

Back to Earth SW Ltd

7 Tuns Lane
Silverton
Exeter
EX5 4HY

Project Information

Reference

Date 20 November 2023

Construction Type

Element : Flat roof - Roof-flat-single ply-175mm

Internal surface emissivity : High External surface emissivity : High

	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m ² K/W)	Pitch (°)	Bridge details Air gaps (Level, Delta U")
Outside surface resistance	-	-	0.040		
EPDM (ethylene propylene diene monomer)	1.0	0.250	0.004		
Plywood (500 kg/m ³)	18.0	0.130	0.138		
Beltermo Ultra	120.0	0.042	2.850		L:0 0.000W/m ² K
SteicoFlex	175.0	0.036	4.850		9.000% Softwood (175.0mm) L:0 0.000W/m ² K
Fermacell	10.0	0.320	0.031		
Ampatex Variano	-	-	-		
Airspace, heat flow upwards, 25 mm thick	25.0	-	0.160		
Gyproc Wallboard	12.5	0.190	0.066		
Inside surface resistance	-	-	0.100		
Total thickness	361.5mm				

U-value = 0.13W/m²K

U-value, Combined Method : 0.133W/m²K (upper/lower limit 7.725 / 7.319m²K/W, dUf 0.0033, dUg 0.0000, dUp0.0000, dUr0.0000, dUrc1 0.0000, dUrc2 0.0000)

Correction factors

Mechanical fasteners :-

Warm pitched roof - insulation over rafters

Alpha : 0.80 per m lambda f : 50.0000W/mK nf : 6.700 per m² Af : 12.500mm² Recess : 0.0mm

Delta Uf for Beltermo Ultra : 0.0033

nf = fasteners per m² Af = fasteners cross-sectional area

Air gaps, Delta Ug = 0.000W/m²K

(Based on the combined method for determining U-values of structures containing repeating thermal bridges)

Detailed U-value Calculation Results

Construction includes 1 bridged layer

Non-bridged layers

Outside surface resistance	0.040 m ² K/W
EPDM (ethylene propylene diene monomer)	0.004 m ² K/W
Plywood (500 kg/m ³)	0.138 m ² K/W
Beltermo Ultra	2.850 m ² K/W
Fermacell	0.031 m ² K/W
Airspace, heat flow upwards, 25 mm thick	0.160 m ² K/W
Gyproc Wallboard	0.066 m ² K/W
Inside surface resistance	0.100 m ² K/W
Resistance of non-bridged layers, R _{NB} =	<u>3.389 m²K/W</u>

Bridged layer

SteicoFlex (L1) bridged by Softwood (B1)

Path 1 - SteicoFlex

Path 2 - Softwood

Resistance and fraction of heat flow paths

$$R_{P1} = R_{NB} + R_{L1} = 3.389 + 4.850 = 8.239 \text{ m}^2\text{K/W} \quad F_{P1} = 91.000\%$$

$$R_{P2} = R_{NB} + R_{L2} = 3.389 + 1.346 = 4.736 \text{ m}^2\text{K/W} \quad F_{P2} = 9.000\%$$

Upper resistance limit

$$R_{\text{upper}} = 1 / \left(\frac{F_{P1}}{R_{P1}} + \frac{F_{P2}}{R_{P2}} \right)$$

$$R_{\text{upper}} = 1 / \left(\frac{0.910}{8.239} + \frac{0.090}{4.736} \right) = 7.725 \text{ m}^2\text{K/W}$$

Lower resistance limit

$$R_{\text{lower}} = R_{NB} + 1 / \left(\frac{F_{L1}}{R_{L1}} + \frac{F_{B1}}{R_{B1}} \right)$$

$$R_{\text{lower}} = 3.389 + 1 / \left(\frac{0.910}{4.850} + \frac{0.090}{1.346} \right) = 7.319 \text{ m}^2\text{K/W}$$

Total resistance of roof

$$R_T = \left(R_{\text{upper}} + R_{\text{lower}} \right) / 2 = (7.725 + 7.319) / 2 = 7.52 \text{ m}^2\text{K/W}$$

Mechanical fasteners :-

Calculations to BS EN ISO 6946:2007

Warm pitched roof - insulation over rafters

Alpha : 0.80 per m lambda f : 50.0000W/mK nf : 6.700 per m² Af : 12.500mm² Recess : 0.0mm

Delta Uf for Beltermo Ultra : 0.0033

Correction for air gaps, Delta Ug = 0.0000W/m²K

(Delta Uf + Delta Ug + Delta Up + Delta Ur) is less than 3% of (1 / Rt) so U = (1 / Rt) + (Delta Ur) + (Delta Urc) = 0.13 W/m²K

Project Information

Reference

Date 20 November 2023

Thermal Mass Details

	Thickness assessed (actual) (mm)	Density (kg/m ³)	Specific heat capacity (J/kgK)	Heat capacity (kJ/m ² K)
EPDM (ethylene propylene diene monomer)	0.0 (1.0)	1150.0	1000.0	0.0
Plywood (500 kg/m ³)	0.0 (18.0)	500.0	1600.0	0.0
Beltermo Ultra	0.0 (120.0)	180.0	2100.0	0.0
SteicoFlex	0.0 (175.0)	60.0	2100.0	0.0
Fermacell	10.0 (10.0)	1150.0	1000.0	11500000.0
Ampatex Variano	0.0 (-)	280.0	850.0	0.0
Airspace, heat flow upwards, 25 mm thick	25.0 (25.0)	1.2	1008.0	30996.0
Gyproc Wallboard	12.5 (12.5)	0.0	0.0	0.0
Total				11530996.0
kappa value				11.5310
Limiting condition:	insulation			

Admittance : 1.12 W/m²K Decrement : 0.14 factor Decrement delay : -14.87 hours