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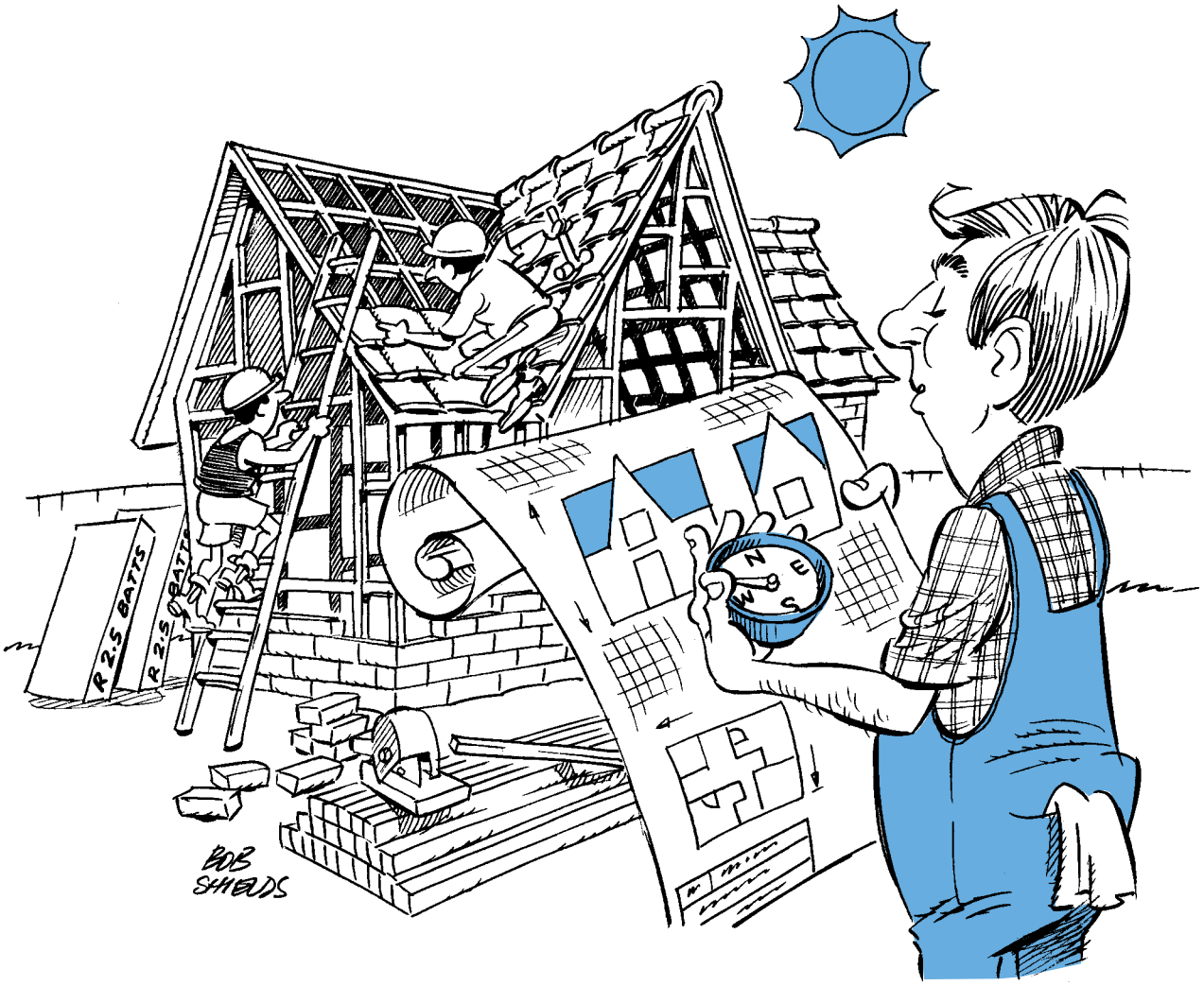
A NSW GOVERNMENT INITIATIVE

HOUSING

Energy Smart renovations



Practical tips to make your renovation Energy Smart.
Simple design features to keep your home warm in winter and cool in summer.
How to choose energy saving fixtures, appliances and lighting.

Energy smart design

Live more comfortably and save money!

If you are about to renovate or extend your home, you can make this major investment more energy efficient and comfortable, and you'll save money at the same time.

An energy efficient renovation will improve the comfort and economy of your whole home. By taking advantage of the sun's warmth and light, and incorporating simple design features into your renovation, your home will be warmer in winter and cooler in summer, bright and welcoming year round, without you having to pay a fortune in energy bills to achieve this.

