

Home comforts

Guidance on using ventilation, heating and renewable energy systems



Guide

NHBC Foundation
NHBC House
Davy Avenue
Knowlhill
Milton Keynes
MK5 8FP
Tel: 0344 633 1000
Email: info@nhbcfoundation.org
Web: www.nhbcfoundation.org
Twitter: @nhbcfoundation

Acknowledgements

This guidance was prepared by Suzanne Davenport and Richard Partington, Studio Partington, and Clive Turner, NHBC Foundation. It is based on research carried out by AECOM for the NHBC Foundation.

Photograph credit:

Page 29 (right) and Page 35: GDC (Dimplex) by kind permission.

Home comforts

Guidance on using ventilation, heating and renewable energy systems



Guide

March 2016

The NHBC Foundation

The NHBC Foundation, established in 2006, provides high quality research and practical guidance to support the house-building industry as it addresses the challenges of delivering 21st-century new homes. To date, it has published more than 65 reports on a wide variety of topics, including the sustainability agenda, homeowner issues and risk management.

The NHBC Foundation is also involved in a programme of positive engagement with the government, academics and other key stakeholders, focusing on the current and pressing issues relevant to house building.

To find out more about the NHBC Foundation, please visit www.nhbcfoundation.org. If you have feedback or suggestions for new areas of research, please contact info@nhbcfoundation.org.

NHBC is the standard-setting body and leading warranty and insurance provider for new homes in the UK, providing risk management services to the house-building and wider construction industry. All profits are reinvested in research and work to improve the construction standard of new homes for the benefit of homeowners. NHBC is independent of the government and house builders. To find out more about the NHBC, please visit www.nhbc.co.uk.

The NHBC Foundation Expert Panel

The NHBC Foundation's research programme is guided by the following panel of senior representatives from government and industry:

Rt. Hon. Nick Raynsford

Chairman of the NHBC Foundation and Expert Panel

Jane Briginshaw

Head of Design and Sustainability, Homes and Communities Agency

Andrew Burke

Policy Officer, National Housing Federation (retired)

Richard Cook

Head of Residential Development, Lend Lease

Claire Curtis-Thomas

Chief Executive, British Board of Agrément

Hywel Davies

Technical Director, Chartered Institution of Building Services Engineers (CIBSE)

Andrew Day

Director, Architecture, Design & Sustainability - New Homes and Communities, Countryside Properties (UK) Ltd

Russell Denness

Group Chief Executive, Croudace Homes Group

Michael Finn

Design and Technical Director, Barratt Developments plc

Cliff Fudge

Technical Director, H+H UK Ltd

Richard Hardy

Managing Director, BRE Global

Richard Harral

Head of Technical Policy, Building Regulation and Standards Division, Department for Communities and Local Government

Richard Hill

Chief Executive, Spectrum Housing Group

Neil Jefferson

Director, NHBC and Chief Executive, Zero Carbon Hub

Rod MacEachrane

Director, NHBC (retired)

Robin Nicholson CBE

Senior Partner, Cullinan Studio

Tadj Oreszczyń

Director, The Bartlett School of Environment, Energy and Resources

Geoff Pearce

Executive Director of Regeneration and Development, Swan Housing Association

Mike Quinton

Chief Executive, NHBC

Helen Saunders

Group Marketing Director, Crest Nicholson plc

Steve Turner

Head of Communications, Home Builders Federation

Andy von Bradsky

Consultant, PRP

Karl Whiteman

Divisional Managing Director, Berkeley Homes

Tony Woodward

Managing Director, Kingerlee Homes

Neil Smith

Head of Research and Innovation, NHBC, and Secretary to the Expert Panel

Contents

Foreword	v
Introduction	1
Part 1 Ventilation	3
Natural ventilation (trickle vents and extract fans)	4
Mechanical extract ventilation (MEV)	8
Mechanical ventilation with heat recovery (MVHR)	14
Part 2 Solar energy systems	19
Solar photovoltaic (PV) systems	20
Solar hot water (solar thermal) systems	24
Part 3 Heat pumps	29
Air source heat pumps (ASHPs)	30
Ground source heat pumps (GSHPs)	34
Part 4 Heating controls	39
Single-zone heating controls	40
Multiple-zone heating controls	46

Foreword

As the result of successive changes to the Building Regulations over recent years, the energy efficiency of new homes compares very favourably with that of typical older UK housing stock. For example, modelling by the NHBC Foundation and Zero Carbon Hub suggests that a new home will consume around half of the energy that would be used by a typical (improved) Victorian home.*

However, it is clear that realising the full energy saving in practice will depend on the residents making correct use of the home and its appliances. Since it appears that some people fail to understand how to operate even well established devices, such as wall thermostats, it should come as no surprise that some of the more recently introduced technologies, such as mechanical ventilation with heat recovery or heat pumps which are less familiar, cause much head scratching. To make best use of such systems, it is essential that residents understand how to engage with controls, ensure appropriate ventilation and are familiar with the way renewable technologies operate.

This guidance, developed in association with services experts and consumers, does an excellent job of conveying simply what the various systems, technologies and controls are there to do, how they should be operated and, critically, what maintenance is required to keep them working properly. Following the guidance should help keep homes operating efficiently and comfortably.

I hope that house builders and housing providers will find this guidance useful, and, where appropriate adopt the text and illustrations for use in their own published information and guidance for homeowners and tenants.

Rt. Hon. Nick Raynsford
Chairman, NHBC Foundation

* See Homes through the decades: the making of modern housing, NHBC Foundation guide NF62.

Introduction

Background

New homes of today feature a range of energy and ventilation systems. For these to provide good levels of comfort, and for owners and residents to realise the energy-saving benefits that these systems offer, they must be operated correctly. This is, however, a very significant challenge. Many of these systems are relatively recent introductions and may be unfamiliar to new owners and residents, and be poorly understood. As a result, patterns of use will inevitably vary markedly between different people, sometimes resulting in poor or disappointing performance.

The information presented in this guide has been developed for the NHBC Home User Guide (HUG), which is provided free of charge to home buyers. It explains simply the following systems and their operation and maintenance:

Ventilation – natural ventilation, mechanical extract ventilation and mechanical ventilation with heat recovery.

Solar energy systems – solar PV and solar thermal.

Heat pumps – air source and ground source.

Heating controls – single zone and multiple zone.

In each case this guide explains what the particular system does, how it works, and its main benefits. Each is clearly illustrated and details are provided on efficient operation and maintenance. The illustrations and text in this guide, developed by services experts, have undergone detailed review with resident groups and equipment manufacturers.

As well as being made available to house buyers, the material included in this guide may be downloaded freely and used by house builders and housing providers to promote the correct operation and maintenance of these systems.

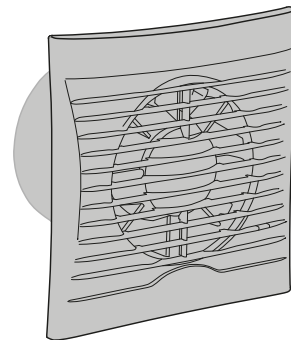
To download text and individual high quality graphics from this report visit: www.nhbcfoundation.org.

Your ventilation system provides fresh air to your home. It also removes humid air that can lead to condensation and mould, and it controls the build-up of airborne pollutants from normal household activities, such as cooking and cleaning. It is designed to keep your home fresh, healthy and comfortable.

The three most common ventilation systems used in homes are:

- **Natural ventilation (trickle vents and extract fans)**

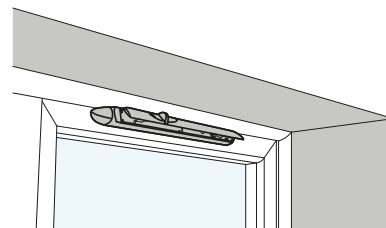
Fresh air is provided by trickle vents, which are usually on your window frames. These also allow stale or humid air to escape. Extract fans are provided to temporarily speed up the removal of humid or stale air from certain rooms, such as kitchens and bathrooms. In some kitchens, the cooker hood provides the air extraction.



Extract fan – used with natural ventilation

- **Mechanical extract ventilation (MEV)**

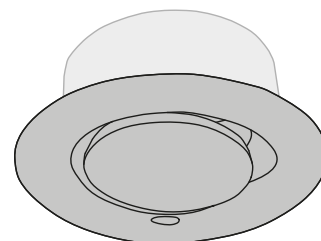
Fans run all the time to remove humid or stale air from your kitchen, utility room, bathroom and WCs. You will have extract grilles in these rooms, typically in the ceiling, behind which there are ducts connected to a central fan unit, normally located in the loft. Fresh air is usually drawn into your home through trickle vents in your windows.



Trickle vents – used with natural ventilation and MEV systems

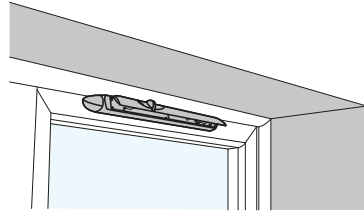
- **Mechanical ventilation with heat recovery (MVHR)**

Fans run all the time to remove humid or stale air from the kitchen, utility room, bathroom and WCs, and to supply fresh air to the living rooms and bedrooms. You will have extract or supply grilles in all rooms, typically in the ceiling. Behind these grilles are ducts connected to a central fan unit with heat exchanger, usually located in a cupboard or the loft.

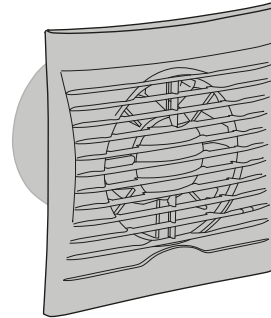


Air extract grille – used with MEV and MVHR systems (MVHR also has similar grilles that supply air)

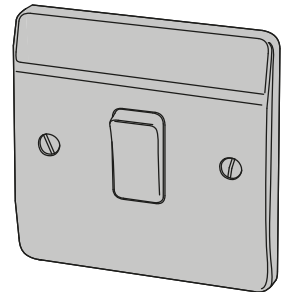
Natural ventilation (trickle vents and extract fans)



A trickle vent. Air enters and leaves the home through these



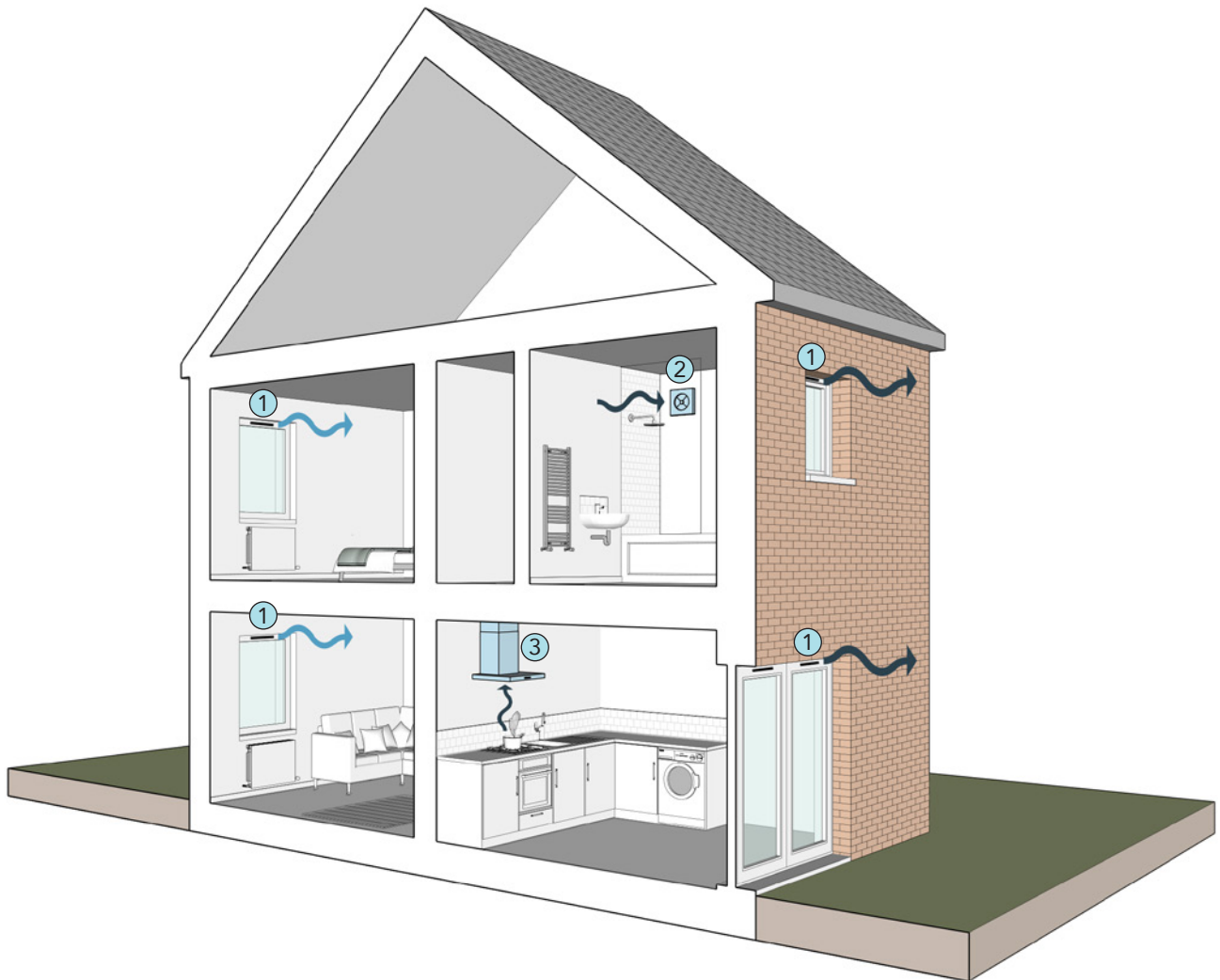
An extract fan. These provide additional ventilation for short periods



