
POLYTHENE SEPARATION LAYER	0.5		0.001			500	
KOOLTHERM K3	100	0.02	5			45	
DAMP PROOF MEMBRANE	0.9		0.001			800	
CONCRETE 1:2:4 2000 kg/m³	150	1.4	0.107		100	15	
Ground			0.04				

Key: Bridged and fastened; Bridged; Fastened

Supporting Information

Product Details

For further information on the specified products e.g. literature or specification clauses, please follow the links below or scan the QR code to the right:

Kooltherm K3
www.kingspaninsulation.ie/k3

Detailed U-value

The calculation method is in accordance with BS EN ISO 6946:2017 / I.S. EN ISO 6946:2017. A simplified summary of the steps involved are shown below

$R\text{total}(R_{tot}) = R_{si} + R_1 + R_2 + \ldots + R_n + R_{se}$

For a construction containing inhomogeneous layers the upper and lower resistances of the construction must be used

$R_{tot;upper} = 1/((f_a/R_{tot;a}) + (f_b/R_{tot;b}) + \ldots + (f_q/R_{tot;q}))$
$R_j = 1/((f_a/R_{aj}) + (f_b/R_{bj}) + \ldots + (f_q/R_{qj}))$
$R_{tot;lower} = R_{si} + R_1 + R_2 + R_j + \ldots + R_n + R_{se}$

$R_{tot} = (R_{tot;upper} + R_{tot;lower})/2$
$= (5.391 + 5.391)/2$
$U = 1/R_{tot}$
$= 6.190$
$\Delta U = \Delta U_g + \Delta U_f + \Delta U_r$

ΔU_g correction for air voids - 0.000

ΔU_f correction for fasteners by approximate procedure - 0.000
(alpha 0.00 | fasteners per m² 0.00 | fasteners cross sectional area 0.00 | thermal conductivity of fasteners 0.00)

ΔU_f correction for fasteners by detailed calculation method (rainscreen cladding) – 0.000
(point thermal transmittance 0.00 | fasteners per m² 0.00)

ΔU_r correction for inverted roofs – 0.000
(precipitation 0.00 | f· x 0.00)

Total U-value (U_c) = $U + \Delta U$
If ΔU is less than 3% of U then the corrections need not be applied.

Calculations including a steel frame construction are calculated in accordance with BRE Digest 465.

Calculations for floor and basement constructions are calculated in accordance with BS EN ISO 13370:2017 / I.S. EN ISO 13370:2017.

Characteristics	Value	Characteristics	Value
Perimeter	13.800m	Area	19.600m²
P/A	0.704	Soil type	Sand or Gravel
Earth conductivity	2.000W/mK		

Condensation

Condensation calculations have been performed in accordance with I.S. EN ISO 13788:2012 and BS 5250:2011+A1:2016 and the risk assessed within environmental conditions with the following characteristics

Humidity class 4 - Dwellings with high occupancy, sport halls, kitchens, canteens; buildings heated with unflued gas heaters

Location: 7a Northern Ireland (East)

Condensation risk has been assessed up to and including Level 4 Humidity Class (4 - Dwellings with high occupancy, sport halls, kitchens, canteens; buildings heated with unflued gas heaters) within worst case environment conditions. The risk level is 1 in 20 years

Condensation has been calculated to accumulate at the followings interfaces:

Interface1: KOOLTHERM K3 / DAMP PROOF MEMBRANE

Condensation Analysis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Internal Temperature (°C)	20	20	20	20	20	20	20	20	20	20	20	20
Internal Relative Humidity (%)	70.7	69.7	68.8	68.4	69.1	72.6	75.3	75.2	75.9	72.1	70.8	71
External Temperature (°C)	2	2.5	4	6	9	12	13	12.5	11	8	5	3
External Relative Humidity (%)	95	92	89	87	85	86	88	89	94	93	94	96
Interface1 (Gc (kg/m²))	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.002
Interface1 (Ma (kg/m²))	0.01	0.012	0.014	0.016	0.018	0.02	0.021	0.001	0.003	0.004	0.006	0.008

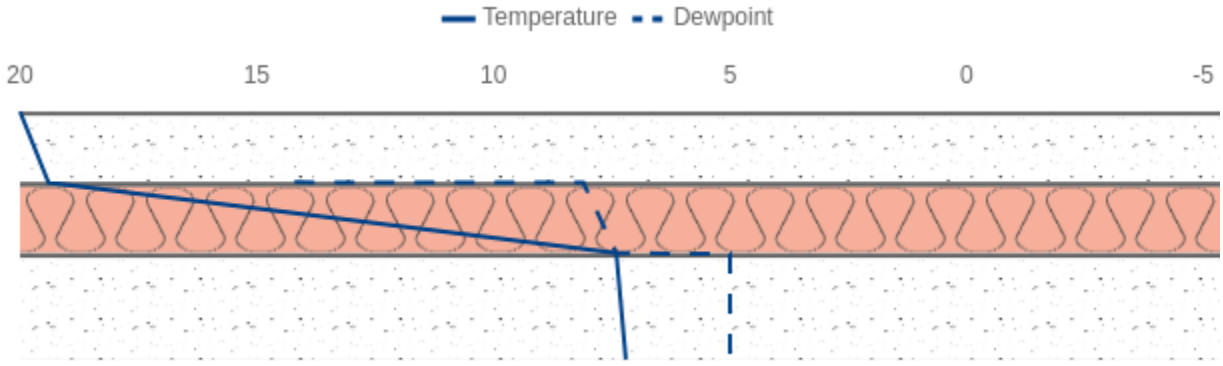
Gc = Monthly moisture accumulation per area at an interface