This brochure provides some practical tips to get you started on the way to an energy efficient renovation. The Energy Smart Information Centre has a range of more detailed information brochures and can provide further assistance as required. Phone the Energy Smart Hotline on 1300 138 638.

What makes a renovation Energy Smart?

To make your renovation energy efficient, the two major components to consider are (a) the building design itself and (b) the fixtures used.

The building design

North-facing living areas

The most important principle of energy efficient house design is to ensure living areas face north to take advantage of the winter sun. This provides them with warmth and abundant natural light. (See Diagrams 1 and 2)

Ideally, the family room, kitchen/meals area, lounge, dining and rumpus rooms should all face north. Bedrooms, the study and utility rooms can be located on the east, west or south sides of the home. (See Diagram 2)

Unlike new homes, renovations are often more limited in the siting options and space available. Direct access to the north, for example, is not always possible. In many cases, however, clever design can compensate for a badly oriented building. (See case studies 1, 2 and 3 on the following page)

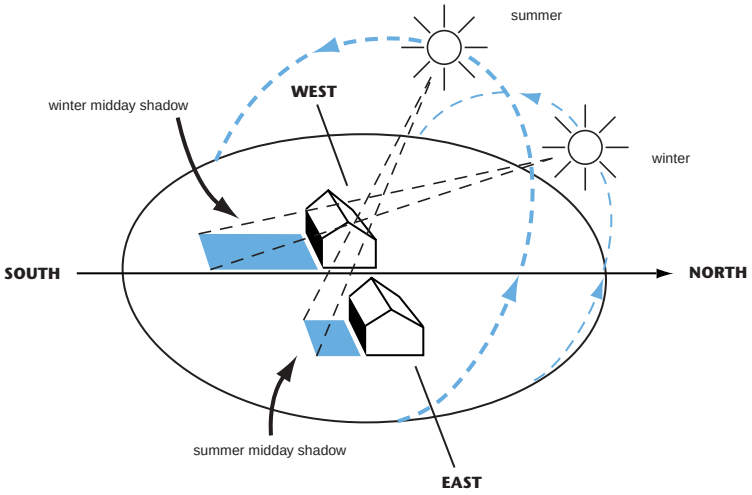


Diagram 1

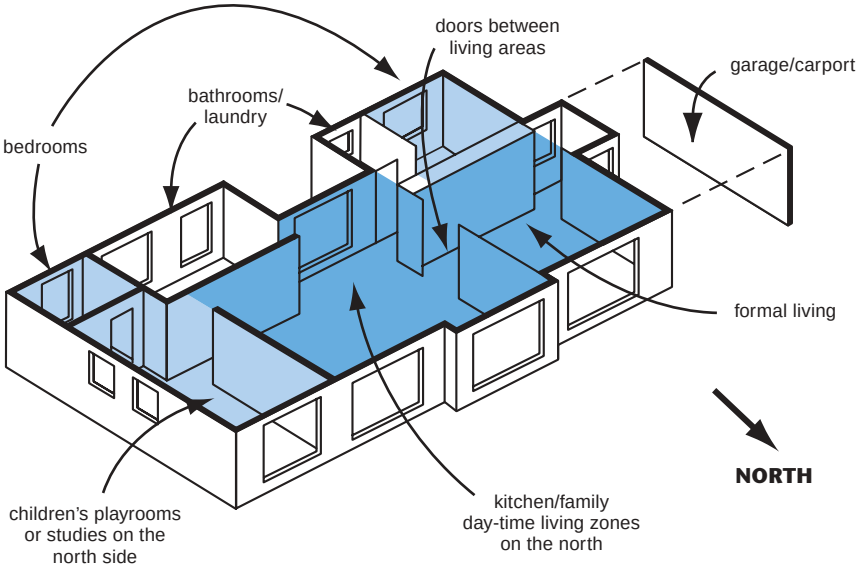


Diagram 2

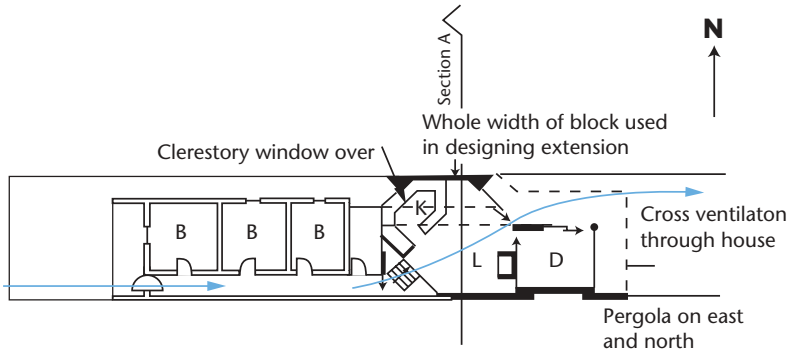
Case studies

The following case studies provide examples where north-facing living areas can be incorporated into designs/sites with limited solar access.

