

**Project Information**

Reference IS 212  
 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 - IS212 - 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 : 0.504  
 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 mm<sup>2</sup>  
 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 <sup>2</sup> 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 Firecheck	12.5	0.250	0.050	
Inside surface resistance	-	-	0.100	

**U-value - 0.24W/m<sup>2</sup>K**

U-value, Combined Method : 0.24 W/m<sup>2</sup>K (upper/lower limit 5.046 / 3.279 m<sup>2</sup>K/W, dUf 0.0029, dUg 0.0000, dUp0.0000, dUr0.0000)

(Correction for mechanical fasteners, Delta Uf = 0.003W/m<sup>2</sup>K)

(Correction for 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

Construction includes 1 bridged layer.

### Non-bridged layers

Outside surface resistance	0.040 m <sup>2</sup> K/W
Rockwool Flexi or Equivalent	2.432 m <sup>2</sup> K/W
Lafarge Firecheck	0.050 m <sup>2</sup> K/W
Inside surface resistance	0.100 m <sup>2</sup> K/W
Resistance of non-bridged layers, R <sub>NB</sub> =	<u>2.622 m<sup>2</sup>K/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

$$R_{P1} = R_{NB} + R_{L1} = 2.622 + 2.432 = 5.054 \text{ m}^2\text{K/W} \quad F_{P1} = 99.833\%$$

$$R_{P2} = R_{NB} + R_{L2} = 2.622 + 0.002 = 2.624 \text{ m}^2\text{K/W} \quad F_{P2} = 0.167\%$$

### Upper resistance limit

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

$$R_{upper} = 1 / \left( \left( 0.998/5.054 \right) + \left( 0.002/2.624 \right) \right) = 5.046 \text{ m}^2\text{K/W}$$

### Lower resistance limit

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

$$R_{lower} = 2.622 + 1 / \left( \left( 0.998/2.432 \right) + \left( 0.002/0.002 \right) \right) = 3.279 \text{ m}^2\text{K/W}$$

### 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 : 0.504

$$R_T = ( p \times R_{upper} + (1 - p) \times R_{lower} ) = (0.504 \times 5.046 + (1 - 0.504) \times 3.279) = 4.17 \text{ m}^2\text{K/W}$$

Correction for mechanical fasteners, Delta U<sub>f</sub> = 0.003W/m<sup>2</sup>K. Correction for air gaps, Delta U<sub>g</sub> = 0.000W/m<sup>2</sup>K

(Delta U<sub>f</sub> + Delta U<sub>g</sub> + Delta U<sub>p</sub>) is less than 3% of (1 / R<sub>T</sub>) so U = (1 / R<sub>T</sub>) + (Delta U<sub>r</sub>) = 0.24 W/m<sup>2</sup>K