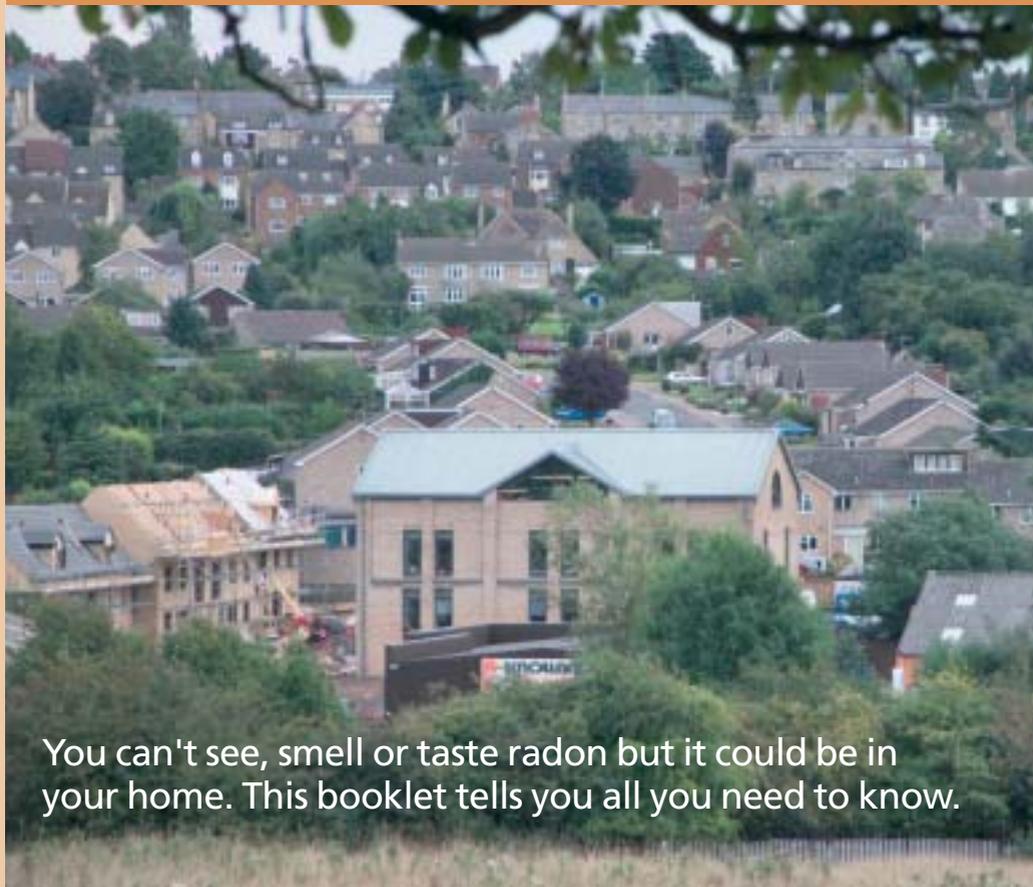


Radon: a householder's guide



You can't see, smell or taste radon but it could be in your home. This booklet tells you all you need to know.

radon
Don't live with the risk


defra
Department for Environment
Food and Rural Affairs

This booklet, published by the **Department for Environment, Food and Rural Affairs**, provides information about methods for radon reduction. Every effort has been made to ensure that the information is accurate, but the department cannot accept liability for the application of this advice. **Defra** cannot endorse or recommend any particular supplier, product or service.

The information in this booklet applies to England. For specific information applicable to Northern Ireland, Scotland and Wales, write to the addresses given on the inside back cover.