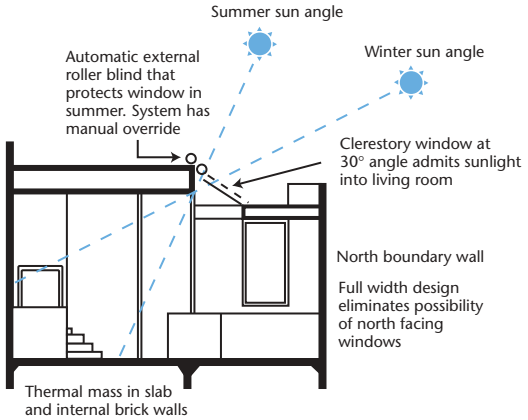
Case study 1

This 93 m² semi-detached terrace house has been extended to provide more living space. Because the site was narrow, a large part of the extension had to be situated to face east-west, eliminating the possibility of windows facing north. This drawback was overcome by using a north-facing clerestory window.

Plan



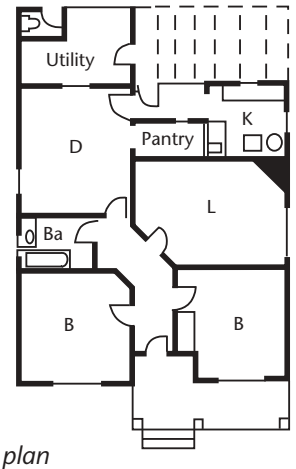
Section A



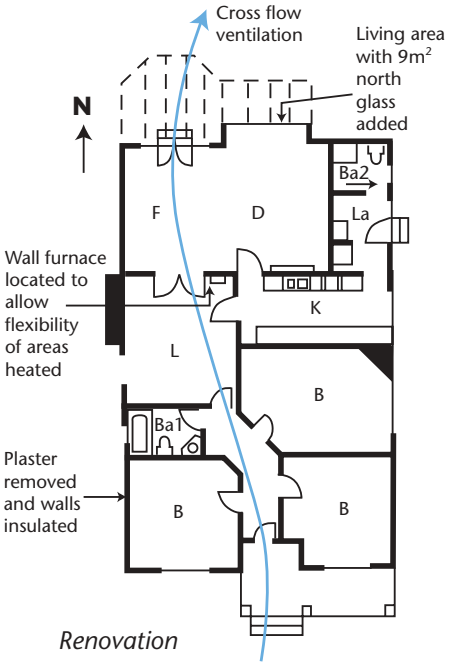
Case study 2

This 100 m² weatherboard Californian bungalow lacked north-facing living areas. It was extended by 35 m² to provide additional living space, an extra bedroom and bathroom. North-facing windows were included as part of the new living area, overlooking the private rear garden.

To improve the energy efficiency of the home, insulation in the original ceiling and walls was topped up. The existing chimneys and wall vents were blocked off and a new energy efficient space heater installed.



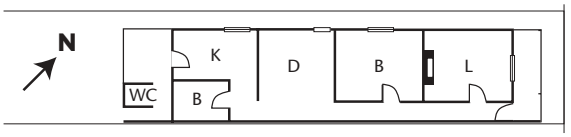
Existing plan



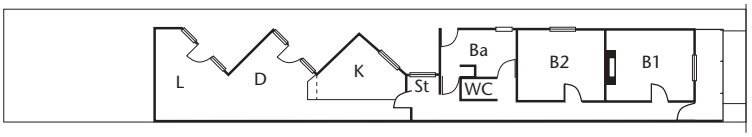
Renovation

Case study 3

This single fronted, semi-detached terrace has been extended to include a new kitchen, dining and living area. The saw-tooth design used allows access to northern sunlight which makes the home warmer by up to 5°C in winter. West-facing windows have been avoided to minimise overheating in summer.



