Environmental **Radon Newsletter**

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A Healthy Lifestyle, Radon and the Palace of Westminster

Martyn Green, National Radiological Protection Board

There is always a tendency, especially for the more cynically minded, to believe that politicians have a strong survival instinct and are very good at protecting their own interests. In matters of personal health and safety, this is a trait we should all emulate and, indeed, we are constantly cajoled by the Government, the media and the medical profession to strive towards a more healthy lifestyle: to eat less fat and more fruit and vegetables, to moderate our intake of alcohol, to take more exercise, to protect ourselves from the sun's rays and to stop smoking.

In this plethora of advice, the importance of reducing the high radiation exposure of the estimated quarter of a million or so British people who live in homes with high radon levels is sometimes overlooked. The lower end of the annual dose range to these persons, living in homes with radon concentrations at or above the Action Level of 200 becquerels per cubic metre of air, is of the order of 10 millisieverts (mSv). This implies for these individuals a significant increase in their lifetime risk of lung cancer. The highest doses are well in excess of 100 mSv; such doses would incur the immediate attention of the Health and Safety Inspectorate if they occurred in the workplace.

In contrast to the lack of concern shown by many people, both in private and public life, to the matter of excessive radon exposure, our Westminster Members of Parliament are leading by example. Right at the start of the national radon campaigns, back in the 1980s, radon levels both in the main debating chambers and in the extensive cellars under the Palace of Westminster were measured and found to be low.

One of the downsides to being a politician is job insecurity: the average term for a Westminster MP is under ten years. This means that the majority of current Members know relatively little about radon and were not present to hear the almost regular parliamentary questions on radon asked and answered during the 1990s. This potential lack of knowledge has now been addressed with the publication by the Parliamentary Office of Science and Technology (POST) of a four page 'postnote' on reducing radon risks in the home.

POST is an office of both Houses of Parliament, charged with providing independent and balanced analysis of public policy issues that have a basis in science and technology. Leaflets in the postnote series are sent to all MPs and provide a concise summary of individual topics. The radon postnote (number 158 and published in June) covers the risks from radon, the control strategy based on the concepts of a radon Action Level and radon Affected Areas, a radon probability map of the UK, radon remedies

(continued on page two)

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Short-term Radon Testing

Most companies which provide radon measurement services use detectors which are placed in houses for three months, but some companies offer detectors which are placed for a week or less. To clarify the circumstances in which such short-term tests would be appropriate, the National Radiological Protection Board (NRPB) issued the following statement recently:

The health risk from radon depends upon the total exposure over time so it is the long-term average radon concentration in a home that is important.

Radon levels in houses vary substantially from day to day as they are influenced by weather conditions. The Action Level refers to the annual average concentration in a home. For this reason, it is preferred that radon measurements are carried out with two detectors (in a bedroom and living room) and are conducted over a reasonable period of time, typically three months or more. This averages out short-term fluctuations.

Sometimes, however, the requirement exists to obtain an estimate of the radon concentration within a building in a much shorter period of time. NRPB re-iterates its advice that such short-term measurements, carried out over a fortnight or less, will give less accurate estimates of the long-term average concentration, but may be sufficient for screening purposes.

Short-term measurements will, in many cases, and particularly in lower risk areas, show such a low radon level that it is reasonably certain that the long term radon concentration is below the Action Level. In these circumstances, further testing is not required.

However, in other dwellings, and particularly in high risk areas, the screening measurement will give a higher result. Long-term measurements are then required to determine whether or not the radon concentration is above the Action Level.

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Note: NRPB has already issued advice on how to apply the results of measurements made using charcoal detectors, which are normally exposed in houses for 4-7 days. It advised that if the result of such a measurement is less than 75 Bq m^{-3} it is reasonably certain that the annual average level is below the Action Level of 200 Bq m^{-3}. If the result is above 75 Bq m^{-3} then a long term measurement is required.

A Healthy Lifestyle, Radon and the Palace of Westminster - continued

for existing dwellings and radon prevention in new dwellings as well as sources of further information.

There is also a brief history of successive government radon campaigns since 1987 and a more detailed discussion of the new three-year roll-out programme involving over 30 local authorities.

This was announced by the Environment Minister, Michael Meacher, in July last year and began in earnest early this year in the North West of England.

Copies of postnotes and more details of POST can be found on their website: www.parliament.uk/post/home.htm

Radon in Irish Schools

David Pollard, Radiological Protection Institute of Ireland

In 1998 the Radiological Protection Institute of Ireland (RPII) was commissioned by the Minister for Education and Science to survey radon in all primary and post-primary schools in the Republic of Ireland. There are approximately 4,000 schools in the country, which range in size from small rural two-classroom primary schools to large post-primary schools catering for more than a thousand students.

The project was undertaken in three annual phases, and is due to finish later this year. The first phase, which ran between 1998 and 1999, covered schools in the east of the country excluding Dublin. Schools in Dublin, the midlands and the northwest were surveyed between 1999 and 2000, while the schools in the south and west are currently being surveyed.

Following consultation between RPII and the Department of Education and Science (DES), an action level for schools of 200 Bq m^{-3}, averaged over the school year, was adopted. DES arranged for remedial work to be carried out in all schools found to have radon above the action level, with priority given to schools with the highest levels.