On/off switch for an extract fan

What does it do?	What are the benefits?
<p>Most of the time, ventilation will be provided in your home through natural air movement. Fresh air is supplied and stale air is removed through small ventilation openings called trickle vents, usually found towards the top of your window frames.</p>	<p>Trickle vents and extract fans reduce the risk of condensation and mould by removing humid air from your home. Correctly ventilating your home provides you with fresh air and also helps to control the build-up of airborne pollutants that could affect your health.</p>
<p>When necessary, you should also use your extract fans to remove humid air from bathrooms, utility rooms and kitchens. You will see a fan grille on the ceilings or walls of these rooms, or integrated into your cooker hood. The fans are sometimes referred to as 'intermittent extract fans' because they run only some of the time.</p>	<p>Trickle vents and extract fans provide draught-free ventilation in a way that helps to keep your home secure (you do not need to leave windows open for fresh air).</p>

Natural ventilation - main features in a typical home



Key

- 1 Trickle vents
- 2 Extract fan
- 3 Cooker hood with extract fan

Using natural ventilation systems

Helping to keep your home healthy

Trickle vents

Your trickle vents allow sufficient fresh air to enter your home and humid or stale air to escape. Check they are open when you move into your new home and ensure they are always left open. If you close them you will have insufficient ventilation and your home will become stuffy, and condensation and mould may appear.

Extract fans

Extract fans are important for quickly getting rid of humid air or unwanted smells. They are not intended to run all the time.

You may have manually-operated extract fans, controlled by their own separate switches in bathrooms, utility rooms and kitchens, or connected to the light switches for these rooms. In kitchens, your cooker hood may provide the air extraction and will have its own control nearby. Extract fans should be used, for example, when showering, having a bath, hanging up clothes to dry indoors or to remove smells when cooking. Some extract fans may continue running for a set time after you turn them off.

Some extract fans are automatically controlled by humidity or motion sensors. However, a manual switch is sometimes available if you need to over-ride the automatic control. With some automatic fans, there may be a short delay before they turn on – this ensures that the fan does not switch on, for example, if you are in a bathroom for only a short time.

See your user manual for more details.

Extract fan settings

When you move in, your extract fans should be set to the correct settings and you should not need to change them.

Should I open my windows to provide extra ventilation?

Your trickle vents should normally provide you with enough ventilation. In summer, it may be helpful to open your windows to increase the amount of air entering your home. If you are producing fumes in your home, for example when painting, you may want to open your windows.

Looking after natural ventilation systems

Take the following steps to ensure your trickle vents and extract fans continue to operate effectively:

Cleaning trickle vents

Trickle vents have a plastic or metal grille to stop insects from entering your home and this can accumulate dust and dirt from the air that passes through. Aim to clean the grilles once a year. It should be possible to clean them from inside the home using a stiff brush, by vacuuming or by using a damp cloth. Sometimes the grilles themselves can be removed for cleaning.

Cleaning extract fans

Dust and dirt can accumulate on extract fans and their grilles, and these need to be kept clean. Before cleaning, switch off the extract fan at the mains isolator and follow any safety guidance on the unit. Some extract fans have filters which you should check every 6 months or so and clean or replace according to the guidance in your user manual.

Allowing air to flow

Check, inside and outside, that nothing is blocking or restricting the flow of air through the trickle vents or extract fans.

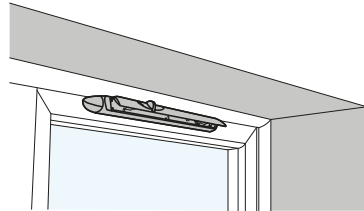
If you are fitting new carpets or flooring, do not change the size of the gaps under any doors between rooms (usually at least 10 mm is needed between the bottom of the door and the top of the carpet or flooring). These gaps are needed to make sure that there is good air movement around your home.

Servicing extract fans

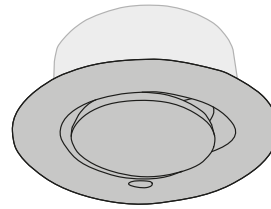
Follow any servicing advice in your extract fan user manual. You should not attempt to carry out any electrical or mechanical maintenance or repair of the extract fan unit: this work should always be carried out by a specialist.

You should arrange servicing through your landlord if you are renting your home.

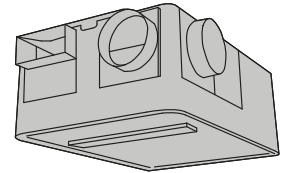
Mechanical extract ventilation (MEV)



Air enters your home through trickle vents



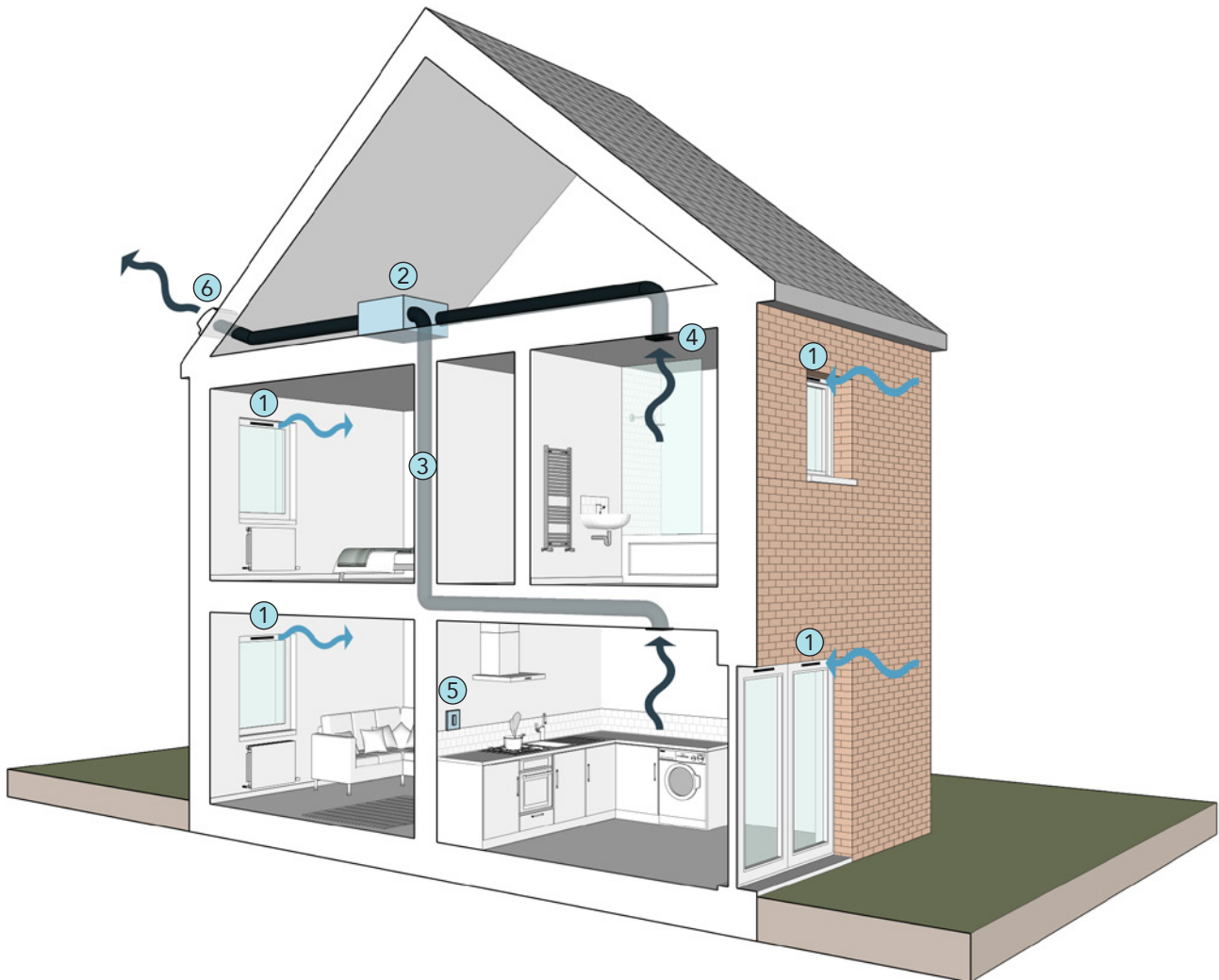
Stale air leaves your rooms through extract grilles



A central fan unit draws stale air out of your home

What does it do?	What are the benefits?
<p>An MEV system continuously extracts stale air from bathrooms, utility rooms and kitchens. You will see MEV air-extract grilles (sometimes called 'valves') on the walls or ceilings of these rooms. These grilles are connected by ducts to a central fan unit with a fan that runs all the time. Normally the central fan unit is fitted in a loft, but may be in a cupboard.</p>	<p>MEV reduces the risk of condensation and mould by removing humid air from your home. Correctly ventilating your home provides you with fresh air and helps to control the build-up of airborne pollutants that could affect your health.</p>
<p>The expelled stale air is replaced by fresh air supplied into your home, normally through trickle vents (small ventilation openings, usually found in your window frames).</p>	<p>An MEV system provides draught-free ventilation in a way that helps to keep your home secure (you do not need to leave windows open for fresh air).</p>

MEV - main features in a typical home



Key

- 1 Trickle vents
 - 2 Central fan unit
 - 3 Ducting
 - 4 Extract grille
 - 5 Boost switch
 - 6 Exhaust vent
-

Using MEV systems

Helping to keep your home healthy

Should the MEV system ever be switched off?

Your MEV is designed to run continuously, so it should not be turned off, except for maintenance. Turning off the MEV will reduce the air quality in your home and may cause dampness and mould.

What controls does an MEV system have?

Boost switch Most MEV systems have a 'boost' function that can temporarily increase the amount of ventilation if needed. The boost switch is usually found in your kitchen and/or bathroom. The boost may be automatically controlled.

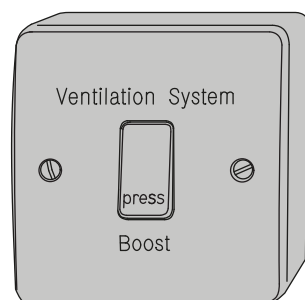
Control panel There may be a control panel or remote control that allows you to change your ventilation settings.

Air flow sensors Instead of a boost switch, some MEV systems have sensors that automatically control the ventilation rate.

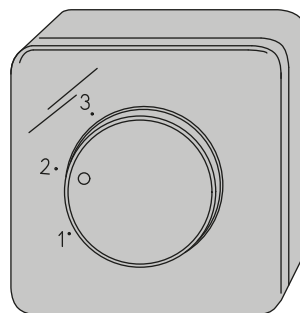
Please note that MEV systems vary and yours may not have all of the controls described on this page: see your user manual for more details on what controls you have and how to use them.

Control panel settings

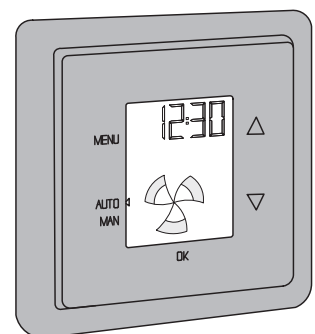
When you move in, your system should already be set up correctly, so you should not have to adjust any ventilation settings. However, in some circumstances you may want to override these settings and choose a higher fan speed for a longer period.



Use the boost switch when you need additional ventilation



Typical MEV control panels. If one is fitted in your home, it may be mounted on the central fan unit or separately on a wall



Using the boost function on the MEV system

You may want to use the boost setting to take humid air out of your home more quickly, for example when you are using the shower, hanging up clothes to dry in your home or to remove smells when you are doing lots of cooking.

- Some systems automatically switch the boost mode on and off using humidity and occupant sensors. Sometimes you can manually override this.
- Some systems have a boost setting you can turn on and off manually.

Your boost control switch or switches may be separate, or they may be connected to your bathroom and kitchen light switches or to your cooker hood. The boost setting should not be left on permanently as it uses more energy and increases noise.

Opening windows

Your MEV system and the trickle vents in your windows should usually provide you with enough ventilation on their own. If your home feels too hot in summer it could be helpful to open your windows to allow cool air to enter your home. In the winter, however, opening windows will increase heat loss from your home, leading to higher heating bills. If you are producing fumes in your home, for example when painting, you may want to open your windows.

