

# LAW OF DIMINISHING RETURNS

DOUBLING BULK INSULATION FROM R2 to R4 ONLY GIVES ANOTHER 2% BENEFIT



NSB-163  
NOTES ON THE SCIENCE OF BUILDING  
DIVISION OF BUILDING, CONSTRUCTION  
& ENGINEERING  
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**EXTRACT**

## Thermal Insulation: Installation and Materials

### AMOUNT OF INSULATION

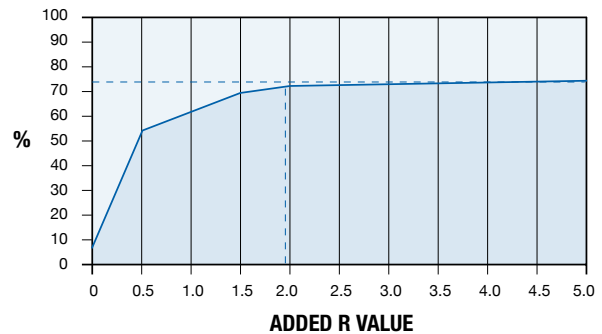
7.01 The amount of insulation that is economically justifiable depends on the type of construction and local climatic conditions. Money saved by thermal insulation will vary not only with building design and layout but also with the lifestyles of the occupants and the pattern of their use of energy. Some people consider that feeling comfortable is more important than saving energy.

7.02 The initial insulation added to a surface makes the most significant effect. As extra insulation is added an increasing proportion of the total heat transfer occurs through paths that have not been insulated; doors, windows etc. It is better to consider all of the heat paths in a particular building rather than to insulate one of them heavily.

7.03 Benefits are not directly proportional to the R value (see 12.01) of the insulation because the surfaces being insulated have an initial thermal resistance. For Australia's temperate coastal regions, insulation with a thermal resistance of 1.5 to 2.0 m<sup>2</sup>K/W (or R values of 1.5 to 2) would be generally adequate for ceilings. For roof/ceilings in buildings that need significant winter heating, AS 2627-1983<sup>9</sup> gives recommended levels for various locations.

NOTE: AS2627.1(1993) was formally withdrawn by Standards Australia in January 2007.  
[http://www.concertinafoilbatts.com/FOIL\\_BATT\\_FACTS-9.pdf](http://www.concertinafoilbatts.com/FOIL_BATT_FACTS-9.pdf)

R VALUES OVER R2.5 PROVIDES MINIMAL EXTRA BENEFIT



Increasing R-value over R2.5 is of little benefit. For summer comfort CONCERTINA FOIL BATTs laid over fibrous insulation will protect it from the intense summer radiant heat from the roof

CSIRO "REBUILD" pg. 4  
DIV: Building Research, Highett VIC.  
April – June 1981

**EXTRACT**

In general, the higher the thermal resistance of the insulation (expressed commercially as an R-value) the lower the heat leakage will be, but there is an economic optimum. For Australian homes, we recommend the maximum amount of batt or loose-fill insulation for ceilings as that which corresponds to an 'R' value of 2. For walls, the suggested insulation is aluminium foil, or the currently available R1.5 batts.

Insulation rated R2 in the ceiling will reduce the heating load by about 30%. Increasing this to R4 will only reduce the heating load by a further 2% (ie to 32%).

### WREN SUMMARY – in the public and national interest

Insulation is installed in houses for two purposes – to keep a house warm in winter and cool in summer. In ceilings in winter situations, convected heat (heat from a heater) needs to be trapped in the house. Bulk insulation of between R2.5 and R3.5 (see graph) will do this job adequately. For Australian winter climates, the recommended level of bulk insulation is:

- \* Melbourne/Sydney/Adelaide/Perth: R2.5 maximum
- \* Canberra/Great Dividing Range/Tasmania: R3.5 maximum

For hot climates, bulk fibrous insulations in ceilings also need to be protected from the penetration of high temperature radiant heat flow down. CONCERTINA FOIL BATTs laid on top of bulk insulation significantly reduces radiant heat and reduces ceiling temperature by several degrees. This in turn greatly lessens the dependence on refrigerative air-conditioning.

Example: R2.5 batt + FOIL BATT + foil sarking = Total R4.2winter / R4.9summer

- <http://www.concertinafoilbatts.com/dd1.pdf> \* example MR1
- <http://www.concertinafoilbatts.com/summer.pdf> \* ceiling temperature reductions
- <http://www.concertinafoilbatts.com/foilfacts.htm> \* read all data sheets

### FURTHER TECHNICAL OPINION SEE

<http://fricker.net.au/>  
"Diminishing Benefit of Extra Home Insulation"

