



**MINERAL WOOL MANUFACTURERS'
ASSOCIATION OF AUSTRALIA**

SUBMISSION TO GOVERNMENT:

DOMESTIC INSULATION STANDARDS

IMPROVED COMFORT LEVELS

POTENTIAL ENERGY SAVINGS

MANDATORY DOMESTIC INSULATION

SELECTED EXTRACTS

**KEY CONCLUSIONS: Pages 10, 19 & 63
"OPTIMUM INSULATION LEVELS IN CEILINGS"**

OCTOBER 1975

SUBMISSION TO GOVERNMENT

ON

- DOMESTIC INSULATION STANDARDS
- IMPROVED COMFORT LEVELS
- POTENTIAL ENERGY SAVINGS
- MANDATORY DOMESTIC INSULATION

presented by

THE MINERAL WOOL MANUFACTURERS'
ASSOCIATION OF AUSTRALIA

OCTOBER, 1975

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INTRODUCTION

Australia uses **more** energy per capita than all but four other nations - yet we live in an equable climate and our secondary industry is not as highly developed as is that of the other four. We do, in fact, waste energy.

This submission puts forward an energy-saving proposal that is readily, and economically, achievable.

The Mineral Wool Manufacturers' Association of Australia believes that :

- Australia-wide minimum thermal insulation standards should be adopted, relating to performance and safety.
- Comfort standards are rising, and should be considered within the context of necessary energy conservation.
- Substantial and nationally significant energy savings can be effected through insulation.
- Domestic housing insulation should be mandatory and Governments should consider offering incentives to new and existing home owners to insulate their houses.

The case put forward in this document is based on two technical papers produced by the Mineral Wool Manufacturers' Association. These papers have been discussed in depth with the CSIRO, and have the approval of this body in regard to thermal and technical assumptions, methodology and objectivity. A letter from the CSIRO to this effect is appended.

The cases illustrated in the body of this submission draw on the technical papers and are, of necessity, theoretical. They could be given different academic interpretations which would provide slightly different results. Please note that they are included to illustrate the order of energy savings available and not the precise amounts, because the actual **S**avings will

depend on individuals' living habits. There is total agreement with the CSIRO that thermal insulation will save enormous amounts of energy.

Calculations detailed in this submission indicate that if mandatory insulation was introduced for new houses in Southern Australia now, more than 513,000 terajoules (1425×10^8 kWh) of secondary energy worth over \$2,400 million at today's prices could be saved over the next 25 years. Another case: in Victoria alone, some 15,000 terajoules (42×10^8 kWh) of secondary energy, worth about \$52 million, were wasted in 1973/74 through inadequate insulation. Government sources believe that only five per cent of all Australian homes are insulated; while we agree that this is likely, we would add that up to 15 per cent are insulated in some colder areas.

This document deals primarily with insulation as it affects energy usage for winter heating. Research is planned to provide a further paper on summer and hot climate domestic cooling.

Most developed countries already have specific insulation standards, and many have introduced mandatory insulation legislation to achieve energy efficiency and improved comfort levels. The need for further enquiry into the benefits of insulation in Australia has been recognised by authorities independent of the insulation industry, and we hope this document will stimulate further interest, and action.

It is of course accepted that members of the Mineral Wool Manufacturers' Association could benefit if insulation became mandatory, and this naturally is one of several reasons why the Association is expending effort on the matter.

However, the purpose of this document is to show that introduction of mandatory insulation standards would be strongly in the national interest, with any benefit to the insulation industry being irrelevant to the central issue.

Information on standards and formulae used overseas is contained in the "International Comparison of Building Regulations - Thermal Insulation", published by the Building Research Establishment, U.K."

(g) Recommended Insulation Requirements

There is a strong case for the following standards to be adopted :-

1. Thickness (Mineral Wool Batts)*

Adelaide	-	50 mm (2")
Canberra	-	100 mm (4")
Sydney	-	75 mm (3")
Melbourne	-	75 mm (3")
Hobart	-	75 mm (3")

2. Safety - of non-organic and non-combustible composition to guard against fire.
3. Permanence - an insulation material that has sustained performance over lifetime of the building.