When to turn down the MEV system

You may have the option to reduce the air flow of your MEV system to an extra low setting when you do not need so much ventilation, for example when you are away on holiday. Do not forget to switch it back to the normal setting when you return and remember it is important that the ventilation system is not switched off completely.

Looking after MEV systems

Take the following steps to ensure your MEV system continues to operate effectively:

Extract grilles

Extract grilles need to be kept clean and unrestricted to allow air to flow through the system. When grilles are cleaned or accessed it is important not to adjust the position of other parts behind the extract grilles as they will have been set up to provide the correct air flow rate in the room. Some MEV systems have filters behind the grilles. These should be cleaned or replaced about once every 6 months. The filters protect the central fan unit from damage and stop dirt building up, keeping the system running well.

Cleaning trickle vents

Trickle vents have a plastic or metal grille to stop insects from entering your home and this can accumulate dust and dirt from the air that passes through. Aim to clean the trickle vent grilles once a year. It should be possible to clean them from inside the home using a stiff brush, by vacuuming or by using a damp cloth. Sometimes the grilles themselves can be removed for cleaning.

Allowing air to flow

Check that nothing is blocking or restricting the flow of air through the trickle vents and also check outside, once a year, that nothing is blocking the MEV exhaust vent.

If you are fitting new carpets in your home try to make sure you do not change the size of the gaps under doors between rooms (usually at least 10 mm between the bottom of the door and the top of the carpet or flooring). To work effectively, the MEV system requires these gaps to allow good air movement around your home.

Periodic check/dealing with problems

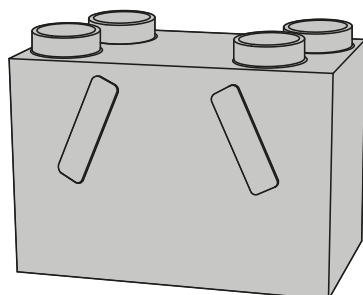
Keep an eye on your control panel for maintenance or system error alerts. In all cases, consult your user manual to see what it means, and follow the advice given. If you are renting your home, contact your landlord if you have any concerns about your MEV system.

Servicing

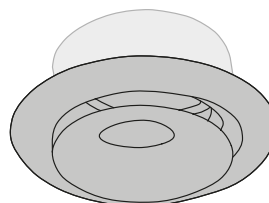
MEV components such as the central fan unit require maintenance and some manufacturers recommend having a regular service, which will include checking the operation of the system and replacing any filters used. Check your user manual for details of the servicing your system requires. You should not attempt to carry out any electrical or mechanical maintenance of your MEV system: this work should always be carried out by a specialist.

You should arrange servicing through your landlord if you are renting your home.

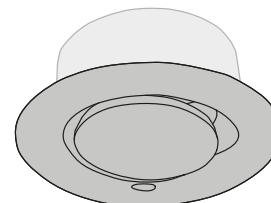
Mechanical ventilation with heat recovery (MVHR)



A typical MVHR central fan unit, which houses a heat exchanger



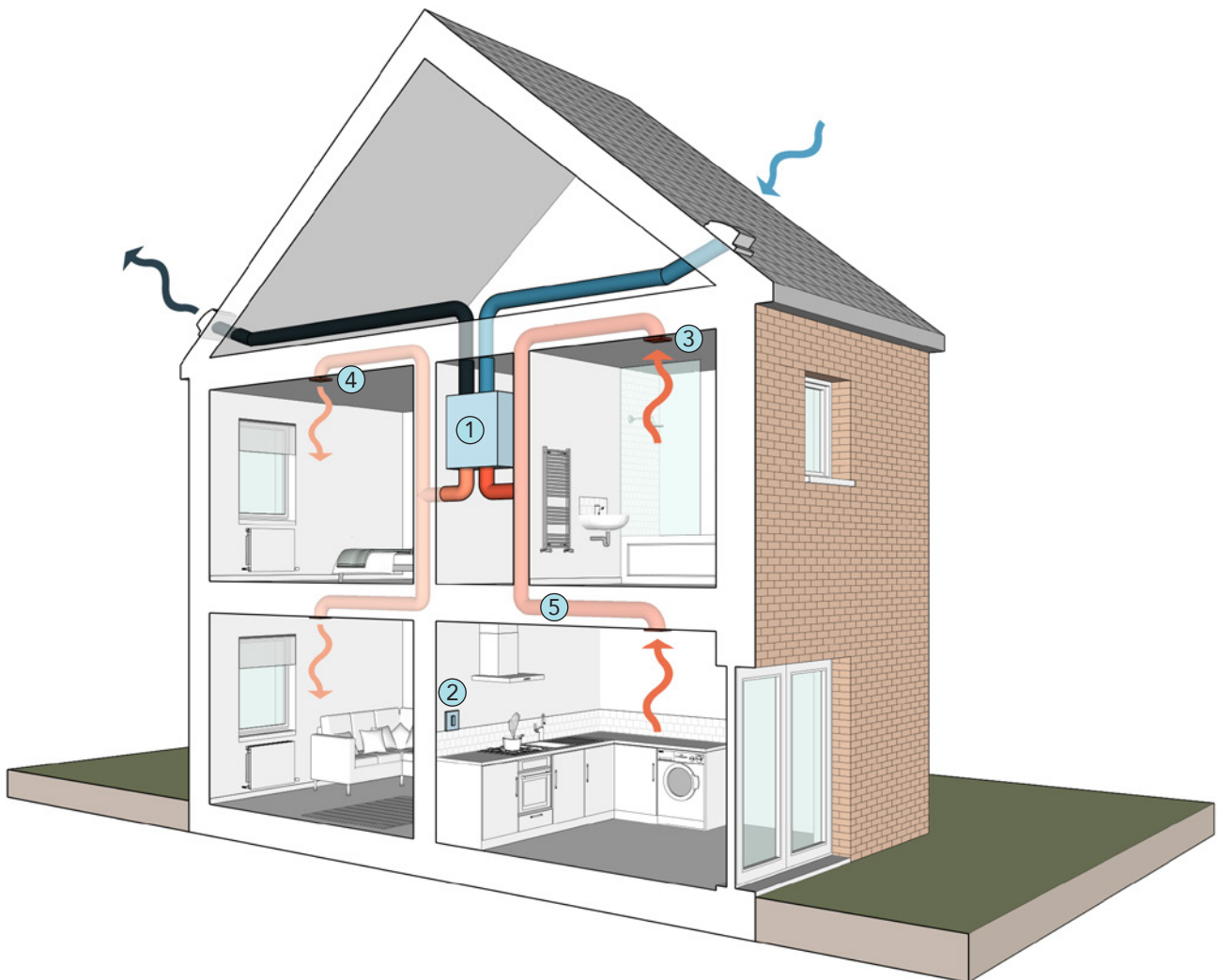
MVHR supply grille. Fresh air enters your home through these



MVHR extract grille. Stale air leaves your home through these

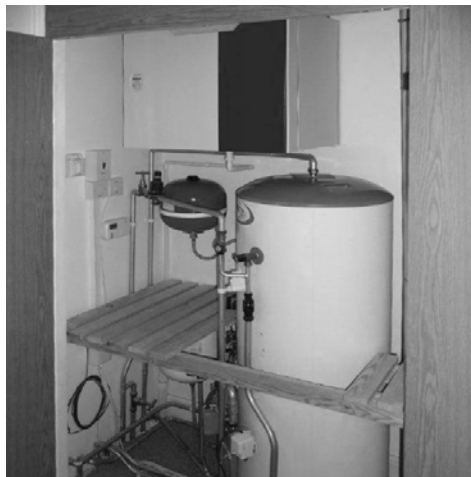
What does it do?	What are the benefits?
MVHR supplies fresh air from the outside to living rooms and bedrooms, and extracts stale air from kitchens, utility rooms, bathrooms and WCs. MVHR includes a central fan unit and ducts terminating with a grille in each room.	MVHR reduces the risk of condensation and mould by removing humid air from your home. Correctly ventilating your home provides you with fresh air and helps to control the build-up of airborne pollutants that could affect your health.
Supply grilles provide the fresh air and stale air leaves through extract grilles . You will see these grilles on your ceilings or walls.	Because MVHR ventilates your home with warm, fresh air you should not need to open your windows when it is cold outside.
MVHR uses a heat exchanger in its central fan unit which takes heat from the air being extracted from your home. It uses this heat to warm up the fresh air that is taken from outside your home and supplied to your living rooms and bedrooms.	Because MVHR re-uses heat from your home, your heating bills should be lower.
MVHR has filters to remove particles from the air. These are usually found on the central fan unit but are sometimes behind the extract grilles.	The pollen filters installed on some systems may provide health benefits for some people.

MVHR – main features in a typical home



Key

- 1 Central fan unit with heat exchanger
- 2 Boost switch
- 3 Extract grille
- 4 Supply grille
- 5 Ducting



MVHR central fan unit in a cupboard above the hot water cylinder

Using MVHR systems

Helping to keep your home healthy and energy efficient

Should the MVHR system ever be switched off?

Your MVHR is designed to run continuously, so it should not be turned off, except for maintenance. Turning off the MVHR will reduce the air quality in your home and may cause dampness and mould.

What controls does an MVHR system have?

When you move in, your MVHR system should have been set up to provide the right level of background ventilation.

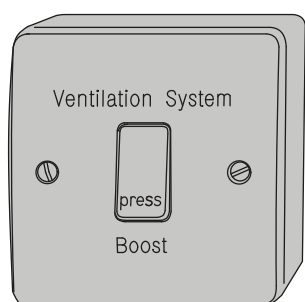
Boost switch If more ventilation is needed temporarily, most systems have a boost function. It may be manually controlled by a simple on/off switch, usually in the kitchen and/or bathroom, or controlled automatically by sensors. The boost will run for a set period (typically 30 minutes).

Control panel There may be a control panel that will display current settings. The control panel may be on the MVHR fan unit or may be wall mounted separately – sometimes you may have a remote device to control ventilation. Your control panel allows you to check that the system is working correctly and to make adjustments.

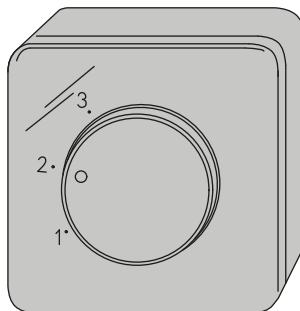
MVHR systems vary and yours may have controls different from those illustrated in this guide. See your MVHR user manual for more details on the controls you have and how to use them.

When to use the MVHR boost function

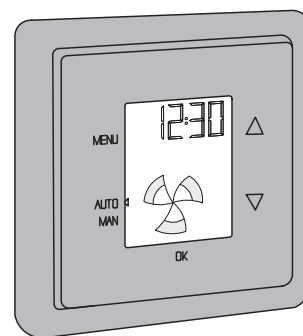
The boost function quickly removes humid air from bathrooms and kitchens and gets rid of cooking/household smells. If you have a manually-operated boost function, use it when having a bath or shower, when cooking or if you need to remove household smells.



Your MVHR system may have a boost switch to increase ventilation



Typical MVHR control panels. If one is fitted in your home, it may be mounted on the central fan unit or separately on a wall



Adjusting the control panel settings

If the fan speed is set to 'normal' on the control panel you should not need to change it. The boost function provides temporary additional ventilation when required. However, there may be rare occasions when you need a longer period of additional ventilation: for this you may be able to increase the fan speed at the control panel.

Purge ventilation

Purge ventilation involves opening windows and/or selecting 'maximum' fan speed at the control panel to increase air movement. It can help to keep you comfortable in hot weather and is best carried out at night, when the outside air is coolest. It may also be used for removing fumes, for example from painting. Select 'normal' fan speed when you no longer require 'purge' ventilation.

Summer bypass

Your MVHR system does not provide air conditioning or cooling of air; however, you may have a summer bypass function. Summer bypass stops incoming air being heated by the MVHR heat exchanger, ensuring that air entering your home is no hotter than that outside. Your control panel should tell you if the summer bypass is on or off. Some operate manually and others are automatic.

What else will the MVHR control panel tell you?

As well as displaying the fan speed, the control panel may provide alerts on maintenance (for example that the filters need to be replaced) and indicate any malfunction.

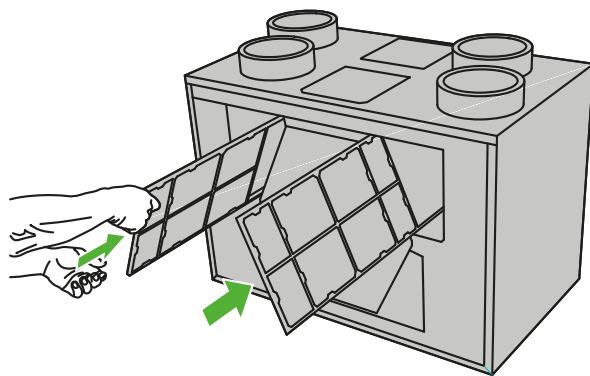
Looking after MVHR systems

Take the following steps to ensure your MVHR system continues to operate effectively:

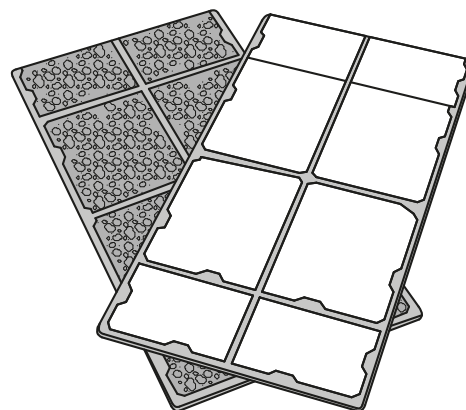
Filters

Importance of filters MVHR systems have air filters. These prevent dust from accumulating inside the central fan unit, which can reduce ventilation levels, increase energy costs and potentially damage the heat exchanger. Cleaning filters or replacing them is something most people can do for themselves.