Existing plan



Renovation

General design features

Here are some easy to incorporate tips which will maximise the energy efficiency of your renovation:

- Create zones by grouping rooms with similar uses together. Separate informal living areas, formal living areas and sleeping areas with doors. This means you can use a space heater or a zoned central heating system to heat only occupied rooms, reducing your heating costs.
- A doorway to separate the renovated, more energy efficient section of the home from the old section is also a useful addition.
- Keep 'wet' areas together — your kitchen, bathroom, laundry and ensuite should be near each other. This reduces the need for long water pipe runs, resulting in a more efficient hot water system and lower plumbing costs.
- Try to keep ceiling heights to a maximum of 2.7 metres (9 feet). Even with older homes, it is often not architecturally necessary to maintain constant ceiling heights throughout the home. Higher ceilings result in increased heating costs and lower comfort levels.
- In rooms with ceilings higher than 2.7 metres, ceiling sweep fans should be installed to circulate the warm air that collects near the ceiling (see Diagram 3).
- In multi-storey renovations, avoid having the stairwell in living areas. Ideally, it should be located in a separate hallway or section which can be closed off from other rooms by doors.

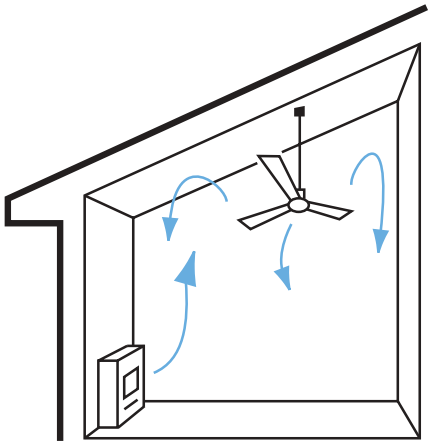


Diagram 3: Use ceiling fans to distribute heat, especially in rooms with high ceilings

These design features will all help to control the flow of heat through the home and reduce heat loss. The Energy Smart Information Centre can help you incorporate energy efficient design features in your renovation plans, or provide you with a list of trained NatHERs consultants. Also see our brochure, *Energy Smart house design*

Building materials

Choosing the right building materials will make a big difference to the energy efficiency of your home. Follow these guidelines to make your building materials work for you:

- Heavyweight building materials such as concrete slab floors and internal masonry walls ('thermal mass') help stabilise internal temperatures, particularly in north-facing rooms (see Diagram 4). Consider using heavyweight materials in your renovation wherever possible, especially if the existing house is of lightweight construction (eg. timber floors and brick veneer or weatherboard walls).

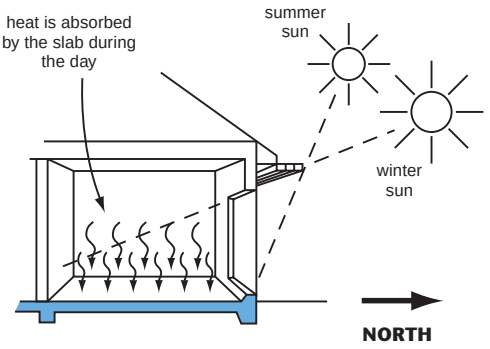


Diagram 4: In winter a concrete floor slab can be used to store the sun's incoming energy. At night, when the room starts to cool, the warm slab radiates heat back into the space.

In summer, the concrete slab keeps the home cool by soaking up excess heat from the air in the room.

- Cavity brick external walls also provide thermal mass. However, insulation should be installed between the two leaves of brickwork (see next page).
- Lightweight materials such as timber floors and weatherboard walls provide little mass for heat storage. Brick veneer walls are also poor storers of heat, as the wall insulation prevents the transfer of heat into the home.

Window size and placement

Compared to other building elements, windows provide little insulation, which means they can allow significant heat loss in winter and heat gain in summer. It is therefore important to have the right size windows in the right places. (See Diagram 5a)

- Where possible, windows should face north. Keep the north side of the home clear of any obstructions, such as large trees or high fences, as these can block out warm winter sunshine.
- West-facing glass should be minimised to reduce overheating in summer. Consider having your garage on the west side of your home.
- East-facing windows can provide early morning sun in winter, but can overheat the home in summer if not properly protected, so it's best to keep them small.

