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BRITISH BOARD OF AGRÉMENT TEST REPORT No 51542

Determination of the thermal transmittance (U-value) of a NLS L2 Trade Range Kerb for NaturaLight System Ltd

Contents

Summary

This report describes the determination of the thermal transmittance (U value) of a NLS L2 Trade Range uPVC kerb in accordance with BS EN ISO 8990:1996.

The Kerb section is nominally 1125 mm in length by 1125 mm in width and 168 mm high.

The measured thermal transmittance (U value) of the Kerb section is 2.05 W/(m^2·K).

Approved by:
(Senior Test Technician)

Date: 19/4/2013

Authorised by:
(Test Operations Manager)

Date: 19/04/2013

On behalf of the British Board of Agrément

Client:	NaturaLight Systems Ltd Accessory House Barrington Industrial Estate Bedlington Northumberland NE22 7DQ
Job No:	T1 51542
Requested by:	Simon Johnston
Work period:	March 2013

1 TEST SPECIMEN

The Client supplied a NLS L2 Trade Range uPVC kerb.
Specimen details are given in Appendix A and has been assigned the BBA reference T1 51542/1

2 APPARATUS

The test was carried out in the British Board of Agrément Thermal Transmittance Facility designated U Rig 2 which is designed to satisfy the relevant criteria of BS EN ISO 8990 : 1996 *Thermal Insulation – Determination of steady-state thermal transmission properties – Calibrated and guarded hot box.*

The apparatus is a Guarded hot box with metering box aperture dimensions of 1.9 m high by 2.4 m wide. The guard chamber and cold box apertures are 2.8 m high by 3.3 m wide. All surfaces 'seen' by the test specimen are matt black.

3 TEST PROCEDURE

3.1 Calibration measurements

In establishing the operating parameters of the facility, a series of tests were conducted on calibration panels (infill panels of known thermal performance) mounted in the same surround panel used for the window test in accordance with section 6.2 of BS EN ISO 12567-1: 2010 *Thermal performance of windows and doors - Determination of thermal transmittance by hot box method – Complete windows and doors*. A 20 mm thick calibration panel was used to establish the air velocity on the cold side for which, at a heat flux density of 35 W/m^2, the sum of the hot and cold side surfaces resistances for the calibration panel is 0.17m^2/KW. The measured air velocity on the cold side was 2.8 ± 0.3 m/s.

Further tests were conducted with the same calibration panel and 60 mm calibration panel at the same air velocity for heat flux densities (q_{sp}) of 17, 26, and 44W/m^2 in order to establish the following relationships:

- total surface resistance: $R_{s,t} = 0.1871 \cdot q_{sp}^{-0.02330}$
- hot side convective fraction $F_{c,i} = 0.3549 + 0.00162 \cdot q_{sp}$
- cold side convective fraction $F_{c,e} = 0.7783 + 0.000337 \cdot q_{sp}$

In order to ensure that the heat flow through the surround panel is fully accounted for the variation of its thermal resistance with mean temperature was established. Tests were conducted using a second calibration panel at panel heat flux densities of 5, 9, 12 and 16 W/m^2 in accordance with section 6.2.3 of BS EN ISO 12567-1: 2010. The resistance of the surround panel was determined as:

- $R_{sur} = 2.502+0.016600 \cdot \theta_{me,sur}$

3.2 Window test

The test procedure is in accordance with the relevant criteria of BS EN ISO 12567-1: 2010. The specimen is mounted vertically in a central aperture in a 100 mm thick surround panel, with the warm face of the outer window frame flush with the warm surface of the surround panel. This assembly is placed between the hot and cold boxes of the facility such that the heat flow is horizontal.

4 TEST RESULTS

The test started on 10-Mar-13 and ended at 10:04 on 11-Mar-13 after a 15.7 hour period of stability.