Where are they? Filters are found on the fan unit itself (usually on pull-out sliders) and/or fitted behind the grilles in rooms.



MVHR filters are usually located on the central fan unit – often carried on sliders



Filters accumulate dust and fine particles from the air. They need to be cleaned or replaced at recommended intervals

Cleaning and replacement Typically, filters need cleaning every 6 months and replacing every 12 months, but this varies depending on the MVHR system and how you use your home. In the first few months after moving in, and if there is ongoing house-building work nearby, you may need to clean the filters more often.

There may be an alert on your control panel indicating that filter cleaning or replacement is due. Cleaning is often done by vacuuming or by washing filters after they have been removed from the central fan unit – check your user manual for guidance on filter cleaning and replacement.

When grilles are removed, to clean or replace filters, it is important not to alter the position of other parts behind the grilles: they will have been adjusted to provide the correct air flow rate.

Air flow in rooms

Extract and supply grilles in rooms need to be kept clean and should not be concealed by anything that could restrict air movement.

If you are fitting new carpets or flooring do not change the size of the gaps under any doors between rooms (usually at least 10 mm is needed between the bottom of the door and the top of the carpet or flooring). To work effectively the MVHR system requires these gaps to allow good air movement around your home.

Periodic check/dealing with problems

Keep an eye on your control panel for maintenance or system error alerts. If there is an alert, consult your user manual to see what it means, and follow the advice given. If you are renting, contact your landlord if you have any concerns about your MVHR system.

Servicing

MVHR components such as the central fan unit require maintenance and some manufacturers recommend having a regular service, which will include checking the operation of the system and replacing any filters used. Check your user manual for details of the servicing your system requires. You should not attempt to carry out any electrical or mechanical maintenance of your MVHR system: this work should always be carried out by a specialist.

You should arrange servicing through your landlord if you are renting your home.

Solar energy systems

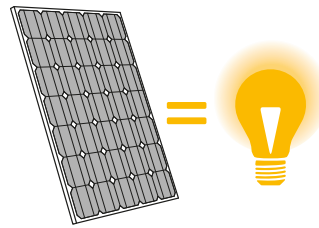
Part 2

Solar energy systems use free energy from the sun to generate cheap electricity or hot water.

Two types are used in homes:

- **Solar photovoltaic (PV) systems**

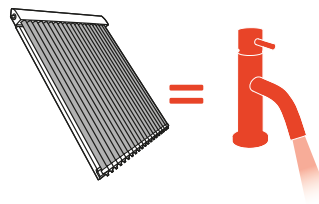
These use blue-black, roof-mounted PV panels or PV tiles to generate **electricity** from the sun's energy. You will have an inverter to convert the direct current (DC) electricity produced by the panels into alternating current (AC) electricity suitable for your home. Your inverter is either a wall-mounted box, usually found in your loft or garage, or much smaller 'micro-inverters' hidden behind your PV panels. Solar PV systems often have their own electricity meter which tells you how much electricity your system has generated.



PV systems generate electricity

- **Solar hot water (solar thermal) systems**

These use roof-mounted thermal panels to provide **hot water** from the sun's energy. Some have flat panels and others are made up of sets of glass tubes. Liquid is circulated through the panels during daytime, gaining heat from the sun. The warmed liquid is pumped through a coil in your hot water cylinder, topping up the amount of hot water as the day proceeds.



Solar thermal systems provide hot water



PV panels – often several flat panels per house. Panels (or sometimes PV 'tiles') may be integrated into the roof

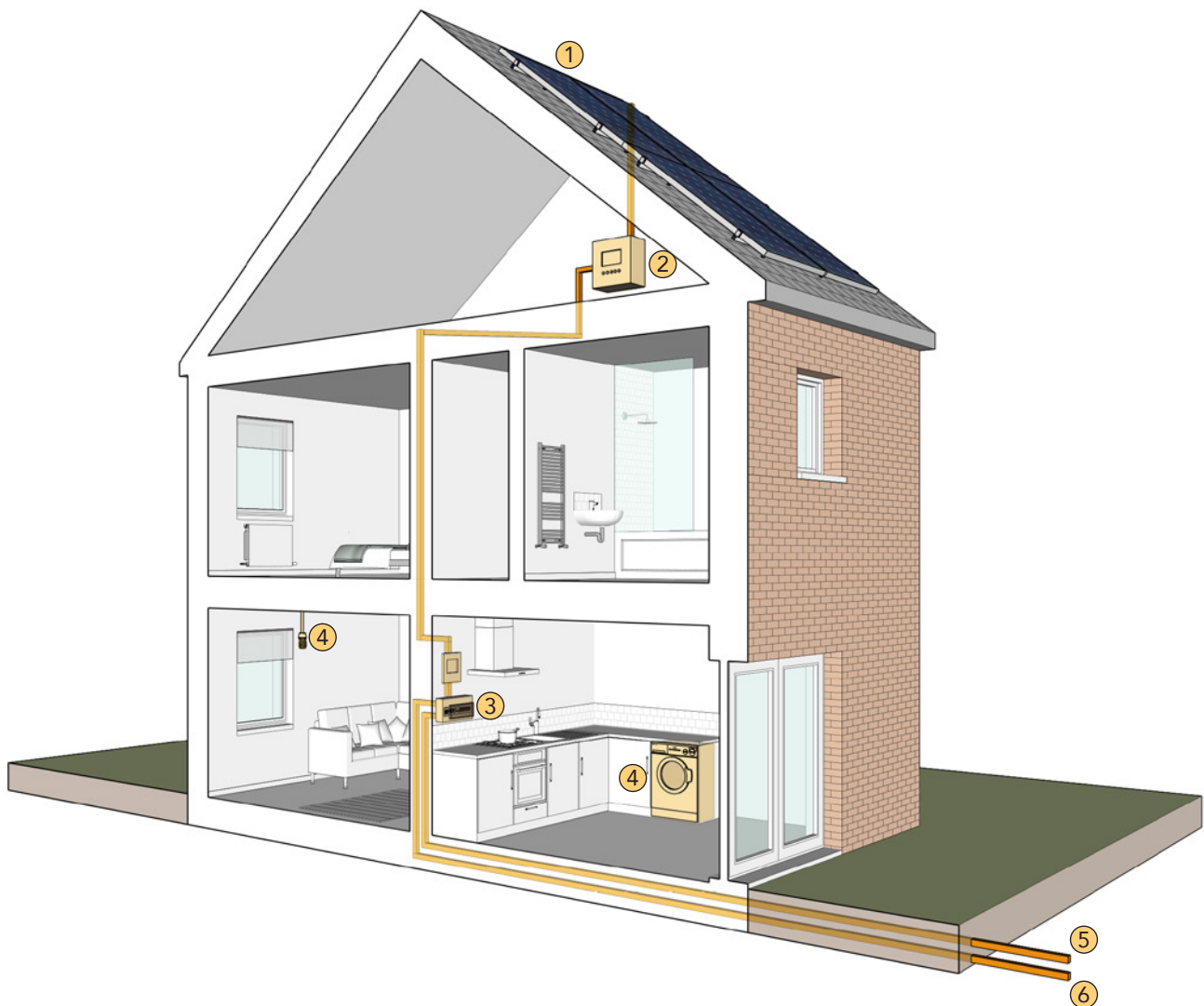


Solar thermal panel – usually one panel per house – may be tubular or flat

Solar photovoltaic (PV) systems

What do they do?	What are the benefits?
<p>Solar PV panels use energy from the sun to generate electricity, even on cloudy days.</p>	<p>The electricity generated by your solar PV system can be used directly in your home, which means you will need to buy less electricity from your electricity supplier, reducing your energy bills.</p>
<p>Solar PV systems work as follows:</p> <p>PV panels or tiles convert sunlight to electricity.</p> <p>Inverters convert the DC electricity generated by the PV system into the AC electricity that is used in homes.</p> <p>A generation meter measures the electricity produced by your PV panels.</p> <p>Safety components provide protection.</p>	<p>Solar PV should also:</p> <ul style="list-style-type: none"> • Provide some protection against rises in energy prices, and • Reduce the use of fossil fuels. <p>If you live in a rented home, your landlord may own the electricity generated by the PV system, but may pass benefits on to you, for example through reducing your service charges.</p>
	<p>Currently solar PV also provides a source of income. Through the government’s Feed in Tariff (FIT) scheme, you receive payments for the electricity you generate and use yourself, and also a lower payment for any surplus electricity you generate and export to the National Grid.</p> <p>If you live in a rented home, your landlord may pass these benefits on to you.</p>

Solar PV - main features in a typical home



Key

- 1 Solar PV panels
- 2 Inverter (converts DC to AC)
- 3 Consumer unit (with generation meter above)
- 4 PV-generated electricity used in the home
- 5 PV-generated electricity sent to the electricity grid when not needed by the home
- 6 Additional electricity being supplied from the electricity grid when needed



PV panels – often several flat panels per house

Using solar PV systems

Helping you to reduce your electricity costs

Do I need to turn it on or off?

Your system should already be turned on when you move in and it should normally be left on all the time. It generates electricity even on dull days.

PV systems have built-in safety features. They should turn off automatically during a power cut and switch back on again when mains power is restored. The only times they should be switched off manually is during maintenance (see next section) or during an emergency. There will be an isolator switch that enables the system to be switched on and off manually.

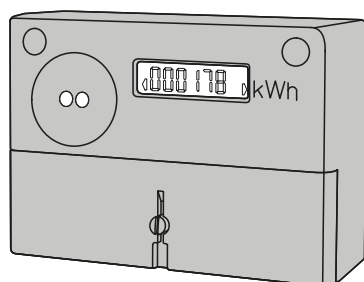
Checking on how your solar PV system is performing

The amount of electricity generated by your system depends on how much sunlight your panels are getting during daylight hours – peaking on bright days in summer. Your generation meter will show how much electricity your system produces under different conditions, and you can compare this with the amount the system is designed to generate.

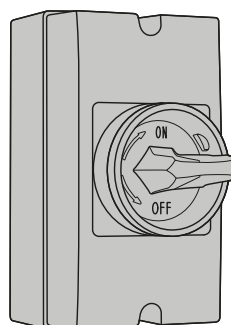
Many systems have separate display monitors (wall mounted or sometimes on a wireless device) which provide more detail about how your solar PV is performing. If you live in a rented home, your landlord may receive information remotely about electricity generation.

Making the best use of your generated electricity

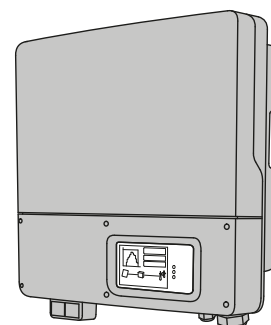
A solar PV system does not normally store electricity, and unless you use the electricity as it is generated during the day, it will be exported to the National Grid. Although you benefit from exporting to the grid, using your own generated electricity is the cheapest option. So during the day always try to run household appliances, such as washing machines and dishwashers, and recharge smaller appliances and batteries. Avoid running several appliances at once as this may exceed the electricity being generated by your solar PV system.



Generation meter. Shows how much electricity your PV panels have produced



PV isolator switch



A PV inverter unit, usually located in the loft or garage

Looking after solar PV systems

Take the following steps to ensure your solar PV system continues to operate effectively:

Panels

Dirt accumulating on the surface of panels will reduce their performance, but usually rainfall is sufficient to clean them. They may need cleaning if dirt builds up on them. If PV panels or tiles become shaded this will reduce performance. Keep any trees that are starting to shade the panels trimmed back and avoid the installation of equipment such as satellite dishes in positions that would shade them.

Overall system operation

Check regularly that the system is still operating. Your meter will show that electricity is being generated and that the inverter is switched on. The inverter may have its own display or light showing it is switched on.

If your system does not seem to be working (and it is not due to a power cut) check whether the 'isolator' switch (often next to your consumer unit, but may be near the inverter) has been turned off accidentally or if a circuit breaker has tripped.

Occasionally check the display on your inverter if you have one – check your user manual to understand any displayed messages and follow any instructions. Your inverter generates an amount of heat: do not place objects near it that could restrict air movement.

If you have a problem

Check your user manual and follow the guidance. If you are renting, contact your landlord if you have any concerns about your PV system.

