

**Project Information**

Reference

Date 14 September 2018

**Construction Type**

Element : Suspended ground floor - 0 Spec generator copies

Internal surface emissivity : High External surface emissivity : High

	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m <sup>2</sup> K/W)	Pitch (°)	Bridge details Air gaps (Level, Delta U")
Inside surface	-	-	0.170		
Floor deck Particleboard (600 mg/m <sup>3</sup> )	22.0	-	0.157		
Beltermo Ultra	100.0	0.042	2.350		L:0 0.000W/m <sup>2</sup> K
Ampatex Sinco	-	-	-		
SteicoFlex	100.0	0.036	2.750		9.000% Softwood (100.0mm) L:0 0.000W/m <sup>2</sup> K
Ampatex Aero	-	-	-		
Airspace, heat flow downwards, 300 mm thick (Slightly vented cavity - width=12.0mm, hro=5.100, E1=0.900, E2=0.900, downward heat flow, opening area 1500 mm <sup>2</sup> /m)	300.0	-	0.230/0.000		
Deck underside surface resistance			0.170		
<b>Total thickness</b>	<b>522.0mm</b>				

**Ground Floor Details**

Floor type : Suspended floor

Calculation method : EN ISO 13370:2007

Perimeter : 42.00 m Area : 104.00 m<sup>2</sup>

P/A : 0.404 Characteristic dimension, B' : 4.952

Thermal conductivity of ground: : 1.500 W/mK Width of walls, w: : 0.300 m

Height of floor above ground, h: : 0.225 m U-value of sub-floor walls, Uw: : 1.700 W/m<sup>2</sup>K

Average wind speed, V: : 5.000 m/s Wind shielding factor, fw: : 0.050

Ventilation opening area, E: : 0.0015 m<sup>2</sup>/m Subfloor ground resistance, Rs : 0.170 m<sup>2</sup>K/W

Resistance of insulation on ground, Rg : 0.000 m<sup>2</sup>K/W External surface resistance, Rse : 0.040 m<sup>2</sup>K/W

Deck resistance : 0.157m<sup>2</sup>K/W

Description : Particleboard (600 mg/m<sup>3</sup>)

Edge insulation position : None

**U-value = 0.16W/m<sup>2</sup>K**

U-value, Combined Method : 0.157W/m<sup>2</sup>K (upper/lower limit 5.569 / 5.310m<sup>2</sup>K/W, dUf 0.0000, dUg 0.0000, dUp0.0000, dUr0.0000, dUrc1 0.0000, dUrc2 0.0000)

**Correction factors**

Air gaps, Delta Ug = 0.000W/m<sup>2</sup>K

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

## Detailed U-value Calculation Results

### Calculation of U-value for floor deck (U<sub>f</sub>)

Construction includes 1 bridged layer

#### Non-bridged layers

Inside surface	0.170 m <sup>2</sup> K/W
Floor deck Particleboard (600 mg/m <sup>3</sup> )	0.157 m <sup>2</sup> K/W
Beltermo Ultra	2.350 m <sup>2</sup> K/W
Airspace, heat flow downwards, 300 mm thick	0.230 m <sup>2</sup> K/W
Deck underside surface resistance	0.170 m <sup>2</sup> K/W
Resistance of non-bridged layers, R <sub>NB</sub> =	<u>3.077 m<sup>2</sup>K/W</u>

#### Bridged layer

SteicoFlex (L1) bridged by Softwood (B1)

Path 1 - SteicoFlex

Path 2 - Softwood

#### Resistance and fraction of heat flow paths

$$R_{P1} = R_{NB} + R_{L1} = 3.077 + 2.750 = 5.827 \text{ m}^2\text{K/W} \quad F_{P1} = 91.000\%$$

$$R_{P2} = R_{NB} + R_{L2} = 3.077 + 0.769 = 3.846 \text{ m}^2\text{K/W} \quad F_{P2} = 9.000\%$$

#### Upper resistance limit

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

$$R_{upper} = 1 / \left( \frac{0.910}{5.827} + \frac{0.090}{3.846} \right) = 5.569 \text{ m}^2\text{K/W}$$

#### Lower resistance limit

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

$$R_{lower} = 3.077 + 1 / \left( \frac{0.910}{2.750} + \frac{0.090}{0.769} \right) = 5.310 \text{ m}^2\text{K/W}$$

#### Total resistance of suspended ground floor

$$R_F = \left( R_{upper} + R_{lower} \right) / 2 = (5.569 + 5.310) / 2 = 5.44 \text{ m}^2\text{K/W}$$

$$U_f = 0.184 \text{ m}^2\text{K/W}$$

### Calculation of U-value for ground (U<sub>g</sub>)

$$\text{Equivalent thickness of ground, } dg = 0.300 + 1.500(0.170 + 0.000 + 0.040) = 0.615 \text{ m}$$

$$U_g = \left( (2 \times 1.500) / \left( (\pi \times 4.952) + 0.615 \right) \right) \times \ln \left( \frac{(\pi \times 4.952)}{0.615} + 1 \right) = 0.606$$

### Calculation of U-value for sub-floor void (U<sub>x</sub>)

$$U_x = \left( 2 \times \left( \frac{0.225 \times 1.700}{4.952} \right) \right) + \left( \frac{1450 \times (0.002 \times 5.000 \times 0.050)}{4.952} \right) = 0.264$$

#### Floor U-value, U:

$$1 / U = \left( \frac{1}{0.184} \right) + \left( \frac{1}{0.606 + 0.264} \right) = 6.588$$

$$U = 0.152 \text{ W/m}^2\text{K}$$

Correction for air gaps, Delta U<sub>g</sub> = 0.0000 W/m<sup>2</sup>K

(Delta U<sub>f</sub> + Delta U<sub>g</sub> + Delta U<sub>p</sub> + Delta U<sub>r</sub>) is less than 3% of (1 / R<sub>t</sub>) so U = (1 / R<sub>t</sub>) + (Delta U<sub>r</sub>) + (Delta U<sub>rc</sub>) = 0.16 W/m<sup>2</sup>K

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**Thermal Mass Details**

	Thickness assessed (actual) (mm)	Density (kg/m <sup>3</sup> )	Specific heat capacity (J/kgK)	Heat capacity (kJ/m <sup>2</sup> K)
Floor deck Particleboard (600 mg/m <sup>3</sup> )	22.0 (22.0)	0.0	0.0	0.0
Beltermo Ultra	0.0 (100.0)	180.0	2100.0	0.0
Ampatex Sinco	0.0 (-)	280.0	850.0	0.0
SteicoFlex	0.0 (100.0)	0.0	0.0	0.0
Ampatex Aero	0.0 (-)	300.0	850.0	0.0
Airspace, heat flow downwards, 300 mm thick	0.0 (300.0)	1.2	1008.0	0.0
Total kappa value				0.0 0.0000
Limiting condition:	insulation			

Admittance : 0.86 W/m<sup>2</sup>K    Decrement : 0.00 factor    Decrement delay : 0.00 hours