4.1 Measured values

Kerb dimensions:	
- length	1125 mm
- width	1125 mm
- height	168 mm
Warm side temperatures:	
- mean air	18.8°C
- mean enclosure	18.6°C
Cold side temperatures	
- mean air	-0.2°C
- mean enclosure	-0.1°C
Air speed in cold box (up the panel)	3 ms^{-1}
Air speed in hot box (down the panel)	<0.3 ms^{-1}

4.2 Calculated values

Total mean power to metering box	58.7 W
Heat flux density through EPS and sample	31.5 W/m^2
Warm side convective fraction	0.406
Cold side convective fraction	0.789
Mean warm side environmental temperature	18.7°C
Mean cold side environmental temperature	-0.2°C
Thermal transmittance (measured)	2.05 W/(m^2·K)
Total surface resistance	0.173 (m^2·K)/W
Thermal transmittance (standardised)	2.0 W/(m^2·K)*

* The overall measurement uncertainty is estimated to be within ± 5.5% based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.

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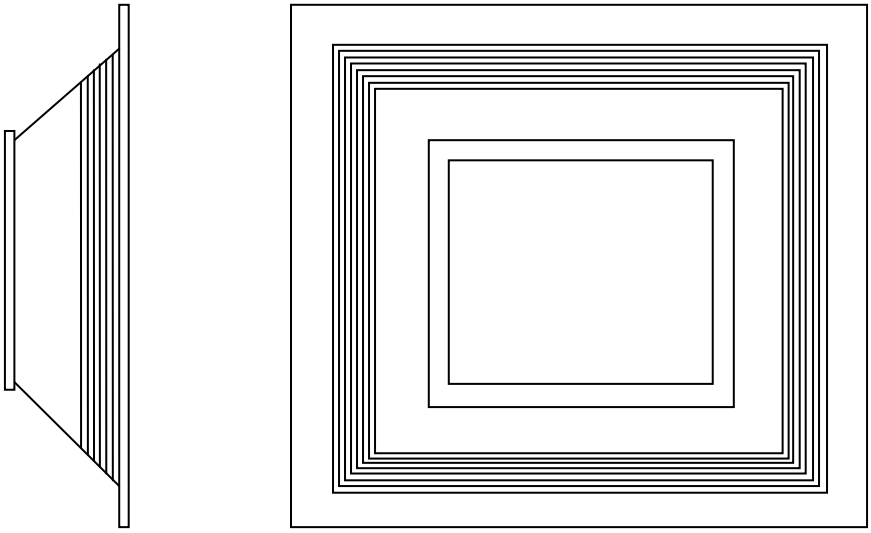
Appendix A (Test specimen)

This information is as declared by Simon Johnston of NaturaLight Systems Ltd on 25-Mar-13.

1 **DRAWING OF SAMPLE** (Drawn by BBA – not to scale)



2 **PHOTO**
(Viewed from outside)

3 **DIMENSIONS**

Overall: 1125 mm length x 1125 mm width x 168 mm high.

4 **DESCRIPTION**

A NLS L2 Trade Range uPVC kerb section.

Appendix B (U-Value Calculation)

U-Value calculation based on the linear area of the sample.

Linear Area of Sample	=	0.8064 m^2
Area of EPS	=	0.6513m^2
Conductivity of EPS Insert	=	0.0377 W/m·K
Thickness of EPS Insert	=	30.1244 mm
EPS Surface ΔT	=	14.92 °C
Sample Surface ΔT	=	11.89 °C
Total Power (Sample + EPS)	=	31.836 W

Calculated power through EPS:

$$\frac{1000}{30.1244} \times 0.0377 = 1.2515 \text{ W/m}^2\cdot\text{K}$$

$$1.2515 \times 14.92 = 18.672 \text{ W/m}^2$$

$$18.672 \times 0.6513 = 12.161 \text{ W}$$

Calculated sample power:

$$31.836 - 12.161 = 19.675 \text{ W}$$

U value calculation

$$\frac{19.675}{11.89} = 1.655 \text{ W/K}$$

$$\frac{1.655}{0.8064} = 2.05 \text{ W/m}^2\cdot\text{K}$$

U-Value = 2.05 $W/m^2 \cdot K$