

# Choosing a heating system



As heating accounts for one third of the average household's energy costs, it is important that you think carefully before making a decision on how to heat your home.

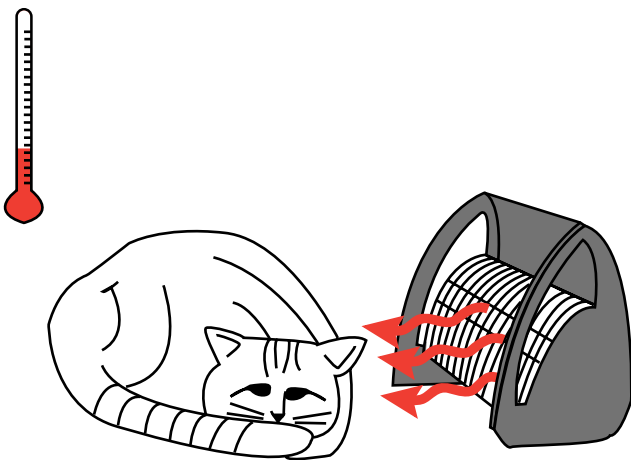
Making the wrong decision can be a costly and uncomfortable mistake. This brochure will help to identify your heating needs, outline the types of systems available and provide a guide to their running costs.

# A heating package—not just a heater

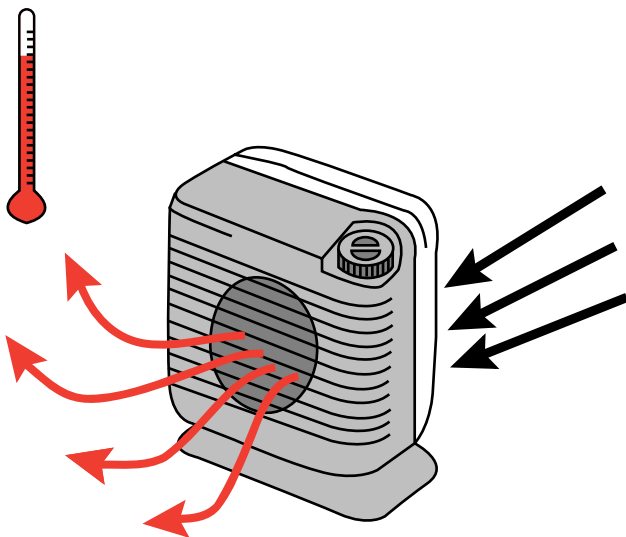
*An effective and economical heating system is more than just a good heater. It is a 'heating package' which should always include:*

- *insulation in ceilings, walls and floors where possible;*
- *sealing off draughts;*
- *effective window coverings;*
- *zoning of living and sleeping areas;*
- *appropriate and efficient heater(s); and*
- *YOU using your heating package wisely and efficiently.*

**An energy-efficient heating package can use 40% less energy!**



*Radiant heaters heat objects rather than the air surrounding them*



*Convection heaters fill a room with warm air*

## Radiant and convective heat

### Radiant heat

Radiant heat is emitted from hot surfaces, e.g. the glowing panel of a gas heater, the surface of a heated concrete slab, a bar radiator or open fire. Radiant heat heats objects within the room directly but does not directly warm the room air.

Radiant heaters can be appropriate if your rooms have large open spaces or high ceilings, or are particularly draughty.

### Convective heat

Convective heat is heat which is transferred from one object to another, using moving air or water. Convection heaters work by filling a room with warm air. Fan heaters and ducted heating are examples of convection heaters.

Convection heaters are most appropriate if your rooms are insulated, well sealed against draughts and have average ceiling heights.

They should be avoided in draughty rooms, rooms with high ceilings or areas with open stairwells.

**Some heaters combine the effects of radiant and convection heating. Hydronic radiator panels, wood heaters, storage fan heaters and many gas heaters function in this way.**

## Decision 1 Central heating or space heating?

Firstly, it is important to establish which areas of the home you need to heat, how large the areas are, and how long you need to heat the areas for.

