

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-150mm

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 | 150.0 | 0.036 | 4.150 | | 9.000% Softwood (150.0mm) 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 | 336.5mm | | | | |

U-value = 0.14W/m²K

U-value, Combined Method : 0.144W/m²K (upper/lower limit 7.117 / 6.753m²K/W, dUf 0.0040, 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 : 0.0040

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

$$R_{P1} = R_{NB} + R_{L1} = 3.389 + 4.150 = 7.539 \text{ m}^2\text{K/W} \quad F_{P1} = 91.000\%$$

$$R_{P2} = R_{NB} + R_{L2} = 3.389 + 1.154 = 4.543 \text{ m}^2\text{K/W} \quad F_{P2} = 9.000\%$$

Upper resistance limit

$$R_{upper} = 1 / ((F_{P1}/R_{P1}) + (F_{P2}/R_{P2}))$$

$$R_{upper} = 1 / ((0.910/7.539) + (0.090/4.543)) = 7.117 \text{ m}^2\text{K/W}$$

Lower resistance limit

$$R_{lower} = R_{NB} + 1 / ((F_{L1}/R_{L1}) + (F_{B1}/R_{B1}))$$

$$R_{lower} = 3.389 + 1 / ((0.910/4.150) + (0.090/1.154)) = 6.753 \text{ m}^2\text{K/W}$$

Total resistance of roof

$$R_T = (R_{upper} + R_{lower}) / 2 = (7.117 + 6.753) / 2 = 6.94 \text{ m}^2\text{K/W}$$

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 : 0.0040

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 $U = (1 / R_t) + (\text{Delta Ur}) + (\text{Delta Urc}) = 0.14 \text{ W/m}^2\text{K}$

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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 (150.0) | 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 : 1.11 W/m²K Decrement : 0.17 factor Decrement delay : -13.80 hours