Radon measurements were made by placing one passive alpha track etch detector in every ground floor classroom and occupied office over the full school year. Each year the RPII contacted individual school boards of management in the spring, informing them about the survey and inviting them to participate. Each September detectors were dispatched from RPII to the participating schools with instructions for placement. The detectors were returned between May and June of the following year and were processed over the summer and autumn.

The results were issued directly by RPII to the participating schools and copied to DES, who put into operation the arrangements to remediate the affected schools. Each year the issue of the schools' results attracted considerable local media attention, and RPII staff gave a number of interviews on local radio and to local newspapers. In the weeks following the issue of the results the RPII radon hotline received a large number of calls from both school staff and parents.

In the first two years of the project, 25,956 individual radon measurements were made and results were issued to 1,763 schools. A further 19,081 detectors were issued to 1,805 schools in September 2000, and these detectors are currently being processed. Approximately 23% of schools surveyed in phases I and II were found to have one or more ground floor rooms with radon levels above the schools action level (200 Bq m^{-3}). Six percent of schools were found to have one or more rooms above the Irish national Reference Level for workplaces, which has been set at 400 Bq m^{-3}.

Remedial work was carried out during the spring and summer of 2000 for affected schools identified from phase I. This was followed with post-remediation testing over the full school year 2000 to 2001. Though these tests have only been completed in a limited number of schools so far, the available results are very encouraging. Radon concentrations in all of these schools were reduced below 200 Bq m^{-3}.

Reduction factors of greater than 20 were observed for many rooms, and one classroom with an initial value of 2,688 Bq m^{-3}, the highest result recorded, was reduced to 42 Bq m^{-3}, a reduction factor of 63. At the time of writing post remediation testing for phase II schools is about to commence while the programme to remediate the remaining schools with radon concentrations above the action level is continuing. The programme should be largely complete by 2003.

Controls on Occupational Exposure to Radon Worldwide

Gerry Kendall, National Radiological Protection Board

Although radon in ordinary workplaces (and in homes) was not generally recognised as a radiological hazard until the 1980s, knowledge of radon is now widespread. The table summarises data on workplace exposures world-wide. The European Union has included exposures to radon and other natural radiation sources at work in its recent Basic Safety Standards Directive, and has complemented this with more detailed suggestions on the practical implementation of controls.

The European Union recommends that national Action Levels for radon in workplaces should be set in the range 500-1000 Bq m^{-3}, or possibly lower. This range may be contrasted with the range of 500-1500 Bq m^{-3} recommended by the International Commission on Radiological Protection (ICRP) and the single value of 1000 Bq m^{-3} given by the International Atomic Energy Agency. These differences should probably be taken as an expectation that safety standards in Europe may be a little higher than the world-wide average. It is not because radon levels in Europe are conspicuously low!

A review of occupational radon Action Levels in a variety of states within Europe and elsewhere has reported a wide range of occupational Action Levels, 200-3,000 Bq m^{-3}. However, it should be noted that the highest level, 3,000 Bq m^{-3}, is the enforcement level for a country where action is advised at 400 Bq m^{-3}. The next highest Action level is 1500 Bq m^{-3}, and no other example exceeded 1000 Bq m^{-3}. The arrangements for implementing and supervising occupational controls on radon exposure vary widely. This article cannot begin a comprehensive review, but a few examples will be given.

Germany has a long tradition of controlling radon exposures in mines and (since 1994) waterworks and most other below-ground workplaces. The number of monitored workers was almost constant at around 25,000 from the mid 1970s to the end of the 1980s. The number then fell sharply, reflecting a reduction in mining activities. Attention has recently turned to above-ground workplaces. A survey of 8,000 such workplaces has suggested that 5-10% (corresponding to 20,000-60,000 employees) may have levels above 1000 Bq m^{-3}. It must be emphasised that these radon measurements are cautious, being made under 'closed' conditions. Nor do they take account of occupancy. Nevertheless, it confirms that radon problems in Germany are worse than in the UK!

Finland also has a long history of attention to radon in workplaces with measurements in mines going back to the 1970s, extension to above-ground workplaces being introduced in legislation about ten years ago. Exposures in mines have fallen greatly in recent years, largely due to better ventilation in modern mines. Areas where attention should be given to radon in above-ground workplaces are being identified using data on radon in dwellings. A variable Action Level is defined to take account of occupancy.

In the South African gold mines, a quarter of a million miners extract 100 million tonnes of ore per year, which yield 600 tonnes of gold. The mines extend to a depth of 3500 metres, where heating is considerable and rock bursts present a more immediate threat than radiation. Nevertheless, uranium associated with the gold deposits does give rise to radiation exposures by the usual routes of radon, inhalation of dust and external radiation. The first of these is the most important, giving over 70% of the dose. Doses have been falling with time, largely because of improvements in ventilation, and it is thought that the industry will be able to operate within the dose limits recommended by ICRP.

Occupation	Numbers of workers
Coal mining	3,910,000
Other mining	760,000
Above ground exposures	1,250,000
Total	**5,900,000**

Worldwide occupational exposures to radon 1990-1994

This is a shortened version of a paper, International advice and national implementation of controls on occupational exposure to radon, presented at the third International Symposium of Naturally Occurring Radioactive Materials, Brussels, September 2001.

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.