Creating zones in your home can allow you to heat each zone individually, giving you **flexibility**—the key to energy efficiency.

Heating individual rooms with efficient space heaters, or installing a zoned central system, is preferable to whole house central heating which heats all rooms regardless of whether they are in use or not.

Work through the following chart to identify the best heating arrangement for your home.

If you need to heat...

Only living zones	use one or more high efficiency space heaters
Living areas for long periods, sleeping areas for short periods	use high efficiency space heaters for living zones and electric 'spot' heaters for sleeping areas, or a zoned central heating system
Living and sleeping areas for long periods but at different times of the day	use a zoned central heating system
Living and sleeping areas both for long periods at the same time	use a zoned central heating system
Bathrooms/ensuites	use radiant heaters, e.g. strip heaters, infra-red lamps

## Decision 2 What size do I need?

A correctly sized heater is essential for comfort and economy. A heater which is too large will cost more, will not operate efficiently and can create uncomfortable conditions. An undersized heater will not heat the area adequately.

Heaters should be sized to maintain a comfortable temperature in a room on an average cold day in winter. This 'heat load' is determined by room dimensions, insulation levels, window areas and coverings, indoor and outdoor temperatures etc.

You can use the following table as a guide, but **the size of your system should be determined by your supplier**. This is especially important when sizing central heating systems.

Home	Heater output required per m <sup>2</sup> of floor area*
Uninsulated home	130 watts/m <sup>2</sup>
Insulated ceiling and walls	100 watts/m <sup>2</sup>
Energy Smart home	70-80 watts/m <sup>2</sup>

\* Figures will be greater for electric storage heaters and for rooms with ceilings higher than 2.4 m.

## Decision 3 What type of heater?

Try to identify those heaters which closely match your heating requirements

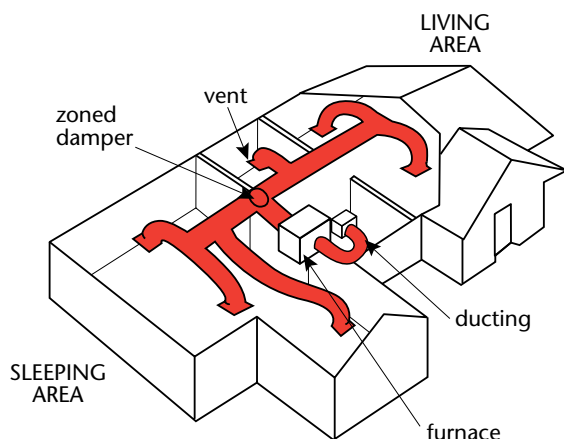
### Central heating systems

Central heating systems are large heaters capable of heating most of your home at the one time. To help you control your heating and reduce running costs, all large central heating systems should be zoned.

Central heating systems can also be supplemented by installing a high efficiency space heater in the main living area, to be used when whole house heating is not required. (If you are 'upgrading' from space to central heating, consider retaining the existing space heater for this purpose).

### Ducted air heating

- Are convection heaters which circulate warm air around the home through insulated ducts entering rooms through the floor or ceiling.
- Typically run on gas, but electric reverse cycle air conditioners are also available.
- Are able to heat areas quickly to a thermostat setting.
- Typically up to one third of the total number of outlets can be closed off at any one time, depending on the size of the system. Check with your installer.
- Can circulate dust and tend to dry the air.
- Systems available are able to serve from 90 m<sup>2</sup> to over 300 m<sup>2</sup> of floor area.
- Costs start at around \$2000.