- South windows should also be kept reasonably small, as this side of the home receives no direct sun in winter. (See Diagram 5b)

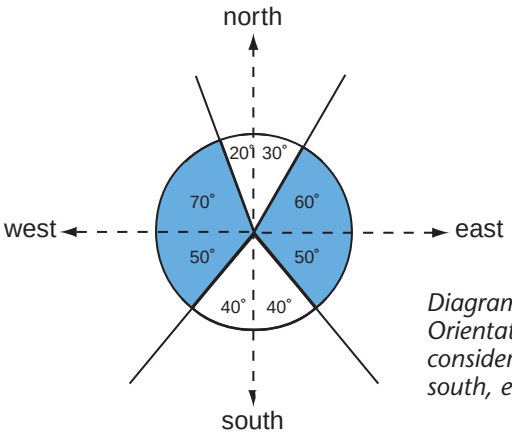


Diagram 5a: Orientation of windows considered to be north, south, east or west

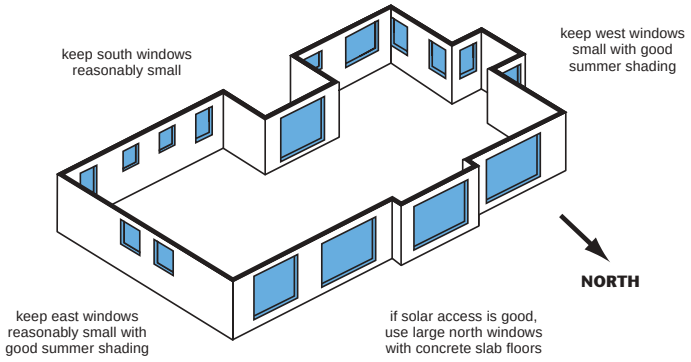


Diagram 5b: Size and placement of windows for north, south, east and west-facing rooms

Make sure your renovation is designed to allow cross-ventilation. This is essential to allow cooling of the home in summer without requiring air-conditioning.

Try to keep short, direct paths between windows. Use casement, sliding or double-hung windows. Awning windows are not as effective for ventilation (see Diagram 6).

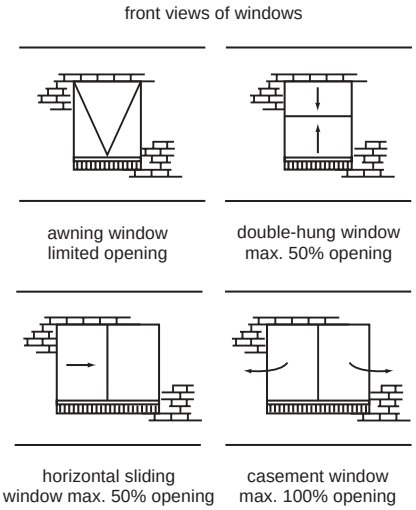


Diagram 6: Window types

Insulation

You should insulate the ceilings, walls and, in some cases, the floor of your renovation. The Energy Smart Information Centre recommends the following levels of insulation:

- All new and existing ceilings should be insulated to at least R2.0*. Where re-roofing or a new roof is part of the renovation, the addition of 'sarking' will provide extra benefits, especially in summer.
- All new external walls should be insulated, together with existing walls where possible:
  - brick veneer walls should be insulated with R1.5* insulation **. Insulation can be installed in existing walls if re-plastering is being carried out.
  - painted weather board walls should have R1.5* insulation installed. Existing walls can be insulated when re-plastering or re-cladding.
  - in brick veneer and weatherboard walls, insulating with reflective foil laminate alone is often insufficient.
  - new double brick walls can be insulated with polystyrene insulation (eg. foil-backed polystyrene boards or styrofoam) installed between the two leaves of brickwork. Existing double brick walls can be insulated with cavity fill insulation which is pumped into the cavity.
- If suspended timber floors are being installed, sub-floor insulation should be considered, particularly underneath floors which will not be carpeted. Existing timber floors can also be easily insulated. Perforated reflective foil is most appropriate.

Note: When insulating, do not leave gaps. Ensure total coverage.

* These figures are for Sydney and similar climates. Ring the Energy Smart Information Centre for information if you are building in other areas.

** Batts must be supported in brick veneer walls to ensure they do not sag forward. Reflective foil laminate, galvanised wire, nylon cord or strapping fixed to the outside of the studs are suitable.

