Insulation

All insulations have some benefits but not necessarily in all situations.

Houses built from 2003 onwards have, by regulation. had insulation installed during construction yet, air-conditioning is still used extensively.
Currently block homes are the most popular in the tropics.
Unlike some earlier houses, modern homes MUST have air-conditioning to give inhabitants some chance of comfort

Speculation is that up to 40% of heat in a home comes through the ceiling via the roof.

The belief is that the majority of heat comes from walls, windows, doors, air leaks, white goods, computers, TVs, lighting, humans and animals.

The external temperature of block walls can reach 50C. or more
The heat is absorbed and passed into the home for most of the day and night, because heat moves from hot to cold, never the other way.

Thermal imagery showed that a house externally insulated with RBM was protected from heat penetration. See below

The picture is of a block wall covered with multi-layered RBM with 19mm thick battens, before having fixed an outside wall of hardboard, corrugated iron or even polystyrene.

In cold climates the aim is to keep **in** the heat and this is done with bulk insulation, which forms a blanket when placed above the ceiling.

In hot climates the aim is the keep **out** the heat and quickly disperse any heat stored in the home during the day. Radiant Barrier Material (RBM) accomplishes this; refer Dr. Richard Aynsley's submission.

In hot climates, bulk insulation above the ceiling can become superheated (a concern of some electricians) and the heat passed to the rooms below. After sunset heat stored in floors, furniture and curtains moves to the ceiling by convection. Its progress of dispersal into the atmosphere is more readily achieved with RBM than bulk insulation.

In the same hot climates, some RBM can reflect up to 98% of heat producing infra red rays. See below

The picture is of a roof space with a multi-layered RBM above the ceiling

In climates with cold winters and hot summers a combination of bulk insulation with

RBM above it will keep in the heat during winter and keep out the heat in summer. Refer Brad Lindsay's submission.

The video shows that in a REAL situation, more IS NOT better in hot climates.
In fact more is detrimental because it increases the temperature in the house

Windows.
Tinting can reduce the temperature of glass by 15 – 20C.
Glass in direct sunlight can reach 60C+ so tinting can reduce it to 40 – 45C, which is still a significant heat source.
Natural (trees, bushes etc) or manufactured shading brings glass temperature down to ambient.

Ventilation
The designs of early Australian homes took advantage of natural ventilation to disperse accumulated heat.
Modern designs pay little or no attention to ventilation.

In the roof space (attic) above the ceiling, high temperatures are experienced in hot weather, which is most of the time in the tropics.

This can reduce the effectiveness of any insulation and increase power usage and costs
Where RBM is used in the roof, improved ventilation is essential because of the extra heat that is reflected back to its source. (up to 98% reflection)

Natural ventilation is preferred but difficult to achieve

Exhaust units such as power driven fans remove the heat efficiently as long as there are sufficient air inlets in the eaves.
The Windworker is an efficient air extractor as long as there is sufficient breeze.

Tests and field experience have shown that industry standards for vent areas are far below the actual requirements obtain optimum airflow...

Solar fans are questionable.
They are influenced by cloud cover and shade from trees and tall buildings.
The biggest problem is their inactivity after sunset when much of the stored heat has to be removed from the house.
In the tropics it is usual to experience cool conditions outside at say 9pm whilst in the house it is still uncomfortably hot unless air-conditioning is used.
The purpose of insulation is to reduce or eliminate the use of air-conditioning.

Insulation installation hazards
Extreme temperatures are experienced in the roof space during summer throughout Australia..
In the tropics about 9am (subject to roof colour and cloud cover) is the latest one should attempt roof space activity.
Air-conditioning (hired, portable) should be used after this time.
Until Horizon Energy Systems (USA) obtained their own portable air-conditioner they were able to do only one installation per crew a day. The air-conditioner has allowed three installations a day.

Installers should be well paid considering the heat, confined space, electrical dangers, dirt, vermin, etc.
Conditions in some of these attics are reminiscent of the 'chimney sweep' era in London in the 19th century when young children were forced to work in appalling conditions.

I wonder if the reduction of the rebate from $1600 to $1200 was at the expense of the installers.
I also wonder if the people making the decisions about rebate have experienced the hardships of installation.

Tests
More testing is needed insitu.
What seems satisfactory in the laboratory does not necessarily perform well in the field.
There seems to be too much reliance on computer testing. (GIGO)

In the USA the recommended placement of RBM was in the rafters but actual independent tests showed that this was the worst placement.
Four identical houses were each insulated with fibreglass above the ceiling and one was used as a control.
One house had shingles (tiles) laminated with RBM which was facing down.
Another house had RBM stapled to the underside of the rafters,
The third house had RBM placed on top of the fibreglass.
This third house out performed all others with the control second best, the laminated shingles third and the stapled RBM (the code recommendation) last.

Refer http://www.savenrg.com/1testpag.htm .

Scroll down to the subheading **Other Testing by Electric Utilities**

In conclusion, if incorrect insulation is used or the correct insulation is used but in the wrong position, home owners will have bigger power bills
In addition tax payer's money will be wasted.

Installing ceiling insulation without due consideration of improved ventilation can devalue the insulation and disappoints customers.

More field testing and less computer guessing is essential

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