

Environmental **Radon** Newsletter

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Rapid radon-in-water monitor

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A prototype instrument to assess the radon concentration in potable (and other) waters has been designed, built, calibrated, and successfully tested in the field.

The European Union has published a draft recommendation on the protection of the public against exposure to radon in water supplies*. Because the way in which radon irradiates the body is quite different if it is swallowed instead of inhaled, the Action Level for radon in water is not the same as for radon in air. The draft recommendation sets an Action Level for radon in water such that the risk to a typical person drinking water with radon at this concentration is similar to the risk which would arise from breathing air which contains radon at a concentration of 200 Bq m⁻³. Since the UK Action Level for radon in air is 200 Bq m⁻³, this fits well with the current level of protection in the UK. The recommendation is:

- for private water supplies that are part of a commercial or public activity (for example hotel or bed and breakfast) remedial action should **always** be taken when the radon concentration exceeds the Action Level for water of 1,000 becquerels per litre.
- for individual water supplies (no commercial or public activity) consideration should be given to taking remedial action when the radon concentration exceeds the Action Level.

Traditionally, the measurement of radon in water requires sample collection followed by laboratory analysis by one of several methods. This is expensive, time consuming and risks loss of radon during sampling. The latter is a particular



problem as radon has a tendency to de-gas from solution unless held under considerable pressure. In addition, as one of the noble gases, radon is monatomic and diffuses readily through many materials traditionally used for sealing. For example, polythene offers little resistance to the escape of radon by diffusion.

To overcome these limitations an instrument has been designed which is capable of measuring the radon content at the sampling point in real-time or with a short (two hours) delay. This will enable the large majority of water supplies to be given the all-clear without the need for time-consuming laboratory analysis. A novel sample container and sampling protocol have been developed to eliminate radon loss during sampling from the kitchen tap.

The instrument is capable of operation in the back of a car, and is able to screen the radon content of water samples against the European Union's Action Level. The lower limit of detection using a 5 minute count is 200 becquerels per litre

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NRPB is no more, but the newsletter continues

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For the past ten years, this newsletter has been produced quarterly by the National Radiological Protection Board (NRPB). On 1 April 2005, NRPB merged with the Health Protection Agency (HPA). What was NRPB is now the Radiation Protection Division of the HPA.

The Agency was created in April 2003 to provide better protection against infectious diseases and other dangers to health, including chemical hazards, poisons and radiation.

The merger of HPA and NRPB will not affect production of this newsletter. The newsletter's aim has been to keep Environmental Health Officers and others informed of radon issues, events, and practical lessons learned by those dealing with radon problems. We welcome contributions from all who can help with these aims.



The email addresses of NRPB staff have changed, with @nrpb.org being replaced by @hpa-rp.org.uk. However, old NRPB email addresses will continue to work for the present.

The information about radon on the NRPB website can now be seen on the HPA website, at www.hpa.org.uk/radiation. All past issues of this newsletter are available on the website.

Rapid radon-in-water monitor

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or better. The ability to count immediately after sampling permits the investigation of whether there is complete equilibrium between radon and the short-lived decay products at the kitchen tap. Introducing a 2 hour delay between the sampling time and the counting time gives an accurate assessment of the radon concentration in the water at the time of sampling. The innovative sample container and sampling protocol eliminates the potential loss of radon when sampling from a tap.

Details of the design, calibration and operation of the instrument will be the

subject of a forthcoming scientific paper.

Acknowledgement: *This project was funded by the Drinking Water Quality Division, Scottish Executive Environment and Rural Affairs Department.*

* *European Commission 2001 Commission Recommendation of 20 December 2001 on the protection of the public against exposure to radon in drinking water supplies (notified under document number C(2001) 4580) Off. J. L344 0085-0088.*

Time for action

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The Ionising Radiations Regulations 1999 (IRR99) apply in workplaces where the radon gas concentration is more than 400 Bq m⁻³. Various levels of control are then required according to the estimated annual dose received by the employees: the higher the dose, the greater the need for formal protection measures.

The dose is calculated from a combination of the radon level and the exposure time, so a long exposure at a low radon level can give the same dose as a short exposure at a high radon level: the health risk is the same. High radon levels, therefore, do not necessarily require heroic radon protection measures provided the exposure

