



WHAT YOU NEED TO KNOW ABOUT INSULATION

Why energy efficiency measures?

In South Africa we take energy for granted, with the consequence that our energy consumption is higher than it should be. Whilst our historically low electricity price has contributed towards a competitive position, it has also meant that there has been little or no incentive to save electricity.

Perhaps the most neglected area for implementation is the promotion of public awareness about the costs and benefits of energy efficiency. Major energy savings can only be achieved through changes in people's behaviour, and that depends on informing them about what options exist.

Environmental effects

Coal is the main source of energy in South Africa. When coal is used as energy source, its combustion generates carbon di-oxide which causes air pollution and emission of greenhouse gases. This is an environmental concern as it leads to climatic changes.

South Africa has already seen changes in temperature and rainfall patterns due to global warming. Cheap electrical energy has given rise to excessive use thereof, diminishing the long-term resources and contributing to environmental pollution.

Economical effects

Despite ongoing calls for greater fuel diversification, several coal-linked projects are already under way or in the pipeline and, given its cost advantages, it is widely-anticipated that more mega-watts will inevitably mean more coal.

South Africa would require between one and three new coal-mines over the next ten years to ensure supply to its expanding coal-fired power stations.

As predicted, the country's existing power generation capacity is insufficient to meet the rising national maximum demand, as experienced in recent months.

The problem could worsen and by 2010 there would not even be enough energy to supply certain areas during off-peak periods. This could result in mass blackouts and 'brownouts' (reduced energy supply) across the country.

South Africa need to build more power stations - which would take eight to 12 years - or teach people to learn how to manage energy output.

Eskom's Demand Side Management (DSM) plan was established to deal with the growth in the country's electricity demands. The DSM plan is aimed at managing the residential energy load and encouraging people to use energy-efficient equipment, which reduce energy usage.

The installation of thermal insulation will reduce the need to use mechanical heating or cooling, supporting Eskom's Demand Side Management.

Effect on the Building Industry

The vast majority of buildings and affordable homes currently being built are not energy efficient, further escalating the problem of energy wastage into the future.

The Building Sector has great potential for energy savings since building design is the major factor determining the energy efficiency.

The implementation and sustainability of energy efficiency measures will result in the creation of new job opportunities.

Proposed legislation

The Department of Minerals and Energy (with relevant collaboration from the Department of Housing) are spearheading the development of an energy efficient standard for residential, commercial and industrial buildings at the SABS namely SANS 204 – The Energy Efficiency Standard for Buildings. This standard will cover the planning and design of naturally and mechanically-conditioned buildings in South Africa.

The National Building Regulations and Buildings Act (Act 103 of 1977) will be amended to include and enforce the above standards.

It is envisaged that the Energy Efficiency Standard SANS 204 will be published in 2008.

Energy efficient design principles

- Design for climate - as per climatic zones
- Building orientation - main living area windows to the north
- Insulate roofs, ceilings, walls and floors – installation of recommended insulation levels to minimise heat loss or gain
- Insulate geysers and pipes.
- Positioning of windows to allow cross ventilation and accommodate glass selection

Why is the building process so important?

The Building Sector has great potential for energy savings since building design is the major factor determining the energy efficiency.

The best thermal design can be ruined if built badly. The builder, and even the owner builder, should understand the intention of the designer. The builder takes co-responsibility for the final product since he is the last authority in the whole process of

building procurement that can discover and correct mistakes made in the previous work.

What makes a comfortable home or building?

A thermally comfortable home or building is neither too hot nor too cold for most of the people most of the time. This can be achieved by a clever combination in the design, north orientation, windows, building shell insulation, indoor mass and draught proofing.

How does this work?

Basically, north windows provide winter heating. The combination of indoor mass (concrete floor, heavy walls and roofs) with shell insulation stabilizes the indoor air warmth in winter and coolness in summer.

Heat flows from a higher to a lower temperature level by conduction, radiation and convection. Conduction occurs through solid materials, radiation through the air and convection through free air movement, such as air leakages.

What is draught proofing?

It means reducing the uncontrolled and unwanted leakage of outside air into (“infiltration”) or out of (“exfiltration”) the building. The outside air should not leak into the building because it is too warm in summer and too cold in winter (cold draught). This would defeat the objective of insulation, thermal mass and heating.

How is air leakage controlled?

Air leakage can occur through gaps around exterior doors and windows, airbricks, ceilings and other small holes in the building shell.

Roofs and ceilings

Roofs without ceiling are currently being built in South Africa with government subsidies. Since there is little awareness and no legislation yet, it is common to have ceilings without thermal insulation, even in high-income homes. The misconception that

insulation is not essential and regarded as a luxury item must be eradicated.

What is thermal insulation?

Insulation is the Invisible Energy Saver!

Thermal Insulation is the material that is used to reduce the rate of heat transfer through external surfaces in the home or building. Basically, when you insulate your building you are wrapping it in a “protective blanket” which reduces the transfer of heat into and out of the building.

In winter it reduces the rate at which heat is lost from the building, and in summer it reduces the rate of heat entry into the building. For example, in an un-insulated building on a hot day, heat is conducted easily through your roof, windows and walls from outside, raising the temperature inside.

How to select insulation

When selecting insulation, ensure that the material is:

- the recommended R-value for the relevant area;
- appropriate for the intended installation;
- a material covered by SABS Standards
- sufficient to meet local building authority requirements.

What is insulation ‘R-value’?