*NOTE : While it is convenient to refer to insulation standards in terms of insulation thickness, and that approach has been adopted in this submission, the Mineral Wool Manufacturers' Association of Australia would strongly recommend that, for technical reasons, any regulations concerning insulation be written in terms of "Thermal Resistance" rather than thickness.

- Case 1 considers the effect on energy usage if all new houses in Southern Australia from now on have ceiling insulation and are heated throughout to desirable comfort levels (20°C, 68°F) and that adequate heating appliances are installed to achieve these levels.
- Case 2 deals with the existing comfort levels maintained in Victorian houses and the savings in energy which could be achieved now if all houses were insulated today.

Case 1

As no precise data was available on the percentage of energy that could be saved through insulation in Australia, the Mineral Wool Manufacturers' Association commissioned a programme to determine the facts. A mathematical model for Australian conditions was developed with the assistance of the CSIRO and this work is discussed later in this report. (Section 4, and Appendix D). This model was used as the basis for determining recommended insulation thicknesses.

The study revealed that between 39 and 42.5 per cent of the energy used for heating homes could be saved through the insulation of ceilings alone, if current comfort standards were maintained. The proportion of heat savings does not vary greatly with climatic conditions, as the thickness of insulation recommended has been varied in each area to achieve optimum savings. It should be noted that the cost of heating fuels in different cities varies considerably.

The study demonstrates that optimum standard insulation thicknesses (mineral wool batts) are as follows :-

Adelaide	-	50 mm
Canberra	-	100 mm
Sydney	-	75 mm
Melbourne	-	75 mm
Hobart	-	75 mm

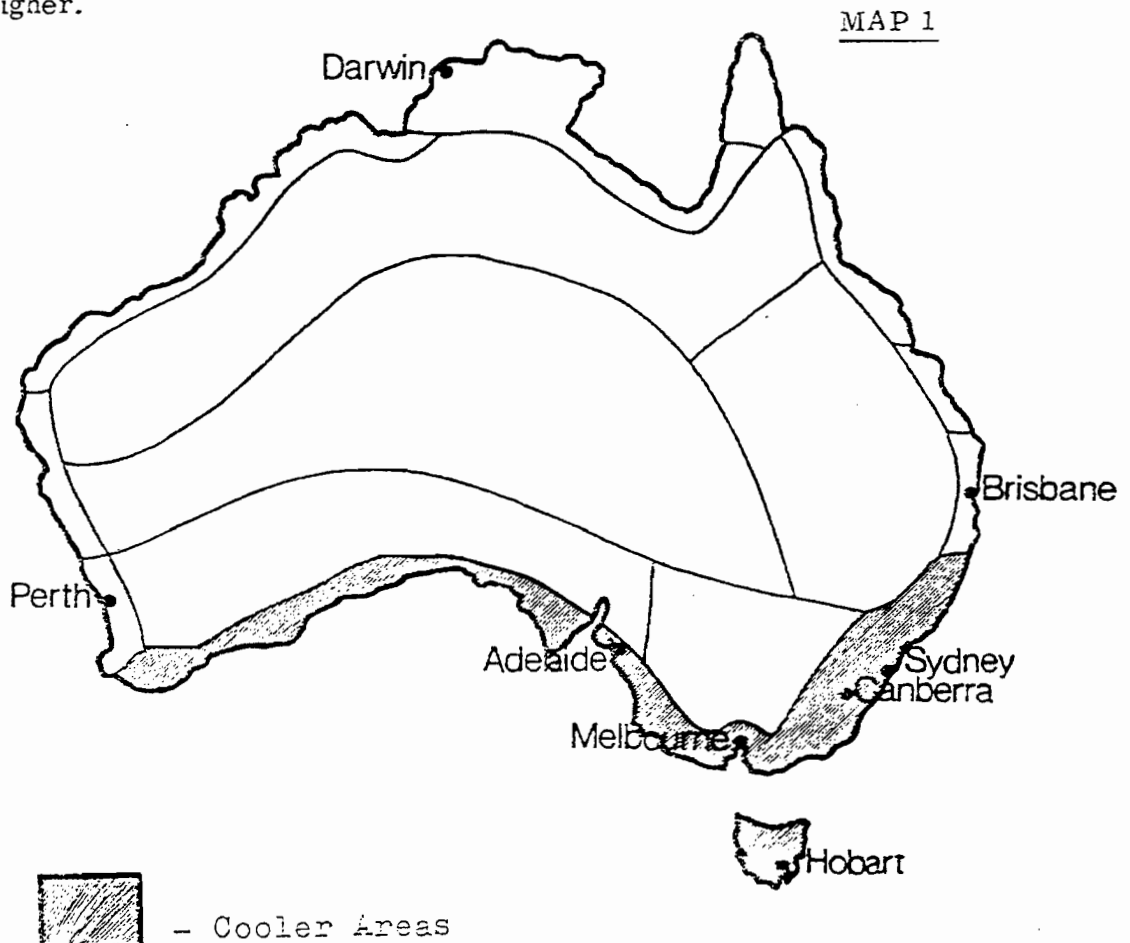
If the optimum standard ceiling insulation is installed the following savings on domestic heating bills could be achieved.