See our brochure *Insulating your home* for further details

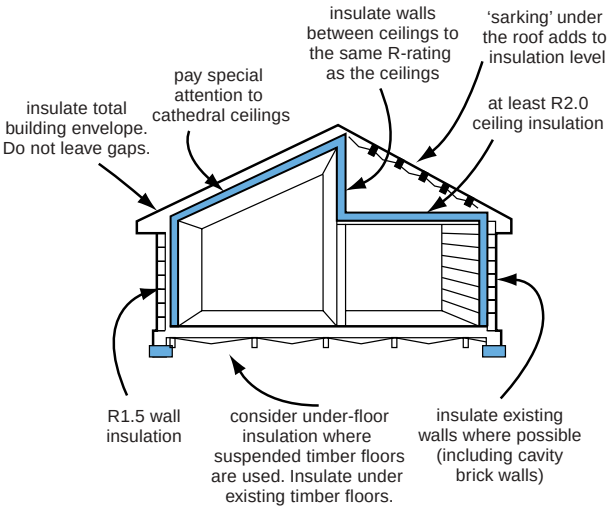


Diagram 7: Full insulation includes ceilings, walls and possibly floors

The fixtures

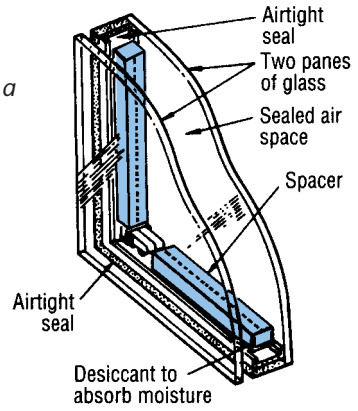
Window protection

Heat loss through windows during winter can be over 25%.

To reduce this use:

- lined or close fitting drapes with pelmets (see Diagram 8b);
- tight-fitting Holland or Roman blinds with pelmets; or
- double glazing—this should be used where internal coverings are impractical (eg. a clerestory window) or not desired, and anywhere large areas of glass are used (see Diagram 8a).

Diagram 8a: Section through a typical double-glazed window



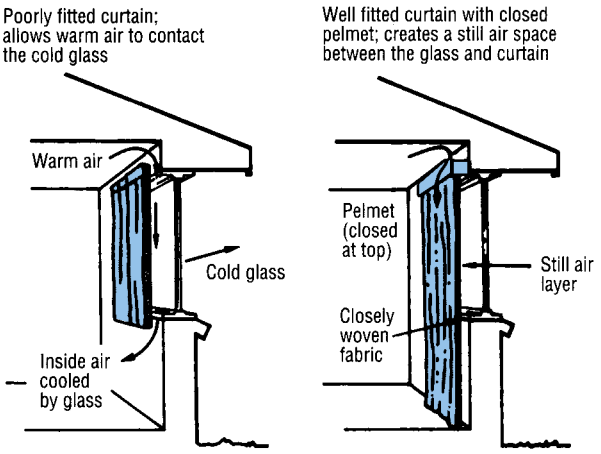
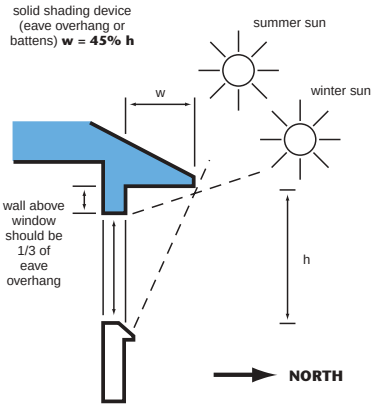


Diagram 8b: Features of an effective internal window covering

35% of total summer heat gain can come through windows. To shade them in summer,

- for north-facing windows: use extended eaves or pergolas, external blinds, awnings or shutters;
- for east and west-facing windows: use external blinds, awnings or shutters (see Diagrams 9 and 10).

Diagram 9: Optimum size of horizontal shading for north-facing windows



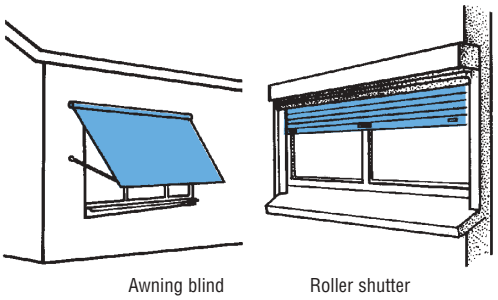


Diagram 10: Adjustable shading for north, east and west windows

Skylights and roof glazing are useful for letting in light, but if unprotected can be a major source of heat loss in winter and heat gain in summer.

To avoid this problem:

- keep skylights as small as possible;
- install double glazed skylights or have a diffuser fitted at ceiling level (see Diagram 11);
- have a shading device where possible, eg. external roller blinds, awnings on tracks, shade mesh or reflective films; roof glazing can be tinted;
- avoid skylights in living areas and bedrooms unless absolutely necessary; and
- do not use vented models in living areas or bedrooms.

See our brochure *Energy saving for windows* for further information.