Contents

Introduction	4
Radon - back to the facts	4
What should people in affected areas do?	8
What can I do if I find my house has a radon problem?	10
What about homes built within the last 15 years?	13
Finding a builder and drawing up a contract	14
What should I do if I am buying or selling a house?	17
Might there be radon in my workplace?	18
Further information	19

Introduction

Perhaps you have heard about radon affecting your area and are wondering whether you should take the test. Perhaps you have taken the test but feel you don't know enough about what it means. Either way, this booklet is for you. It tells you what radon is, where it is found, what the dangers are – and explains the good news that **the measures needed to get rid of radon problems are easy, effective and relatively inexpensive.**

In some areas of the UK, naturally occurring radon poses a health risk to a relatively small number of people in their homes. Since 1987, nearly half a million tests, most funded by government, have been carried out by the National Radiological Protection Board (NRPB) on individual buildings. These have enabled it to build up a country-wide map of radon levels, and helped thousands of individual householders to make their homes safe. The Government is using the map as the basis for its action plan. The Government wants people who may be at risk to test their homes for radon, and to follow up with radon

reduction measures if they find there is a problem. Even though only a small proportion of the UK population is actually affected by radon, everyone should know the facts – so read on.

Radon – back to the facts

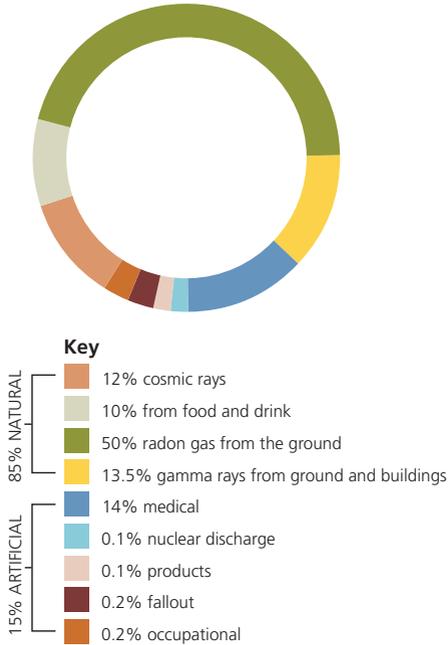
Radon is a radioactive gas that occurs naturally. It has no taste, smell or colour; in fact, special devices are needed to detect it. Radon is everywhere, usually at levels that pose negligible risk.

Where does radon come from?

When uranium decays, it becomes radium, and when radium decays, it becomes radon. Uranium is found in small quantities in all soil and rocks, but amounts vary from place to place. Variations are on a very small scale; there may be different levels of radon even between neighbouring buildings.

Radon rises from soil into the air; outdoors, radon is diluted and the risk it poses is negligible. When it stays in enclosed spaces, however, concentrations can build up.

Average Annual Dose to UK Population
2.6 mSv overall



Radon is the biggest contributor to radiation exposure of the UK population.

Where is Radon found?

Radon is everywhere – but usually in insignificant quantities. There are some areas of the UK where the geology results in higher radon levels. From some 450,000 test results, the NRPB has drawn up