Ma = Accumulated moisture content per area at an interface

Peak accumulated moisture content per area at interface1(Ma) = 0.021 Kg/m²

Annual moisture accumulation (Ma) = 0.020 Kg/m²

Peak moisture build-up month: July



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www.kingspaninsulation.ie

U-Value Calculation and Condensation Risk Assesment

Project Information

Construction: Pitched Roof

Construction Type: Pitched Roof

File reference: 2-WA-201216-095809-537

Calculated U-value = $0.18 W/m^2K$

Selected Build-Up

Description	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m²K/W)	Thermal Bridging	Vapour Resistivity (MNs/gm)	Vapour Resistance (MNs/g)	
Inside Surface			0.1				
KOOLTHERM K7	80	0.02	3.568	12.7% roof timber - 47mm @ 400mm ctrs + 1% for noggins + loft hatches		27.3	
KOOLTHERM K7	50	0.02	2.5			18.4	
BREATHABLE MEMBRANE	0.5		0.006			0.2	
COUNTER BATTEN CAVITY	38		0			0	
TILES / SLATES & BATTENS; VENTILATED PITCHED ROOF.	30		0			0	
Outside Surface			0.104				

Key: Bridged and fastened; Bridged; Fastened

Supporting Information

Product Details

For further information on the specified products e.g. literature or specification clauses, please follow the links below or scan the QR code to the right:

Kingspan Kooltherm K7 Pitched Roof Board
www.kingspaninsulation.co.uk/k7

Detailed U-value

The calculation method is in accordance with BS EN ISO 6946:2017 / I.S. EN ISO 6946:2017. A simplified summary of the steps involved are shown below

$Rtotal(R_{tot}) = R_{si} + R_1 + R_2 + \ldots + R_n + R_{se}$

For a construction containing inhomogeneous layers the upper and lower resistances of the construction must be used

$R_{tot;upper} = 1/((f_a/R_{tot;a}) + (f_b/R_{tot;b}) + \ldots + (f_q/R_{tot;q}))$
$R_j = 1/((f_a/R_{aj}) + (f_b/R_{bj}) + \ldots + (f_q/R_{qj}))$
$R_{tot;lower} = R_{si} + R_1 + R_2 + R_j + \ldots + R_n + R_{se}$

$R_{tot} = (R_{tot;upper} + R_{tot;lower})/2$
$= (5.939 + 5.061)/2$
$U = 1/R_{tot}$
$= 5.500$
$\Delta U = \Delta U_g + \Delta U_f + \Delta U_r$

ΔU_g correction for air voids - 0.000

ΔU_f correction for fasteners by approximate procedure - 0.002
(alpha 0.80 | fasteners per m² 6.20 | fasteners cross sectional area 7.90 | thermal conductivity of fasteners 17.00)

ΔU_f correction for fasteners by detailed calculation method (rainscreen cladding) – 0.000
(point thermal transmittance 0.00 | fasteners per m² 0.00)

ΔU_r correction for inverted roofs – 0.000
(precipitation 0.00 | f· x 0.00)

Total U-value $(U_c) = U + \Delta U$
If ΔU is less than 3% of U then the corrections need not be applied.

Calculations including a steel frame construction are calculated in accordance with BRE Digest 465.

Condensation

Condensation calculations have been performed in accordance with I.S. EN ISO 13788:2012 and BS 5250:2011+A1:2016 and the risk assessed within environmental conditions with the following characteristics

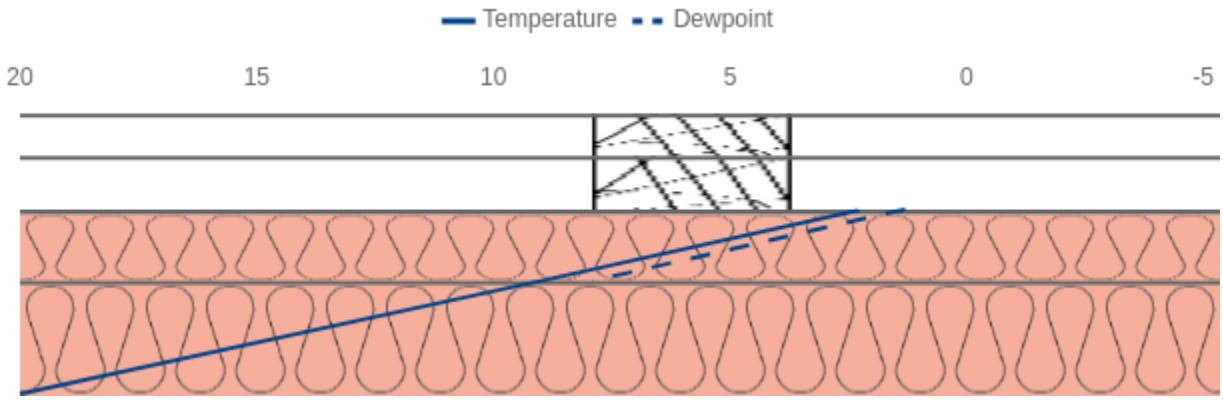
Humidity class 4 - Dwellings with high occupancy, sport halls, kitchens, canteens; buildings heated with unflued gas heaters

Location: 7a Northern Ireland (East)

Condensation risk has been assessed up to and including Level 4 Humidity Class (4 - Dwellings with high occupancy, sport halls, kitchens, canteens; buildings heated with unflued gas heaters) within worst case environment conditions. The risk level is 1 in 20 years

Condensation Analysis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Internal Temperature (°C)	20	20	20	20	20	20	20	20	20	20	20	20
Internal Relative Humidity (%)	70.7	69.7	68.8	68.4	69.1	72.6	75.3	75.2	75.9	72.1	70.8	71
External Temperature (°C)	2	2.5	4	6	9	12	13	12.5	11	8	5	3
External Relative Humidity (%)	95	92	89	87	85	86	88	89	94	93	94	96



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E: info@kingspaninsulation.ie
www.kingspaninsulation.ie

