Environmental Radon Newsletter

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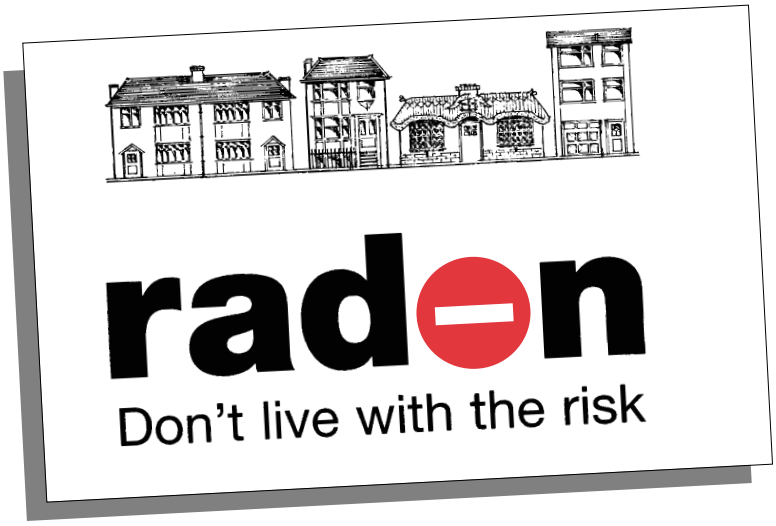
200,000 Invitations

Pylons and Radon

There has been a lot of media interest in a suggestion from Professor Denis Henshaw of Bristol University that electro-magnetic fields from mains electricity in the home or from high voltage power lines outside might affect radon doses. Radon gas itself is not affected by the fields, but the radon decay products (which give the radiation doses to the lungs) can be attracted.

The National Radiological Protection Board responded by agreeing that electro-magnetic fields attract radon decay products, but concluded that this would in general reduce the number of decay products inhaled by people.

However the data are interpreted, it is clear that the only practicable way to prevent excessive exposures to radon is to reduce high levels where they occur.



Andrew Macpherson, Department of the Environment

On 16 January James Clappison, Under Secretary of State at the Department of the Environment, informed Parliament of the latest Government initiative to combat radon. He explained that by building on the progress made so far, it was possible for the next phase of the radon programme to be targeted more accurately and efficiently.

During the week beginning 5 February 200,000 invitations to have a free radon measurement were sent to homes in the five radon affected counties of Cornwall, Devon, Somerset, Northamptonshire and Derbyshire. The invitations were sent directly to the homes most likely to have high radon levels. Each invitation consisted of a short explanatory letter from NRPB, an easy to read leaflet and a post-paid request card. In order to receive their free radon testing kits, all that the householders needed to do was to write their name on the card, and post it to NRPB. The uptake of the offer was boosted by placing full page advertisements in selected local newspapers in the fourth week after the invitations were sent out, to jog the memories of those who had intended to reply, but who had not yet found the time to do so.

It was possible to target invitations in this way because of an analysis, carried out by NRPB, of the 250,000 measurement results already obtained under the Government-funded scheme. NRPB was able to identify the

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POINTS OF CONTACT

Building Research Establishment (BRE)
Garston, Watford, WD2 7JR
BRE Radon Hot Line:
Telephone: 01923-664707
Fax: 01923 664010

National Radiological Protection Board
Radon Survey,
Chilton, Didcot, OX11 0RQ
Radon Freephone: 0800 614529.
Fax: 01235 833891

Department of the Environment
Room A518, Romney House
43 Marsham Street,
London, SW1P 3PY
Telephone: 0171 276 8825
Fax: 0171 276 8909

Welsh Office
Housing Division
Cathays Park, Cardiff, CF1 3NQ
Telephone: 01222 825219
Fax: 01222 825391

Environment Service
Department of the Environment for Northern Ireland
Calvert House, 23 Castle Place
Belfast, BT1 1FY
Telephone: 01232 254754
Fax: 01232 254700

Scottish Office Development Department
Housing Division 1
First Floor East, Victoria Quay
Edinburgh, EH6 6QQ
Telephone: 0131 244 0131
Fax: 0131 244 0153

Health and Safety Executive
Nuclear Safety Division F1
Rose Court, 2 Southwark Bridge
London, SE1 9HF
Telephone: 0171 717 6000
Fax: 0171 717 6717

Radon South West Committee
Secretary
c/o Environmental Health
Teignbridge District Council
Forde House, Newton Abbott,
Devon, TQ12 4XX

