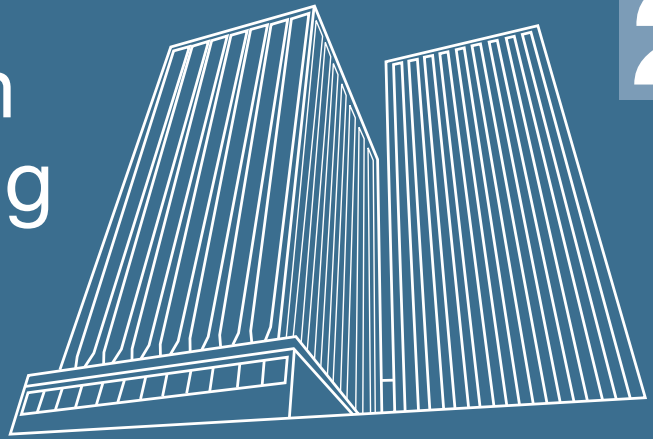


# Saving energy in business: heating and cooling



New Zealand's commercial buildings account for 9% of our total energy use – equivalent to the energy used in more than one million homes. Heating, ventilation and air conditioning (HVAC) accounts for around 40% of this. Many systems, even in small businesses, don't run as efficiently as they could. Businesses may save 10 - 20% of heating and cooling costs with some simple changes.

## Energy-saving leases

Reducing energy costs from HVAC can sometimes be difficult for tenants when the system is owned and maintained by the landlord. If you are negotiating a new lease, make sure expectations about building services are set out clearly. It's possible to insert performance standards – for example, specifying that energy use per sq m will meet certain benchmarks. And when performance targets aren't met, it should be spelled out who bears the cost of improvement.

## Put staff first

It's essential to be guided by comfort – staff won't be happy or productive in an environment that is too hot or cold. It is almost certain there will be ways to run your heating and cooling more efficiently and have a more comfortable workplace at the same time.

In modern offices people often have far less control over heating and cooling than they do over lights or appliances. However, there may still be small heaters, fans or local air conditioning. Personal fans and heaters shouldn't be needed in a centrally heated environment – they're a sign that the system isn't working properly. If there are local air conditioning controls staff should understand how to use them correctly and the wider effects they have, as pockets of variation can make the system work harder than it needs to. Windows shouldn't be open while heating or air conditioning is in use.



Personal fans and heaters shouldn't be needed in a centrally heated environment – they're a sign that the system isn't working properly.



## Systems and controls

Most commercial environments have centralised HVAC systems. Ensuring these are set correctly to start with – known as ‘commissioning’ – is crucial, and settings should be checked regularly.

Make sure your system is set to heat and cool only when needed, and that cooled space is separate from heated space. There may be times that using both is justified for different areas – such as late afternoon when the sun heats up one side of the building while the other side is too cold. The key is to make sure spaces are ‘zoned’ correctly and that sensors are well located.

A good rule of thumb for offices is to set the heating target at 20°C and cooling at 24°C – so that in the comfortable zone between the two settings, neither system runs.

Pay particular attention to server rooms and kitchens where excess heat can be generated. This could be as simple as providing opening windows, or you may need some expert advice to cool these spaces cheaply and effectively. You may be able to use the excess heat elsewhere. State of the art design allows heat from server rooms to be transferred to office spaces that need heating.

### From the good ideas file

Make a record of the ideal temperature and time settings for your HVAC system at different times of the year, with a short explanation, and keep this somewhere easily locatable. When seasonal changes or temporary adjustments are needed it might be useful to refer back to what settings are most appropriate, and when.

### Case study – ‘continuous commissioning’

Following an energy audit, a government agency optimised its HVAC systems with a process of constant monitoring and adjustment called ‘continuous commissioning’. As a result it’s on track to save 22% of energy, worth \$60,000, every year.

## Maintain and monitor

Dirty, poorly maintained systems use more energy and are also more likely to break down, incurring large unplanned costs. All parts of HVAC systems – including boilers, filters, sensors, controls and ductwork – need regular checking and maintenance. Set up an annual schedule for maintenance. If your staff or building service providers don’t have the capability, get training for them. If your equipment provider is not open to providing manuals or training, consider finding an alternative supplier. Training is generally good value for money. Keep an eye on what HVAC is costing – if you’re a tenant and have high ongoing costs it may be worth renegotiating your lease.

## Heating options

In smaller premises, a heat pump may be the most efficient and cost-effective choice for heating. These have low running costs, but should always be sized correctly for the space they heat. If buying a heat pump, look for the ENERGY STAR® mark which denotes the most efficient models. See [www.energywise.govt.nz](http://www.energywise.govt.nz) to find out more about domestic-sized heating options and how to use them properly.

## Consider wood energy

When installing or replacing a boiler, consider ongoing fuel and maintenance costs. Many companies and schools in New Zealand have switched to wood as a boiler fuel. It’s cheaper than LPG or diesel, and is clean-burning and renewable. Wood energy is also virtually carbon neutral, so drastically reduces greenhouse gas emissions for companies that replace fossil fuels with wood energy.

## Building management systems

In larger premises where heating and cooling is a significant energy cost, it may be worth considering a building energy management system (BEMS or BMS). This is software with a user interface for real-time monitoring of all energy used – including heating, cooling and ventilation as well as lighting, equipment and hot water. It enables changes to be made quickly and generates monitoring reports – so it’s easy to see exactly where your energy is used and to measure the difference over time.

