

U-Value Calculation and Condensation Risk Assessment

Project Information

PEU-0169551 St Oliver Plunkett NS Ballina Mayo

Construction: Tapered Flat Roof - insulation / membrane fixed with telescopic tube fasteners. Effective U-value calculation calculated in accordance with ISO 6946 Annex E

Construction Type: Flat Roof

File reference: 2-MB-260407-081556-17

Calculated U-value = $0.19W/m^2K$

Selected Build-Up

Description	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m ² K/W)	Thermal Bridging	Vapour Resistivity (MN/gm)	Vapour Resistance (MN/g)	
Inside Surface			0.130				
PLYWOOD DECKING	18.0	0.140	0.129		520.000	9.360	
VAPOUR CHECK BITUMINOUS	3.0	0.230	0.013			300.000	
KINGSPAN THERMATAPER TT46 	107.0	0.022	4.864			100.000	
SINGLE PLY MEMBRANE (mechanically fixed) 	1.5	0.160	0.009			138.000	
Outside Surface			0.040				

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 Thermataper TT46
www.kingspaninsulation.co.uk/tt46



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

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

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

$$R_{tot;upper} = 1 / ((f_a / R_{tot;a}) + (f_b / R_{tot;b}) + \dots + (f_q / R_{tot;q}))$$

$$R_j = 1 / ((f_a / R_{aj}) + (f_b / R_{bj}) + \dots + (f_q / R_{qj}))$$

$$R_{tot;lower} = R_{si} + R_1 + R_2 + R_j + \dots + R_n + R_{se}$$

$$R_{tot} = (R_{tot;upper} + R_{tot;lower}) / 2$$

$$= (5.184 + 5.184) / 2$$

$$U = 1 / R_{tot}$$

$$= 5.184$$

$$\Delta U = \Delta U_g + \Delta U_f + \Delta U_r$$

ΔU_g correction for air voids - 0.0000

ΔU_f correction for fasteners by approximate procedure - 0.0000

(Fastener 1 : alpha 0.00 | fasteners per m² 0.001 | fasteners cross sectional area 0.001 mm² | thermal conductivity of fasteners 0.00 W/mK

Fastener 2 : alpha 0.00 | fasteners per m² 0.001 | fasteners cross sectional area 0.001 mm² | thermal conductivity of fasteners 0.00 W/mK)

ΔU_f correction for fasteners by detailed calculation method (rainscreen cladding) – 0.0000
(point thermal transmittance 0.000 W/K | fasteners per m² 0.000)

ΔU_r correction for inverted roofs – 0.0000
(precipitation 0.000 mm/day | f • x 0.0000)

$$\text{Total U-value } (U_c) = U + \Delta U$$

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 5250:2021 and the risk assessed within environmental conditions with the following characteristics

Humidity class 4 - Sports halls, kitchens, canteens, school classrooms, hospitals and buildings heated with unflued gas heaters

Location: Republic of Ireland - Galway (Mean min)

Condensation risk has been assessed up to and including Level 4 Humidity Class (4 - Sports halls, kitchens, canteens, school classrooms, hospitals and 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: KINGSPAN THERMATAPER TT46 / SINGLE PLY MEMBRANE (mechanically fixed)

Condensation Analysis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Internal Temperature (°C)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Internal Relative Humidity (%)	66.2	66.3	68.5	70.3	69.7	70.4	72.0	72.2	71.3	70.1	70.4	68.6
External Temperature (°C)	-2.2	-2.0	-0.8	0.7	2.6	5.9	7.9	7.6	6.1	3.0	0.4	-1.0
External Relative Humidity (%)	92.0	91.0	91.0	93.0	92.0	92.0	93.0	94.0	94.0	93.0	93.0	93.0
Interface1 (Gc (kg/m²))	0.006	0.005	0.005	0.005	0.004	0.003	0.002	0.003	0.003	0.005	0.005	0.006
Interface1 (Ma (kg/m²))	0.028	0.033	0.038	0.043	0.048	0.051	0.053	0.003	0.006	0.011	0.016	0.022

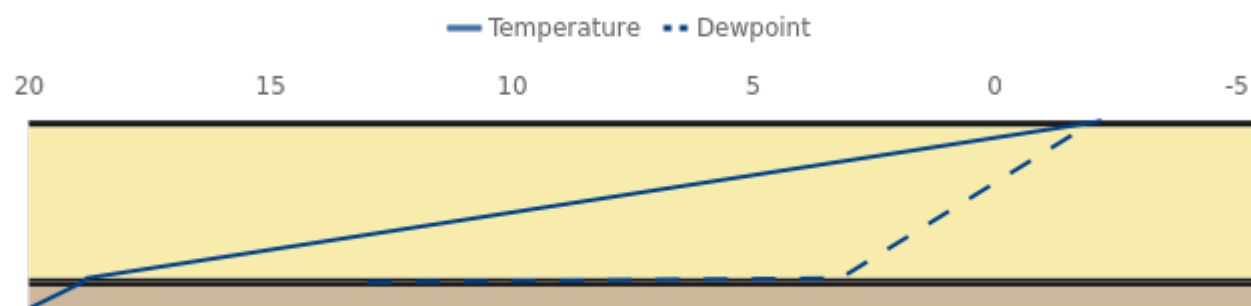
Gc = Monthly moisture accumulation per area at an interface

Ma = Accumulated moisture content per area at an interface

Peak accumulated moisture content per area at interface1 (Ma) = 0.053m Kg/m²

Annual moisture accumulation (Ma) = 0.052 Kg/m²

Peak moisture build-up month: July



Whilst the information and / or specification contained herein is, to the best of our knowledge, true and accurate we specifically exclude any liability for errors, omissions or otherwise arising therefrom. Details, practices, principles, values and calculations should be verified as to accuracy and suitability for the required purpose use.

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