Steering Group on Radon
(Northamptonshire and elsewhere)
c/o Environmental Health Department
Borough Council of Wellingborough
Chess Board House,
20 Sheep Street, Wellingborough,
Northampton, NN8 1BL

Derbyshire Radon Steering Group
c/o Environmental Health Department
Derbyshire Dales District Council
Town Hall, Matlock,
Derbyshire, DE4 3NN

The Radon Council Limited
PO Box 39, Shepperton
Middlesex, TW17 8AD
Telephone: 01932 221212
Fax: 01932 229779

Somerset Radon Campaign Steering Group
c/o Taunton Deane Borough Council
The Deane House, Belvedere Road
Taunton, Somerset, TA1 1HE

200,000 Invitations

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homes most likely to have high radon levels, and to rank them in terms of the probability of the homes being above the action level. Generally speaking, these homes would also tend to have the highest radon concentrations. Each of the top 200,000 homes on that list received an invitation, no matter where in the five affected counties they were situated.

The previous system of carrying out free measurements on the basis of widespread general invitations has now given way to the targeted approach which is expected to be more efficient in identifying homes above the radon action level, and to be much more successful than previous schemes at encouraging householders to apply for a measurement. So far the new approach has proved to be highly successful. Over 44,000 people have applied for a measurement. These are all new applicants who, for one reason or another, had not previously applied for free measurements despite being encouraged to do so in earlier campaigns.

NRPB is currently completing a mapping exercise of the whole of England. This will be published later in the year, and will indicate more precisely than before those areas with high radon levels. Also later in the year, the DoE will be promoting new initiatives to persuade householders with homes above the action level to take remedial action. Radon is a serious problem, but one that is amenable to simple, relatively inexpensive solutions.

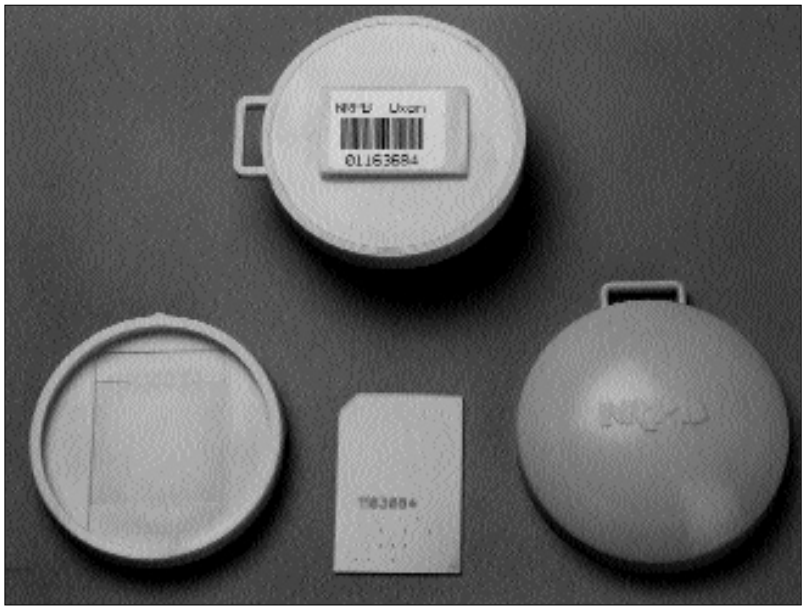
The DoE is keen to work with others who have expertise and influence in this area in order to provide information to householders, so that they can make informed and objective decisions about radon, the need for remedial work, and which remedial method to use. Discussions with local authorities have already begun and we shall be consulting them, and others, about the best ways of getting the messages over.

Pages from the radon leaflet

Passive Radon Detectors

Glenn Hardcastle, National Radiological Protection Board

It would be very convenient if radon surveys could be carried out by taking an instrument into a building and reading the concentration off the display. You can make a radon measurement like this, but the information you get is useless for deciding whether a building has a serious radon problem. The reason is that indoor radon levels vary widely from day to day and season to season. Variations can be caused by changes in climatic conditions, such as temperature, pressure and wind, and by how the building is ventilated. To find out the annual average indoor radon level, measurements must be made over a long period so that any variations in radon levels are averaged. Normally such measurements are made over a three month period and a correction is made to take account of seasonal variation.