## Building energy benchmarks

Building type	Energy performance indicator (annual kWh per m <sup>2</sup> of floor space) (approx. annual \$ per m <sup>2</sup> of floor space)		
	Low	Typical	High
<b>Offices</b>			
- <i>with HVAC</i>	200 (\$26)	280 (\$36)	400 (\$52)
- <i>naturally ventilated</i>	100 (\$13)	210 (\$27)	300 (\$39)
- <i>'tenant' electricity only</i>	60 (\$8)	150 (\$20)	200 (\$26)
<b>Hotels (large)</b>	180 (\$23)	330 (\$43)	670 (\$87)
<b>Libraries</b>	120 (\$16)	162 (\$21)	200 (\$26)

(nb costs are gst exclusive)

## Consulting the professionals

Understanding a building's energy use and identifying the most cost-effective savings, isn't simple. It may be worth investing in a professional energy audit. There are three levels of audit – a level 2 audit is the most common, and appropriate for most business premises. This includes a detailed site assessment, a reconciliation of energy invoices with end use, and energy-saving recommendations with estimated costs. EECA's analysis shows that typically for every \$1 invested in an energy audit, \$7.50 of savings are identified.

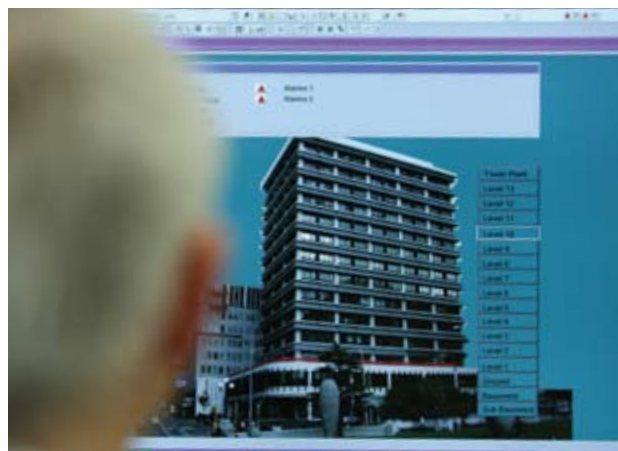
## Structure and design

If you're commissioning a new building, get all consultants to talk together to set targets for energy use and reduce the amount of energy needed to run the building comfortably. With good design you may be able to rely on passive solar heating and passive ventilation. When fitting out or refurbishing an office, make the most of any natural light and ventilation. EECA has building design guides to help with this.

---

If you're commissioning a new building, get all consultants to talk together to set targets for energy use and reduce the amount of energy needed to run the building comfortably.

---



## Control excessive heating from the sun

Too much heat from the sun can make workspaces uncomfortable and interfere with air conditioning. External awnings or adjustable shades may be useful to prevent over-heating and glare. If this isn't feasible, blinds can also help. Shutting out the most intense sunlight from the east in the morning and from the west in the evening will have the most impact.

## Insulate

Insulation can be especially cost effective in small premises, especially when upgrading the building anyway. Check whether roof and under floor insulation is adequate and if not, install it. Retro-fitting insulation in large commercial buildings is often more difficult and best done as part of a wider refurbishment. Insulating the roof is often easier and may make a difference for top-floor occupants. Underfloor insulation can often be retrofitted to floors above unconditioned or open spaces (like car parks) and make a noticeable difference to the comfort of people working above.

### Fact

'Fighting' heating and cooling where the same space is heated and cooled simultaneously – is estimated to occur in at least a third of New Zealand commercial buildings, causing their energy use to be 50 – 100% higher than normal.

## Action checklist: heating, cooling and ventilation

	Close windows and exterior doors when using heating or air conditioning
	Avoid personal heaters or fans if your office is centrally heated. If people are uncomfortable, consult your HVAC engineer to fix the problem
	Turn off heaters and air conditioning in areas that aren't occupied
	Reduce the heat load by ensuring lights and equipment are turned off when not in use. Encourage staff to get into the 'switching off' habit
	If heating and cooling is controlled manually, make sure the relevant staff know how to use it and understand its wider effect
	Ensure doors and windows are well sealed and that automatic doors close quickly
	Install roof and / or under floor insulation if necessary and feasible
	Install shades and awnings to control solar gain, or use blinds if external shading isn't possible
	Set timers so that heating and air conditioning come on around half an hour before people arrive at work, and turn off half an hour before they leave
	Make sure there is a process for weekend and holiday shut downs
	Set the temperature bands for heating and cooling at 20°C to 24°C
	Set air conditioning so that relative humidity floats between 30% and 60%
	Make sure thermostats are correctly calibrated and not placed next to a heat source or in direct sunlight
	Fit simple time controls to switch off ventilation fans outside work hours
	Consider installing condition controls so your heating and air conditioning systems respond automatically to occupants' needs
	Have a building services engineer optimise the controls for your HVAC system at least once a year, including looking at the set points
	Invest in energy efficiency and / or HVAC maintenance training for your building services staff – this is likely to be good value for money
	Ensure heating and air conditioning systems are regularly cleaned and maintained, including servicing boilers and replacing air conditioning filters
	Insulate heating and air conditioning pipes and ducting against heat loss and gain
	Consider investing in an energy audit to identify savings potential in your building's HVAC system, as well as other area (such as lighting)
	When you upgrade your premises, think about installing a wind lobby to create a buffer zone between the heated space and outdoors
	Consider investing in a PC-based building energy management system to adjust, monitor and report on your HVAC energy consumption

### For more information

The New Zealand Green Building Council has developed the Green Star rating tool for new and refurbished buildings. Visit their website at [www.nzgbc.org.nz](http://www.nzgbc.org.nz)

The Energy Management Association of New Zealand maintains a list of registered energy auditors at [www.emanz.org.nz](http://www.emanz.org.nz)

