

5

PASSIVE DESIGN FACT SHEET



WELL DESIGNED BUILDINGS ARE MORE COMFORTABLE TO LIVE IN, BETTER FOR THE ENVIRONMENT AND ARE CHEAPER TO COOL AND HEAT.

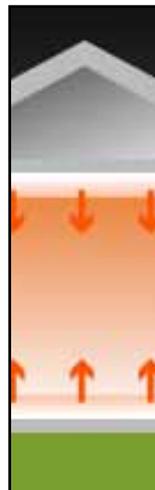
Passive design does not require mechanical heating and cooling, using the natural climate to maintain occupant comfort. Most buildings do not take passive design principles into account and are cold in winter and hot in summer. Thankfully there are many ways to improve the thermal performance, which is how well a building retains or expels

heat, of buildings in variety of cost effective ways. This is fortunate as due to the cold winters in Canberra, heating costs are often a significant part of a businesses energy bills. Improving the thermal performance of the building your business will provide greater comfort for staff and clients and provide immediate and significant savings.



INSULATION

Insulation acts as a heat barrier, stopping heat entering a building while also keeping heat in. A well insulated building will provide year round comfort and reduced heating and cooling costs. Insulation falls into two categories bulk (keeps heat in) and reflective (to keep heat out) and is rated using an 'R-Value' which shows how effective the insulation is. Insulation can be put under roof material, into roof cavities, walls and under floors and speaking to a professional will allow the best choice to be made factoring in building characteristics, climate and cost.



THERMAL MASS

Thermal mass is the ability of a material to absorb and retain heat. Building materials that need high levels of heat energy to change temperature like bricks, tiles and concrete have a high thermal mass. Materials that have low thermal mass are generally light weight like timber. The correct use of thermal mass involves it being used in the right location. i.e. allowing high thermal mass materials to heat in the sun and then radiate that heat throughout a building providing warmth. Incorrect positioning can create the opposite desired effect and make buildings cold in winter and hot in summer.



DRAUGHT SEALING

Draught proofing is one of the easiest and cheapest options to stop heat loss and keep buildings warmer in winter. Draught proofing materials can be purchased at hardware stores or professionals can identify and fix more complex issues. Gaps normally exist around doors and windows and are generally straight forward to fix. More complex solutions look at exhaust fans, vents, door seals, floorboards and internal draught leaks. Effective internal draught sealing allows areas inside a building to be 'zoned' further increasing comfort and energy savings.



ORIENTATION

Correct orientation allows the sun to heat a building in winter but is also shaded from the sun in summer. The correct orientation for a building in the ACT (and Australia) is for the building to face north. The winter sun is lower in the sky allowing it access to glass and north facing openings, which heats the building. In summer the sun is directly overhead which doesn't allow access to windows and openings as the building is shielded by the roof and correctly positioned eaves. Buildings with poor orientation can be improved by increasing sun access in north areas and shading the building on east and west elevations.



Shop Basics is a retail shop fitting outlet in Fyshwick. The shop operates from a warehouse style open plan premises. The owner of shop basics contacted ACTSmart looking for ways that efficiency could be improved within their business. It was identified by an assessor during an on-site visit that the large roller doors at the back of the shop, next to the office area, were a large source of heat loss. The roller doors were south

facing meaning they never got any direct sunlight and so were very cold. Due to the fact that the roller doors were no longer used it was recommended that the business owner board-off and insulate roller doors and seal all the gaps around its edges.

Since boarding-up and insulating the rear roller door the staff at Shop basics have found the working environment to be much more comfortable. It is also estimated that the business is saving approximately \$350 per year on their electricity bill

PASSIVE COOLING AND SHADING

With Canberra's cold climate, often the focus is improving the thermal performance of buildings in winter. It is

also important to ensure that buildings aren't too hot in summer, which will reduce AC costs and increase comfort.

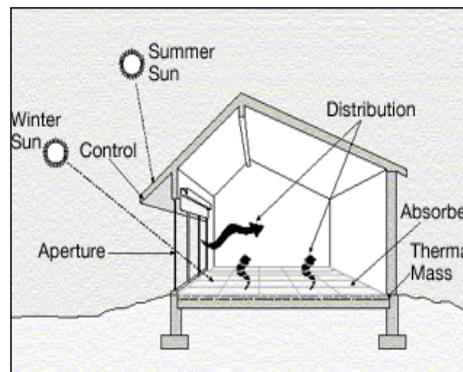
SHADING – Fixed shading is permanent and includes eaves, pergolas and louvres. Adjustable shading gives greater control in the amount of shade a building gets.

VENTILATION – Includes increasing air movement through cross ventilation and allowing hot air to escape, drawing cool air in.

PLANTS – Deciduous plants, trees, shrubs, wall vines and ground cover are all good options in the appropriate situation.

ELEVATION – Relates to orientation, north sides get winter sun, south sides are coldest while east sides get morning sun and west sides get afternoon sun.

PASSIVE DESIGN AND THERMAL MASS



WINDOW COVERINGS AND GLAZING

Windows are one of the main sources of heat gain and loss in a building and should be viewed as a priority in improving thermal performance. A variety of solutions exist for improving window performance but generally

to stop heat entering use an external shade while to keep heat in use an internal one. Window coverings should be chosen not just on aesthetic qualities and cost but on their thermal performance also.

CURTAINS – Thick, block out curtains are very effective at stopping heat loss. Ensure few gaps to maximise insulative performance with track returns and pelmets.

BLINDS – Blinds are generally not as effective as curtains but are cheaper and better suited for some situations.

GLAZING – Double glazing of windows can make a large difference on the thermal performance of a building. A variety of glazing options exist depending on requirements.

TINTING AND FILMS – While not as effective as double glazing, tints and films are easier and cheaper to install and can still give significant improvements.

GLOSSARY

AMBIENT TEMPERATURE

The natural temperature of the atmosphere surrounding a particular location or building.

CONDUCTION

The distribution of heat or coolness through a material.

GREENHOUSE EFFECT

The build-up of heat in an interior space caused by energy input through a transparent membrane such as glass.

HEAT SINK

Material which is capable of accepting and storing heat or cool and, therefore, may also act as a delayed heat source.

R-VALUE

Measurement of the thermal resistance of a material, frequently referenced as a measurement for insulation. The higher the R value the better.

STORAGE

Using the mass in the walls or floor of a building to collect heat during the day for use at night or on cloudy days.

U-FACTOR

The rate of heat loss is indicated in terms of the U-factor (U-value) of a window assembly. The lower the U-value, the greater a window's resistance to heat flow.

CHECKLIST

DETERMINE HOW WELL YOUR BUILDING IS PERFORMING What are the reasons for upgrading and what are you wanting to achieve? Get staff involved.

AUDIT CURRENT HEATING AND COOLING COSTS What building renovations will reduce heating and cooling costs? Determine usage patterns of HVAC.

DETERMINE UPGRADE OPTIONS Rank them based on payback periods. Prepare a business case for upgrading. Speak to a professional for the best advice.

GET QUOTES FOR UPGRADES Check installer credentials, legal compliance and product warranty. Cheapest may not necessarily be best. Check old items are being disposed of properly. Check product warranties.

COMPLETE AND CHECK THE OF QUALITY WORK implement any behavioural change strategies.

ASSESS EFFECTIVENESS OF UPGRADES Check your energy bills pre and post retrofit. Where your projections correct?

FOR MORE INFORMATION VISIT **ACTSMART.ACT.GOV.AU**