Servicing

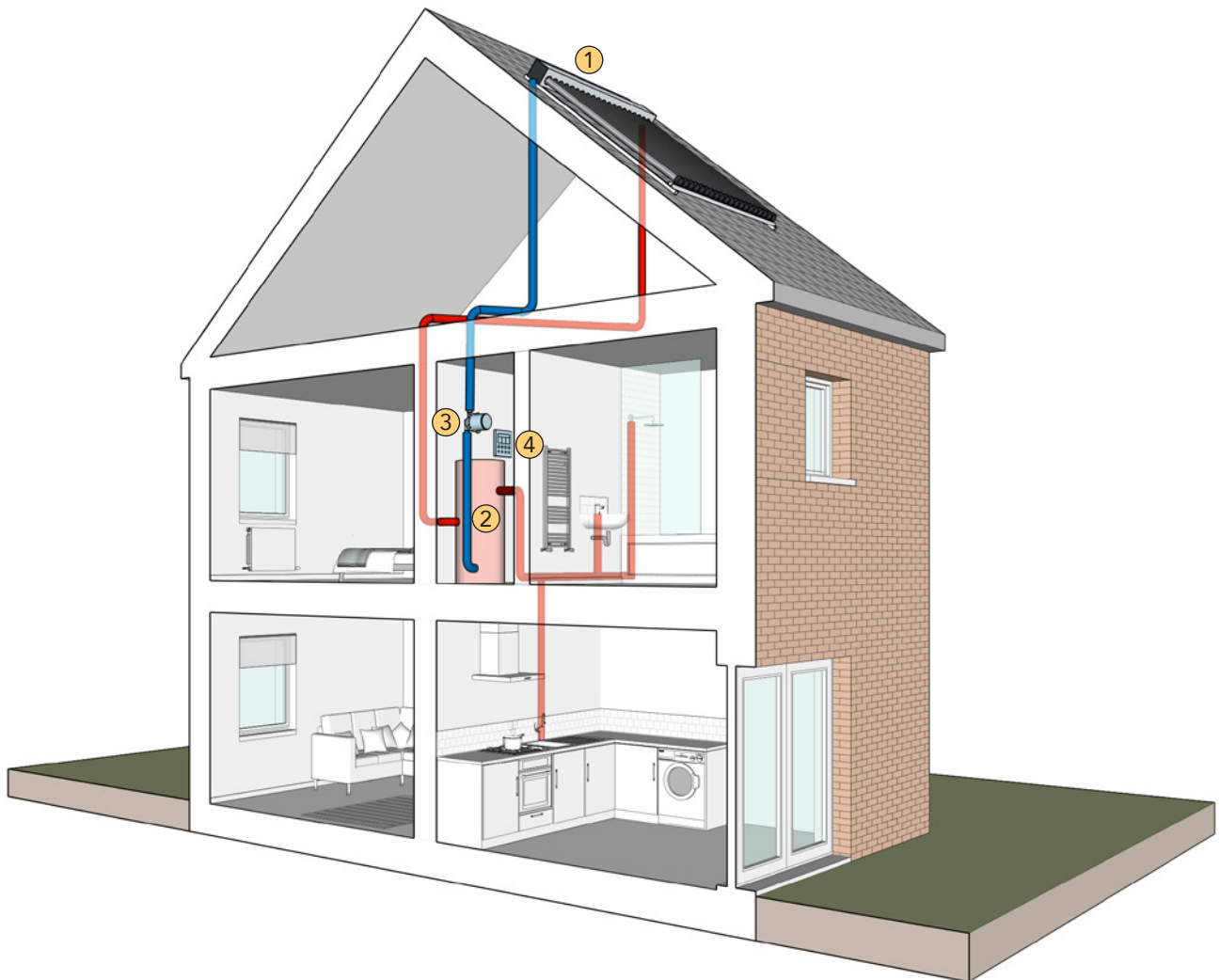
PV systems generate electricity and are connected to your home's mains electrical installation. For safety, all electrical servicing or maintenance should be done by a specialist. Your PV system's user manual will indicate the regularity and type of electrical servicing/maintenance that is needed to ensure safe operation.

You should arrange servicing through your landlord if you are renting your home.

Solar hot water (solar thermal) systems

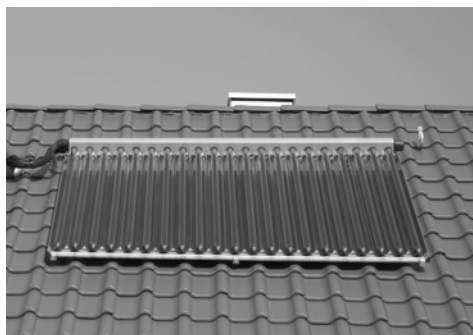
What do they do?	What are the benefits?
<p>Solar thermal systems use energy from the sun to produce hot water for use in your home. They work even on cloudy or cold days, although they produce less hot water in winter.</p>	<p>By generating hot water for your home, a solar thermal system can reduce your energy bills.</p>
<p>Solar thermal systems work as follows:</p> <p>Solar panels (flat or made up of tubes) containing fluid collect heat energy from the sun.</p> <p>Pipes and a pump transfer the heat into a hot water storage cylinder in your home.</p> <p>Back-up water heating operates when there is not enough energy from the sun (this back-up system may also provide your central heating – for example, it may be a gas boiler).</p> <p>A hot water storage cylinder stores the water heated by both the solar thermal and the back-up water heating systems.</p> <p>Automatic controls operate the solar thermal system.</p>	<p>Solar thermal systems should also:</p> <ul style="list-style-type: none"> • Provide some protection against rises in energy prices, and • Reduce the use of fossil fuels.

Solar thermal - main features in a typical home



Key

- 1 Solar thermal panel
- 2 Hot water storage cylinder
- 3 Pump
- 4 Control panel



Solar thermal panel – usually one panel per house

Using solar thermal systems

Helping you to reduce the cost of hot water

Do I need to turn it on or off?

Your solar thermal system should already be turned on when you move in and there is normally no need to turn it off, unless it is undergoing maintenance. Solar thermal systems are automatically programmed to collect energy efficiently and the circulation pump only operates when the panels are able to collect heat from the sun. Also the system has automatic safeguards to prevent overheating or freezing within the hot water system.

Choosing your settings

Your solar thermal system will have a control panel (usually found near your hot water storage cylinder) which allows you to select the hot water temperature. Check your user manual for instructions on how to do this.

Solar thermal systems cannot provide all your hot water during the year and you will have a back-up water heater. This back-up may be an immersion heater or your gas boiler, with its own separate controls that you will need to understand.

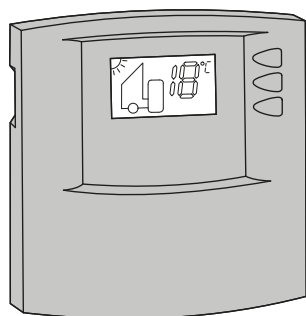
Some systems have a 'holiday mode' for use if you are away for an extended period. Check your user manual for information on this.

Getting the most out of your solar thermal system

Solar thermal systems can save you money if used carefully.

Using the back-up water heater Do not use your back-up water heater unnecessarily. It is often best to set the back-up heating to come on for a short period just before you use the most hot water. For example, if you use the back-up heater early in the morning before you have a shower, this will ensure there is sufficient hot water, regardless of the amount of hot water left in the cylinder from the previous day, and it will maximise the water-heating contribution that the thermal panels can make during the following daylight hours. Another benefit of daily use of the back-up water heater is that it can provide a short programmed period at 60°C, which prevents any bacterial growth in the hot water.

Two cylinders of solar-generated hot water per day If you are at home during the day (particularly during hotter weather) you should take advantage of your solar thermal system's ability to replenish your hot water twice a day. If you draw off all your hot water around noon (for showering and washing machine use for example) you should have a further full cylinder of hot water by the end of the day.



Solar thermal control panel. Shows the temperature of your hot water and allows you to set maximum temperature

Looking after solar thermal systems

Take the following steps to ensure your solar thermal system continues to operate effectively:

Panels

Dirt accumulating on the surface of panels will reduce their performance, but usually rainfall is sufficient to clean them. They may need cleaning if dirt builds up on them. If solar thermal panels become shaded this will reduce performance. Keep any trees that are starting to shade the panels trimmed back and avoid the installation of equipment such as satellite dishes in positions that would shade them.

Regular check of system operation

Check regularly that the system is operating correctly. Your control panel, near the hot water storage cylinder, will show that the system is functioning and should indicate how much hot water is being produced. The control panel should alert you to any faults in the system. If there are any alerts, check your user manual to see what they mean and follow the guidance.

If your system does not seem to be working (and it is not due to a power cut) check whether it has been inadvertently switched off at the control panel or whether a circuit breaker has tripped.

If you have a problem

Check your user manual and follow the guidance. If you are renting, contact your landlord if you have any concerns about your solar thermal system.

Servicing

Solar thermal systems should be serviced approximately every 5 years, although some manufacturers recommend that it should be done more regularly. Servicing should include an overall check of the pipework and pump, system efficiency and, importantly, the replacement of the antifreeze used in the pipes (to ensure that the pipework and panels remain properly protected from frost).

All mechanical maintenance and servicing should be carried out by a specialist. Check the maintenance and servicing requirements in your user manual.

You should arrange servicing through your landlord if you are renting your home.

Heat pumps

Heat pumps take heat from the outside air or the ground and use it to provide heating for your home, and in some cases provide your hot water as well. Heat pumps can continue to draw heat from outside, even at sub-zero temperatures. Underfloor heating is well suited to the heat levels produced by heat-pump technology.

You may have one of the following types of heat pump. Both are used as the source of heat for your central heating system:

- **Air source heat pumps (ASHPs)**

An ASHP takes heat from the outside air. The main unit is usually attached to the outside of your home and has a large fan to draw air over the heat-capturing evaporator component inside.

- **Ground source heat pumps (GSHPs)**

A GSHP takes heat from the ground, using a set of underground pipes. It usually doesn't have an outside unit, but you may see pipes entering your house near ground level. Indoors you will have the main heat pump which may be stand alone, or integrated with other units in the kitchen or utility area.



With ASHPs the main unit, which draws heat from the air, is located outdoors

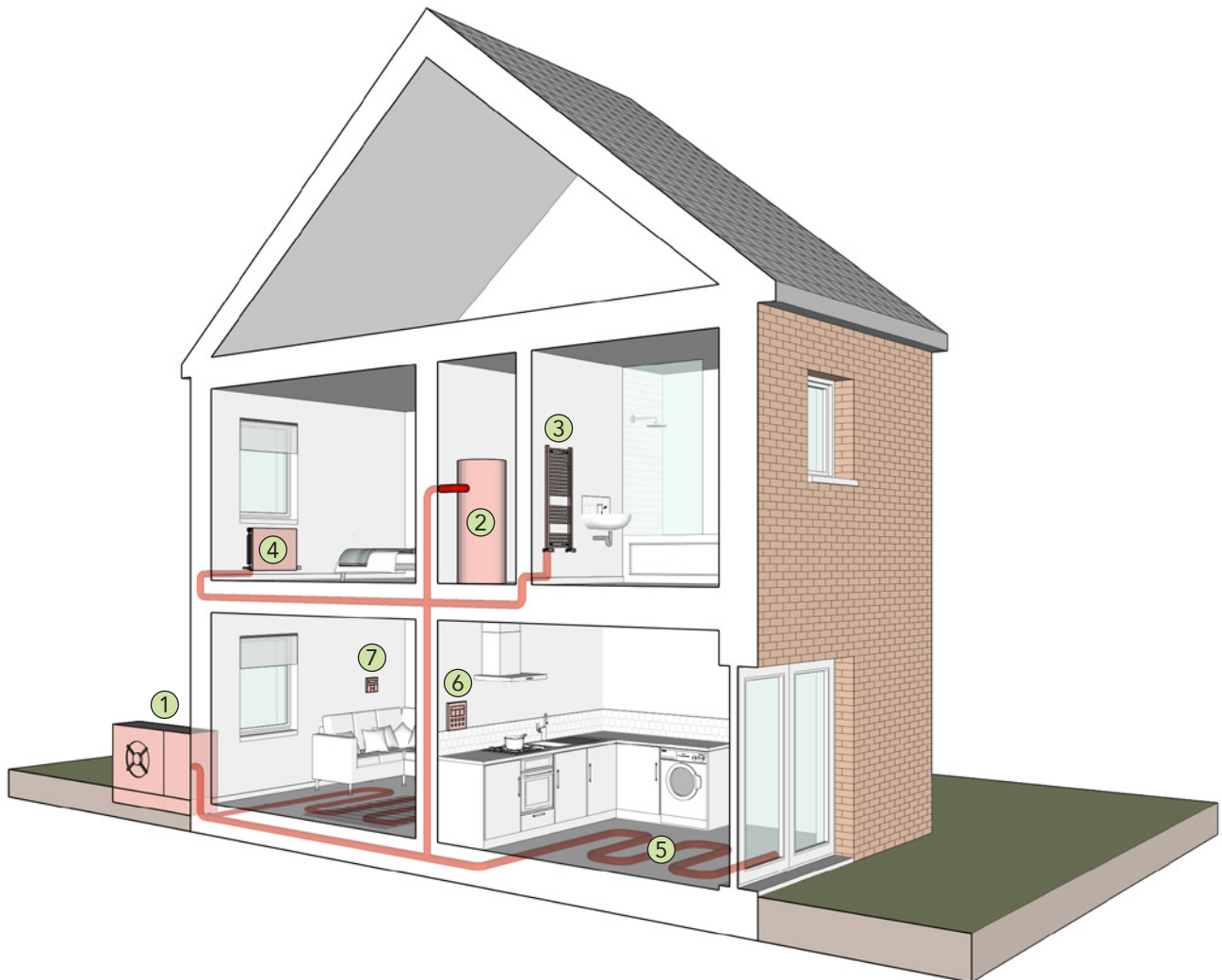


With GSHPs the main unit (right) is normally located indoors. It draws heat from fluid which has been pumped through underground pipes

Air source heat pumps (ASHPs)

What do they do?	What are the benefits?
<p>An ASHP uses heat from outside air to provide heating in your home.</p>	<p>Because ASHPs use heat from the outside air and use electricity more efficiently than conventional electric heaters, they should help you to save money on your energy bills.</p>
<p>ASHP systems work as follows:</p> <p>Outdoor air is drawn into the ASHP unit with a fan and heat from the air is captured by a refrigerant. The heat pump concentrates this captured heat and transfers it to your heating system.</p> <p>The heat can be used in radiators or underfloor heating to warm your home. You may also have a back-up source of heating.</p> <p>Your heat pump may also be used to heat water in your hot water storage cylinder, combined with a back-up system such as electric immersion heating.</p> <p>The heat pump needs electricity to run, but produces a large amount of heat from a small amount of electricity.</p>	<p>An ASHP should also:</p> <ul style="list-style-type: none"> • Provide some protection against rises in energy prices, and • Reduce the use of fossil fuels.