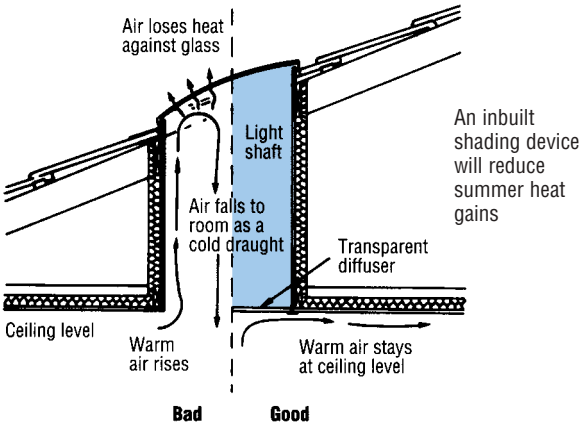


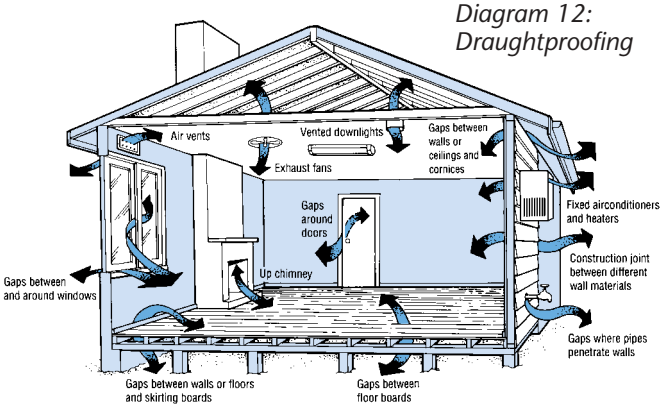
Diagram 11: A diffuser at ceiling level will reduce down-draughts from skylights

Draughtproofing and weathersealing

Unwanted air leaks and draughts account for up to 25% of heat loss from a home in winter. To reduce draughts:

- fit draughtproofing strips and weathersealing tape to external doors and windows;
- fit fireplaces with a chimney damper in the throat of the chimney;
- install exhaust fans with louvres which shut when the unit is switched off;
- seal existing wall and/or ceiling vents with an appropriate filler where appropriate; and
- avoid vented, recessed downlights.

Diagram 12: Draughtproofing



Heating systems

The most efficient and cost effective way to heat your home is to use one or more space heaters or a zoned central heating system. (See Diagrams 13 and 14).

Choosing an appropriate heating system is a complex task, as factors such as the size and condition of existing systems, ceiling heights, room placement, etc. must be taken into account.

Our brochure *Choosing a heating system* makes this decision much easier.

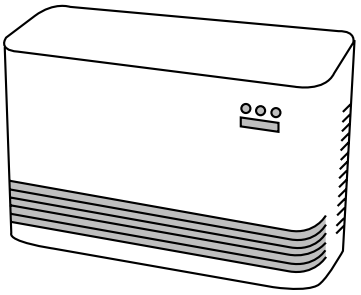


Diagram 13: Gas space heater

Hot water systems

If you need a new hot water system as part of your renovations:

- install an energy efficient system as near as possible to the kitchen, bathroom and laundry (see Diagram 16);
- install a unit which is correctly sized for your needs;
- insulate hot water pipes for at least the first 2 metres leading away from the unit. Pipe insulation can be purchased from plumbing suppliers and major hardware stores. Ordinary pipe lagging is insufficient (see Diagram 15);
- consider installing a solar or heat pump hot water system; and
- use AAA rated shower heads.

Our brochures *Choosing a hot water system* and *Solar hot water* provide more detailed information on these topics.

Diagram 14: Zoned ducted heating

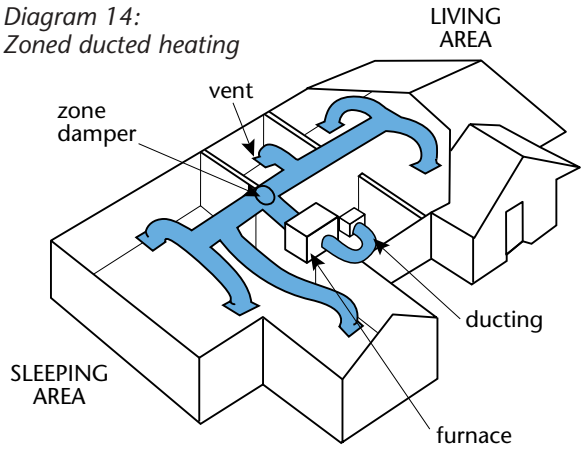
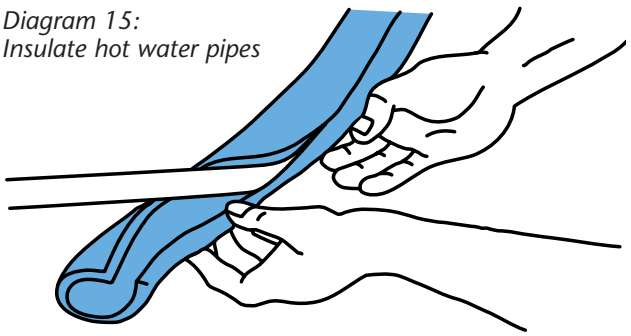