Adelaide	-	39.2 per cent
Canberra	-	42.5 per cent
Sydney	-	41.3 per cent
Melbourne	-	41.3 per cent
Hobart	-	41.3 per cent

Note that if walls are insulated as well as ceilings, then percentage savings are significantly greater.

In conclusion, it is recommended that the above thicknesses of insulation be adopted as the minimum standard.

If all NEW dwellings in the cooler areas of Australia (see Map 1) are built with adequate ceiling insulation from now on, then 19,900 terajoules ($55 \times 10^8 \text{kWh}$) of secondary energy will be saved during the next five years. When converted back to primary energy resources the figures are considerably higher.



6. THE ENERGY SITUATION IN AUSTRALIA

In future years it may be decided that the Arab nations did the world a service by exploiting the "oil weapon" in 1973. It brought the matter of energy resources into sharp focus, and initiated a re-assessment of the dwindling world reserves of fossil fuels and of the need for alternate sources of energy. It is now apparent that this is not a vague future problem, but something that requires action now.

Australia does not have an energy crisis, but a study of our energy situation shows that it would be irresponsible to be complacent.

The only difference between Australia and the other developed countries is that we have a little more breathing space, because we have relatively large reserves of fossil fuels on a per capita basis. But these sources of energy are not infinite, and we are obliged to share them with less fortunate countries. Above all, our energy resources are simply going to become too valuable on the world energy market for us to waste them here.

Opinion differs on how much time we have before our fossil fuels are exhausted, but it is likely that our known oil reserves will produce at current rates to the early 1980's and then decline, our natural gas will last some three decades, and our coal in excess of 400 years (depending on when other fuels run out or are curtailed).

Availability of suitable topography for additional hydro-electricity generation is exceedingly limited.

The length of time to elapse before Australia's resources of fossil fuels are depleted can only be broadly estimated, because no-one can precisely forecast -

- . The volume of fossil fuels yet to be discovered
- . The availability of oil from other countries.

The volume of resources we will be obliged to export.

With regard to the latter point, Australia cannot regard its energy resources as independent from the world's energy resources. Australia has now entered the "big league" of nations and this brings both responsibility and commitment. Energy crisis in other parts of the world must inevitably affect Australia.

The developing countries and industrialised nations alike are geared to a philosophy of growth and a rising standard of living, and this is placing increasingly greater demands on world resources. It is interesting to note that the U.S.A., with less than 6 per cent of the world population, consumes over one third of the energy and nearly half of the earth's industrial raw materials.

The consumption of energy in Australia is currently the fifth highest in the world on a per capita basis, behind the U.S.A., Canada, Sweden and Switzerland.

INCREASING DEMAND

The demand for energy in Australia is accelerating at an unprecedented rate. Over the past 10 years our demand for energy has increased at an average of 5.8 per cent per annum; in the next 10 years it is expected to increase at an average of 6.6 per cent per annum. The most significant growth sector of primary energy consumption has been electricity generation. Over the past two decades the Australian demand for electricity has been doubling approximately once in every eight years.