ASHP - main features in a typical home



Key

- 1 Heat pump (air source)
- 2 Hot water storage cylinder
- 3 Heated towel rail
- 4 Radiator
- 5 Underfloor heating
- 6 Control panel
- 7 Room thermostat



With ASHPs the main unit, which draws heat from the air, is located outdoors.

Using ASHPs

Helping you to reduce your heating costs

What controls does an ASHP have?

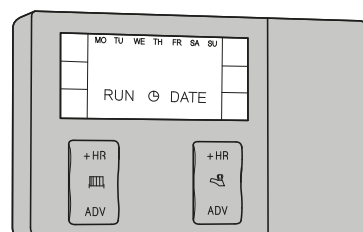
You will have a control panel, usually fixed to an inside wall, sometimes near the hot water storage cylinder. Use the control panel to programme when the heat pump turns on and off, and to adjust the temperature of your central heating. Your control panel will also allow temperature control of your hot water, in cases where this is provided by your heat pump. You may also have separate thermostats allowing you greater control of temperature in some rooms.

In most homes with an ASHP, there will be a separate back-up source of heating. Where an ASHP is also used for water heating, there will be a separate back-up water heater. These back-ups may have their own independent manual controls, but may be automatic. You should familiarise yourself with these controls as there will inevitably be times when they are necessary for your comfort and convenience.

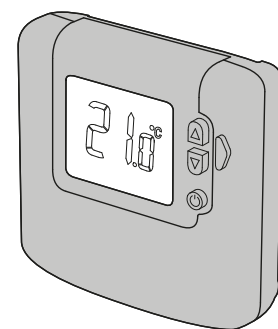
Choosing settings for your ASHP

When you move in, your heat pump should already be operating to standard settings. However, you may want to adjust them to suit your own preferences using your control panel. Check your user manual for advice on the best settings for your system and also see Part 4 of this guide, 'Heating controls'.

ASHP heating systems heat your home steadily and over longer periods of time, compared with more conventional heating systems such as gas boilers. To maintain comfortable temperatures they need to be on for longer periods than you might expect, but this pattern of heating takes advantage of the way the heat pump operates for maximum efficiency and economy. So, do not be surprised if your radiators are not as hot to the touch as you are used to and, if you have an underfloor heating system, remember this is intended to deliver gentle heating over a long period.



Control panel to programme when the heating is on. With some heat pump systems you can also programme your supply of hot water



Room thermostat

Using your ASHP system efficiently

To get to a comfortable temperature it will normally be cheaper to run your ASHP for a longer period, rather than relying on your back-up heating to raise the temperature quickly. Explore how long it takes for your ASHP to achieve a comfortable temperature and then programme it to come on early enough to provide sufficient warmth when you need it.

If your ASHP is providing hot water, switch on your back-up hot water heating only when the ASHP is not producing enough, and remember to turn it off when no longer needed. Consider setting your heat pump to run during cheaper periods if you are on a variable tariff.

Looking after ASHPs

Take the following steps to ensure your ASHP continues to operate effectively:

Outdoor unit

Regularly check the air inlet grille (which is in front of the fan) and remove any debris or leaves. If the grille or other parts of the unit get dirty, switch off the unit and clean it with a soft damp cloth. Do not allow plants to grow or spread near the unit.

Check your control panel

Watch out for error or maintenance notices or indicators on your control panel. Check your user manual to see what they mean and follow the instructions.

Air flow

Avoid positioning furniture in front of radiators as this can prevent heat from circulating around your home.

If you have underfloor heating

Do not fit carpets in rooms with underfloor heating, as carpets trap heat and reduce its circulation.

If you have a problem

Check your user manual and follow the guidance. If you are renting, contact your landlord if you have any concerns about your ASHP.

Servicing

ASHPs should be serviced by a specialist who will make various checks, including the level and condition of the refrigerant in your system, the system's pressure and the operation of the heat pump unit. Your user manual should tell you how often this servicing should be done, typically once every 3 to 5 years. You should not attempt to carry out any electrical or mechanical maintenance yourself.

You should arrange servicing through your landlord if you are renting your home.

Ground source heat pumps (GSHPs)

What do they do?	What are the benefits?
<p>A GSHP uses heat from the ground to provide heating in your home.</p>	<p>Because GSHPs use naturally available heat from the ground and use electricity more efficiently than conventional electric heaters, they should help you to save money on your energy bills.</p>
<p>GSHP systems work as follows:</p> <p>A liquid (usually water and antifreeze) passes through underground pipes and absorbs heat from the ground.</p> <p>The heat pump takes the heat from the liquid, concentrates the heat and transfers this heat to your heating system.</p> <p>The heat can be used in radiators or underfloor heating to warm your home. You may also have a back-up source of heating.</p> <p>Your heat pump may also be used to heat water in your hot water storage cylinder, combined with a back-up system such as electric immersion heating.</p> <p>The heat pump needs electricity to run, but produces a large amount of heat from a small amount of electricity.</p>	<p>A GSHP should also:</p> <ul style="list-style-type: none"> • Provide some protection against rises in energy prices, and • Reduce the use of fossil fuels.

GSHP - main features in a typical home



Key

- 1 Heat pump (ground source)
- 2 Heat collector pipes (underground)
- 3 Hot water storage cylinder
- 4 Heated towel rail
- 5 Radiator
- 6 Underfloor heating
- 7 Control panel
- 8 Room thermostat



With GSHPs the main unit (right) is normally located indoors. It draws heat from fluid which has been pumped through underground pipes

Using GSHPs

Helping you to reduce your heating costs

What controls does a GSHP have?

You will have a control panel, usually fixed to an inside wall, to the heat pump unit itself or to the hot water storage cylinder. Use the control panel to programme when the heat pump turns on and off, and to adjust the temperature of your central heating. Your control panel will also allow temperature control of your hot water, in cases where this is provided by your heat pump.

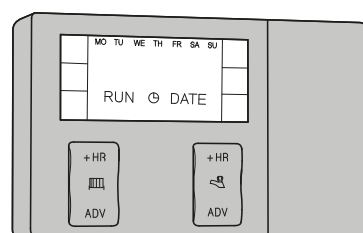
You may also have separate thermostats allowing you greater control of temperature in some rooms.

In most homes with a GSHP, there will be a separate back-up source of heating. Where a GSHP is also used for water heating, there will be a separate back-up water heater. These back-ups may have their own independent manual controls, but may be automatic. You should familiarise yourself with these controls as there will inevitably be times when they are necessary for your comfort and convenience.

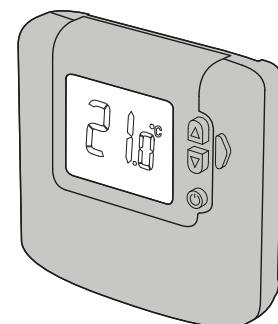
Choosing settings for your GSHP

When you move in, your heat pump should already be operating to standard settings. However, you may want to adjust them to suit your own preferences using your control panel. Check your user manual for advice on the best settings for your system, and also see Part 4 of this guide, 'Heating controls'.

GSHP heating systems heat your home steadily and over longer periods of time, compared with more conventional systems heated with gas boilers. To maintain comfortable temperatures they need to be on for longer periods than you might expect, but this pattern of heating takes advantage of the way the heat pump operates for maximum efficiency and economy. So, do not be surprised if your radiators are not as hot to the touch as you are used to and, if you have an underfloor heating system, remember this is intended to deliver gentle heating over a long period.



You will have a control panel which enables you to programme when the heating is on. With some heat pump systems you can also programme your supply of hot water



Room thermostat

Using your GSHP system efficiently

To get to a comfortable temperature it will normally be cheaper to run your GSHP for a longer period, rather than relying on your back-up heating to raise the temperature quickly. Explore how long it takes for your GSHP to achieve a comfortable temperature and programme it to come on early enough to provide sufficient warmth when you need it.

If your GSHP is providing hot water, switch on your back-up hot water heating only when the GSHP is not producing enough, and remember to turn it off when no longer needed. Consider setting your heat pump to run during cheaper periods if you are on a variable tariff.

Looking after GSHPs

Take the following steps to ensure your GSHP continues to operate effectively:

Check your control panel

Watch out for error or maintenance notices or indicators on your control panel. Check your user manual to see what they mean and follow the instructions.

Air flow

Avoid positioning furniture in front of radiators as this can prevent heat from circulating around your home.

Underfloor heating

Do not fit carpets in rooms with underfloor heating, as carpets trap heat and reduce its circulation.

Liquid spills

Take care not to spill any liquids on the GSHP unit.

If you have a problem

Check your user manual and follow the guidance. If you are renting, contact your landlord if you have any concerns about your GSHP.

Servicing

GSHPs should be serviced by a specialist who will make various checks, including the level and condition of the heat absorbing liquid, the system's pressure and the operation of the heat pump unit. Your user manual should tell you how often this servicing should be done, typically every 3 to 5 years. You should not attempt to carry out any electrical or mechanical maintenance yourself.

You should arrange servicing through your landlord if you are renting your home.

Heating controls

Heating controls allow you to set when your heating system is on, and to control the temperature in your home. Careful use of your controls can considerably reduce your energy bill, so it is worth taking time to get to know how they work.

The heating controls in your new home may be different from what you are used to and may offer more scope for tailoring heating to your exact needs.

You will have one of the following types of heating controls, depending on the size of your home:

- **Single-zone heating controls**

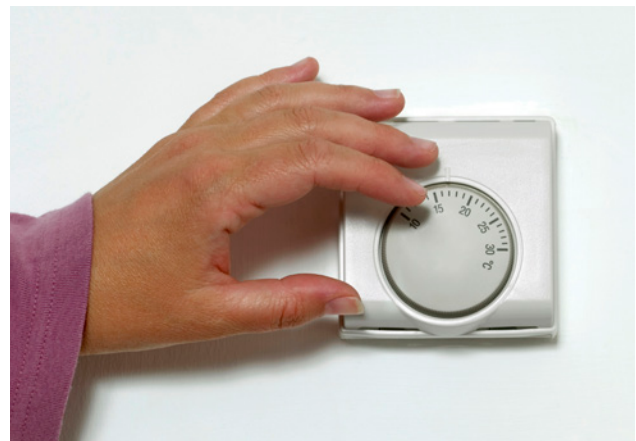
This means that all of the rooms in your house are included in one heated zone, controlled by one programmer. The timing of heating will be the same throughout the house, although it is possible to reduce heating in some rooms manually.

- **Multiple-zone heating controls**

Here your home is divided into two or more heated zones. The timing of heating and the temperature can be programmed separately to meet particular needs in each zone.