U-Value Calculation and Condensation Risk Assesment

Project Information

Construction: Wall

Construction Type: Wall

File reference: 2-WA-201216-100318-539

Calculated U-value = $0.13 W/m^2K$

Selected Build-Up

Description	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m²K/W)	Thermal Bridging	Vapour Resistivity (MNs/gm)	Vapour Resistance (MNs/g)	
Inside Surface			0.13				
PLASTER LIGHTWEIGHT	13	0.18	0.072		60	0.78	
BLOCKWORK 2000 kg/m³ (k-value = 1.13 W/mK)	100	1.13	0.088	6.6% Mortar, 450.0 centres	45	4.5	
KOOLTHERM K8 PLUS	130	0.02	6.5			100	
UNV. A/SPACE;	20		0.524			0.05	
BLOCKWORK 2000 kg/m³ (k-value = 1.13 W/mK)	100	1.13	0.088	6.6% Mortar, 450.0 centres	45	4.5	
CEMENT RENDER	20	0.5	0.04		100	2	
Outside Surface			0.04				

Key: Bridged and fastened; Bridged; Fastened

Supporting Information

Product Details

For further information on the specified products e.g. literature or specification clauses, please follow the links below or scan the QR code to the right:

Kingspan Kooltherm K8 PLUS
www.kingspaninsulation.ie/k8plus

Detailed U-value

The calculation method is in accordance with BS EN ISO 6946:2017 / I.S. EN ISO 6946:2017. A simplified summary of the steps involved are shown below

$R\text{total}(R_{tot}) = R_{si} + R_1 + R_2 + \ldots + R_n + R_{se}$

For a construction containing inhomogeneous layers the upper and lower resistances of the construction must be used

$R_{tot;upper} = 1/((f_a/R_{tot;a}) + (f_b/R_{tot;b}) + \ldots + (f_q/R_{tot;q}))$
$R_j = 1/((f_a/R_{aj}) + (f_b/R_{bj}) + \ldots + (f_q/R_{qj}))$
$R_{tot;lower} = R_{si} + R_1 + R_2 + R_j + \ldots + R_n + R_{se}$

$R_{tot} = (R_{tot;upper} + R_{tot;lower})/2$
$= (7.483 + 7.483)/2$
$U = 1/R_{tot}$
$= 7.483$
$\Delta U = \Delta U_g + \Delta U_f + \Delta U_r$

ΔU_g correction for air voids - 0.000

ΔU_f correction for fasteners by approximate procedure - 0.003
(alpha 0.80 | fasteners per m² 4.90 | fasteners cross sectional area 8.55 | thermal conductivity of fasteners 17.00)

ΔU_f correction for fasteners by detailed calculation method (rainscreen cladding) – 0.000
(point thermal transmittance 0.00 | fasteners per m² 0.00)

ΔU_r correction for inverted roofs – 0.000
(precipitation 0.00 | f· x 0.00)

Total U-value (U_c) = $U + \Delta U$
If ΔU is less than 3% of U then the corrections need not be applied.

Calculations including a steel frame construction are calculated in accordance with BRE Digest 465.

Condensation

Condensation calculations have been performed in accordance with I.S. EN ISO 13788:2012 and BS 5250:2011+A1:2016 and the risk assessed within environmental conditions with the following characteristics

Humidity class 4 - Dwellings with high occupancy, sport halls, kitchens, canteens; buildings heated with unflued gas heaters

Location: 7a Northern Ireland (East)

Condensation risk has been assessed up to and including Level 4 Humidity Class (4 - Dwellings with high occupancy, sport halls, kitchens, canteens; buildings heated with unflued gas heaters) within worst case environment conditions. The risk level is 1 in 20 years

Condensation has been calculated to accumulate at the followings interfaces:

Interface1: UNV. A/SPACE; / BLOCKWORK 2000 kg/m³ (k-value = 1.13 W/mK)

Condensation Analysis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Internal Temperature (°C)	20	20	20	20	20	20	20	20	20	20	20	20
Internal Relative Humidity (%)	70.7	69.7	68.8	68.4	69.1	72.6	75.3	75.2	75.9	72.1	70.8	71
External Temperature (°C)	2	2.5	4	6	9	12	13	12.5	11	8	5	3
External Relative Humidity (%)	95	92	89	87	85	86	88	89	94	93	94	96
Interface1 (Gc (kg/m²))	0	-0.009	0	0	0	0	0	0	0	0	0	0.001
Interface1 (Ma (kg/m²))	0.002	0	0	0	0	0	0	0	0	0	0	0.001

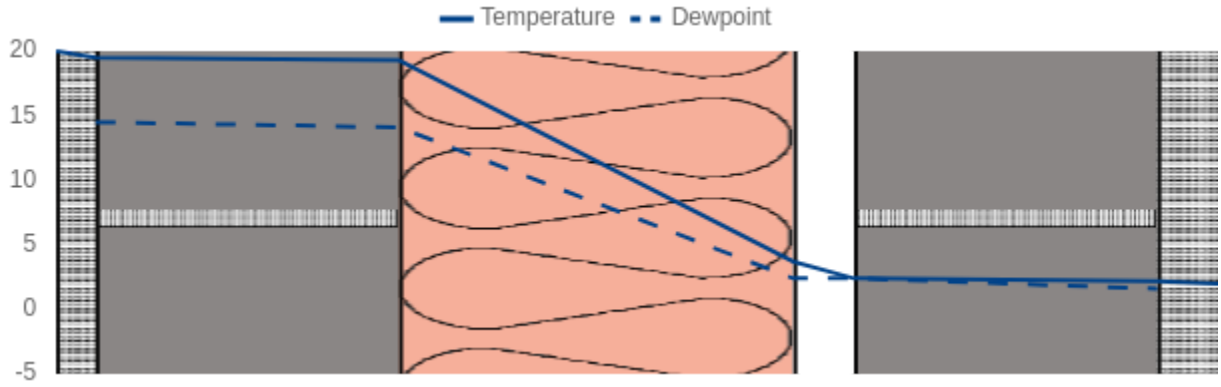
Gc = Monthly moisture accumulation per area at an interface

Ma = Accumulated moisture content per area at an interface

Peak accumulated moisture content per area at interface1(Ma) = 0.002 Kg/m²

Annual moisture accumulation (Ma) = 0.000 Kg/m²

Peak moisture build-up month: January



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Co. Monaghan | A75 X966

T: +353 42 975 4297
E: info@kingspaninsulation.ie
www.kingspaninsulation.ie

From: @kingspan.com>
Sent: 20 June 2018 11:39
To: @finance-ni.gov.uk>
Subject: Kingspan Insulation - TNI, Airport Road, Belfast

REDACTED

Thank you for your recent enquiry, please find attached u value calculations as requested.

