

2004 Audit Review

of

Standard Guidelines & Assumptions

**For the Calculation of the Thermal Resistance of Building Elements
and Assemblies incorporating Reflective Insulation Materials for
Compliance with AS/NZS 4859.1:2002**

for

Aluminium Foil Insulation Association, Inc.

by

Dr Richard M Aynsley

October 2004

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Background

I have been involved in research, teaching, and professional activities relating to the thermal performance and energy efficiency of buildings in Australia for over thirty years. This includes membership of Standards Australia BD58 'Thermal Performance and Insulation of Dwellings' committee since 1975, and a long interest in the use of reflective foil insulation in reducing heat transfer by radiation in roof spaces of tropical buildings in Australia. I served a period of 7 years as Director of the Australian Institute of Tropical Architecture at James Cook University where I conducted many tests and research projects on thermal performance of buildings in the topical regions of Australia. I am currently involved in the optimization of energy efficiency of industrial buildings using air movement.

The body of knowledge of reflective foil insulation in Australia is limited due to the lack of independent research and testing to support this industry and for the benefit of the public. Most of the relevant knowledge has been derived from international research projects conducted under different climatic conditions to those found in Australia.

The Australian standards relating to this industry are inadequate and their preparation, periodic review and upgrading is not adequately funded.

Summary

My review of AFIA's Standard Guidelines and Assumptions has found it to be sufficient for application in the Australian building industry. Taking into account the shortcomings mentioned above, the document is of a high standard and makes a worthwhile contribution to the application of reflective foil insulation in buildings in Australia. I endorse its use by the reflective foil insulation industry in Australia.

I make specific recommendations in the following paragraphs.

Recommendations

Reflect3

This software can be extended beyond 100mm air gaps when adjustments suggested by Dr David Yarbrough, based partly on his work at Oak Ridge National Laboratory, are incorporated into the program. This will make the program even more useful.

Dust

Having read the results of much research conducted into determining the effects of dust deposits on reflective foil insulation I have come to the decision that this is no longer the problem it was perceived to be in the past. In Australian housing and most Australian commercial buildings, there will be little dust present to deposit on foil laying horizontally and certainly no dust will be deposited on vertical, downward facing or the most common inclined installations.

Evidence shows that deposits of dust induced in laboratory settings on horizontal installations do not nullify its emissivity. The emissivity is increased but still it is an effective reflective insulation. Any attempts to change the low emissivity of these products to a high emissivity in energy rating software and mathematical calculations of the R-values, because of dust deposits, will do disservice to the products and should be stopped. There is no statistically credible 'rate of deposit' factor and this is unlikely to be established. I recommend that manufacturer's warranty instructs that installation must be in a dust free environment and that labeling warns of reduction in efficacy of the reflective insulation when there is a significant amount of dust on its surface.

Most construction designs included in this document have reflective foil barriers installed facing downwards under or over battens to avoid any consideration of dust.

It is hoped that dust issues can be treated fairly by other insulation industry groups and building regulators so Australian home owners can be offered more energy efficient choices by the appropriate application of reflective foil insulations.

Durability

Currently durability is not a required condition of performance in the Building Code of Australia (BCA). Therefore, for the purposes of the BCA, there should be no derating for durability of any building insulation and particularly reflective foil insulation, with respect to dust accumulation, incorporated into the building requirements by any local, state or national authority. The public can be made aware of potential durability issues by appropriate product labeling as provided for in AS/NZS 4859.1:2002.

Research

Government funded research into the in-field durability of all home insulation products should be conducted and results disseminated to the public for their information.

With the introduction of new instrumentation, new in-field studies need to be conducted into the thermal performance of building materials and building construction by *independent* groups rather than by industry insiders.

The Australian Institute of Refrigerating, Air-Conditioning and Heating (Inc) needs to regularly review the information published in its Handbook and update it, as research contributes new knowledge. Industry professionals need to have the latest information for use in their work.



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