

# Environmental **Radon** Newsletter

SUMMER 2001

ISSUE 27

## Protective Measures for New Dwellings in Northern Ireland

Gerald Coulter, Northern Ireland Construction Service

A requirement for radon preventive measures in new dwellings has been included in the Northern Ireland Building Regulations since 1994. This requirement covered parts of the south-east of the province, where the highest radon levels are found.

In 1999 NRPB, in association with Environment and Heritage Service of the Department of Environment for Northern Ireland, published *Radon in Dwellings in Northern Ireland: Atlas and 1999 Review\**, giving results of a new survey of radon in dwellings over the whole of Northern Ireland. This showed that the areas affected by radon in Northern Ireland are much more widespread than indicated by earlier surveys, with all counties of Northern Ireland affected by radon to some degree.

This publication triggered proposals to extend the Building Regulations to cover all new dwellings in the radon Affected Areas identified in the survey. The proposals were based on two principles: firstly, that the risk of radon ingress should be dealt with in two risk bands; and secondly that the measures to be installed should be appropriate to the degree of risk.

It was proposed that dwellings in areas with a 1% to 10% risk of radon ingress (Zone 1) should have a radon membrane over the footprint of the dwelling. Those in areas with a greater than 10% risk (Zone 2) should additionally have a sump and stub duct which, should subsequent testing show them to be above the Action Level of 200 becquerels per cubic metre, could have a fan added to provide extraction of radon from the subsoil.

Public consultation was carried out on the proposals, including the question of whether radon protection measures should be incorporated in all new dwellings irrespective of their location. There was a degree of support for

this option, especially from those who felt it would minimise the risk of radon ingress in all new dwellings and make the application of the Building Regulations easier. This option was not, however, adopted.

Finally, when the relevant Northern Ireland Assembly Committee scrutinised the new Building Regulations, it took the view that the application of radon protection measures should perhaps include buildings other than dwellings. At the end of the day it was agreed to proceed with the new Building Regulations as proposed, but to review the radon regulations further in light of the Assembly Committee's comments.

The new Building Regulations were made on 11 December 2000 to come into operation on 1 April 2001. The regulations require radon protection measures in all new dwellings in the radon Affected Areas designated in the report. The requirements are those consulted upon and outlined above.

The technical measures to be incorporated in new dwellings will be given in a new publication

entitled *Radon: guidance on protective measures for new dwellings in Northern Ireland* to be published in March by the Building Research Establishment as BR 413. This document will give details of how to provide a radon membrane in a dwelling located in Zone 1 and additionally how to provide for subsoil ventilation under a dwelling in Zone 2.

\* *Radon in Dwellings in Northern Ireland: Atlas and 1999 Review*. NRPB R308. Copies may be obtained from: Environment and Heritage Service of the Department of Environment for Northern Ireland, 23 Calvert house, Castle Place, Belfast BT1 1FY.



## POINTS OF CONTACT

Building Research Establishment (BRE)  
Garston, Watford, WD2 7JR  
BRE Radon Hot Line:  
Tel: 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,  
Transport and the Regions  
Zone 4-E8, Ashdown House  
123 Victoria Street, London SW1 6DE  
Tel: 020 7890 6266/6265 Fax: 020 7890 6289

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

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

Scottish Executive Development Department  
Housing Division 1  
First Floor East, Victoria Quay  
Edinburgh, EH6 6QQ  
Tel: 0131 244 5575 Fax: 0131 244 5596

Health and Safety Executive  
Health Directorate B6  
Rose Court, 2 Southwark Bridge  
London, SE1 9HF  
Tel: 020 7717 6854 Fax: 020 7717 6717

Northern Radon Liaison Group  
c/o Environmental Health Department  
South Lakeland District Council  
South Lakeland House, Lowther Street  
Kendal, Cumbria, LA9 4UD

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)  
Environmental Health Department,  
Daventry District Council  
Lodge Road, Daventry  
Northamptonshire, NN11 5AF.

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  
Tel: 01932 221212 Fax: 01932 229779

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

# Radon in Drinking Water

David Talbot, British Geological Survey

The British Geological Survey (BGS) has undertaken a number of surveys of radon in drinking water both in the UK and overseas, for example in Jordan and Cyprus. The most recent BGS work in this field was a research project funded by the Department of the Environment, Transport and Regions (DETR) on natural radioactivity in private water supplies derived from groundwater in West Devon\*. The survey involved testing water samples taken both at source and at the tap in over 100 homes.

The presence of radon in water supplies can result in radiation exposure of people in their homes in two ways: by ingestion of the water, or by release of the radon into the air, allowing radon and its decay products to be inhaled. With household drinking water supplies the main route is by ingestion, although inhalation of radon released from water during showering or bathing may also be significant.

Although the behaviour of ingested radon is not fully understood, calculations suggest that the great majority of the radiation dose is delivered to the stomach (see Environmental Radon Newsletter 23).

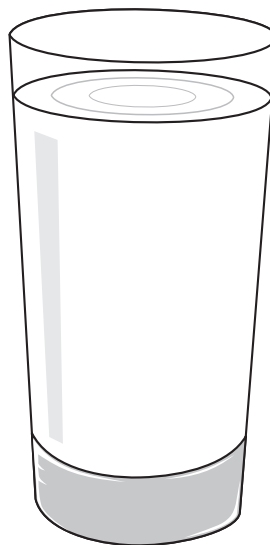
The primary adverse health effects of exposure to radon are caused by cell damage due to alpha particles produced by radon and its associated decay products. Likely effects will depend upon the level of exposure. High levels of exposure to radon and its decay products by inhalation have been shown to lead to an increased risk

of lung cancer. The risks arising from ingestion of radon are thought to include a very small increase in the likelihood of developing various cancers associated with exposure to radioactivity.