Elements of the passive detector

Passive etched-track radon detectors can easily detect normal radon levels over three months; they are inexpensive and small enough to be sent through the post and so are ideal for large scale surveys of indoor radon levels. They consist of a small plastic holder and a radon detecting element. The detecting element is usually made of CR-39, a transparent material which is also used as an optical plastic for spectacles. Because large numbers of detectors are used in surveys, the holders are numbered with bar codes. This eliminates the need for manual recording of numbers which is time consuming and open to error.

While the detectors are exposed to the air inside a building, radon diffuses into the holder. Alpha particles from radon and its decay products strike the CR-39 detecting element causing damage to the chemical bonds in the CR-39. At the end of the measurement period, the detectors are returned to the laboratory for processing.

Counting the tracks

As the alpha particle damage in the CR-39 is on the atomic scale, the alpha particle tracks are invisible. To reveal them, the detecting elements are immersed in a heated solution of sodium hydroxide. The damaged chemical bonds in the CR-39 are etched away much more rapidly than the surrounding undamaged areas. The alpha particle tracks are then visible under a microscope as dark spots which contrast against the undamaged transparent material. The alpha tracks on each element are automatically counted on an image analysis system. As the number of tracks is proportional to the exposure of the detector to radon, the radon concentration in the building can easily be calculated.

Although this process is quite simple in principle, there are many pitfalls that can cause erroneous readings. To ensure that good quality control measures are in place to prevent such errors, NRPB has set up a scheme to validate the measurement of radon in dwellings by laboratories. For a laboratory to be validated, it has to meet strict administrative requirements and pass regular performance tests.

Radon Risks from Uranium Mining in Germany

Werner Burkart, Bernd Grosche & Klaus Martignoni, Institute for Radiation Hygiene of the Federal Office for Radiation Protection, Germany

Most of the uranium needed by the Soviet Union after World War II was mined in Saxony and Thuringia in Germany. The hectic quest for uranium involved up to 130 000 workers in many mines including the deepest shaft in Europe, a large open pit, and several leaching operations. By the end of operations in 1990, some 220 000 tonnes of uranium had been extracted and large, densely populated areas were devastated. The environmental legacy consists of tailings ponds containing several kilograms of radium-226, about 20 square kilometres of mine tailings, and polluted groundwater and rivers.

Mining of uranium ore for weapons and atomic power started at the small town of Schneeberg, an area with a long history of mining for silver and other precious and rare metals. In fact, the splendour of Dresden, the capital of Saxony, was built on the silver mines of the Schneeberg district. Even when silver was mined, radon was killing the miners. As early as the sixteenth century, in his famous work *De Re Metallica* (1552) on the art of mining, Agricola noted that many women had lost several husbands to a condition called "Schneeberger disease". Only in 1879 was this disease recognised as lung cancer. Today, some of the worst environmental problems are those caused by the old silver mines. Dwellings built over old mine shafts have been found to have indoor radon levels up to some 100 000 Bq m^{-3}.

When silver was mined, pitchblende was an unwanted by-product: the German word 'Pechblende' translates as 'bad luck glitter'. The mining of it to extract uranium during the Cold War was kept strictly secret. During 1946 to 1954, known as the wild years, ore was mined by pick and shovel. Levels of radon, dust and chemicals were high because of dry drilling and insufficient ventilation. There was no radon monitoring, but the exposure was estimated to be up to 300 WLM per annum, 75 times higher than the current limit.

Picture from De Re Metallica

More than 5000 lung cancer cases were officially recognised as occupational disease by the mining company, but this is now thought to be an underestimate. At present, the Workers Compensation Board is confronted with about 200 to 300 new cases a year. Depending on the risk projection model used, authorities fear that the final toll of lung cancer from uranium mining in Saxony and Thuringia might be as high as 20 000.

Since the end of uranium mining in 1990 a huge cleaning-up operation has started, but the population is still exposed to high indoor radon concentrations. Under these circumstances, the German Radiation Protection Commission recommended that an epidemiological study, already in progress in radon-prone areas of western Germany should be extended to the east German mining region. In addition, an epidemiological study of 60 000 workers is underway. It is hoped that such studies will reduce the uncertainties on risk projections for present exposures in workplaces and elsewhere to uranium, radon, and their decay products.

This newsletter is prepared for the Chartered Institute of Environmental Health by the National Radiological Protection Board. It is published quarterly as an insert in Environmental Health and distributed by the Royal Environmental Health Institute for Scotland. Any suggestions for topics for future issues should be sent to Jon Miles at NRPB (see address on page 2). The views expressed in the contributions here are not necessarily those of the Chartered Institute of Environmental Health, the Royal Environmental Health Institute for Scotland or the National Radiological Protection Board.