Programmer. Heating controls include a programmer to provide automatic control over when the heating comes on

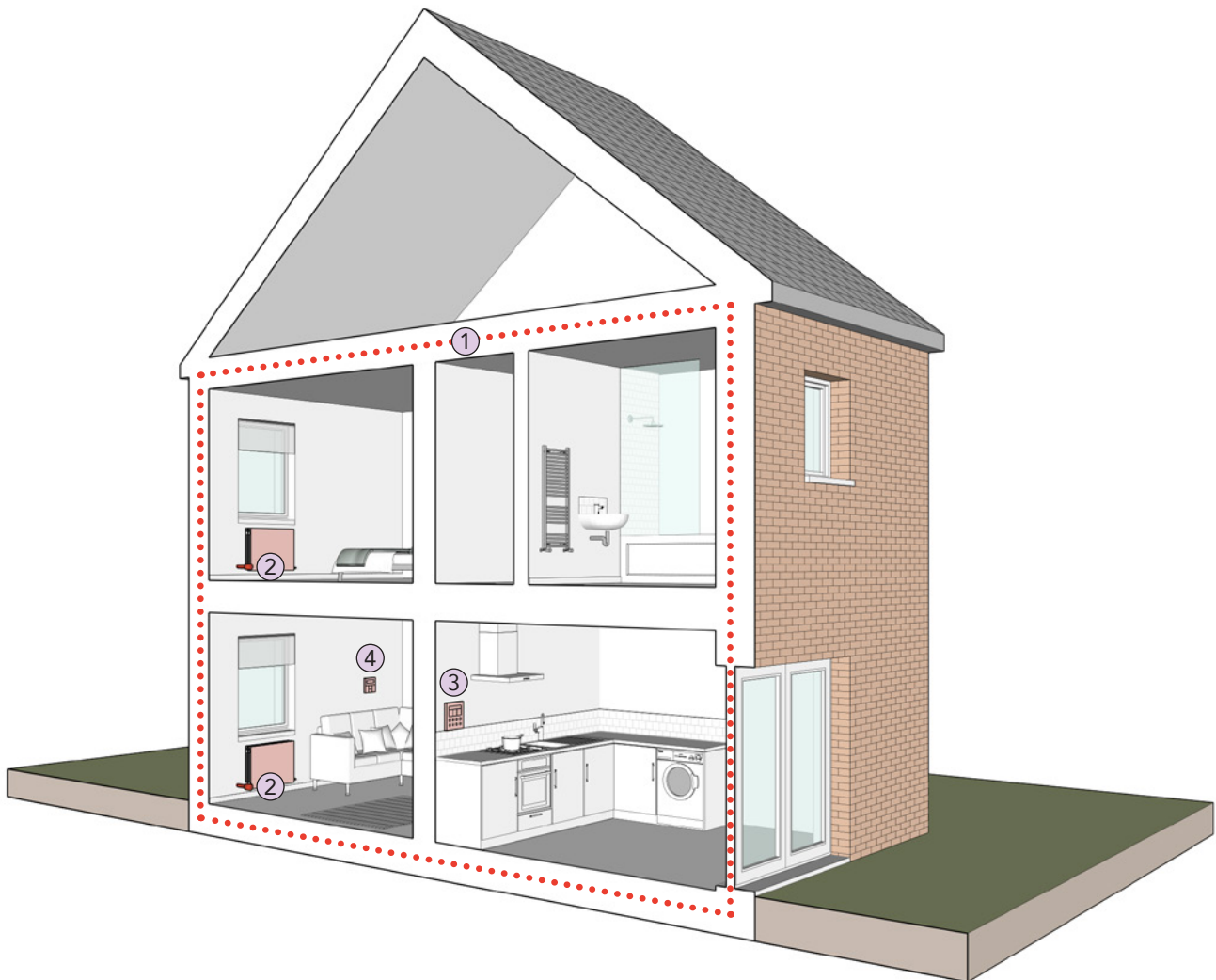


Thermostat. Heating controls include a thermostat that allows you to set the heating temperature you require

Single-zone heating controls

What do they do?	What are the benefits?
<p>Your single-zone heating controls allow you to programme when the heating comes on in your home and to set the temperature you want.</p>	<p>Heating is usually the major energy usage in your home. Your heating control system has the following benefits:</p> <ul style="list-style-type: none"> • It can help you to save money on your energy bills while also keeping your home comfortable. • It can help to reduce the use of fossil fuels. • It gives you flexibility in how you use your heating and automatic control.
<p>The heating controls in your home work as follows:</p> <p>A programmer with a timer for setting when the heating is on. Your programmer will usually be found in your kitchen or near your heating system (e.g. boiler).</p>	<p>You can set your programmer so that your heating automatically comes on only when you want it.</p>
<p>A room thermostat, which has a display or dial, for setting the temperature of your home. Your room thermostat is often found in your living room or hallway. You may have wireless control of your thermostat setting.</p>	<p>You can set your thermostat to keep your home at the temperature you want. It automatically turns your heating off when it is not needed.</p>
<p>Alternatively, you may have a single programmable room thermostat which combines the functions of both the programmer and the room thermostat. This allows you to set different temperatures for different times.</p>	<p>These have all the advantages of separate programmers and thermostats, but also allow you to automatically adjust your heating temperature at different times of the day.</p>
<p>If you have radiators, you will also have thermostatic radiator valves (TRVs) on most of your radiators. These allow you to control the temperature in each room.</p>	<p>Your TRVs allow you to adjust the temperature in each room where you do not have a thermostat and to turn down the temperature in rooms that need less heat.</p>

Single-zone heating controls - main features in a typical home



Key

- 1 One zone - your controls set the temperature and timing of heating for your whole home
- 2 Thermostatic radiator valves (TRVs)
- 3 Programmer
- 4 Room thermostat

Using single-zone heating controls

Saving on your heating costs

Using programmers

Programmers, whether separate or incorporated into programmable room thermostats, allow you to control when your home is heated. When 'timed' is selected on your programmer, you will be able to select automatic 'start' and 'stop' times for periods of heating. You may also see an 'off' setting which will stop the heating at any time, manually overriding your timed settings. Occasionally you may need heating for longer and there may be an option called 'boost', giving an extra hour, or a simple 'on' override.

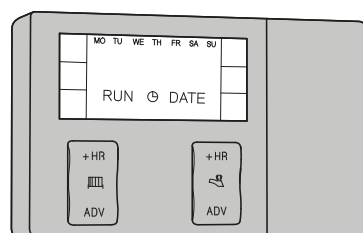
Minimise heating time Your programmer can save you a lot of money if you select your timed heating periods carefully. It is worth trying to identify the ideal time for your heating to be on and off. In winter, your new home (with its improved insulation) may need less heat than you would expect to warm up and it will stay warmer for a surprisingly long time after the heating has switched off. So a typical weekday heating pattern in winter, for a home unoccupied during the day, might be:

Heating phase 1 A 'timed start' set at one hour before you get up (comfortable start to the day) and a 'timed stop' set around the point you normally get up (home remains sufficiently warm before you depart).

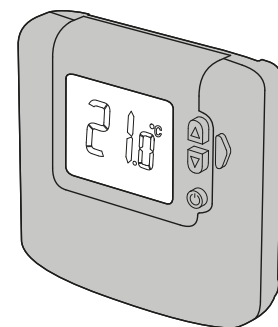
Heating phase 2 A 'timed start' set for an hour before you get home (comfortably warm when you return) and then 'timed stop' set for late evening (home still warm, but cooling down when you go to bed).

This example is for a heating system with a gas boiler with radiators.

Compared with winter, you are likely to need much less heating in spring and autumn. For these seasons, adjust your programmer to try more economical heating patterns.



Programmer. Used to set when your heating is on (and when your water is heated)



Room thermostat (digital type). Used to maintain the temperature you need

Using room thermostats

Your room thermostat has a temperature display or dial allowing you to set the temperature in your home. If the air temperature around the thermostat drops below your setting, the heating system is automatically switched on. Once the air temperature is higher than the thermostat setting the heating is automatically switched off.

Base your choice of temperature settings on what is comfortable for those in your home. Usually you will not need your thermostat to be above 21°C, and you may be able to turn it down at times when you are more active.

Using programmable room thermostats

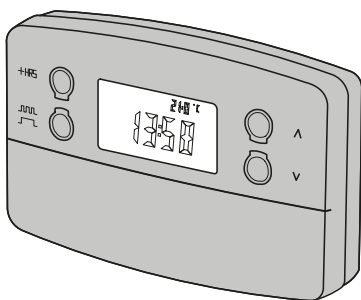
These controls combine programmer and thermostat functions. Use them in the same way as separate programmers and thermostats (see above), but note that programmable room thermostats may give you the extra flexibility to set different temperatures for particular times of the day. Most programmable room thermostats do not have settings marked 'on/off'; instead you should set a low temperature (e.g. 10-14°C) for times when you do not want heating, and your preferred temperature for when you do want heating.

Using thermostatic radiator valves (TRVs)

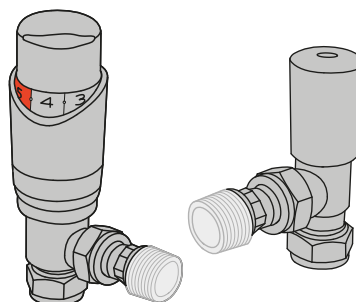
When your heating system is turned on, TRVs control the amount of hot water flowing through a radiator, and allow you some control of the temperature in rooms in which they are installed. You can save energy by turning them down in rooms that need little heat, or which are not being used.

Going on holiday

If you are leaving your house for several days, there may be a 'Holiday' setting on your programmer that allows you to switch off the heating for a selected number of days (alternatively you can turn your system to 'off'). If away in very cold weather, keep your heating on, with your thermostat set to a low temperature (for example 10°C or less). You may have a frost protection setting you can use which turns the heating on only when the temperature falls below a certain point.



A programmable room thermostat. Now quite commonly used in new homes: these can programme both the timing of heating and the temperature you need



TRVs can be manually adjusted to control the temperature of individual rooms they are installed in

Looking after single-zone heating controls

Take the following steps to ensure your controls continue to operate effectively:

Alerts and error notices

Watch out for error or maintenance notices/indicators on the displays of your programmer, thermostat and heating system. Check your user manual to see what they mean and follow the guidance.

Air flow

Do not obstruct TRVs, thermostats or radiators with furniture or curtains as they need air flow around them.

Portable thermostats

If you have portable thermostats, keep them away from sources of heat such as radiators and fires, and do not let dust build up on them, which could prevent them from accurately sensing the temperature of the room. Also keep them at a height of around 1.5 m above the floor.

Is the time correctly set?

Make sure the time is kept up to date on your programmer or programmable room thermostats, for example when the clocks change (although this may happen automatically).

If you have a problem

Check your user manual and follow the guidance. If you are renting, contact your landlord if you have any concerns about your heating controls.

Electrical checks

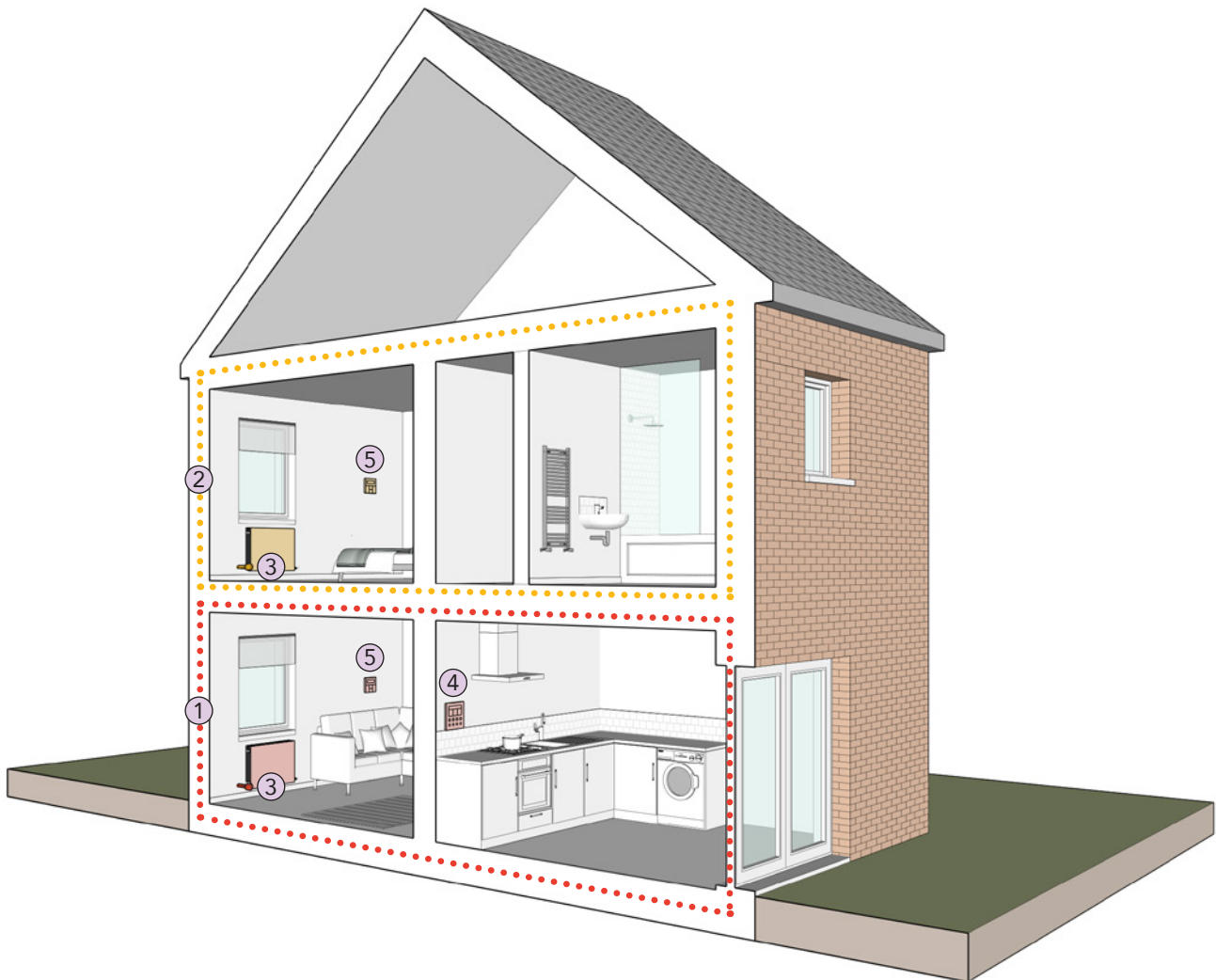
Your user manual should advise you if your controls need to be checked and how often. Remember that some controls are connected to the electricity supply and you should not attempt any electrical maintenance or repair of them. All electrical work should be done by a specialist.

