

Project Information

Reference IS 412
 Date 10 May 2006
 Client Scottsdale Steel UK Project Proposed Details for
 500 Chiswick High Road BRE Approval
 Centre 500 Suite 35
 W4 5RG

Construction type

Element : Flat roof - IS412 - U value for Ceiling / Cold Roof
 External wall insulation
 Internal surface emissivity : High External surface emissivity : High
 Light steel-frame construction - Cold frame or Hybrid type:-
 Stud depth, d : 90.0 mm Stud spacing, s (mm) : 400.0 mm
 Flange width : not exceeding 50mm p : 0.508
 Correction for mechanical fasteners :-
 Alpha : 1.6 per m Thermal conductivity of fastener : 17.00 W/mK
 Fasteners per square metre : 9.00 off Fasteners cross-sectional area : 12.00 mm²
 Wall with cavity fill, mild steel twist ties, 900 x 450 cntrs - walls upto 15m with >=90mm leaves

Construction

	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m ² K/W)	Pitch Bridge Details (°)
Outside surface resistance	-	-	0.040	
Rockwool Flexi or Equivalent	90.0	0.037	2.432	
Rockwool Flexi or Equivalent	90.0	0.037	2.432	0.2% Steel studs (90.0mm)
Lafarge Standard Wallboard	12.5	0.180	0.069	
Lafarge Firecheck	12.5	0.250	0.050	
Inside surface resistance	-	-	0.100	

U-value - 0.24W/m²K

U-value, Combined Method : 0.24 W/m²K (upper/lower limit 5.115 / 3.348 m²K/W, dUf 0.0029, dUg 0.0000, dUp0.0000, dUr0.0000)
 (Correction for mechanical fasteners, Delta Uf = 0.003W/m²K)
 (Correction for 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
Rockwool Flexi or Equivalent	2.432 m ² K/W
Lafarge Standard Wallboard	0.069 m ² K/W
Lafarge Firecheck	0.050 m ² K/W
Inside surface resistance	0.100 m ² K/W
Resistance of non-bridged layers, R _{NB} =	<u>2.691 m²K/W</u>

Bridged layer

Rockwool Flexi or Equivalent (L1) bridged by Steel studs (B1)

Path 1 - Rockwool Flexi or Equivalent

Path 2 - Steel studs

Resistance and fraction of heat flow paths

$$R_{P1} = R_{NB} + R_{L1} = 2.691 + 2.432 = 5.123 \text{ m}^2\text{K/W} \quad F_{P1} = 99.833\%$$

$$R_{P2} = R_{NB} + R_{L2} = 2.691 + 0.002 = 2.693 \text{ m}^2\text{K/W} \quad F_{P2} = 0.167\%$$

Upper resistance limit

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

$$R_{upper} = 1 / ((0.998/5.123) + (0.002/2.693)) = 5.115 \text{ m}^2\text{K/W}$$

Lower resistance limit

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

$$R_{lower} = 2.691 + 1 / ((0.998/2.432) + (0.002/0.002)) = 3.348 \text{ m}^2\text{K/W}$$

Total resistance of roof

Light steel-frame construction - Cold frame or Hybrid type

Stud depth, d : 90.0 mm Stud spacing, s : 400.0 mm

Flange width : not exceeding 50mm p : 0.508

$$R_T = (p \times R_{upper} + (1 - p) \times R_{lower}) = (0.508 \times 5.115 + (1 - 0.508) \times 3.348) = 4.25 \text{ m}^2\text{K/W}$$

Correction for mechanical fasteners, Delta U_f = 0.003W/m²K. Correction for air gaps, Delta U_g = 0.000W/m²K

(Delta U_f + Delta U_g + Delta U_p) is less than 3% of (1 / R_t) so U = (1 / R_t) + (Delta U_r) = 0.24 W/m²K