

U-Value Calculation and Condensation Risk Assessment

Project Information	PEU-0171193a St. Kevin's College, Ballygall
	Construction: Tapered Flat Roof – bonded. Effective U-value calculation calculated in accordance with ISO 6946 Annex E
	Construction Type: Flat Roof
	File reference: 2-MB-260605-120441-707
	Calculated U-value = $0.15W/m^2K$

Selected Build-Up

Description	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m²K/W)	Thermal Bridging	Vapour Resistivity (MN/gm)	Vapour Resistance (MN/g)	
Inside Surface			0.130				
CONCRETE 1:2:4 2000 kg/m³	200.0	1.400	0.143		100.000	20.000	
MASTIC ASPHALT 2 LAYERS	20.0	0.700	0.029		250000.000	5000.000	
BAUDERTHERM DS1 DUO AIR & VAPOUR CONTROL LAYER	3.5		0.001			7500.000	
THERMATAPER TT47	159.0		6.090		300.000	47.700	
BITUMEN ROOFING FELT 2 LAYERS	6.0	0.230	0.026			500.000	
Outside Surface			0.040				

Key  Bridged and fastened  Bridged  Fastened

Supporting Information

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

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

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

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

$$R_{tot} = (R_{tot;upper} + R_{tot;lower}) / 2$$
$$= (6.458 + 6.458) / 2$$

$$U = 1 / R_{tot}$$
$$= 6.458$$

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

ΔU_g correction for air voids - 0.0000

ΔU_f correction for fasteners by approximate procedure - 0.0000

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)

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 - Dublin (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 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 (%)	64.9	66.1	66.9	67.1	65.9	65.6	66.7	67.5	68.2	68.9	70.2	68.3
External Temperature (°C)	-3.0	-2.0	-1.0	0.0	2.0	5.0	7.0	7.0	5.0	2.0	0.0	-1.0
External Relative Humidity (%)	92.0	90.0	86.0	80.0	79.0	80.0	82.0	84.0	87.0	89.0	92.0	92.0

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 all interfaces (Ma) = 0.000 Kg/m²

Annual moisture accumulation (Ma) = 0.000 Kg/m²

