

## 1. AIM

To determine the AS/NZS 4859.1:2002/Amdt 1 (Dec 2006) Total R-Values of various building systems incorporating Polyair reflective insulations.

The client for this calculation set is Polyair Pty Ltd, 4 Macdonald Road, Ingleburn NSW 2565, Australia, contact being Tino Zuzul, phone: (02) 9829 2299, fax: (02) 9829 2211, email: sales@polyairinsulation.net.au.

## 2. CALCULATIONS

The calculations are based upon:

- a) AS/NZS 4859.1:2002/Amdt 1 (Dec 2006) "Materials for the thermal insulation of buildings. Part 1: General criteria and technical provisions",
- b) the Australian Institute of Refrigeration Air-conditioning & Heating (AIRAH) Handbook Millennium Edition 2000, Section 6, and (if necessary) the ASHRAE Fundamentals Handbook.

Results reported are for the **insulation path** only per the original AS/NZS 4859.1:2002 Clause 1.5.3.3 – "*Total thermal resistance - A total resistance associated with a material or a system or construction of materials, specified as a Total R, including surface film resistances*" to be in alignment with the BCA2007 Specification J1.3 examples.

R-values for parallel-faced air cavities were calculated using the Reflect-3 computer software that is based on Robinson and Powell data and validated by Oakridge National Laboratory, USA. These calculations are iterative and only the converged results are shown.

The R-values of enclosed air spaces greater than 100mm were calculated per ISO 6946:2007 "Building components and building elements — Thermal resistance and thermal transmittance — Calculation method".

Because of normal variations in building materials, the report resistance values for frames and other building materials have an estimated error of 10%.

Total R-values are based on product in-service conditions in accordance with AS/NZS 4859.1:2002/Amdt 1 (Dec 2006) including the alteration of insulation material R for temperature.

## 3. APPLICATION

In accordance with AS/NZS 4859.1:2002/Amdt 1 (Dec 2006) Clause K3.1, Total R-values (insulation path) are presented for the Australian summer air temperature difference of 12K (36°C less 24°C), and winter air temperature difference of 6K (18°C less 12°C).

## 4. THERMAL BRIDGING

The original AS/NZS 4859.1:2002 clearly required reporting of the thermal resistance for the insulation path only.

Amendment 1 (Dec 2006) of AS/NZS 4859.1:2002 Clause 1.5.3.3 now states Total R is "representative of the element of construction". This report assumes the "element of construction" is that which typifies the insulation path only, to be consistent with earlier calculations. To emphasise this, this report reports Insulation path Total Thermal Resistance (with abbreviation  $R_{Ti}$ ).

All calculations were done by:



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### **PAPERS PUBLISHED:**

*Computational Analysis of Reflective Air Spaces, AIRAH Journal, Oct 1997*

*Low Energy Housing Design, UNESCO conference, Alice Springs 1990 (co-author with Angelo Delsante, CSIRO)*

*Calculation of Energy Targets, ASHRAE Journal, Oct 1987.*

*Testing and Modelling Flexible Air Duct Insulation Performance, 21<sup>st</sup> International Conference on Thermal Insulation (co-author with Dr Peter Johnson, RMIT)*