A schematic plan of a zoned, ducted heating system

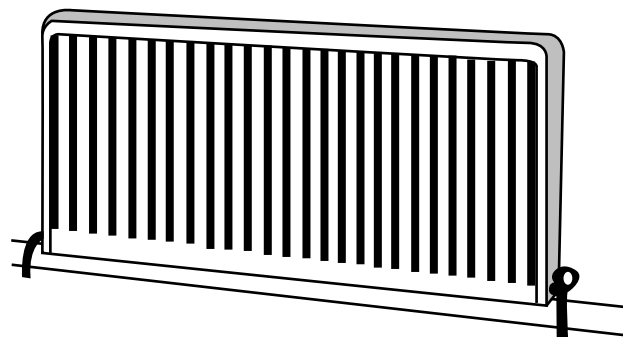
#### CHECKLIST FOR GREATEST EFFICIENCY

Should have:

- high star rating;
- well insulated
- zoning option;
- 'positive close-off' floor registers;
- electronic ignition; and
- thermostat with programmable timer.

### Hydronic heating

- Water is heated in a boiler and then circulated around the home to radiator panels, skirting board convectors or fan coil convectors that heat the room by convection and radiation.
- Typically fuelled by natural gas, LPG or wood, but also possible to use off-peak electricity.
- Each panel usually has its own control valve to give individual room control.
- Has silent operation, little dust circulation and does not dry the air.
- Cost of a system starts at around \$5000.



Hydronic heating radiator panel

#### CHECKLIST FOR GREATEST EFFICIENCY

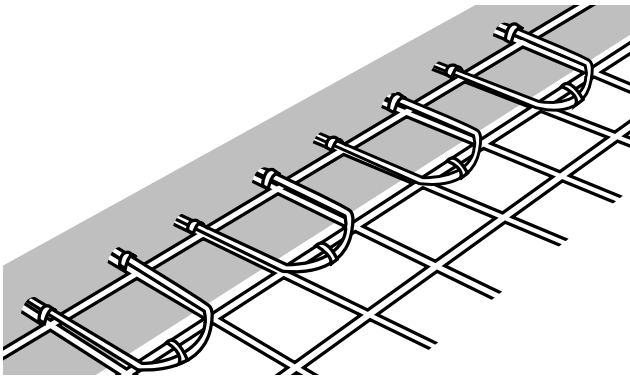
Should have:

- low water content boiler;
- quick response panels, e.g. mild steel with low water content;
- well insulated pipes; and
- independent valve controls/thermostats in each room.

### In-slab heating

- A concrete slab is heated by internal electric cables or hot water pipes.
- Usually installed only in new homes or extensions before the concrete is poured.
- Gives off radiant heat suitable for rooms with high ceilings.
- Typically fuelled by off-peak electricity (for cables) or natural gas (for hot water pipes). LPG or solid fuel can also be used for heating water in pipes.
- Slow response time (6 – 8 hours) to changes in thermostat settings means systems should be set and left on for 24 hour heating.
- Greatest economy when run at a moderate temperature (18°C).
- Not recommended for suspended concrete floors where the space underneath is unoccupied, or for slab-on-ground in areas with a high water table.
- Costs of a system start at around \$30/m<sup>2</sup> of floor area.

# Selecting a heating system



Electric cables through a concrete floor for in-slab heating

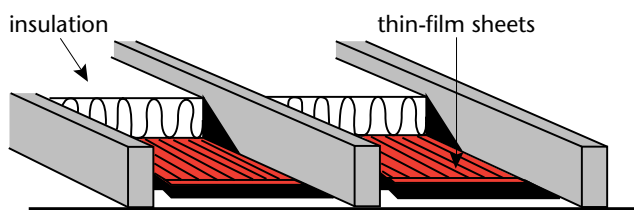
## CHECKLIST FOR GREATEST EFFICIENCY

### Should have:

- zoning for each bedroom, with thermostatic control in each zone;
- slab edge insulation; and
- hard floor coverings, e.g. tiles.

## Electric thin-film heating

- Thin films installed in the ceiling, in wall panels or under floor coverings to give radiant heat.
- Operate on 'peak rate' electricity.
- Can effectively heat an area using less electricity than other peak rate electric heaters.
- Thermostatically controlled.
- Costs start at around \$35/m<sup>2</sup>.



