UNSW Personal Heater Guidelines

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Never Stand Still

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This information is provided for the guidance of UNSW staff in the use of personal heaters within UNSW grounds and facilities only. The information contained in this publication is consistent with other relevant UNSW policies and complies with relevant legislation and regulations.

Contents

Staff safety and energy strategy

This strategy is aimed at FM staff, OHS staff and School, Faculty and Department administration officers.

Whenever winter draws near, people begin to use portable heaters in their workspaces. Schools and Departments are also purchasing heaters for their staff. Typically these heaters are one of the following:

- bar radiators
- convection heaters
- oil heaters
- fan heaters.

These heaters are high wattage, inefficient and in some cases dangerous. They create the following problems:

- Even if the heater is thermostatically controlled, most types in use are grossly inefficient in open plan offices.
- Security confirms that people leave heaters on 24 hours a day and set the thermostats high.
- Most electrical distribution boards were not designed with high loads from a large number of personal heaters in mind. Tripping breakers are a problem.
- Some heaters, especially bar radiators, but also ceramic heaters, fan heaters and even oil heaters are a fire/safety risk; and
- They add to the maintenance load as heaters and their leads should be regularly examined and tagged as safe.

The end result is wasted energy, high electrical loads and potential OHS problems (high electrical loads cause breaker tripping which creates a lot of unnecessary work).

The good news is that energy efficient, low wattage radiant panel heaters are available to reduce these problems.

Radiant panel heaters and OHS

While the panel on radiant panel heaters is hot to touch, the temperature is not high enough to create a major OHS issue (as opposed to bar radiators). Their safety is better than most other heaters, yet they use only 160W. They are effective in draughty spaces where other forms of heating are next to useless.

Appropriate personal heating in non-heated workspaces

People in non-heated workspaces can use one or two 160W radiant heaters.

We do not use a single 320W heater instead of two smaller heaters for several reasons. First, two small heaters are cheaper than one large heater. Second, a single large heater is invariably too long which means much of the radiant heat is wasted. Two small heaters also provide flexibility with positioning under the workstation.

In very cold and draughty workspaces, such as foyers or reception areas, moderate wattage micathermic radiant heaters have been found to provide excellent comfort levels.

Various combinations of radiant panel heaters, moderate wattage micathermic radiant panel heaters provide flexibility and enable heating to be tailored to individual needs.

Personal heating strategy

People want to use portable heaters because their workspaces are cold and/or they are not dressed appropriately for the season. The challenge is to improve inherent space comfort, provide appropriate supplemental or personal heating and encourage people to dress for winter.

The FM Energy Unit is implementing a broad personal heating strategy that:

1. Aims to stop the use of high wattage and potentially dangerous heaters.
2. Encourages people to swap existing heaters for approved ones.

3. Removes dangerous and inefficient heaters (the priority is bar radiators, fan and convection heaters).
4. Investigates ways to improve the worst case buildings (the thermal performance of a few key buildings will be reviewed).
5. Encourages the responsible use of oil heaters in worst-case buildings (although the long term objective is to phase out these heaters).
6. Develops and disseminates educational and communication resources (via the UNSW Environment Website, this Guidelines, etc).

How heaters work

Electricity is used in a heater to create a heat source. There are three basic ways this heat source can heat a person or working space:

Convection: The heat source heats air directly. The hot air rises or is blown by a fan and mixes with the surrounding air mass. The temperature of the air in the room rises and this makes the room feel warm to an occupant. The warm room reduces the rate at which the occupant's body loses heat to the environment. Oil heaters, convection heaters and fan heaters use this principle.

Radiation: When we step out of the shade into direct sunlight the warmth we immediately feel is due to radiant heat from the sun. Along with ultraviolet and visible light, the sun's rays contain infrared radiation. Radiant heaters also generate invisible infrared energy. This form of energy travels directly from the heat source through the air, and heats people and objects in its path. Infrared energy barely heats the air it passes through, however. Instead air is heated when objects in front of a radiant heater are warmed up and transfer heat to the surrounding air.

Conduction: Heat is directly transmitted from one material to another. When you place your hands directly on an oil or panel heater for a few seconds to warm them up, the heat transfer mechanism is conduction. Conduction also occurs with heated car seats and electric blankets. A hot bath heats you via conduction. Floor heating mats use conduction to a degree, but generally this form of heat transfer plays a minor role with personal or portable heaters.