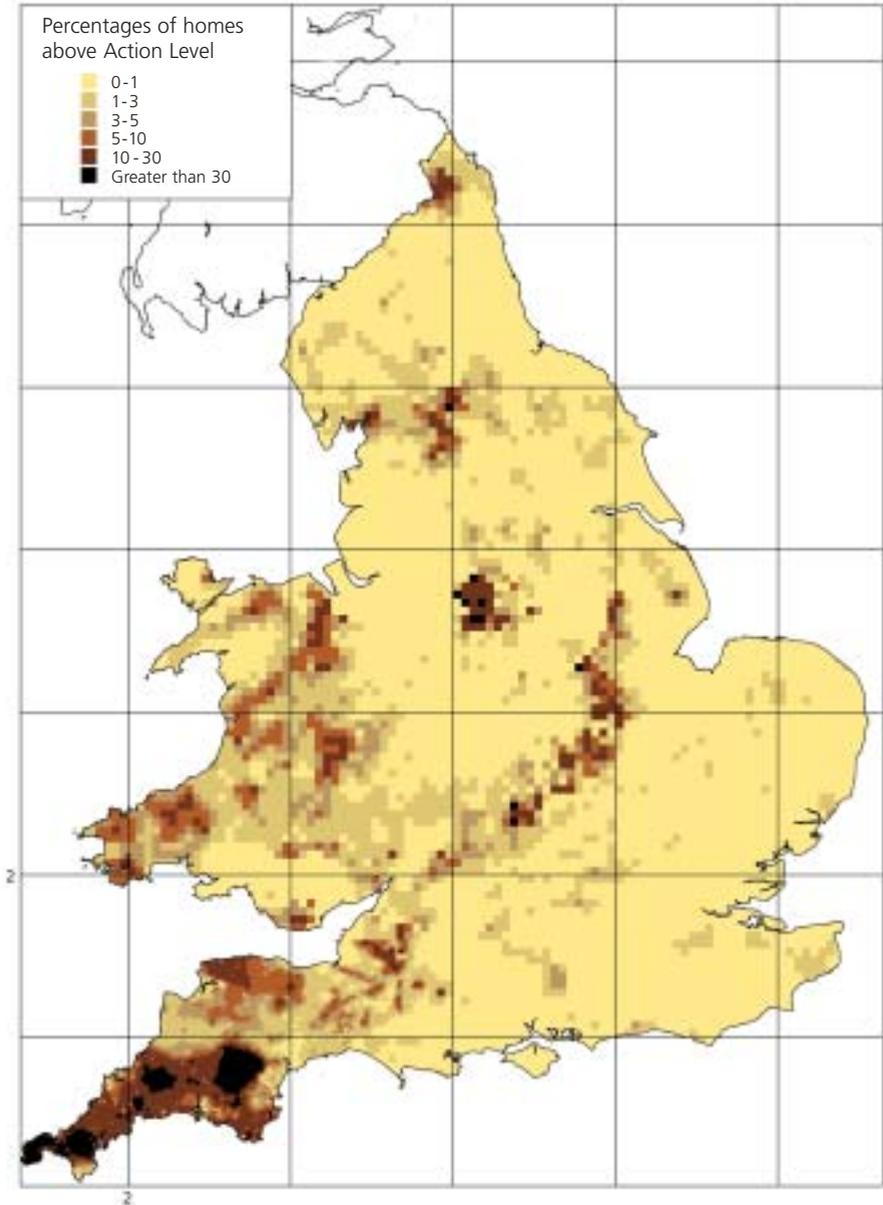
maps of radon-affected areas. Most homes, even in these areas, will not have a radon problem, but a proportion will do so. As you can see from the map on page 6, in many places radon is found in small pockets.

Radon can be dangerous

It should be emphasised that when the radon concentration is high, it does pose a serious risk to your health. Radioactive decay of radon forms particles called ‘radon daughters’, and if you breathe these in they damage your lung tissues. Health studies from around the world have linked radon and lung cancer. The lung cancer radon causes proceeds in exactly the same way as cancer caused by smoking. The NRPB measures radon levels in becquerels per cubic metres of air (Bq m^{-3}), and has advised the Government that the level of 200 Bq m^{-3} in homes should be considered the **Action Level** (the level at which action should be taken to reduce radon concentration).

Radon: a householders guide

Map showing estimated proportion of homes exceeding the action level in England.

