BBA INFORMATION BULLETIN NO 5

REFLECTIVE BREATHER MEMBRANES IN TIMBER FRAME WALLS – THERMAL PERFORMANCE CLAIMS

(17-06-075 Iss 5)

Reflective breather membranes have become an accepted means for improving U values without changing wall thickness. The reflective surface, facing into a vented cavity, inhibits radiative heat transfer thus increasing its thermal resistance. The results of calculations for a 110 mm thick timber stud wall with insulation (λ value 0.034 $W \cdot m^{-1} \cdot K^{-1}$) between studs and with 50 mm wide vented cavity and a brick outer skin are shown in Table 1.

Table 1 Thermal performance

Membrane emissivity (ε)	Cavity resistance ($m^2 \cdot K \cdot W$)	U value ($W \cdot m^{-2} \cdot K^{-1}$)	U value improvement
0.9(1)	0.18	0.33	–
0.15	0.50	0.30	10%
0.05	0.67	0.28	15%

(1) Typical value for a non-reflective breather membrane and a brick surface.

These calculations are in accordance with BS EN ISO 6946 : 2017 and BR 443 : 2019, as specified in the documents supporting the national Building Regulations.

These same documents also support the use of guarded hot box testing to establish thermal performance, and the formula (BS EN ISO 6946 : 2017, Annex D) for calculating the thermal resistance of a cavity is based on a large number of hot box measurements on a range of cavities.

The calculation and measurement approach, therefore, should give similar values.

The BBA's approach is to establish a membrane emissivity that can be shown to be representative of normal production and include effects of ageing and overprinting. An expected 'design' cavity resistance value can then be calculated to the codes referred to above.

When using the guarded hot box method, it is important to ensure that any test samples used are constructed in a form representative of actual use of the product on site, otherwise apparent performance could exceed that which will actually be obtained in the building. For example, data obtained by the BBA indicate that hot box measurements can exceed calculated cavity resistance values if greater than normal stapling centres (up to 2 m) and looseness of membrane fit permit the formation of an additional air cavity between the membrane and the timber-frame sheathing. This 'fortuitous' pocket of relatively still air, unlikely to exist when such membranes are installed in practice, can enhance the total cavity resistance value as measured in a guarded hot box (see the test example given in Table 2 overleaf).

It is the BBA's view that cavity resistance values obtained via a guarded hot box method must be based upon samples constructed in accordance with established industry practice [eg NHBC Standards 2024 Chapter 6.2, section 6.2.13, and the TRADA Wood Information sheet (WIS 1-35) Breather membranes for timber frame walls) (revised January 2013)] recommending that stapling centres should not exceed 600 mm horizontally and 300 mm vertically. Greater fixing centres may increase the risk of wind damage prior to completion of the wall construction.

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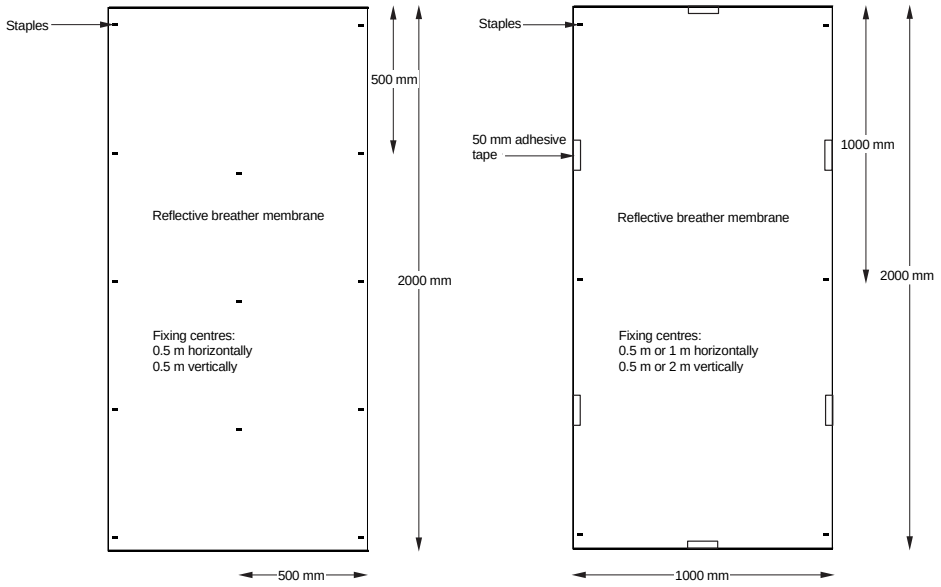
Results of tests carried out in UKAS accredited guarded hot boxes (to BS EN IS0 8990 : 1996) and calculations (to BS EN ISO 6946 : 2017, Annex D) show that when using the correct fixing centres, hot box measurement and calculations of cavity resistance to EN 6946 agree very well (<2%), but if the hot box test sample incorporates a fortuitous air pocket between the sheathing and the membrane, the difference can be significant, see Table 2.

Table 2 Example cavity resistance values

Characteristic (ε–0.06)	Fixed as per NHBC and Trada recommendations (Figure 1)	Fixed out with NHBC and Trada recommendations (Figure 2)	Difference
Total Cavity R value $m^2 \cdot K \cdot W^{-1}$	0.64	0.73	+14%



Summary

When using cavity resistance values measured from a guarded hot box test, users should satisfy themselves that the conditions under which the tests were carried out, properly reflect the actual installation conditions to be used on site, for example, the spacing of fixings.