Electric thin-film radiant heating installed in ceiling

## CHECKLIST FOR GREATEST EFFICIENCY

### Should have:

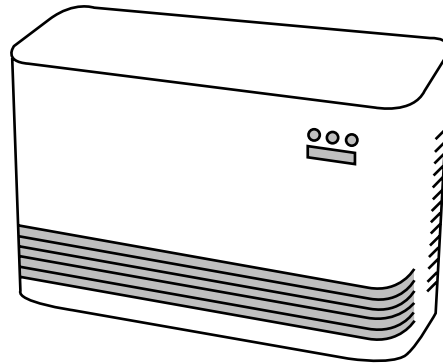
- adequate insulation against heating film and in ceilings, walls and timber floors;
- individual thermostat control for each room; and
- programmable timers.

## Space heaters

Space heaters are designed to heat a zone, rather than a whole home (although some wood heaters can produce enough heat for a whole home). Installing individual space heaters in different zones of a home according to your needs gives you greater heating flexibility.

## Gas space heaters

- Produce convective heat, radiant heat, or a combination of the two.
- Run on natural gas or LPG
- Can be mounted on internal walls where a vertical flue can be fitted, or external walls.
- Some wall furnaces have a rear register to heat an adjoining room.
- Rated for energy efficiency with an energy rating label; the more stars, the more energy efficient the unit.
- Units are available to heat from 30 m<sup>2</sup> up to 100 m<sup>2</sup>.
- Costs start at around \$600.



Gas space heater

## CHECKLIST FOR GREATEST EFFICIENCY

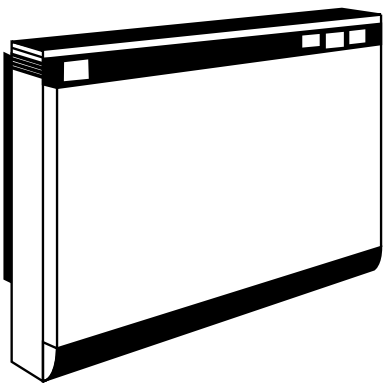
### Should have:

- high star rating (5 – 6 stars on the energy rating label);
- heat outlet at floor level;
- electronic ignition;
- remote thermostat;
- power flue; and
- programmable timer.

## Off-peak electric storage heaters

- Radiant/convection heaters which store off-peak electricity as heat in storage bricks.
- Storage fan heaters are available to heat up to 50 m<sup>2</sup>. The fan helps distribute the heat and control the heat delivery and temperature.
- Storage radiators deliver 24 hour background heat for areas up to 30 m<sup>2</sup>.
- 'Combi' heaters are storage radiators with a back-up day rate electric element to boost the off-peak output when necessary and for more rapid on-demand heating.
- Costs start at around \$500.

# Selecting a heating system



*Off-peak electric storage heater*

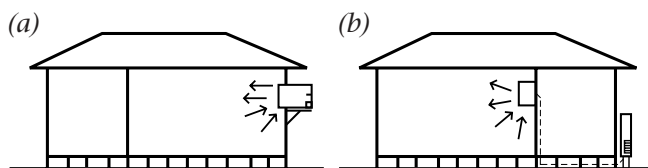
## CHECKLIST FOR GREATEST EFFICIENCY

### Should have:

- remote thermostat;
- charge controller; and
- fan control.

## Reverse cycle air conditioners

- Electric convection heaters which extract heat from the outside air and deliver it into the home. Use a compressor and fan.
- Also provide refrigerative cooling in summer.
- Can be installed in a wall or window, as a split system with the compressor outside and console unit mounted internally, or as a central ducted system, usually zoned.
- Available in sizes suitable for bedrooms, living areas or whole house.
- Heat output of some units declines when outside temperatures drop below 5°C. This should be considered when sizing units in cold areas.
- Carry an energy rating label. The more stars, the more energy efficient the unit is.
- Costs start at around \$800.