If you require any further information please do not hesitate to contact me, additional details and product literature can be found online at KingspanInsulation.ie.

Regards,
REDACTED
TECHNICAL ADVISOR

direct tel: REDACTED

direct fax: REDACTED

For specific Project specification clauses please contact your local Technical Specification Manager copied on this email, contact a member of the technical services team on +353 (0)42 9754297 or email: technical@kingspaninsulation.ie

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fax: +353 (0) 42 975 4299

www.kingspaninsulation.ie

Client : [redacted]
Project ID : TNI, Airport Road, Belfast
Structure element : Wall
Description : Brick and block cavity wall, partial fill, 4.9 ties per m², cavity greater than 125mm
File reference : 2B156K4CB0.FCF

Calculated 'U' value = 0.16W/m²K (Calculated in accordance with BS EN ISO 6946:2017)

Element Description	Element Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m²K/W)	Vapour Resistivity (MNs/gm)	Vapour Resistance (MNs/g)	Mean T (K)	Delta T (K)
Outside surface resistance	-	-	0.040	-	-	80.52	0.08
BRICKWORK FACING	102.5	0.770	0.133	42.00	4.31	80.70	0.27
UNV. A/SPACE;	50.0	-	0.665	-	0.05	81.52	1.36
KOOLTHERM K8	100.0	0.020	5.000	-	100.00	87.33	0.26
BLOCKWORK 2000 kg/m³ (k-value = 1.13 W/mK)	150.0	1.130	0.133	45.00	6.75	92.60	0.27
PLASTER LIGHTWEIGHT	13.0	0.180	0.072	60.00	0.78	92.81	0.15
Inside surface resistance	-	-	0.130	-	-	93.02	0.27

Detailed U-value Calculation Results

Total resistance of wall
$R_T = (R_{upper} + R_{lower}) / 2 = (6.173 + 6.173) / 2 = 6.173$ m²K/W

(Correction for mechanical fasteners, Delta Uf = 0.0027W/m²K | Correction for air gaps, Delta Ug = 0.0000W/m²K)
(Alpha 0.8 m^{-1} | Fasteners per square metre 4.9000)
(Fasteners cross-sectional area 6.200 mm² | Thermal conductivity of fastener 17.00 W/mK)

(Delta Uf + Delta Ug) is less than 3% of (1 / Rt) so U = (1 / Rt) = 0.16W/m²K

For further information on the specified products, e.g. literature or specification clauses, please follows the links below:-

Kooltherm K8

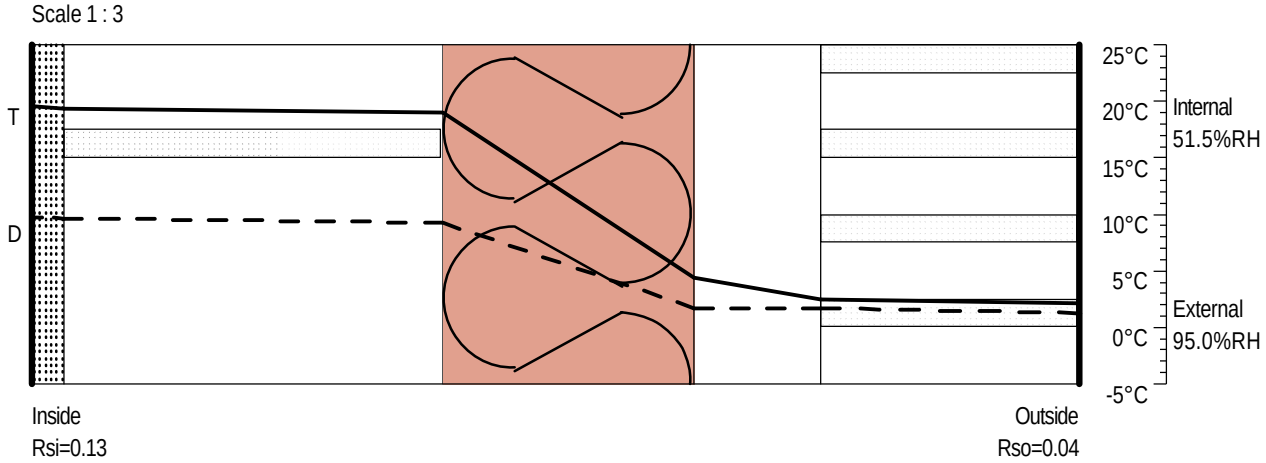
Client : [redacted]
Project ID : TNI, Airport Road, Belfast
Structure element : Wall
Description : Brick and block cavity wall, partial fill, 4.9 ties per m², cavity greater than 125mm
File reference : 2B156K4CB0.FCF
Humidity Class: 2 - Offices, Shops
Location: 7a Northern Ireland (East)

