

Multi-Foil Insulation?

The debate on claims made by the multi foil manufacturers industry has raged on for a number of years. They have long claimed U values below 0.20 are achievable using their product as a single system insulation method and let everyone from builders to Building Control Surveyors believe that their products had R values between 5 and 6. At last the debate has been independently settled and it needed to be once the Advertising Standards Authority got involved in the row and did not believe the figures could be true.

The nationally accepted testing bodies the Building Research Establishment and the National Physics Laboratory have both tested multi foil insulation systems, in the laboratory and in 'real world' applications. Test results on the multi foil insulation products indicate that currently manufactured multi foil insulation products cannot and do not meet Building Regulations as an insulation system on its own merits. This article explores why.

The insulation value claims made by the multi foil insulation products industry have been challenged and it is apparent by the research conducted over 2005/2006 by the Building Research Establishment (BRE) and the National Physics Laboratory multi-foil insulation does not live up to the manufacturers' claims - download here. Also of value is this August 2006 Local Authority Building Control Technical Guidance Notes publication, download here.

At best case the tests carried out by the National Physical Laboratory (who are UKAS accredited) testing in accordance with BS EN ISO 8990 indicates an "R" value (the higher the R value the better the thermal resistance of the product and the better it will be as a thermal insulator) for multi-foil thermal insulation products is in a range of 1.69 to 1.71 m²K/W. Manufacturers however are, claiming "R" values for their products with a range of 5.0 to 6.0 m²K/W, approximately three times better than can be verified by either the BRE or National Physics Laboratory. No wonder the ASA got involved.

Over the last few years the debate between multi-foil insulation manufacturers and the insulation industry generally escalated into a row and in stepped the Advertising Standards Authority who decided that multi-foil manufacturers could not substantiate their R value claims and had to withdraw promotional material claiming R values as high as 5. This has led to a very embarrassing situation for Local Authority Building Control Surveyors who had been previously known to accept multi-foil products as meeting Building Regulations. There is no doubt now, multi-foil insulation products whatever their merits cannot and do not on their own meet April 2006 Building Regulations by whatever method of single system installation the manufacturers might specify. If multi foil is to be used it must be used in conjunction with other methods for thermal insulation control and so one of its alleged advantages, cost, is lost.

The August 2006 Local Authority Building Control LABC Technical Guidance Note (Subject: Use of Multi-foil insulation products, Compliance with Regulation 7 and Requirement L1) briefs Local Authority Building Control Surveyors on what to do about current and new planning applications that have a multi-foil insulation system specified. Also, the LABC notes make it clear that only BS EN standards using test methods BR 443 for product testing will be accepted and testing must be

by an accredited laboratory, in the UK this will mean in practice a UKAS accredited laboratory. Since only one manufacturer has had their product tested to BS EN standards this rules out all but one multi foil products. And the results of that manufacturer who had their product tested to BS EN standards by a UKAS accredited laboratory gave a R value of 1.69 m²K/W and a U value of 0.53 W/m²/K. It is hard to see how a multi foil system can now be accepted as a single method of insulation alone since as a system on its own it cannot meet a U value of 0.20, the required value on the sloping ceiling part of a loft conversion.

For aged polyurethane foam (worst case scenario), a typical calculated value of thermal conductance by test method ASTM is k value = 0.026 W/mK, to achieve a U value of 0.20 would require an R value (depth/ k value) of 5 for the foam depth sprayed ($1/u$ value or $1/0.20 = 5$) and therefore calculating for depth is $k * R$ or $0.26 * 5 = 130$ mm . A 130 mm coating of high density polyurethane foam will hence do the job here to achieve a U value of 0.20. Depth of foam required to achieve a particular U value is given by the conductance value of the foam divided by the U value, $k/U = \text{depth}$. Polyurethane spray foams have typical thermal conductances in the range 0.015 to 0.030 W/mK with high density foams at the lower end of the scale.

Essentially, the research conducted by the BRE has looked at 'real world' applications and concluded that multi-foil insulation products significantly differ from the measured on site U values (the lower the U value the lower the heat loss will be through the product and therefore the better the insulator will be) to that claimed by the manufacturers. Significant because the real world measurements indicate that for most applications foil based insulation products cannot come close to meeting the new standards for thermal insulation introduced by the April 2006 Building Regulations. Best case U value was 0.43 given favourable assumptions whilst worst case was a U value of 0.98 (the lower the U value the better the thermal insulation value) Given that the Building Regulations demand at least U values starting from 0.25 and below, it is clear that foil based insulation products cannot meet the new standards. This is against a background where foil based insulation product manufacturers have been claiming that U values as low as 0.18 are achievable with multi foil. This was not borne out by real world research by the BRE where actual U values measurement were significantly inferior. No wonder the ASA so fit to take action against the multi-foil insulation manufacturers.

Based upon the BRE results, as a comparison, a 40 mm coating of polyurethane foam produces a thermal U value of worst case 0.53. A multi-foil insulation product of 30 mm at best case as tested by the BRE gives a real world U value of 0.78, significantly inferior to polyurethane foam. A 100 mm coating of polyurethane falls in U value to below 0.25, the new minimum starting U value under the new April 2006 Building Regulations. A multi-foil system is stuck at 0.78, hopelessly outclassed and cannot comply with Building Regulations. Even going from one manufacturer's test claim of $U = 0.533$ as the best of the best this still falls hopelessly short of complying with Building Regs.

And what about cold bridging? Clearly with polyurethane foam you can minimise the cold bridging problem of rafters by spraying behind and in between laths but with multi-foil the cold bridges have to be ignored because there is no satisfactory way with multi foil alone of minimising this important real world affect. Clearly, multi foil on its own cannot meet modern insulation standards and all manufacturers will have to go back to the drawing board and redesign their product and for the first time have their products tested by rigorous standards by accredited laboratories.

Finally, the multi-foil system U or R values are measured at the time when the product will give the best values, i.e. when it is new. There is the problem that multi-foil products performance must degrade over time as dust accumulating on the surface will diminish its performance.