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BRITISH BOARD OF AGREMENT TEST REPORT No 47404 Issue 2

Comparison of the thermal transmittance (U-value) of a window with a blind fitted in the open and closed positions for Fours Limited.

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Summary


This report describes the comparative thermal transmittance (U value) of a window with a blind fitted in both the open and closed positions using the principles of BS EN ISO 12567-1:2000.

The window is a nominally 1480 mm high by 1230 mm wide and comprises a fixed light above a top hung opening light incorporating coated sealed units.

The standardised thermal transmittance (U value) of the window with blind open is 1.81 W/(m²·K).

The standardised thermal transmittance (U value) of the window with blind closed is 1.43 W/(m²·K).


Tested By:
(Testing Technician)


Authorised by:
(Test Unit Leader)

Date: 22 December 2010

Date: 22 December 2010

On behalf of the British Board of Agrément

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Client: Fourds Limited
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County Derry
Northern Ireland
BT45 7AG

Job No: T147404

Report by: BBA Test Services

Work period: Dec-10

1 TEST SPECIMEN

The Client supplied a window and blind unit on 01 December 2010.
Specimen details are given in Appendix A and has been assigned the BBA reference T147404/1

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: 2000 *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/m², the sum of the hot and cold side surfaces resistances for the calibration panel is 0.17m²/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/m² 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/m² in accordance with section 6.2.3 of BS EN ISO 12567-1: 2000. 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 to compare the performance of a blind using the principle of BS EN ISO 12567-1: 2000. The specimen is mounted vertically in a central aperture in a 100 mm thick surround panel, with the blind supported in a wooden frame protruding 40mm into the hot side with the blind approximately 120mm from the upper glazing unit and 90mm from the lower glazing unit. This assembly is placed between the hot and cold boxes of the facility such that the heat flow is horizontal.

4 TEST RESULTS

The first test with the blind open started on 08-Dec-10 and ended at 09:09 on 09-Dec-10 after a 32.6 hour period of stability. The laboratory temperature during the period of stability was between 22.5°C and 27.1°C.

The second test with the blind closed started on 09-Dec-10 and ended at 11:20 on 10-Dec-10 after a 18.8 hour period of stability. The laboratory temperature during the period of stability was between 16.1°C and 19.3°C

4.1 Measured values

Window Dimensions		
- height	1480mm	
- width	1230mm	
Warm side temperatures:		
	BLIND OPEN	BLIND CLOSED
- mean air	20.2°C	20.7°C
- mean enclosure	19.8°C	20.3°C
Cold side temperatures		
- mean air	0.1°C	0.1°C
- mean enclosure	0.1°C	0.1°C
Air speed in cold box (up the panel)	2.3ms	<0.3ms ⁻¹
Air speed in hot box (down the panel)	2.2ms	<0.3ms ⁻¹

4.2 Calculated values

	BLIND OPEN	BLIND CLOSED
Total mean power to metering box	85.7W	73.4W
Heat flux density through the window	35.9 W/m ²	28.9 W/m ²
Warm side convective fraction	0.413	0.402
Cold side convective fraction	0.790	0.788
Mean warm side environmental temperature	20.0°C	20.5°C
Mean cold side environmental temperature	0.1°C	0.1°C
Thermal transmittance (measured)	1.81 W/(m ² ·K)	1.42 W/(m ² ·K)
Total surface resistance	0.172 (m ² ·K)/W	0.173 (m ² ·K)/W
Thermal transmittance (standardised)	1.81 W/(m ² ·K)*	1.43 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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The report is Issue 2 due to blind closed is $1.43 \text{ W}/(\text{m}^2 \cdot \text{K})$ being omitted from Issue 1.

Appendix A (Test specimen)

1 IMAGES OF SAMPLE



2 DIMENSIONS

Overall: 1230 mm wide and 1480 mm high.

3 DESCRIPTION

The sample consisted of a wooden framed window with a top hung light over a fixed light. The window was glazed with two 4/20/4mm sealed glazed units with a low emissivity coating to the warm side.

Appendix B (Thermal image)

Thermal images

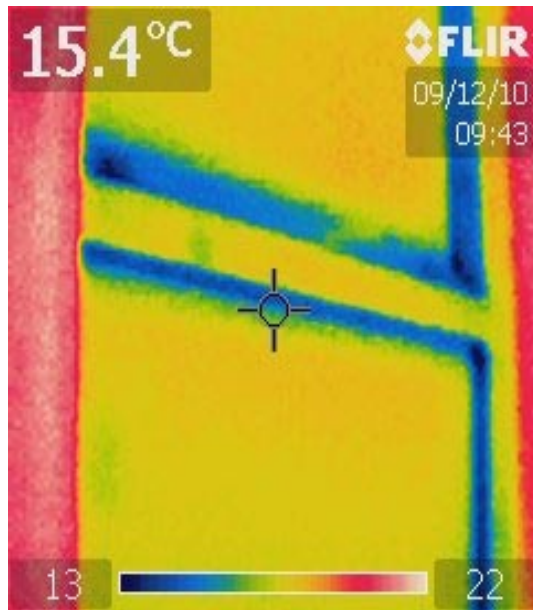


Image of window with blind open

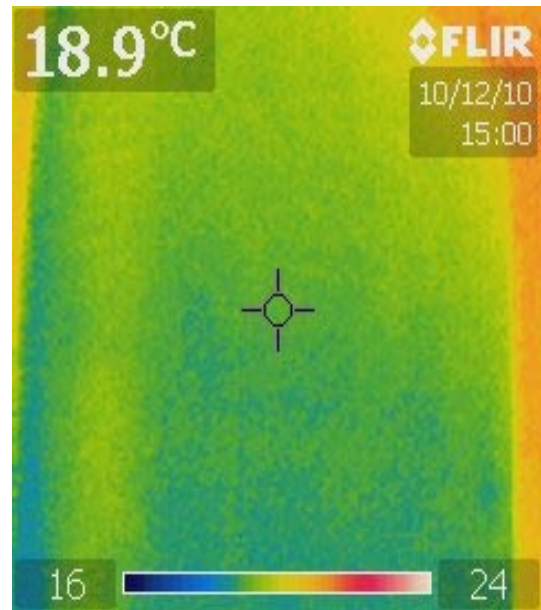


Image of window with blind closed