*(a) Wall mounted and (b) split system air conditioners*

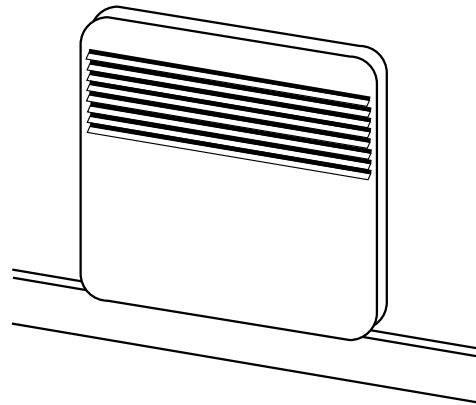
## CHECKLIST FOR GREATEST EFFICIENCY

### Should have:

- high star rating (5 or 6 stars);
- remote thermostat;
- adjustable directional louvres; and
- programmable timer.

## Electric space heaters/panel convectors

- Convection or radiant heaters which use 'peak rate' electricity
- Can be very expensive to run, so should be limited to heating for short bursts only, e.g. for bedrooms, bathrooms. Not suitable for main living areas.
- Available in sizes to heat up to 70 m<sup>2</sup> of floor area.
- Costs start at around \$200.



*Electric panel convector*

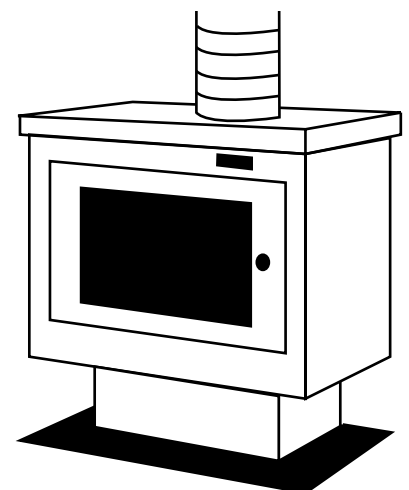
## CHECKLIST FOR GREATEST EFFICIENCY

### Should have:

- remote thermostat and;
- programmable timer.

## Solid fuel heaters

- Convection or radiant heaters burning wood, briquettes, coal etc.
- Highest efficiency units are airtight 'slow combustion' heaters, boilers (for hydronic heating) and furnaces (for ducted heating).
- Require a flue.
- Efficiency and performance depend on the quality of wood and method of operation.
- Heating outputs adequate to heat up to around 150 m<sup>2</sup>, but require suitable heat distribution methods to disperse heat evenly.
- Costs start at around \$800.



*Slow combustion wood heater*

## CHECKLIST FOR GREATEST EFFICIENCY

### Should have:

- air intake controls, baffles, secondary combustion chambers;
- quality wood supply; and
- correct method of operation.

# Comparative running costs for heaters

In general terms, space heating is more economical to run than central heating, essentially because of the smaller area being heated.

## Space heaters

The most economical space heaters in terms of running costs are either:

- high efficiency (5 – 6 stars) natural gas heaters;
- high efficiency (5 – 6 stars) reverse cycle air conditioners; or
- off-peak electric storage fan heaters.

## Central heaters

The most economical central heating systems are either:

- zoned, high efficiency, natural gas ducted heaters;
- zoned, natural gas hydronic systems; or
- zoned, off-peak electric in-slab heating.

The actual running costs of a system will depend on a range of variables. These include the size of your heater, operating temperature, hours of operation and the energy efficiency and size of your home.

The following table is a guide to

the approximate running costs of different heating systems in a typical new home. Adjust figures for each of the following:

- for an existing home, increase space heating costs by approximately 25%, central heating costs by approximately 45%;
- for an Energy Smart home, reduce costs by approximately 30%;
- for every 1°C increase in operating temperature, increase costs by approximately 15%; for 24 hour heating, double these costs (except in-slab).