Condensation calculations performed in accordance with BS 5250: 2011

Month	Int (°C)	Int (%RH)	Ext (°C)	Ext (%RH)	Prediction of mould growth	Prediction of surface condensation
Jan	20.0	51.5	2.0	95.0	No	No
Feb	20.0	51.0	2.5	92.0	No	No
Mar	20.0	51.3	4.0	89.0	No	No
Apr	20.0	52.6	6.0	87.0	No	No
May	20.0	55.7	9.0	85.0	No	No
Jun	20.0	61.8	12.0	86.0	No	No
Jul	20.0	65.3	13.0	88.0	No	No
Aug	20.0	64.7	12.5	89.0	No	No
Sep	20.0	64.2	11.0	94.0	No	No
Oct	20.0	57.9	8.0	93.0	No	No
Nov	20.0	54.1	5.0	94.0	No	No
Dec	20.0	52.7	3.0	96.0	No	No

fRsi for mould growth = 0.979
fRsi,max for mould growth = 0.617
fRsi,max for surface condensation = 0.429
Gc = Monthly moisture accumulation per area at an interface
Ma = Accumulated moisture content per area at an interface

Peak accumulated moisture content per area at interface (Ma) = 0.00 Kg/m²
Annual moisture accumulation (Ma) = 0.00 Kg/m²



Client : [redacted]
Project ID : TNI, Airport Road, Belfast
Structure element : Pitched roof, horizontal ceiling, insulation at ceiling level
Description : Cold pitched roof
File reference : 2B156K4DDD.FCF

Calculated 'U' value = 0.12W/m²K (Calculated in accordance with BS EN ISO 6946:2017)

Element Description	Element Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m²K/W)	Vapour Resistivity (MNs/gm)	Vapour Resistance (MNs/g)	Pitch	Mean T (K)	D
Outside surface resistance	-	-	-	-	-	30.0°	76.90	0
TILES / SLATES ON BATTENS ; PITCHED ROOF.	30.0	0.000	0.000	0.00	0.00	30.0°	76.90	0
BREATHABLE MEMBRANE	0.5	-	0.000	-	0.20	30.0°	76.90	0
Loft space - ventilated	-	-	0.200	-	-		77.09	0
GLASS FIBRE INSULATION	150.0	0.044	3.409	10.00	1.50		80.49	6
GLASS FIBRE INSULATION 12.7% roof timber - 47mm @ 400mm ctrs + 1% for noggins + loft hatches (150.0mm)	150.0	0.044	3.409	10.00	1.50		86.93	6
KOOLTHERM K18 (12.5mm plasterboard internal finish)	42.5	-	1.494	-	100.00		91.55	2
Inside surface resistance	-	-	0.100	-	-		93.06	0

Detailed U-value Calculation Results

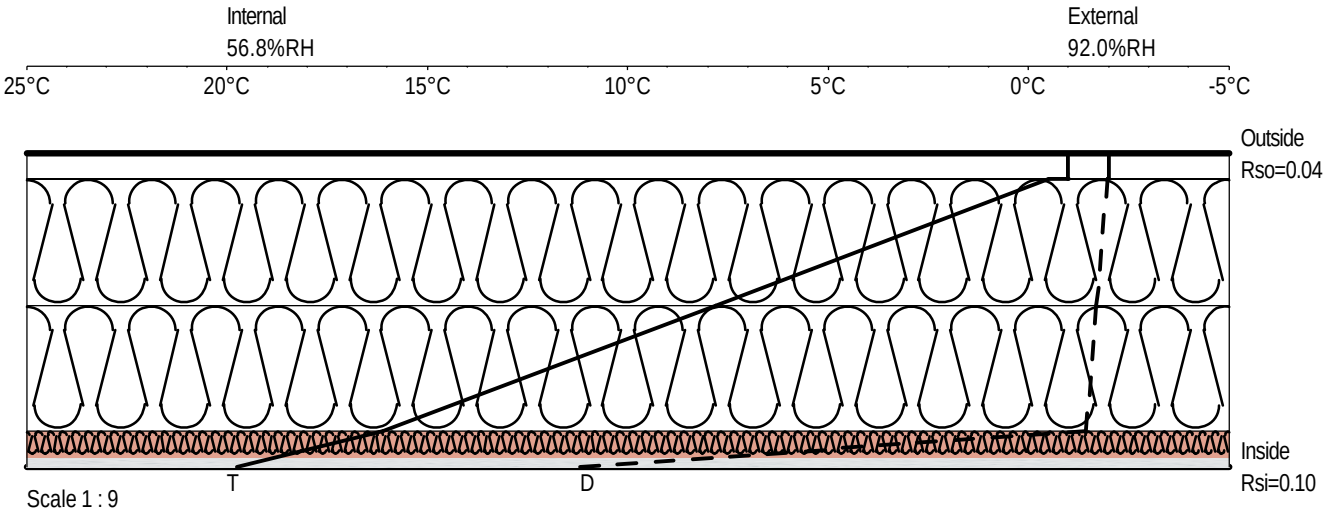
Client : [redacted]
Project ID : TNI, Airport Road, Belfast
Structure element : Pitched roof, horizontal ceiling, insulation at ceiling level
Description : Cold pitched roof
File reference : 2B156K4DDD.FCF
Humidity Class: 3 - Dwellings with low occupancy
Location: Europe - Republic of Ireland - Dublin (Mean min)

Condensation calculations performed in accordance with BS 5250: 2011

Month	Int (°C)	Int (%RH)	Ext (°C)	Ext (%RH)	Prediction of mould growth	Prediction of surface condensation
Jan	20.0	56.8	-1.0	92.0	No	No
Feb	20.0	58.2	0.0	90.0	No	No
Mar	20.0	60.4	1.0	86.0	No	No
Apr	20.0	58.5	2.0	80.0	No	No
May	20.0	58.0	4.0	79.0	No	No
Jun	20.0	59.1	7.0	80.0	No	No
Jul	20.0	61.2	9.0	82.0	No	No
Aug	20.0	62.2	9.0	84.0	No	No
Sep	20.0	62.1	7.0	87.0	No	No
Oct	20.0	61.5	4.0	89.0	No	No
Nov	20.0	62.1	2.0	92.0	No	No
Dec	20.0	62.1	1.0	92.0	No	No

fRsi for mould growth = 0.988
fRsi,max for mould growth = 0.788
fRsi,max for surface condensation = 0.618
Gc = Monthly moisture accumulation per area at an interface
Ma = Accumulated moisture content per area at an interface