The BGS survey in West Devon found elevated levels of radon in some of the private water supplies: approximately 9% of the supplies tested were found to exceed the draft European Union Commission

Recommended Action Level of 1000 becquerels per litre for such supplies.

It is unlikely that the occurrence of radon in drinking water is restricted to West Devon, although levels of radon are only likely to be elevated at properties in which drinking water is derived from private groundwater sources (such as springs, wells, adits and private boreholes).



Major public supplies, even when they come from groundwater sources, are unlikely to carry elevated levels of radon due to losses in the treatment processes. The extent of the potential for elevated levels of radon in drinking water outside of the West Devon area is presently uncertain, although previous data collected from natural springs suggests the problem to be restricted to areas in which radon in indoor air is also a problem.

The report on this study, Natural Radiation in Private Water Supplies in Devon (DETR Reort No: DETR/RAS/00.010) can be seen at: <http://www.environment.detr.gov.uk/radioactivity/research/complete/natrad/index.htm>

# Control of Radon in the Water Industry

Tracy Gooding, National Radiological Protection Board

**R**adon is readily soluble in water, so it can seep out of bedrock into groundwater used for water supply or, to a lesser extent, into reservoirs. Much of this radon will outgas during water processing, so by the time the water finally reaches the tap it generally has a low radon concentration.

There are employees concerned with its supply, however, who will have been exposed to high levels of radon in the air during the course of their work, and the control of their exposures is an important issue for the water industry. Three common problem areas are described below.

## Boreholes

Although the majority of water in the UK is from surface reservoirs, natural underground reservoirs (aquifers) supply a significant proportion for some users, especially in times of drought. To obtain water from an aquifer, a borehole is drilled from the surface so that water can be pumped from underground when required. The pumping gear may be contained within a small building which is infrequently occupied, and consequently closed and unventilated, or in a larger building where people work routinely.

The turbulence during pumping can cause radon dissolved in the water to outgas; radon gas concentrations of more than 1000 Bq m<sup>-3</sup> have been found in these buildings. The Ionising Radiations Regulations 1999 require that the annual doses to employees be assessed if radon concentrations in the air exceed 400 Bq m<sup>-3</sup>.

## Water Treatment Works

There are many stages to water treatment, such as aeration and dissolved air flotation, to remove pollutants. Some of these processes take place within closed chambers or pipes, but others are open to the air, providing a route for any radon which has been released to escape into the works buildings.

## Service Reservoirs

Some water is pumped straight from the treatment works into the distribution network, but most is temporarily stored in service reservoirs. These are engineered chambers of various volumes of either brick or concrete, which have steel and concrete covers to keep the water clean. They are normally on high ground, to enable gravity flow into the mains, or assisted by a small pumping station.

To ensure that the stored water is not contaminated, the service reservoirs need to be cleaned regularly. Small groups of contractors travel to each service reservoir in turn, where the water is pumped out and the interior surface of the chamber cleaned with high powered jets of local groundwater. This may take from several hours to more than a week, depending on the size of the reservoir.

Both the initial pumping of the water and subsequent jet cleaning release radon. Because there is limited ventilation, radon concentrations can build up to high levels in the chamber, and levels over 1000 Bq m<sup>-3</sup> have been found.

The Water Services Association recommends that exposure times in service reservoirs should be restricted, and that forced ventilation should be provided. In addition, radon dosimeters should be used if the work is likely to entail more than a brief inspection visit.

The doses recorded for any one job will usually be low, but the contractors can be serially exposed to many small doses, which may amount to a significant dose over a working year.



# Employee Protection in Buildings with Multiple Stakeholders

*Daryl Dixon, National Radiological Protection Board*

The Ionising Radiations Regulations 1999 (IRR 99) place the responsibility for radiation protection of employees unambiguously on their employer. If there are high levels of radon in a workplace, reducing the exposure of employees may require structural modification of buildings, following a specified schedule to ensure that an appropriate level of protection is provided.

But it is becoming increasingly common for organisations with large property stocks to contract out some aspects of building management, or even transfer responsibility for complete buildings to other organisations. An example of this is transfer of responsibility for operation and maintenance of a local government building to another body under the Public Funding Initiative (PFI). If a Council retains responsibility for the terms and conditions of the employees in a building managed under the PFI, the Council still bears the legal responsibility for their protection under the IRR 99.

Such arrangements for building management can limit an employer's ability to undertake modifications which are required to reduce radon levels. This issue is dealt with by a specific Regulation under the IRR 99 that requires co-operation between employers to ensure that all employees receive the protection to which they are legally entitled. In particular the need to consult or appoint a Radiation Protection Adviser with the criteria of competence specified by the Health and Safety Executive will extend to organisations responsible for building structure.

It would in any case seem reasonable to expect the building manager, where this differs from the occupants' employer, to ensure that the structure provides safe working conditions for employees, just as would be required for other building related hazards such as fire or structural failure. The contractual conditions for management of the building may need to recognise this requirement, and there should be a mechanism for an occupying employer to notify a building manager about issues that require attention under a legal instrument.



Such shared responsibilities may potentially affect a wide range of premises where there are joint facilities, including schools and groups of Council employees offering local services.

A similar position occurs generally for tenanted premises, where the landlord will need to undertake or allow any actions concerning the building structure so that tenants can meet their legal obligations. Employers with staff in all these premises need to ensure that their protection arrangements meet the requirements of IRR 99.

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.