## ANNUAL HEATING COSTS

<b>Central (-150 m<sup>2</sup>)</b>	Ducted natural gas (4 – 5 star)	* \$110 - \$270
	Ducted natural gas (1 – 2 star)	* \$160 - \$360
	Electric in-slab (At 18°C; 24 hr heating on off-peak 1 tariff)	* \$100 - \$135
	Ducted reverse-cycle heat pump (Continuous tariff; average efficiency)	* \$120 - \$220
	Electric radiant thin-film (at 18°C continuous tariff)	* \$150 - \$220
<b>Space (-60 m<sup>2</sup>)</b>	Natural gas space heater (4 - 5 star)	* \$70 - \$125
	Natural gas space heater (1 - 2 star)	* \$85 - \$170
	Electric storage fan heater (off-peak tariff)	* \$50 - \$90
	Reverse-cycle heat pump	* \$55 - \$120
	Electric space heater (continuous tariff)	* \$160 - \$200
	LPG space heater	* \$180 - \$300
	Slow combustion wood heater	* \$85 - \$110

Figures extracted from Energy Efficiency Victoria figures converted for NSW fuel costs and temperatures. Heater use for the winter quarter (90) days for 8hours per day, in an average temperature of 8 - 18 degrees celsius.

\*NB These figures are to be used as an approximate guide ONLY.

## Portable heaters

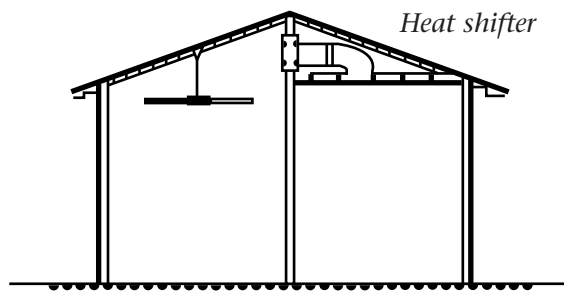
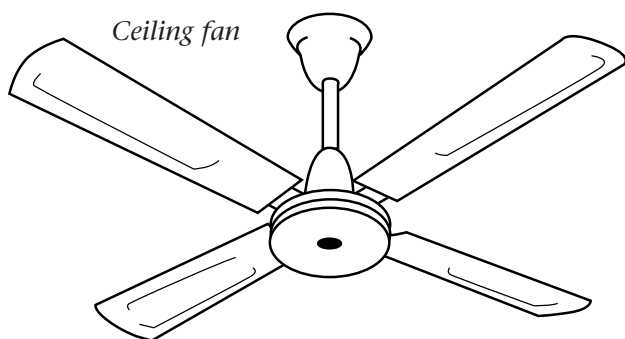
Portable heaters are generally small units designed to heat small areas. They are most suitable for short periods of heating such as in bedrooms, bathrooms or infrequently used rooms.

Typical portable heaters include electric radiators, electric fan heaters, electric natural convection heaters such as oil-filled heaters, portable gas heaters and kerosene heaters.

## Heating accessories

### Ceiling fans

- Useful to help bring down to floor level the hot air that builds up at ceiling level. Especially important in rooms with high ceilings. Also provide cooling breezes in summer. Should have reversible blade action and variable speed control.



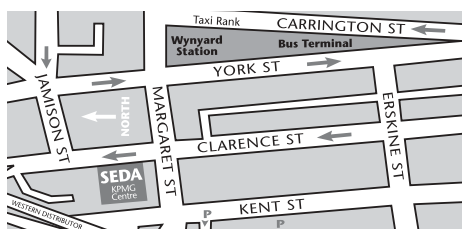
### Heat shifters

- A simple ducting system using a fan to move warm air.
- Useful for moving heated air that has collected in an upstairs area back down to the ground floor, or for taking residual heat from a living area to bedrooms on retiring at night.
- Especially useful with wood heaters.

### Programmable timers

- Devices which automatically turn heaters on and off at pre-selected times.
- Useful to pre-heat rooms in the morning or evening, to avoid running the heater continuously. Available as plug-in units in power points, in-built in the heating appliance, or as part of a remote thermostat.

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.



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Sustainable Energy Development Authority  
Level 6, 45 Clarence Street, Sydney  
PO Box N442, Grosvenor Place, NSW 1220  
Telephone 1300 138 638, or (02) 9249 6125  
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