Peak accumulated moisture content per area at interface (Ma) = 0.00 Kg/m²
Annual moisture accumulation (Ma) = 0.00 Kg/m²



Client : [redacted]
Project ID : TNI, Airport Road, Belfast
Structure element : Wall
Description : Brick and block cavity wall, partial fill, 4.9 ties per m², cavity greater than 125mm
File reference : 2B156K4E79.FCF

Calculated 'U' value = 0.12W/m²K (Calculated in accordance with BS EN ISO 6946:2017)

Element Description	Element Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m²K/W)	Vapour Resistivity (MNs/gm)	Vapour Resistance (MNs/g)	Mean T (K)	Delta T (K)
Outside surface resistance	-	-	0.040	-	-	76.94	0.08
CEMENT RENDER	19.0	0.500	0.038	100.00	1.90	77.02	0.08
BLOCKWORK 2000 kg/m³ (k-value = 1.13 W/mK)	100.0	1.130	0.088	45.00	4.50	77.15	0.18
UNV. A/SPACE;	25.0	-	0.665	-	0.05	77.91	1.34
KOOLTHERM K108	125.0	0.018	6.944	-	37.70	85.57	3.99
BLOCKWORK 2000 kg/m³ (k-value = 1.13 W/mK)	100.0	1.130	0.088	45.00	4.50	92.65	0.18
PLASTER LIGHTWEIGHT	13.0	0.180	0.072	60.00	0.78	92.82	0.15
Inside surface resistance	-	-	0.130	-	-	93.02	0.26

Detailed U-value Calculation Results

Total resistance of wall
$R_T = (R_{upper} + R_{lower}) / 2 = (8.067 + 8.067) / 2 = 8.067$ m²K/W

(Correction for mechanical fasteners, Delta Uf = 0.0024W/m²K | Correction for air gaps, Delta Ug = 0.0000W/m²K)
(Alpha 0.8 m^{-1} | Fasteners per square metre 4.9000)
(Fasteners cross-sectional area 6.200 mm² | Thermal conductivity of fastener 17.00 W/mK)

(Delta Uf + Delta Ug) is less than 3% of (1 / Rt) so U = (1 / Rt) = 0.12W/m²K

For further information on the specified products, e.g. literature or specification clauses, please follows the links below:-

KOOLTHERM K108

Client : [redacted]
Project ID : TNI, Airport Road, Belfast
Structure element : Wall
Description : Brick and block cavity wall, partial fill, 4.9 ties per m², cavity greater than 125mm
File reference : 2B156K4E79.FCF
Humidity Class: 3 - Dwellings with low occupancy
Location: Europe - Republic of Ireland - Dublin (Mean min)

Condensation calculations performed in accordance with BS 5250: 2011

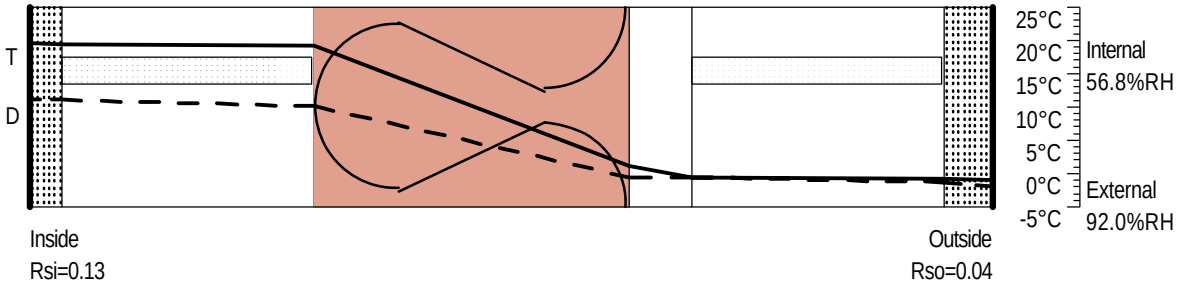
Condensation is occuring at the following layers interfaces:-
Interface 1 : BLOCKWORK 2000 kg/m³ (k-value = 1.13 W/mK) / UNV. A/SPACE;

Month	Int (°C)	Int (%RH)	Ext (°C)	Ext (%RH)	Interface 1		Prediction of mould growth	Prediction of surface condensation
					Gc (Kg/m²)	Ma (Kg/m²)		
Jan	20.0	56.8	-1.0	92.0	0.02	0.05	No	No
Feb	20.0	58.2	0.0	90.0	0.01	0.06	No	No
Mar	20.0	60.4	1.0	86.0	0.00	0.06	No	No
Apr	20.0	58.5	2.0	80.0	-0.03	0.04	No	No
May	20.0	58.0	4.0	79.0	-0.05	0.00	No	No
Jun	20.0	59.1	7.0	80.0	0.00	0.00	No	No
Jul	20.0	61.2	9.0	82.0	0.00	0.00	No	No
Aug	20.0	62.2	9.0	84.0	0.00	0.00	No	No
Sep	20.0	62.1	7.0	87.0	0.00	0.00	No	No
Oct	20.0	61.5	4.0	89.0	0.00	0.00	No	No
Nov	20.0	62.1	2.0	92.0	0.01	0.01	No	No
Dec	20.0	62.1	1.0	92.0	0.02	0.03	No	No

fRsi for mould growth = 0.984
fRsi,max for mould growth = 0.788
fRsi,max for surface condensation = 0.618
Gc = Monthly moisture accumulation per area at an interface
Ma = Accumulated moisture content per area at an interface

Peak accumulated moisture content per area at interface (Ma) = 0.06 Kg/m²
Annual moisture accumulation (Ma) = 0.00 Kg/m²
Peak moisture build-up month : January
Internal conditions : 20.0°C @ 56.8%RH
External conditions : -1.0°C @ 92.0%RH