If you work in an air conditioned office, a workspace that receives a tempered air supply, or one that has a reverse cycle air conditioning unit, then you are experiencing convection heating. The air in the room will be heated either by hot water pipes, an electric in-line resistance heater or hot 'refrigerant' coming from a reverse cycle air conditioning unit.

Convection versus radiant heating

Convection heating

Given the typical characteristics of non-air conditioned spaces at UNSW, portable convection heaters are neither efficient nor effective. They consume large amounts of electricity to make a person comfortable. In large offices they simply cannot heat the air mass enough to do the job. They have four major shortcomings:

- air stratification
- major energy losses through windows, walls and ceilings
- energy losses from draughts
- inability to heat large spaces.

Air stratification

Imagine a person sitting at their desk, using a convection heater (eg. an oil heater) that works by heating the surrounding air. This approach creates a problem, namely temperature stratification.

Temperature stratification is where warm air rises from the heater and a strong vertical temperature gradient develops. The air just under the ceiling is a lot hotter than the air at desk and floor level.

This means only a narrow band of air above the floor will be at the right temperature. The air volume in the top half of the room will be

overheated, while a lesser volume just above the floor will still be too cold.

Air conditioning systems use various techniques to try to overcome stratification problems and ensure the air in a room is reasonably well mixed. These systems do a better mixing job in summer, with cool air coming out of the ceiling registers, than they do with warm air in winter.

Major energy losses

Non-air conditioned offices are often located in older buildings with high ceilings. In such cases you have to heat a massive volume of air to a high temperature to obtain a comfortable environment. Using a ceiling fan in winter mode mitigates this problem, but other factors present in old (and even some relatively new) buildings tend to wipe out the gain.

Most buildings at UNSW are not insulated and lose a lot of energy through the ceilings, walls and old single pane windows. The types of blinds typically used in offices, namely venetian or roller blinds, have little insulating value. Metal window frames are another significant source of heat loss. The bottom line is that heating a large volume of air in a poorly insulated building is not an efficient way to make people comfortable.

Draughts and open offices

Unfortunately old buildings (and some newer ones) are draughty. This means that warm inside air leaks out of the workspace and is replaced by cold outside air that then has to be heated.

Keep your office door closed as much as possible. If your windows are broken, or they don't close properly or you have any other major sources of draft, please contact FM Assist (ext 55111). This will help, but fundamentally convection heaters are not well suited to draughty spaces.

Convection heaters are also not suited to heating large open plan offices, receptions, foyers, and workshops. They will operate in these spaces continuously and the surrounding air will never get warm enough to trip the thermostat. The warm air will rise away in tall foyers, leak out sideways in open receptions or flow through self-opening doors.

People who try to use oil heaters and other convection heaters in open plan offices and other large tall areas invariably huddle right beside the heater. They are trying to use a convection heater as a radiant heater, which it was not designed for.

Radiant heating

Radiant heaters have a number of pros and cons when compared with portable convection heaters:

- they heat people efficiently across a range of conditions
- they have range limitations and can be tricky to configure.

Radiant heating can deal with most of the shortcomings of convection heating. It can efficiently heat people working in large open spaces or draughty environments. More of the energy a radiant heater produces actually heats the person and less disappears as losses through uninsulated ceilings, windows etc. Nonetheless radiant heaters do eventually heat the air to a degree so using ceiling fans in winter mode and taking steps to improve the insulation and reduce draughts are still useful measures.

A person needs to be in front of a radiant heater to get the best result so sometimes furniture needs to be reconfigured to achieve this. Generally, after a bit of experimentation, most people are able to make some small adjustments and find a good, safe heater location that works for them.

A broader problem with portable radiant heaters is that when the person moves away from the heater they lose its heat, though after a while a radiant heater will heat the air in small to medium sized offices to a degree. When using any heating system you should dress for winter. If you are suitably dressed, short excursions way from the heater should not be a problem.

If you were using an oil heater in a large space it will not be able to heat all the surrounding air

anyway. In this case if you move away from your desk you will be no better off than if you had a radiant heater.

Personal heaters

As the cooler months settle in, it can be tempting to bring in your own personal heater from home to keep warm. Whilst this may seem like a simple, quick fix solution, it unfortunately creates a number of safety and energy problems.

Safety

Uncontrolled personal heater use at UNSW is causing electricity load problems (circuits tripping), creating safety risks and leading to inefficient use of energy. A wide range of heaters are in use around the University, including:

- bar radiators
- convection heaters
- oil heaters
- fan heaters.