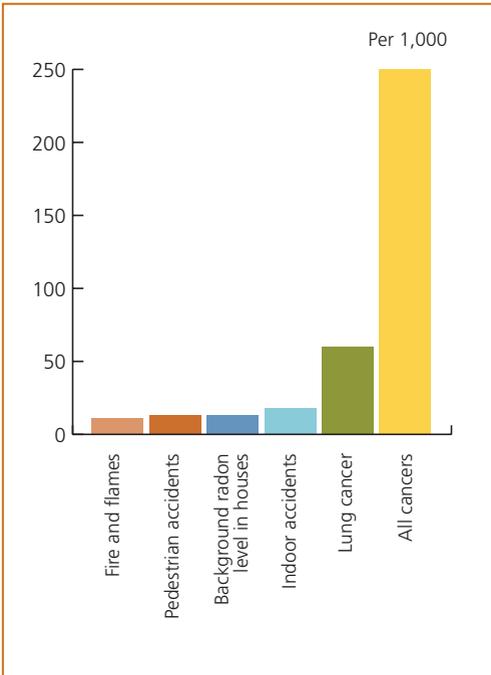


The table below gives some idea of how radon risk compares with other risks when radon is at the average background level found in the UK, which is 20 Bq m^{-3} – that is, 1/10 of the Action Level. However, as this is an average value, many homes will have higher levels than this. You need not be concerned if your home has a radon level above 20 Bq m^{-3} unless it approaches or exceeds the 200 Bq m^{-3} Action Level.

Table 1 shows that, for example, you are more likely to die as a result of an accident indoors, than from lung cancer caused by the background level of radon.

As the radon concentration increases, however, the risk of lung cancer increases. A comprehensive study by the Imperial Cancer Research Fund has confirmed the level of risk from radon in houses in the UK.

Table 1: Lifetime risks of death from common causes (UK average for smokers and non-smokers)



‘Lifetime risk’ is of course a long-term hazard. Radon risk increases with time. When taking steps to reduce it, it is far better to plan carefully than take the wrong precautions. After brisk but sensible planning, action should be taken as soon as practical.

Radon: a householders guide

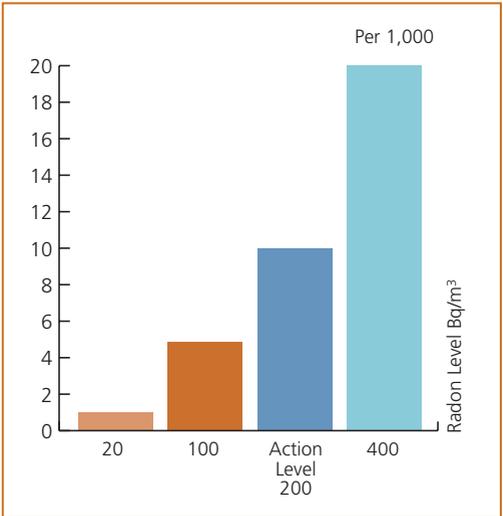
Table 2 applies only to non-smokers. Smoking makes the risk of cancer from radon far worse. If you smoke 15 cigarettes a day, you can multiply the risk factor by 10, so for example at the Action Level your risk is 100 in 1000.

Smokers should remember this, however, whereas they might find it very hard to give up smoking, households at risk from radon can easily take small and effective steps to make their home safe.

How does radon get into my home?

Because of the effects of wind and temperature, the air pressure in your house is usually lower than the air pressure in the soil beneath it. Just as air rushes in to fill a vacuum because the pressure is lower, the same effect happens (much less dramatically) with houses – air from the soil seeps into the lower pressure area of the house through cracks and gaps in the floor or walls. This air contains radon, and in areas where radon levels in the soil are quite high, indoor radon levels can rise above the Action Level.

Table 2: Lifetime risk of lung cancer potentially induced by radon (for non smokers)



What should people in affected areas do?

The Government recommends that people in affected areas test their houses for radon. There is a test available that involves monitoring radon in the home with a simple, safe device for a period of three months. The test costs around £35, and anyone can order it. There are also shorter tests available and these may be used to obtain an estimate of the radon concentration in your home, especially when the levels are very high or very low. They may also

be used where quick measurements are essential. However, the longer term radon measurement will give a more accurate indication of average annual levels of radiation. If you have not taken a test and are worried about radon contact Defra to ask for a leaflet about the test, Radon: you can test for it. The address is at the end of this booklet. The Government, the NRPB and the Building Research Establishment Ltd (BRE) all recommend that if householders' indoor radon levels test above the Action Level, they should take radon reduction measures as soon as practical – and then take the test again to give themselves peace of mind, that the measures have worked.



Radon testing kits

Who gets to see my radon test results?

