

# Test Report

## THERMAL TRANSMITTANCE OF A SECTION OF ROOF - INSULATED ALUMTECH

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FOR  
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For the attention of Mr Bruno Sargentini.

IDENTIFICATION CSM-4 Firm Price Agreement quotation number E07080045, dated 3 August 2007. NPL specimen number R072 was assigned to the roof section insulated with ALUMTECH.


BASIS OF TEST The NPL Rotatable Wall Guarded Hot Box whose calibration is traceable to National Standards and using the measurement procedures defined in the European Standard BS EN ISO 8990.


UNCERTAINTY The overall measurement uncertainty is estimated to be within  $\pm 7.2\%$  based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95 %.

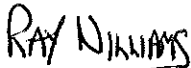
Reference: PP31/E07080045

Page 1 of 5

Date of issue: 11 December 2007

Signed:  Authorised Signatory

Checked by: 

Name:  for Managing Director

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Continuation Sheet

## 1 DESCRIPTION OF THE SPECIMEN

	<b>NPL Identity Number</b> R072 <b>Service Number</b> E07080045
Manufacturer's name	S.A.ME
Description of test element	Representative roof section insulated with ALUMTECH reflective insulation product. Details of the roof section tested are shown in Figure 1.
Technical description	<p>The structure of the test element is shown in Figure 1. The 1.48m long x 1.23m wide test element comprised 2 off 38 mm wide, 100 mm deep wood rafters at 409mm centres and two off 19 mm wide "half" rafters. A layer of 8 mm thick ALUMTECH reflective insulation was fixed on the warm ends of the rafters. A second air cavity was created by fixing three off 25 mm thick counter-battens over the insulation to which was fixed a sheet of 12.5 mm thick, aluminium foil backed plasterboard. A layer of breather membrane "Rhinovent" covered the cold face of the structure.</p> <p>The ALUMTECH product consists of two layers of bubble polyethylene with an average bubble diameter of 10 mm sandwiched between two sheets of aluminium film. The total thickness of the product is about 8 mm.</p> <p>The overall thickness of the test element was 140mm.</p>

## 2 THE APPARATUS

Thermal transmittance measurements are made in the NPL Rotatable Wall Guarded Hot Box, described in NPL Report CBTLM 25. Where relevant, the equipment and measurement procedures are in accordance with the requirements of BS EN ISO 8990:1996. The main features of the equipment are summarised below:

- The interior dimensions of the hot box are 2.4 m x 2.4 m.
- All surfaces "seen" by the test element are matt black.
- There are twenty five air temperature sensors, 75 mm from the holder panel face, positioned at the centres of squares of equal areas in front of the specimen in both the hot and cold boxes.
- The specimen was held at 22.5 degrees to the horizontal during this test.

Reference: PP31/E07080045

2 of 5

Checked by: 

# NATIONAL PHYSICAL LABORATORY

Continuation Sheet

## 3 MEASUREMENT PROCEDURES

The measurement procedure used was essentially an air-to-air method. Thermocouples were also mounted on the hot and cold surfaces of the specimen to facilitate calculation of the environmental temperatures, as specified in BS EN ISO 8990.

The 1.48 m x 1.23 m x 0.140 m roof panel (see figures 1 and 2) were mounted in a 300 mm thick expanded polystyrene (EPS) surround panel. The heat flow through this surround panel was calculated from its thermal conductivity and the surface temperature difference across it. The thermal conductivity of the EPS material was measured in the NPL guarded hot plate facility.

The small heat flow around the test element boundaries was calculated using the 2D FEA software tool THERM5 produced by the Lawrence Berkeley National Laboratory, USA.

Thermal transmittance values quoted are the mean of five sets of readings taken at two-hourly intervals. Equilibrium is assumed when the maximum difference between the five thermal transmittance values is less than approximately 1%.

## 4 RESULTS

The measurements on R072 were carried out on the 19 November 2007.

The standardised thermal transmittance value for R072 is given in Table 2, and a summary of the main experimental parameters is given in Table 3.

Table 2 Standardised Thermal Transmittance (U)

NPL ID number Customer identity	Test element description	Mean environmental temperature (°C)	Environmental temperature difference (°C)	Standardised <sup>[1]</sup> thermal transmittance (W/m <sup>2</sup> .K)
R072 Roof section insulated with ALUMTECH reflective insulation.	See figure 1	11.73	20.07	0.79

Note <sup>[1]</sup> Standardized to include a standard, total surface resistance value of 0.17 (m<sup>2</sup>.K)/W instead of the total surface resistance of 0.184 (m<sup>2</sup>.K)/W that was produced during the measurement.

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Continuation Sheet

Table 3 Measurement data for R072

<b>Test element number R072</b>		
Roof section insulated with ALUMTECH – installed at 22.5 degrees to the horizontal – Heat flow vertically up.		
<b>Test element dimensions</b>		
Height	1.481	m
Width	1.235	m
Thickness	140	mm
<b>Measured values</b>		
Mean warm air temperature	22.09	°C
Mean warm baffle temperature	21.58	°C
Mean cold air temperature	1.68	°C
Mean cold baffle temperature	1.80	°C
Power to hot box	38.203	W
Air flow rate in the cold box	3.7	m/s
Air flow rate in the hot box	0.3	m/s
<b>Calculated values</b>		
Boundary loss correction (calc with THERM5)	0.73	W
Heat flux density through specimen	15.617	W/m <sup>2</sup>
Warm side environmental temperature	21.76	°C
Cold side environmental temperature	1.70	°C
Environmental temperature difference	20.07	°C
Environmental temperature mean	11.73	°C
Measured thermal transmittance (U)	0.778	W/(m <sup>2</sup> ·K)
Total measured surface resistance	0.184	(m <sup>2</sup> ·K)/W
<b>Standardised thermal transmittance (U)</b>	<b>0.787</b>	<b>W/(m<sup>2</sup>·K)</b>
(to a standardised total surface resistance of 0.17 m <sup>2</sup> ·K/W)		

Figure 1 Test element design

## S.A.M.E 8mm Foil Insulation