The energy growth pattern is clearly seen in the attached forecast of consumption of primary fuels prepared by the Department of Minerals and Energy (Table 1). It shows there will be more than a four-fold increase in energy demand by 1999-2000.

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RWRM:HRB

September 23, 1975

Mr Ian Reid
President
Mineral Wool Manufacturers Association
of Australia
370 St Kilda Road
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Dear Mr Reid

As requested, we comment hereunder on two reports submitted by
The Mineral Wool Manufacturers Association of Australia.

"Thermal Insulation and Comfort Levels"
by J W McKenna dated 31st March, 1975.

"The Effect of Mandatory Home Insulation on Energy Usage
in Southern Australia" by D J Russell dated 13th May, 1975.

In general, the use of thermal insulation in buildings will reduce
the fuel energy necessary to maintain the buildings at a given
warmth in winter and there will be an "optimum" at which the total
cost of fuel and insulation is a minimum.

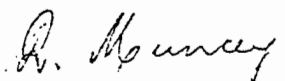
The methodology used by Russell and McKenna to determine the effects
of insulation on energy usage is logical and any assumptions made
have been clearly spelt out.

We would have used non steady temperatures in such a study, but we
acknowledge that the change in the final result between the steady state
method Russell and McKenna have chosen and our approach would be small.

The thermal and technical data and assumptions in the two papers are
reasonable estimates.

Overall, we support the proposition that insulation of houses is desirable
economically and for fuel energy saving. We believe the methods of
McKenna and Russell provide an answer of sufficient accuracy. Some
matters not included and some estimates adopted tend to lower the
optimum calculated, whilst others tend to raise it. We understand that
a copy of this letter will be included as an appendix in the Mineral
Wool Manufacturers Association of Australia Submission to Government.

Yours sincerely



R W R Muncey
Chief of Division

Namely :-

Locality	Recommended Std. Optimum Thickness
ADELAIDE	50 mm
CANBERRA	100 mm
SYDNEY	75 mm
MELBOURNE	75 mm
HOBART	75 mm

The Mineral Wool Manufacturers' Association of Australia recommends that these thicknesses of fibreglass batts be adopted as the minimum standard for dwellings.

As a final check to the logic, it is interesting to calculate the simple "payback" period for these thicknesses. In this simple case, the payback period is defined as the number of years, at current prices, it would take to save the cost of the insulation in reduced fuel bills. The results are shown in Table XI.

TABLE XI SIMPLE PAYBACK PERIOD FOR RECOMMENDED INSULATION THICKNESS

ADELAIDE	4.0 years
CANBERRA	3.3 years
SYDNEY	4.7 years
MELBOURNE	4.1 years
HOBART	3.8 years

These figures serve to illustrate that the recommended thicknesses of insulation represent a good investment.

TOTAL SAVINGS AS A PERCENTAGE OF FUEL BILL

Relative areas of dwellings are given in O'Brien "Thermal Insulation

The New Zealand study presents a case for the setting up of a standard in that country. Because of the wide variety of considerations taken into account it is sometimes difficult to follow the main argument being presented. A large amount of supporting data of interest to the study is included but some of it is not needed for an understanding of the main proposition.

Central Idea :

In this report a simple explanation of the central idea of Trethowen and Hubbard is given without supporting argument and without an attempt to justify the underlying assumptions. Some Australian figures are presented which enable calculations to be made for some local cases of winter heating.

The approach adopted is valid for heat transmission through ceilings, walls and floors, but this paper is concerned only with heat flow through ceilings under winter conditions. The method is not applicable to conditions of cooling in summer.

Direct Capital Savings :

As a first consideration of the economics of insulation it has been pointed out (p.4) that "if a more expensive heating system were proposed, such as any current type of central heating system, typically costing \$60.00 per kilowatt installed, the potential reduction in heating equipment capital cost is likely to exceed the insulation cost. In those cases insulation must obviously lead to a direct capital cost reduction without even considering the further savings available on fuel."

Insulation costs in Australia are higher than those quoted (p.30) for New Zealand.