Only you, the occupier. If the test is organised by your local council they may ask to be given the result. If you are a tenant, your landlord can request and be given the result unless you have asked the measurement laboratory not to do so on the record card that comes with the detectors.

You needn't pass them voluntarily to anyone **(although if someone who wants to buy your house asks about a radon test, you are legally obliged to say what you know)**.

However, radon problems are nothing to be ashamed of, and it could be helpful to your local authority if you choose to inform them of your house's radon test results (even if you have tested below the Action Levels). They will be keen to build up a picture of the radon problem in the area.

When the NRPB does a test and knows that a householder is a tenant, it sends two copies of the results. The idea is that you may wish to pass a copy to your landlord

– again, whether or not the house has a radon problem. In some cases, the terms of your lease may mean that the landlord is responsible for repairs. In this case the landlord may also be responsible for radon reduction work. In other cases the responsibility may not fall to the landlord; you should consult with him or her about the lease.

What can I do if I find my house has a radon problem?

Remember that it is your average exposure to radon that matters. Short exposure to high levels is not important if over the long term your average exposure is low. This means that you have time to plan for the solution that is best for you, your house and your radon level. But having found the best solution, you should implement it as soon as practical.

It is best to stop radon entering a house or, if that is not possible, to try to remove it if it gets in. The aim in both cases should be to reduce indoor radon levels to significantly

below the Action Level. There are five main ways to achieve this; they are described briefly below and dealt with in greater detail in the free booklet 'Radon – a guide to reducing levels in your home', available from **Defra** (see page 19 for details).

Choice A – install a radon sump system

The average cost of a system is about £750 - £1000. It can be installed in a day or two. The sump is a small void (about the size of a bucket) dug under a solid ground floor, to which a pipe and usually a fan are attached. The system limits the amount of radon that enters the house, and for a typical house is by far the most effective method. Modern sumps are often constructed from the side of the house, so there is no disruption inside.

Choice B – improve ventilation under suspended timber floors

Costs could be in the region of £200-£500, but may vary considerably. New air bricks are installed in walls just above ground level; This can be as little as £20 - £50 per air brick, or less if you do the work yourself. In some cases a fan system is also installed. The system again limits the amount of radon that enters the house.

Choice C – use positive ventilation in your house

The average cost of the system, which is designed to change the air pressure in your house by blowing air in from the loft level, is around £500 - £600. The system both dilutes the radon to acceptable levels, and stops some of it getting in. It can be installed in a day.

Choice D – seal cracks and gaps in solid concrete floors

Costs for this work vary a lot: you could spend as little as £25, but it does depend on the house and could cost five or ten times as much. The seals prevent radon entering the house through the floor. However, for sealing to work, it is essential that all of the cracks are sealed. This will involve removing for example carpets and skirting boards. Sealing only say, 90 per cent of cracks is likely to have little effect on radon levels.

Radon: a householders guide

Choice E – change the way your house is ventilated

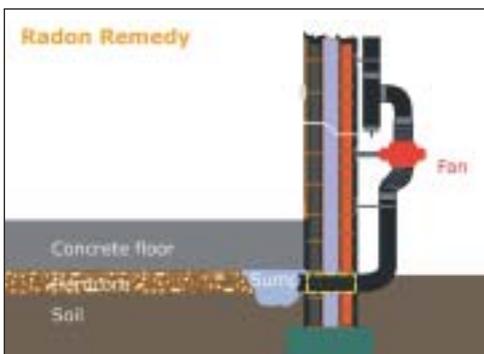
This solution is only suitable in quite special cases, and has drawbacks, but can prove quite inexpensive.



1. Sump systems are generally the most effective method for reducing high levels of radon. The system pictured could be installed in one day.



3. Positive ventilation fans blow air from a loft – or fresh air from outside – into your house.



2. A radon sump system works by drawing air from the soil beneath your home and redirecting it harmlessly into the atmosphere.



4. Modern plastic louvred airbricks are a cheap and simple way to help dilute radon beneath suspended concrete or timber floors.