Generally, these type of heaters are inefficient, ineffective, and in some cases, unsafe. Our strategy is to phase them out, and for replacements and new heaters, we now specify a selection of safe and efficient personal heaters that units can purchase.

Recommended heaters

Two types of heater have been chosen for use at UNSW:

- compact radiant panel heaters
- micathermic radiant panel heaters

These modern and safe radiant heating alternatives generally have three characteristics:

- low intensity radiant source
- unidirectional radiation
- efficient conversion of electricity to radiant energy.

Modern radiant heaters are configured as flat panels. They are thin (ranging from 25 to 75mm in thickness), are larger in area than traditional radiant heaters and the heat source is not as intense.

While they are hot to touch, they will not usually cause a burn. Most of the radiation is emitted from one side of the panel. This means the back panel can be placed against a wall or close to a piece of solid office furniture. Typically, about 80% of their heat output is infrared radiation. The balance is convection heat. Energy outputs range from around 160W to over 1KW.

Radiant heaters have many advantages over bar radiators, oil heaters, other convection heaters and fan heaters. They create infrared heat and warm the user directly.

These heaters are particularly useful in draughty spaces and large or poorly insulated rooms where other forms of heating are ineffective or inefficient.

Compact radiant panel heaters

These heaters range in size. The model we use at UNSW is about 500mm long and 450mm in height. This is an ideal size to heat the legs of a person seated at a desk. A large proportion of the radiant heat produced by the unit will strike the person and be effective.

The heat output of the compact model is 160W. The energy density is only 800W/m^2 (front surface area) compared with 10,000-15,000W/m^2 (reflector area) for a bar heater. This makes the compact radiant panel heater

much safer than a bar heater. The low energy density also means the heater can be placed relatively close to the user. This results in most of the output energy being used to provide comfort.

Compact heaters use a simple resistance element backed by reflective material and insulation to project infrared heat out one side of the panel. There is not a lot of material to heat so they only take about 5 minutes to reach full heat output (much quicker than an oil heater).

The low wattage radiant mode of these heaters means that thermostats are not needed. They usually just have an on/off switch.

Micathermic radiant panel heaters

These heaters are a bit bigger than compact radiant panel heaters. They are around 600x600mm and 60-70mm thick. These heaters are intended for staff in very cold areas such as reception counters and areas where people are moving about and have a rating of 1,500W. They have an energy density of about 2500w/m², more than a compact panel heater but much less than with a strip heater. Once again these heaters can be placed relatively close to the user to create effective and efficient personal heating.

Micathermic radiant panel heaters use a special technology to project infrared heat in one direction. They convert about 80% of the electrical energy input to radiant heat and 20% to convection heat. Micathermic heaters reach full power output in a matter of a minute or two.

Micathermic panel heaters typically have several heat settings. Because they produce a degree of convection heating, a thermostat is usually built in. The heaters have a range of protection devices to guard against overheat or being tipped over and often have a timer.

Purchasing heaters

Radiant panel heaters are the only types of new personal heaters approved for UNSW. The information in this section is for administration officers wanting to purchase portable heaters on behalf of their colleagues.

Staff may not bring personal heaters into UNSW workspaces from home, an electrical store or from any other source. Instead they must request an approved heater from their school or department.

Procuring heaters

There is only one permissible source of personal heaters. Nominated School or Department administration officers who can purchase approved heaters on behalf of their staff through UNSW procurement. New heaters can be purchased directly from the manufacturers/suppliers, through white goods retailers, or from online stores.

Using heaters responsibly

There are a few simple things everyone can do to improve the performance of their heater.

Dress sensibly for winter

Try to meet your personal needs and those of the world halfway Dressing sensibly during Sydney’s short winter months could greatly improve your comfort and help reduce inefficient energy use.

If you have a safe convection heater, please make sure they are thermostatically controlled so that they turn off when the target temperature is reached.

Don't overheat the room

Set the thermostat to the lowest setting that will keep you warm when sensibly dressed and sitting at your desk. If you have to turn the

thermostat to its highest setting to get any comfort then you have the wrong type of heater for the workspace. Try a micathermic radiant panel heater.

Don't use convection heaters in large spaces

Oil and fan heaters are not suitable for large offices, open plan areas, reception areas, foyers and spaces with tall ceilings. The warm air produced by these heaters rises up to the ceiling or otherwise moves away from a user's workstation.