Diagram 15: Insulate hot water pipes



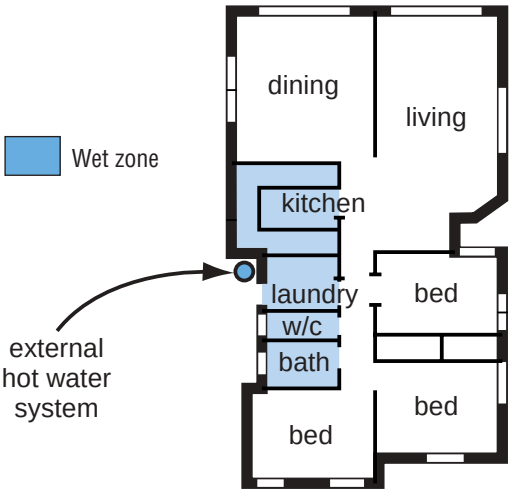


Diagram 16

Energy smart fixtures

Lighting

- Make good use of natural light, particularly from north-facing windows. Paint your walls and ceilings in light colours.
- Use energy efficient fluorescent lights in living areas (see Diagram 17).
- Large banks of recessed lights (or downlights) should be avoided, as these:
  - –increase electricity costs;
  - –require the removal of insulation around each fitting for fire safety;
  - –can increase heating costs if they are directly vented to the roof space; and
  - –can be expensive to replace (see Diagram 18).

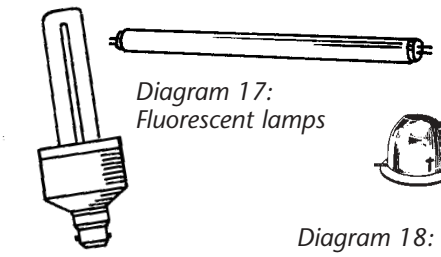


Diagram 17: Fluorescent lamps

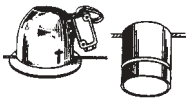


Diagram 18: Downlights

The next step

Choosing a builder

If you wish to incorporate energy efficient design principles into your renovation, it's important to obtain expert advice. Contact the Energy Smart Information Centre for a list of builders and designers of energy efficient homes.

House Plan Energy Consultation

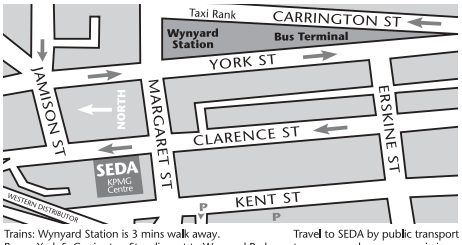
Contact the Energy Smart Information Centre to receive independent advice on the energy efficiency of your proposed new home, extension or renovation.

House energy rating

Homes can be assessed for their energy efficiency using a sophisticated computer program and given a star rating. The more Energy Smart the home, the higher the star rating, with 5 stars being the most energy efficient. Accredited House Energy Rating Assessors can assess your house plans and provide a written report with:

- a star rating (from 1 to 5);
- suggested ways to improve energy efficiency and increase your star rating;
- to obtain a list of Accredited Assessors contact the House Energy Rating Management Board (HMB) Phone: 02 9385 5593 Fax: 02 9385 4507 or web: www.hmb.net.au

The Energy Smart Information Centre is a free advisory service provided by the NSW Government. Energy experts can provide information on a wide range of topics including Energy Smart design for new homes and renovations, appliance selection, solar and wind power systems, choosing heating and cooling systems, insulation, lighting and water saving devices.



Trains: Wynyard Station is 3 mins walk away.
Buses: York & Carrington Sts adjacent to Wynyard Park.

Travel to SEDA by public transport to save greenhouse gas emissions.

SEDA

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