Some choices are more suitable for some houses than others. The costs of many of them can be reduced by do-it-yourself work. BRE publish useful guides about most of the choices; the ordering address is on page 20.

What about homes built within the last 15 years?

With new understanding of the radon risk, the Government has designated areas where new homes should include radon protection measures to satisfy the requirements of the Building Regulations. These areas have been modified as survey information has become available and were delineated in stages:

- In 1988 to parts of Devon and Cornwall, and extended in
- 1992 to parts of Somerset, Derbyshire and Northamptonshire, and following a nationwide survey extended in
- 1999 to all parts of England where there is a significant probability of exceeding the Action Level for radon set by NRPB.

Under the 1999 guidance, there are two levels of radon protection, basic and full.

Basic radon protection consisting of a radon-resistant barrier across the ground floor of the building should be provided where there is a significant probability of exceeding the Action Level for radon. In areas where radon levels would be much higher, there should be provision for full radon protection and include sub-floor depressurisation or ventilation in addition to the radon resistant barrier.

Prior to 1999, the initial means of radon protection was a sump or sub-floor ventilation, radon barriers only being required in areas of highest risk.

In a new home which has a sump, it is a simple matter to activate the sump with a fan to further reduce radon levels if a radon measurement of the house shows the Action Level is being exceeded.

You can find out more information about the Building Regulations by ringing the BRE Radon Hotline; the number is given on page 20. You can also e-mail enquiries to: partscdgh.br@odpm.gsi.gov.uk

How can I keep costs manageable?

As you read above, costs can vary a great deal because so much depends on the amount of radon reduction you need to achieve and the design of your house. However, the equipment and materials needed are not complex or expensive: most of the costs are in the labour needed. This is why do-it-yourself work can be so significant in reducing costs, providing you feel confident about carrying out the work yourself.

It may be cheaper to have several things done at once. Builders have fixed overheads that they charge per job, such as hiring plant; if your builder can carry out all the work in one visit he or she will probably charge less than for several separate ones.

Similarly, if you plan to make other alterations to your house (for example to extend the ground floor) radon reduction measures may be cheaper if you carry them out at the same time.

The other important aspect of managing costs is that of written quotations, dealt with on page 15.

Finding a builder and drawing up a contract

There is nothing complex about the methods used to bring radon down to below the Action Level, and so a local builder who does good quality work should have no problems carrying out the work. But because widespread knowledge of the risks posed by radon is quite new in some parts of the country, builders may not have worked on radon reduction before. If you choose to use a builder, further expert advice is available to help you and your builder. The NRPB advises on health risks posed by radiation and how to guard against them. The BRE has developed practical advice about how building work can reduce radon levels to within safe limits. The Radon Council Ltd, an independent voluntary Regulatory Body, keeps a list of companies experienced in radon reduction work. Addresses and other information available (including telephone hotlines) are listed at the end of this booklet.

The following points are useful when you are looking for a builder:

- **You can draw up a lump sum contract**

Many people employ builders to do minor jobs without professional advice and radon work need be no different. The best plan is to write down in advance the work you need to be doing. If you need help doing this, phone the BRE Radon hotline. Then get at least three written quotations from different builders, asking them to quote on a 'lump sum' basis. This means their price will include everything they think necessary to complete the job as you have described it. It won't include unexpected costs (for things they could not have foreseen, such as discovering dry rot in floor joists), but these aside you will be reasonably sure of the final cost of the work.

- **You can draw up a time-and-material, or dayworks, contract**

If you cannot write down an accurate list of what needs doing, because you don't yet know how much work it will take, a lump sum contract will not be possible. (For example if you need to seal the floor, you may not know how much work needs doing until you take out all the furniture and remove all the carpets and skirting boards.) In this case you could get the builder to quote an hourly rate for labour and a rate for the supply and fixing of materials (for example, so many pounds per metre for sealing edges of floors, so many pounds for sealing around a service pipe), and also ask for an estimate of the overall cost.