Scale 1 : 3



Client : [redacted]
Project ID : TNI, Airport Road, Belfast
Structure element : Solid Ground floor
Description : Solid ground floor (insulation beneath screed / concrete slab)
File reference : 2B156K44D4.FCF

Calculated 'U' value = 0.15W/m²K (Calculated in accordance with BS EN ISO 13370:2017)

Office & lobby Floor

Element Description	Element Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m²K/W)	Mean T (K)	Delta T (K)
Inside surface	-	-	0.170	92.95	0.40
SAND CEMENT SCREED	100.0	1.400	0.071	92.66	0.17
POLYTHENE SEPARATION LAYER	0.5	-	0.001	92.58	0.00
KOOLTHERM K3	100.0	0.020	5.000	86.67	1.81
REINFORCED CONCRETE (2% STEEL)	200.0	2.500	0.080	80.67	0.19
DAMP PROOF MEMBRANE	0.9	-	0.001	80.58	0.00
Ground	-	-	0.040	80.53	0.09

Ground Floor Details

Calculation method : Perimeter / Area (As defined in BRE IP 3/90)
Perimeter : 31.00m
Area : 74.00m²
P/A : 0.419
Floor type : Solid floor
Earth conductivity : 2.000W/mK
Soil type : Sand or Gravel

Detailed U-value Calculation Results

Total resistance of solid ground floor

$R_T = (R_{upper} + R_{lower}) / 2 = (5.363 + 5.363) / 2 = 5.363$ m²K/W

(Correction for mechanical fasteners, Delta Uf = 0.0000W/m²K | Correction for air gaps, Delta Ug = 0.0000W/m²K)
(Alpha 0.0 m^{-1} | Fasteners per square metre 0.0000)
(Fasteners cross-sectional area 0.000 mm² | Thermal conductivity of fastener 0.00 W/mK)

(Delta Uf + Delta Ug) is less than 3% of (1 / Rt) so U = (1 / Rt) = 0.15W/m²K

For further information on the specified products, e.g. literature or specification clauses, please follows the links below:-

Kooltherm K3

Client : [redacted]
Project ID : TNI, Airport Road, Belfast
Structure element : Solid Ground floor
Description : Solid ground floor (insulation beneath screed / concrete slab)
File reference : 2B156K44D4.FCF
Humidity Class: 2 - Offices, Shops
Location: 7a Northern Ireland (East)

Condensation calculations performed in accordance with BS 5250: 2011

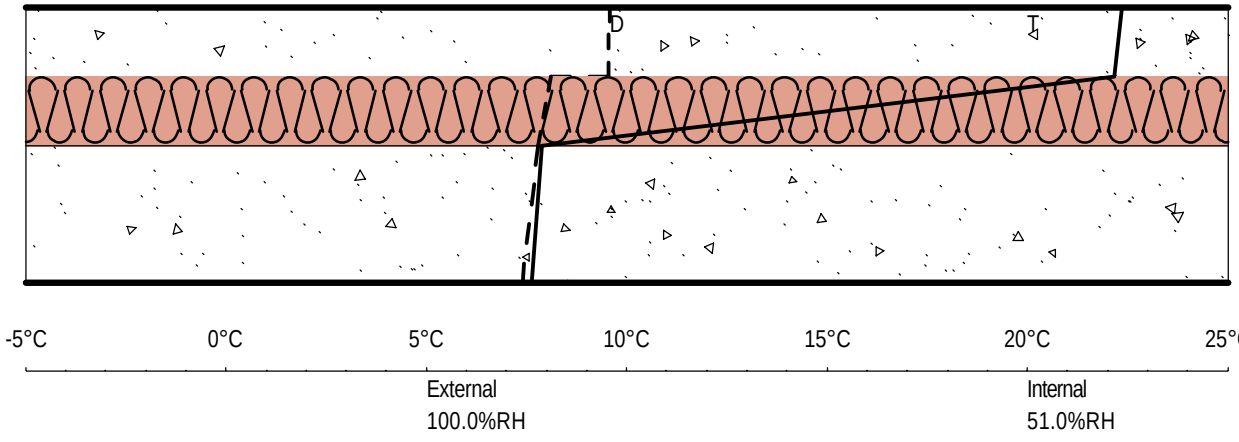
Office & lobby Floor

Month	Int (°C)	Int (%RH)	Ext/Grd (°C)	Ext/Grd (%RH)	Prediction of mould growth	Prediction of surface condensation
Jan	20.0	51.5	2.0/5.2	95.0/100.0	No	No
Feb	20.0	51.0	2.5/4.7	92.0/100.0	No	No
Mar	20.0	51.3	4.0/4.9	89.0/100.0	No	No
Apr	20.0	52.6	6.0/5.7	87.0/100.0	No	No
May	20.0	55.7	9.0/6.7	85.0/100.0	No	No
Jun	20.0	61.8	12.0/8.2	86.0/100.0	No	No
Jul	20.0	65.3	13.0/9.7	88.0/100.0	No	No
Aug	20.0	64.7	12.5/10.2	89.0/100.0	No	No
Sep	20.0	64.2	11.0/9.9	94.0/100.0	No	No
Oct	20.0	57.9	8.0/9.2	93.0/100.0	No	No
Nov	20.0	54.1	5.0/7.7	94.0/100.0	No	No
Dec	20.0	52.7	3.0/6.2	96.0/100.0	No	No

fRsi for mould growth = 0.974
fRsi,max for mould growth = 0.602
fRsi,max for surface condensation = 0.378
Gc = Monthly moisture accumulation per area at an interface
Ma = Accumulated moisture content per area at an interface

Peak accumulated moisture content per area at interface (Ma) = 0.00 Kg/m²
Annual moisture accumulation (Ma) = 0.00 Kg/m²

Scale 1 : 11



Client : [redacted]
Project ID : TNI, Airport Road, Belfast
Structure element : Flat roof
Description : Flat roof - insulation / membrane fixed with steel fasteners
File reference : 2B156K454E.FCF

