

## **THERMAL INSULATION EVALUATION BY CALCULATION**

### **PITCHED METAL ROOF, 40MM SEMIREFLECTIVE AIR GAP, ANTIGLARE RFL, REFLECTIVE ATTIC, SEMI-REFLECTIVE 75MM SL GRADE POLYSTYRENE, 70MM AIR SPACE, PLASTERBOARD CEILING**

**Calculation: 223.22w**

Evaluation for Winter, 12.0°C ambient air temperature, 18.0°C inside air temperature.

Roof Element	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	Assumed Cavity Properties				Note
						e1	e2	mm	Heat Flow	
Outside air film:	0.040	<b>12.00</b>	12.06	12.03	0.06					1
Pitched metal roof:	0.000	12.06	12.06	12.06	0.00					3
Unventilated 40mm air space:	<b>0.453</b>	12.06	12.79	12.43	0.73	0.87	<b>0.15</b>	40	22°Up	5,6
Double Sided Antiglare Foil:	0.000	12.79	12.79	12.79	0.00	(bright RFL face down)				7
Reflective attic:	0.560	12.79	13.69	13.24	0.90					
<b>SL Grade EPS, 75mm, with RFL:</b>	<b>1.899</b>	13.69	16.73	15.21	3.05			75		7
Unventilated reflective 70mm air space:	<b>0.620</b>	16.73	17.73	17.23	0.99	<b>0.03</b>	0.87	70	Up	4,5
10mm plasterboard ceiling:	0.059	17.73	17.82	17.78	0.09					3
Indoor air film (unreflective surface):	<u>0.110</u>	17.82	<b>18.00</b>	17.91	<u>0.18</u>					2
<b>R<sub>Ti</sub> = 3.74</b>		m <sup>2</sup> .K/W		6.00						

**Corresponding Total Conductance (k<sub>Ti</sub>): 0.27 W/(m<sup>2</sup>.K)**

**NOTES:**

Calculated 2/7/08 22:30

Ref: 223\_E.xls

**Determinations based upon AS/NZS 4859.1:2002/Amdt 1 2006, Materials for the thermal insulation of buildings**

- 1 AS/NZS 4859.1:2002/Amdt 1 2006, Clause K5(a)
- 2 AS/NZS 4859.1:2002/Amdt 1 2006, Table K1
- 3 AS/NZS 4859.1:2002/Amdt 1 2006, Clause K8.1(a). (For Tiled Roofs, Total R would be R0.023 more.)
- 4 Cavity air space insulation values (shown in italics) were estimated using Reflect3 software. These are iterative calculations per the USA Division of Housing Research Paper 32, applicable for roof pitch 18°-35° to ±0.05 m<sup>2</sup>.K/W. The cavity R calculation assumes an air cavity of the gap shown with uniform parallel surfaces.
- 5 The calculations incorporate the pessimistic dust assumptions of AS/NZS 4859.1:2002/Amdt 1 2006, Clauses K3.2 & K4.2 (e+0.05)
- 6 Double Sided Antiglare Foil assumed e=0.10 and 0.03
- 7 Assumes k=0.0407 W/m.K for 23°C; e=0.10 and 0.03. R adjusted 0.39%/K in line with AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1
- 8 Indoor & outdoor air temperatures per AS/NZS 4859.1:2002/Amdt 1 2006, Clause K3.1
- 9 Thermal short-circuiting by frames is not considered here as evaluation is for the insulation path only.
- 10 This report may not be reproduced except in full. Results may not be quoted without reference to the assumptions.
- 11 Calculated by James Fricker, M.AIRAH, M.IEAust, CPEng.

**CONCLUSION:**

For the above roof having SL Grade EPS and Double Sided Antiglare Foil infrared emittances of 0.10 and 0.03, the WINTER Total R-value per AS4859.1:2002/Amdt 1 2006 Clause K3.1 is:

**R3.74 m<sup>2</sup>.K/W** for an air temperature difference of 18°-12° = 6K

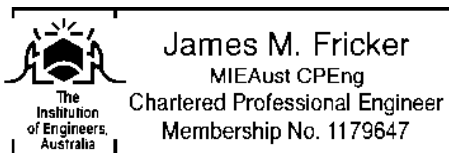
Application results for various EPS grades

(75mm, 15.2°C mean and 6K Δt)

EPS Grade	k at 23°C	EPS R	Total R	Added R value
Class L	0.0427	1.811	3.65	2.43
<b>Class SL</b>	<b>0.0407</b>	<b>1.899</b>	<b>3.74</b>	2.52
Class S	0.0394	1.962	3.80	2.58
Class M	0.0380	2.034	3.88	2.65
Class H	0.0365	2.116	3.96	2.74
Class VH	0.0349	2.213	4.05	2.83
	(W/m.K)	\	m <sup>2</sup> .K/W	/

Signed:

James Fricker



This certificate is issued by:



Valid to 30th June 2012