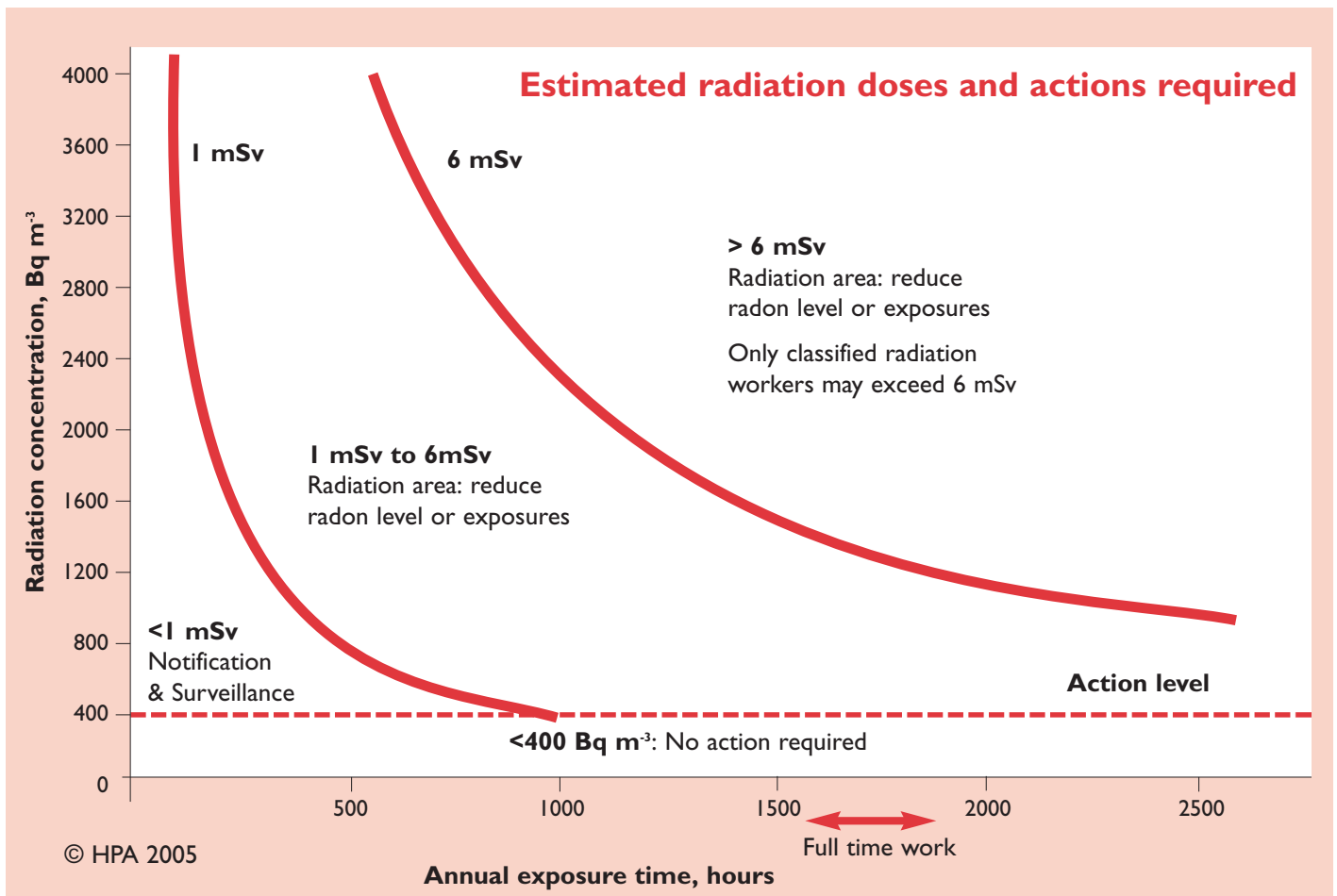
times can be kept low, and that evidence of this is supported by formal records.

Step changes in the level of protection required occur at 1 millisievert (mSv) and 6 mSv. The former is the annual dose limit for members of the public. The latter requires employees to be formally designated as classified workers and subject to the dose and health monitoring arrangements specified in the IRR99. It is illegal for an employee who is not a classified worker to exceed more than 6 mSv in any calendar year.

The graph below provides a guide to the action required at various radon levels and exposure times. The radon

concentration on the vertical axis shows the reported winter maximum value after correcting for seasonal variations. The dose curves, however, are based on assumptions that take into account radon levels being generally lower in the summer to give more realistic estimates.

The graph should only be used as a guide: any employer with a radon level over 400 Bq m⁻³ needs to seek professional advice on the appropriate radon controls, particularly if the annual dose appears likely to exceed several mSv.



Radon myths and legends

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Those working in the radon field find the same myths about radon coming up year after year. Here are a few:

Myth: Radon is only a problem in granite areas

Fact: High radon levels are found on many different rock types around the country, including some limestones and sandstones

Myth: Radon remedial measures cost tens of thousands of pounds

Fact: Effective remedial measures usually cost less than a thousand pounds, comparable with many other household expenditures

Myth: Radon causes leukaemia or other cancers

Fact: There is clear evidence that radon causes lung cancer, but studies of the risks of other cancers have not demonstrated a risk from radon

Myth: I don't need to test my house, because the house next door was tested and had a low radon level

Fact: Radon levels vary greatly from house to house – the only way to find out if there is a problem is to measure the radon level

Myth: Radon levels are high in Cornwall, but the lung cancer rate is low, so radon cannot cause lung cancer

Fact: Most lung cancers are caused by smoking, and smoking rates were low in Cornwall, giving a low rate of lung cancer. But studies of people in Cornwall and Devon have shown that higher radon levels in houses are associated with a higher risk of lung cancer for people living in those houses.

Myth: If you want to build a house in a high radon area, you need to measure the radon concentration in the ground first

Fact: If radon preventive measures are installed when building a house, there is no need to measure radon in the ground first

Myth: High radon levels are only found in Affected Areas

Fact: Although the great majority of houses with radon problems are in radon Affected Areas, radon problems can occur almost anywhere

Myth: Radon concentrations are higher downstairs because it is a heavy gas that sinks down

Fact: Radon is always well-mixed with air, and is carried along with air movements. Concentrations are higher downstairs because that is where the radon enters, mixed with soil air.

Myth: Radon remedial measures require floors to be dug up

Fact: In most cases remedial measures can be installed under the building from outside.

Myth: Houses with high radon levels are blighted

Fact: High radon houses can be remedied, and there is no evidence that radon has caused any housing blight

Myth: Radon is good for you – there are radon spas in other countries

Fact: The evidence from epidemiological studies shows that even radon exposures below the UK Action Level carry a risk of lung cancer

Myth: Radon remedial measures are ugly or noisy

Fact: Properly installed remedial measures are quiet and unobtrusive

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