The level or performance of an insulation product is measured by its Thermal Resistance or ‘R-value’. This is a measurement of the insulation’s resistance to heat transfer and is expressed as a number normally between 1 and 3. The greater the ‘R-value’, the more effective is the insulation at resisting conducted heat flow into the building in summer, and out of it in winter.

Therefore the ‘R-value’ is actually a measure of performance.

One brand of insulation may be thicker or thinner than another, but if they both show the same ‘R-value’, they will perform equally.

What is the recommended ‘R-value’ for your location?

The recommendations for the correct ‘R-value’ are based on the climatic conditions in particular locations. The deemed-to-satisfy provisions are based on climate zones, including dry bulb temperatures; thermal neutrality, humidity and southern coastal condensation risk (see TIASA Map of Climatic Zones of South Africa). Please check the map for details of your area.

These values are recommended in The Thermal Insulation Guide for Energy Efficiency in Buildings, distributed by TIASA (Thermal Insulation Association of Southern Africa)

What types of insulation are there?

There are two basic types of insulation:

- bulk insulation and
- reflective foil insulation

Some insulation products also use a combination of bulk insulation and reflective foil to achieve their insulating effect; this is known as composite bulk insulation.

Bulk insulation

This is the type of insulation that most people are familiar with. The insulation material itself is usually fiberglass, mineral wool (also called rock wool) or synthetic fibre (polyester). These products come in two forms, either in rolls, called blankets, which must be cut to fit the length of space or in pre-cut lengths, called batts. In a horizontal space like a roof space, blankets or batts are simply laid between the timber joists.

Loose Fill

Loose fill (Cellulose fibre) insulation is supplied loose and is simply poured or pumped into the roof space or cavity walls. Cellulose fibre is made from recycled paper which has been chemically treated to resist fire, rot and vermin.

Rigid Insulation

Rigid insulation comes in pre-cut boards. They are also ideal for insulating areas such as raked ceilings, solid brick external walls, under wooden floors and concrete slabs. Extruded and Expanded polystyrene boards are most commonly used because of their rigidity and strength.

Reflective foil insulation

Reflective foil insulation has an ability to minimize radiant heat transfer. It can also act as a water proofing membrane under a roof and as a moisture barrier in roofs and walls. When using single layer reflective foil under a tiled or metal roof, bulk insulation may still be needed at the ceiling level to achieve a good level of insulation through all seasons.

How should insulation be installed?

Flat ceilings with pitched roofs are the easiest to insulate. Use reflective foil laminate over the rafters but below the battens of the roof tiles with a minimum overlap of 150mm. Bulk insulation should be installed allowing batts and blankets to expand to their natural thickness, cut neatly to fit snugly between ceiling joists, and kept clear of recessed light fittings. Blow in insulation should be sprayed with a solution that prevents disturbance from breezes within the ceiling spaces.

Most neglected and very important energy abusing device – your geyser!

Electric water heaters consume about 42% of the domestic energy usage and contribute 22% to the domestic sector peak demand. One quarter of the energy is wasted in standing losses. Install pipe insulation on all hot water pipes and retrofit geysers with an insulation blanket.

Hints and tips when buying insulation:

1. Buy by the 'R - Value' only!

The level or performance of an insulation product is measured by its Thermal Resistance or R -Value. The greater the R-value, the more effective is the insulation at resisting conducted heat flow into the building in summer, and out of it in winter.

Insulations with the same R-value have the same insulation performance no matter what materials are used. Battens of an R-value of 2.5, for example, will perform exactly the same as loose fill insulation with an R-value of 2.5.

2. Always get multiple quotes

Always get multiple quotes and ensure they all stipulate the correct R-value and relevant thermal and fire certification. Ask for copies of these reports. As long as they are installed correctly, insulations with the same R-value have the same insulation performance.

3. Fire Performance and classification

All insulation products should be independently tested in accordance with SANS 428 Fire performance classification of thermal insulated building envelope systems, prior to being sold.

The testing protocol in accordance with SANS 428 incorporates all factors required for fire-hazard or fire-risk assessment of the materials, products, or assemblies under actual fire conditions. Ask for copies of the fire reports or contact TIASA for assistance.

Frequently asked questions!?

What is the best type of insulation?

There are many types of insulation to choose from; however the R-value is a direct, standardized comparison of insulation effectiveness. There may be some other factors that influence your choice of insulation product, for example limited roof space or other installation difficulties. Talk to several insulation suppliers about their products before committing to purchase, and remember that the R-value is a direct comparison of insulation performance.

Is 'foil' under the roof an advantage?

Foil under the roof has advantages in providing waterproofing and also helps to reduce radiant heat transfer into the home. This can mean a reduction in the temperatures inside your home during summer. It is important to also use additional insulation to prevent heat loss during winter or convective heat entry in summer.

Does old insulation lose its efficiency?

Most forms of insulation decrease in efficiency over time. TIASA's recommended R-values for various areas in South Africa take this reduction in efficiency into account.

I am getting a lot of conflicting information about insulation from different suppliers. Who do I believe?

The insulation market is very competitive, and there are many claims regarding the relative performances and safety of various products.

We suggest:

1. Treat bold claims from suppliers cautiously.
2. Identify any installation difficulties and discuss with the supplier.
3. Get three quotes from reputable companies, and if you are satisfied with the company and the price and its performance, choose accordingly.

Remember that it is the R-value that determines the performance of the product, not what it is made from.

**For further information please contact
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