Convection type heaters will remain at full power for long periods because they cannot heat the surrounding air enough to trip their thermostat. Replace this type of heater for a radiant panel heater.

If you have an oil heater, we understand your reluctance to turn it off because they take so long to warm up. Please replace the oil heater for a fast-acting radiant panel heater. If you do keep an oil heater, you must turn it off at night.

Do not use any kind of personal heater in air conditioned spaces

If you are working in an air-conditioned space (or one that is centrally heated) and find conditions a little chilly, don't resort to personal heaters. The air-conditioning system will only work against the personal heater by drawing the warm air away. The system may also be trying to work in cooling mode due to the heat loads from copiers, computers, people, etc.

In this scenario, report the issue to Facilities Management. FM will check the operation of the air conditioning system in your workspace and assess any possibilities to improve the thermal comfort in your area.

Turn your heater off when unattended

When you go home at night, or leave the office for any length of time, turn your heater off. This saves energy and reduces risks. Be wary of using timers – what if you do not come to work tomorrow? The best case scenario is wasted energy, under the worst case scenario a fire results.

Use the ceiling fan

Using a ceiling fan in winter mode helps to break up the layer of very warm air that is created under the ceiling by oil heaters and other convection heaters. Mixing this warm air with the rest of the air in a room improves the efficiency and effectiveness of convection heaters.

Respect heater clearances

Always abide by the required clearances around the front, back, sides and above your heater. Do not allow items to be placed too close to a heater.

Smaller clearances could lead to an overheating of the heater and therefore a fire hazard.

Report broken/faulty windows and doors

Broken windows, windows and doors that don’t close properly or holes in walls all create draughts that suck the energy out of workspaces and allow cold air in.

You will be more comfortable, and your heater more efficient, if these problems are repaired. Contact FM Assist for help on ext 55111.

Adjusting your radiant panel heater

If you are using a radiant micathermic panel heater and it becomes too hot for comfort, then turn the power setting down rather than move the heater away. This way you will be comfortable with the least energy use.

If you feel cold and are using a radiant heater, try moving the heater a little closer (subject to safety) and turning the power down rather than keeping the unit at full power meters away.

Always respect heater clearances and use common sense.

Note that if you have a bar radiator, strip heater, or any type of heater with a quartz infrared heating element you must replace it for an inherently safer and more efficient compact radiant panel heater or micathermic radiant panel heater.

Staying warm in winter

Winters in Sydney are short and mild and that, in itself, can pose a problem. Because our winter is so short, however, it is no great burden to make a few small changes so that you are comfortable during chilly mornings and on those infrequent days when there is a cold southerly.

People respond differently to cold conditions. Nonetheless two small changes can make a big difference to how you feel when sitting at a desk in winter:

- a little exercise
- more clothing.

A little exercise

Exercise, even just walking, raises your body's metabolism. This effect can run on for an hour or so after you stop exercising and sit down. Generating a little bit more body heat helps you to deal with cold conditions and can make you more comfortable.

Why not try:

- getting off the bus a few stops early in the morning and walking the rest of the way to work
- finishing your lunch hour with a brisk walk
- visiting the gym at lunch time

Sitting at your desk for long periods at a time is not good for your health and is a sure way to get cold feet. It can also increase the risk of deep vein thrombosis (DVT) and a range of other health problems.

You can reduce these risks and counteract winter cold at the same time. Make sure you get up every 20 minutes or so and stretch your legs. If you need to stay seated try doing the leg exercises that airlines advocate for passengers to avoid DVT. Just a little movement is good for your health and alleviates cold feet.

More clothing

The human body has a number of major heat radiators; the feet, the hands, the inside of the forearms, the neck and head. Your body will curtail circulation to the hands and feet to reduce heat loss in cold conditions.

Large blood vessels in the front of the neck and forearms mean these areas continue to radiate a lot of heat even when we are cold. The head also remains a major heat radiator.

This simple information can be used to dress appropriately for winter. Most people do not like to cover their hands (with fingerless gloves, for example) or their head (hats, caps and beanies) when working. As a result, we have to make up for the heat loss from these areas by reducing the loss of body heat from the feet, neck and forearms.

Layering your clothing and wearing warmer footwear can make all the difference. By wearing a number of layers you can easily adjust to changing conditions as the day warms up (or cools down).