Calculated 'U' value = 0.22W/m²K (Calculated in accordance with BS EN ISO 6946:2017)

Element Description	Element Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m²K/W)	Vapour Resistivity (MNs/gm)	Vapour Resistance (MNs/g)	Mean T (K)	Delta T (K)
Outside surface resistance	-	-	0.040	-	-	80.53	0.10
SINGLE PLY MEMBRANE (mechanically fixed)	1.5	0.160	0.009	-	138.00	80.60	0.02
KINGSPAN THERMAROOF TR26 LPC / FM	100.0	0.022	4.545	-	100.00	86.30	L1.39
1000 GAUGE 0.25mm POLYTHENE VAPOUR CONTROL LAYER	0.3	-	0.001	-	500.00	92.00	0.00
PLYWOOD DECKING	18.0	0.140	0.129	520.00	9.36	92.16	0.32
TIMBER STUD/JOIST/RAFTER CAVITY; U/V.	200.0	-	0.163	-	0.05	92.53	0.41
PLASTERBOARD	12.5	0.190	0.066	50.00	0.63	92.82	0.16
Inside surface resistance	-	-	0.100	-	-	93.02	0.25

Detailed U-value Calculation Results

Total resistance of roof

$R_T = (R_{upper} + R_{lower}) / 2 = (5.054 + 5.054) / 2 = 5.054$ m²K/W

(Correction for mechanical fasteners, Delta Uf = 0.0200W/m²K | Correction for air gaps, Delta Ug = 0.0000W/m²K)
(Roofs - insulation fixed with nails or screws
Table 4 of Approved Document L1 & L2 default figure)

U = (1 / Rt) + (Delta Uf + Delta Ug) = (1/5.054) + 0.0200 + 0.0000 = 0.22W/m²K

For further information on the specified products, e.g. literature or specification clauses, please follows the links below:-

Thermaroof TR26 LPC / FM

Client : [redacted]
Project ID : TNI, Airport Road, Belfast
Structure element : Flat roof
Description : Flat roof - insulation / membrane fixed with steel fasteners
File reference : 2B156K454E.FCF
Humidity Class: 2 - Offices, Shops
Location: 7a Northern Ireland (East)

Condensation calculations performed in accordance with BS 5250: 2011

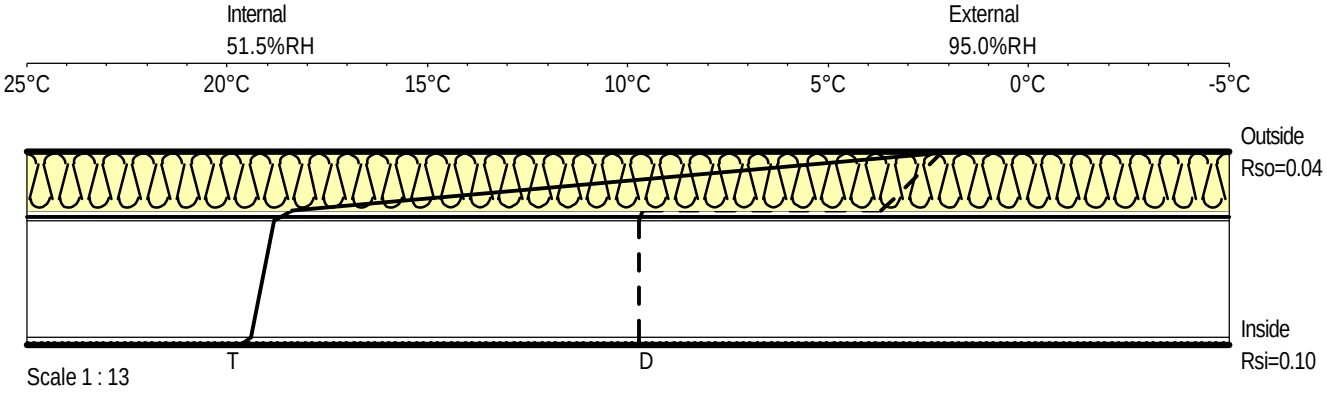
Condensation is occuring at the following layers interfaces:-
Interface 1 : SINGLE PLY MEMBRANE (mechanically fixed) / KINGSPAN THERMAROOF TR26 LPC / FM

Month	Int (°C)	Int (%RH)	Ext (°C)	Ext (%RH)	Interface 1		Prediction of mould growth	Prediction of surface condensation
					Gc (Kg/m²)	Ma (Kg/m²)		
Jan	20.0	51.5	2.0	95.0	0.00	0.00	No	No
Feb	20.0	51.0	2.5	92.0	0.00	0.00	No	No
Mar	20.0	51.3	4.0	89.0	0.00	0.00	No	No
Apr	20.0	52.6	6.0	87.0	0.00	0.00	No	No
May	20.0	55.7	9.0	85.0	0.00	0.00	No	No
Jun	20.0	61.8	12.0	86.0	0.00	0.00	No	No
Jul	20.0	65.3	13.0	88.0	0.00	0.00	No	No
Aug	20.0	64.7	12.5	89.0	0.00	0.00	No	No
Sep	20.0	64.2	11.0	94.0	0.00	0.00	No	No
Oct	20.0	57.9	8.0	93.0	0.00	0.00	No	No
Nov	20.0	54.1	5.0	94.0	0.00	0.00	No	No
Dec	20.0	52.7	3.0	96.0	0.00	0.00	No	No

fRsi for mould growth = 0.978
fRsi,max for mould growth = 0.617
fRsi,max for surface condensation = 0.429
Gc = Monthly moisture accumulation per area at an interface
Ma = Accumulated moisture content per area at an interface

Peak accumulated moisture content per area at interface (Ma) = 0.00 Kg/m²
Annual moisture accumulation (Ma) = 0.00 Kg/m²
Peak moisture build-up month : January

Internal conditions : 20.0°C @ 51.5%RH
External conditions : 2.0°C @ 95.0%RH



Scale 1 : 13