This estimate doesn't have the same legal force as a written quotation. A quotation commits the builder to do the job at a certain cost or rate. An estimate is an approximate guide that helps you to budget but does not commit the builder; of course you may find his or her costs come in lower than the estimate.

Radon: a householders guide

- **Some builders have trained or worked on radon reduction**

The Radon Council Ltd has a list of builders who are experienced in radon work. The builders abide by the Council's Code of Practice and its guidelines on carrying out remedial work. Builders must also have at least one employee who has attended the Council's training course. The Council's address is on page 22.

- **You can get professional advice**

Even if you cannot find a builder experienced in this kind of work, high quality workmanship and good materials are the essential foundations of successful work. An architect or quantity surveyor can advise you on the quality of local builders' work, help you to draw up a contract, assess the quality of work and ensure that the final sum you are charged is right for the work done.

However, you will have to pay for these professional services.

On page 21, you will find lists of professional bodies and trade associations whose members are committed to high quality work and submit to a complaints procedure.

Can I get grants to help pay for the work?

In some cases grants are available, and loans are possible:

- The building societies have agreed in principle to provide loan finance for radon work, subject to the applicant's status;
- If you cannot afford to pay for the work, discretionary 'house renovation' grants may be available from your local authority. The authority will assess your eligibility and will determine how much, if any, of the cost you will have to pay. Agreement for the grant must be obtained before the work is carried out.

Do I need permission to carry out the work?

- **If you own your home but have a mortgage**

You may need the lender's permission before carrying out these changes to the house. Your lender will be able to tell you what the mortgage agreement says and you should check this before starting work.

- **If you are a tenant**

You will need to discuss the work with your landlord before you start. You may be able to carry out some of the jobs yourself, but others, especially if they affect the building's structure, might have to be carried out by the landlord.

- **Planning permission or Building Regulations approval**

Are not usually necessary for small radon reduction jobs (unless you are making bigger changes at the same time). Your local council's Building Control Officer can give you the advice you need. However, if your house is a listed building, or in a designated area of outstanding natural beauty, a national park or a conservation area, you may need permission for any work that alters its external appearance or disturbs internal features that may be part of the character of an historic building. Check with the Planning Department of your local council.

Landfill gases

In the very rare cases where a house needing radon work is on or next to a landfill site or coal mine, additional precautions may be needed to deal with the methane rising from the site. If you have any reason to think that this applies to your house, ring your local authority's Environmental Health Department to check. If there is a problem, you will be able to get expert advice from BRE's Radon hotline.

What should I do if I am buying or selling a house?

Defra has published a special booklet dealing with these issues: Radon – a guide for homebuyers and sellers (details on page 19).

Might there be radon in my workplace?

Radon can affect workplaces and public buildings in the same way as houses. Where the workplace is occupied for a normal working day and the average radon levels are below 400Bq m^{-3} no further action is likely to be required, taking into account that most people spend much more time in the home than at work.

In buildings where radon is at a level over any 24 hour period exceeding 400Bq m^{-3} , employers have a legal responsibility under the Ionising Regulations 1999 to ensure that any consequential risk to health is restricted as far as reasonably practicable for those using the building.

If you have concerns, you should take them up with the employer; you can get more advice from your local Health and Safety Executive (HSE) Area Officer or the Environmental Health Department of your local authority. HSE, BRE, and NRPB publish information on Radon in the workplace.

Further information

Having read this booklet, you may well have further questions on radon. Defra can answer most of these questions. The other organisations listed here can provide more detailed information on specific aspects of the radon problem.

To contact Defra

Radioactive Substances Division

Defra

Zone 4/F7

Ashdown House

123 Victoria Street

London SW1E 6DE

Tel: 020 7082 8497/8498

Fax: 020 7082 8474

Web: www.defra.gov.uk/environment/radioactivity/radon

Defra has several publications including:

Radon – you can test for it (Publication Code: 00EP0414A)

Radon – a guide for homebuyers and sellers (Publication Code: 00EP0414B)

Radon – a guide to reducing levels in your home (Publication Code: 00EP0414C)

You can get free copies of the publications by contacting:

Defra Publications

Admail 6000

London SW1A 2XX

Tel: 0845 955 6000

Fax: 020 8957 5012

e-mail: Defra@iforcegroup.com

Radon: a householders guide

NRPB can provide an information pack on radon in the home, with advice about radon, its health risks and details of how to order the test.