You should arrange any checks of your controls through your landlord if you are renting your home.

Multiple-zone heating controls

What do they do?	What are the benefits?
<p>Your multiple-zone heating controls allow you to select how you heat different parts (or zones) of your home. You can control the temperature and the timing of heating in each zone.</p> <p>You will have at least two zones: one zone will include your living room, and another will include your main bedroom – often there is one zone upstairs and one downstairs.</p>	<p>Heating is usually the major energy use in your home. Your heating control system has the following benefits:</p> <ul style="list-style-type: none"> • It can help you to save money on your energy bills while also keeping your home comfortable. • It can help to reduce the use of fossil fuels. • It gives you flexibility in how you use your heating and automatic control.
<p>The heating controls in your home work as follows:</p> <p>A programmer with a timer for setting when the heating is on in the different zones. Your programmer will usually be found in your kitchen or near your heating system (e.g. boiler).</p>	<p>You can set your programmer so that your heating automatically comes on where and when you want it</p>
<p>A room thermostat for each heated zone. These allow you to set different temperatures in the zones in which they are located. You may have wireless control of the room thermostats.</p>	<p>You can set your thermostats to keep each zone of your home at the temperature you want.</p>
<p>You may have programmable room thermostats which combine the functions of both the programmer and the room thermostat, but also allow you to select suitable temperatures for different times of the day in each of the zones.</p>	<p>Programmable room thermostats give you additional automatic control over the heating in each zone.</p>
<p>If you have radiators, you will also have thermostatic radiator valves (TRVs) on most of them. These allow manual control of heating in rooms where they are installed.</p>	<p>TRVs provide useful manual control of temperature. They allow you to selectively reduce heating within part of a heating zone.</p>
<p>Instead of the controls above, you may have networked electronic controls in all your rooms, usually on your radiators (or walls). These allow you to separately control the time and temperature of your heating in each individual room.</p>	<p>Electronic controls combine the benefits listed above and give you additional automatic control and flexibility in using your heating system.</p>

Multiple-zone heating controls - main features in a typical home



Key

1 Heating zone one

2 Heating zone two

Your controls allow you to set different temperature and timing of heating in each zone

3 Thermostatic radiator valves

4 Programmer

5 Room thermostat

Using multiple-zone heating controls

Saving on your heating costs

Multiple zone controls should include separate heating control of at least two areas of your home. Typically you will have separate control for at least your living room and main bedroom.

Using programmers in multiple-zone heating

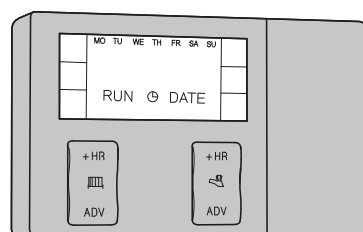
Programmers, whether separate or incorporated into programmable room thermostats, allow you to control when particular zones of your home are heated. When 'timed' is selected on your programmer, you will be able to select automatic 'start' and 'stop' times for periods of heating in the different zones, tailoring heating to suit different individuals and activities. You may also see an 'off' setting which will stop the heating at any time, manually overriding your timed settings. Occasionally you may need heating for longer and there may be an option called 'boost', giving an extra hour, or a simple 'on' override: the programmer will allow you to apply these to any individual zone or all of them.

Minimise heating time Your programmer can save you a lot of money if you select your timed heating periods carefully. It is worth trying to identify the ideal time for your heating to be on and off. In winter, your new home (with its improved insulation) may need less heat than you would expect to warm up and it will stay warmer for a surprisingly long time after the heating has switched off. So a typical weekday heating pattern in winter, for a home unoccupied during the day, might be:

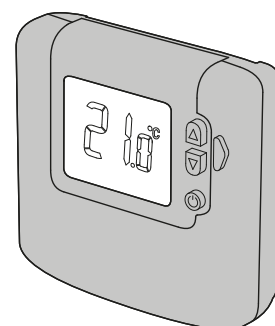
Heating phase 1 A 'timed start' set at one hour before you get up (comfortable start to the day) and a 'timed stop' set around the point you normally get up (home remains sufficiently warm before you depart).

Heating phase 2 A 'timed start' set for an hour before you get home (comfortably warm when you return) and then 'timed stop' set for late evening (home still warm, but cooling down when you go to bed).

This example is for a heating system with a gas boiler with radiators. With multiple-zone control, you will have a lot of flexibility to customise heating during the day, for example, just heating those parts of the home you are using, and adjusting temperatures so that they are suitable for different activities.



Programmer. Used to set when your heating is on (and when your hot water is heated)



Room thermostat (digital type). Used to maintain the temperature you need in a room or heating zone

Compared with winter, you are likely to need much less heating in spring and autumn. For these seasons, adjust your programmer to try more economical heating patterns.

Using room thermostats

Room thermostats will have a temperature display or dial allowing you to set the temperature in each zone. If the air temperature around the thermostat drops below your setting, the heating system is automatically switched on. Once the air temperature is higher than the thermostat setting, the heating is automatically switched off.

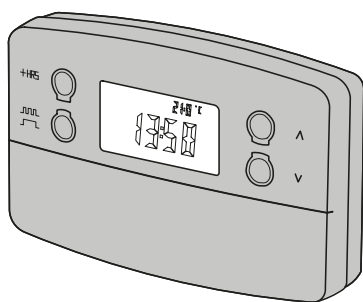
When choosing your temperature settings, experiment to find what is comfortable for those in your home. Usually you will not need your thermostat to be above 21°C in living rooms, but other zones might not need thermostat settings above 18°C. Lower temperatures might be suitable at times when you are more active.

Using programmable room thermostats

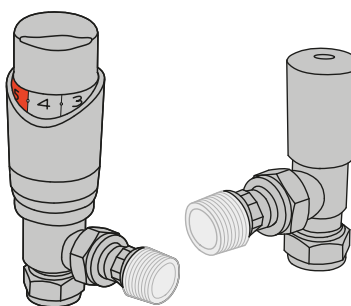
These controls combine programmer and thermostat functions. If these have been installed in your home, you will have one for each heating zone. Use them in the same way as separate programmers and thermostats (see above), but note that programmable room thermostats may give you the extra flexibility to set different temperatures for particular times of the day. Most programmable room thermostats do not have settings marked 'on/off'; instead you should set a low temperature (e.g. 10-14°C) for times when you do not want heating, and your preferred temperature for when you do want heating.

Using thermostatic radiator valves (TRVs)

When your heating system is turned on, TRVs control the amount of hot water flowing through a radiator, and allow you some control of the temperature in rooms in which they are installed. You can save energy by turning them down in rooms that need little heat, or which are not being used.



A programmable room thermostat. Now quite commonly used in new homes: these can programme both the timing of heating and the temperature you need



TRVs can be manually adjusted to control the temperature of individual rooms they are installed in

Using networked electronic heating controls in each room

Networked electronic heating controls on your radiators or walls can be used to set the time and temperature of your heating separately in each room of your home. They communicate wirelessly with your heating system and a separate control panel, and you may also have remote control using your mobile phone.

Going on holiday

If you are leaving your house for several days, there may be a 'Holiday' setting on your programmer that allows you to switch off the heating for a selected number of days (alternatively you can turn your system to 'off'). If away in very cold weather, keep your heating on, with your thermostat set to a low temperature (for example 10°C or less). You may have a frost protection setting you can use which turns the heating on only when the temperature falls below a certain point.

Looking after multiple-zone heating controls

Take the following steps to ensure your heating controls continue to operate effectively:

Alerts and error notices

Watch out for error or maintenance notices/indicators on the displays of your programmer, thermostat and heating system. Check your user manual to see what they mean and follow the guidance.

Air flow

Do not obstruct TRVs, thermostats or radiators with furniture or curtains as they need air flow around them.

Portable thermostats

If you have portable thermostats, keep them away from sources of heat such as radiators and fires, and away from direct sunlight. Do not let dust build up on them, which could prevent them from accurately sensing the temperature of the room. Also keep them at a height of around 1.5 m above the floor.

Is the time correctly set?

Make sure the time is kept up to date on your programmer or programmable room thermostats, for example when the clocks change (although this may happen automatically).

If you have a problem

Check your user manual and follow the guidance. If you are renting, contact your landlord if you have any concerns about your heating controls.

Electrical checks

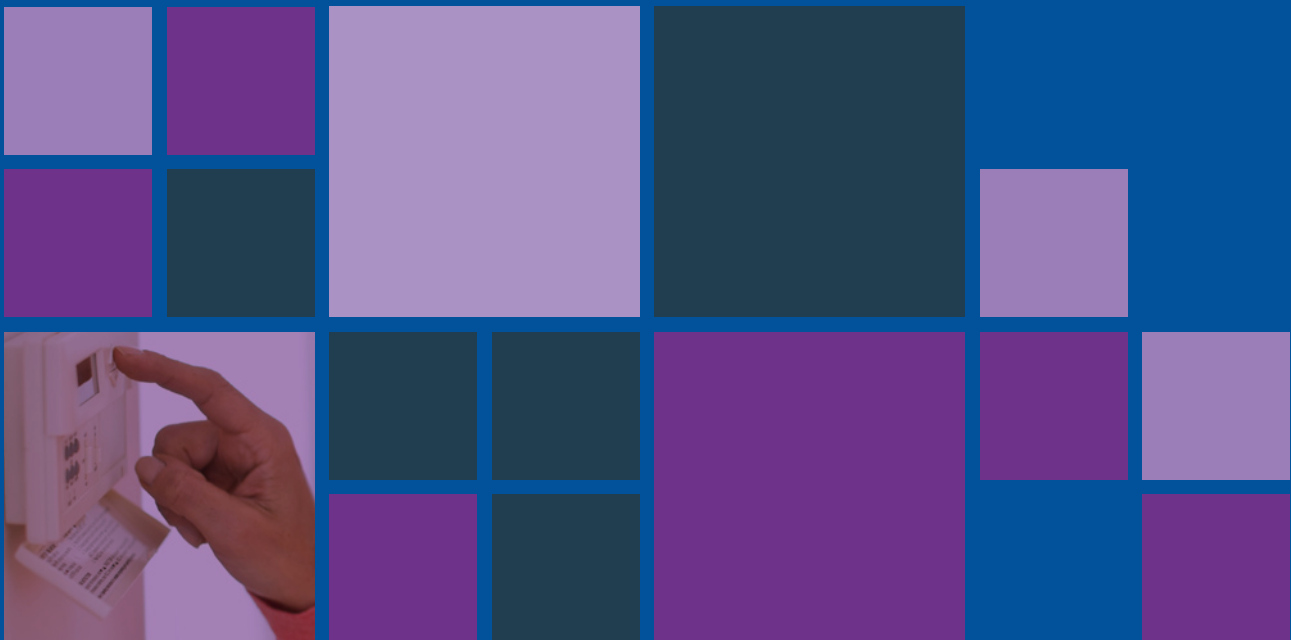
Your user manual should advise you if your controls need to be checked and how often. Remember that some controls are connected to the electricity supply and you should not attempt any electrical maintenance or repair of them. All electrical work should be done by a specialist.

You should arrange any checks of your controls through your landlord if you are renting your home.

Home comforts

Guidance on using ventilation, heating and renewable energy systems

New homes of today feature a range of energy and ventilation systems. For these to provide good levels of comfort, and for owners and residents to realise the energy-saving benefits that these systems offer, they must be operated and maintained correctly. The information presented in this guide was developed for the NHBC Home User Guide (HUG) to improve the understanding of these systems and how they should be used. This published version from the NHBC Foundation is a convenient source of home user guidance on the common ventilation, solar, heat pump and control systems. Its content and graphics are freely available for house builders to use in their own home user guides.



The NHBC Foundation, established in 2006, provides high quality research and practical guidance to support the house-building industry as it addresses the challenges of delivering 21st century new homes. Visit www.nhbcfoundation.org to find out more about the NHBC Foundation research programme.