NRPB also offer a range of leaflets, reports and a video on radon matters. Single copies of many leaflets are free. The reports and video are on sale at prices between £2 and £20.

To contact NRPB

NRPB

Chilton

Didcot

Oxon OX11 0RQ

NRPB Radon Freephone: 0800 614529

Web: www.nrpb.org

BRE can provide practical and effective advice about construction work to reduce radon levels. They also publish a range of easy to follow guides, and a video, for builders and householders on how to tackle radon levels in existing homes.

To contact BRE:

Radon advice

Building Research Establishment Ltd

Garston

Watford WD2 7JR

BRE Radon hotline: 01923 664707.

Fax: 01923 664010

Web: www.bre.co.uk/radon

More information about the guides, and the video are available from:

Construction Research Communication Ltd

151 Rosebery Avenue

London EC1R 4QX

Tel: 020 7505 6622

Fax: 020 7505 6606

e-mail: enquiries@bre.co.uk

Web: www.brebookshop.com

For more advice about Building Regulations, write to:

Buildings Division
Office of the Deputy Prime Minister
Floor 18A
Portland House
Stag Place
London SW1E 5LP

Web: www.safety.odpm.gov.uk

For more advice about radon in the workplace, write to:

Health & Safety Executive
Sheffield Information Centre
Health & Safety Laboratory
Broad Lane
Sheffield S3 7HQ
Fax: 0114 2892333

Web: www.hse.gov.uk/radiation/ionising/radon

The following professional organisations unite and regulate members practising their respective trades:

Builders Federation of Master Builders
Gordon Fisher House
14/15 Great James Street
London WC1N 3DP
Tel: 020 7242 7583
Fax: 020 7242 0296
e-mail: central@fmb.org.uk

Web: www.fmb.org.uk

The Construction
Confederation
56-64 Leonard Street
London EC2A 4JX
Tel: 020 7608 5000
Fax: 020 7608 5001
e-mail: enquiries@mecc.org.uk

Web: www.constructionconfederation.co.uk

Radon: a householders guide

Architects Royal Institute of
British Architects
66 Portland Place
London W1N 4AD
Tel: 0906 302 0400
e-mail: info@inst.riba.org
Web: www.riba.org

Quantity Surveyors Royal Institution of Chartered Surveyors
Contact Centre, Surveyor Court
Westwood Way
Coventry CV4 8JE
Tel: 0870 333 1600
e-mail: contactrics@mis.org
Web: www.rics.org

For a list of companies experienced in radon reduction work, and for details of companies who can offer short term tests, contact the independent voluntary regulatory body:

The Radon Council Ltd
PO Box 39
Shepperton
Middlesex TW17 8AD
Tel: 01932 221 212
Fax: 01932 229 779
e-mail: radoncouncil@radon-uk.demon.co.uk
Web: www.radonhotline.org

The information in this booklet applies to England. Readers in Northern Ireland, Scotland and Wales should write to:

Northern Ireland Northern Ireland Assembly
Environment and
heritage Service
Calvert House
23 Castle Place
Belfast BT1 1FY
Tel: 02890 254 709
Fax: 02890 254 700
e-mail: ipri@doeni.gov.uk
Web: www.ehsni.gov.uk

Scotland Scottish Executive
Housing 2
First Floor East
Victoria Quay
Edinburgh EH6 6QQ
Web: www.scotland.gov.uk

Wales Environmental Science Advisor
National Assembly for Wales
Cathays Park
Cardiff CF10 3NQ
Tel: 029 2082 3178
Fax: 029 2082 5008
Web: www.wales.gov.uk

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Caerdydd CF10 3NQ

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