

# Environmental **Radon** Newsletter

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## Radon: How Aware are Construction Professionals?

*Deborah Haley*, Nottingham Trent University

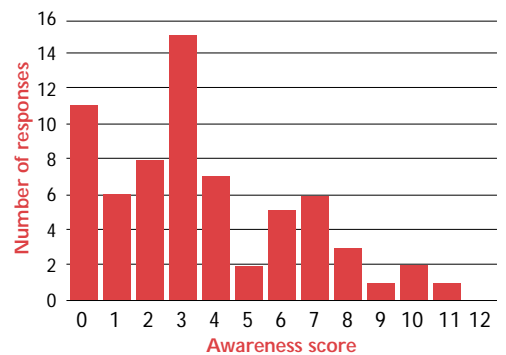
The awareness of radon amongst construction professionals is of particular importance, as they can advise clients in high risk areas, arrange for radon monitoring and advise on the most appropriate type of remedial action for their building, if it is required.

To research this awareness, I devised a questionnaire and sent it to 170 Chartered Quantity Surveyors and Chartered Building Surveyors, 67 of whom returned it. A marking scheme was created to measure their awareness: a total of 17 marks were available, with a score of zero corresponding to no awareness and 17 corresponding to high awareness.

Three key questions were included in the questionnaire:

- 1) Which of the following areas would you consider to be of a high risk with regard to radon levels?
  - Cornwall
  - Derbyshire
  - Devon
  - Somerset
  - Northamptonshire
- 2) What do you think the Action Level is for present homes in England?
  - 150 Bq m<sup>-3</sup>
  - 200 Bq m<sup>-3</sup>
  - 250 Bq m<sup>-3</sup>
- 3) In your opinion how many people die each year in the UK from exposure to radon gas in the home?
  - Zero
  - 1-10
  - 11-100
  - 101-499
  - 500 or more

The mean overall awareness score was found to be 3.6, with 95.5% of respondents scoring between 0 and 9. Respondents who qualified 10



years ago or less had a mean score of 4.6 whereas those who qualified 11 years ago or more had a mean of 3.2, indicating a higher awareness in those who recently qualified.

The results revealed that only 13% were aware of all five high risk areas and 6% aware of four. The best known area was Cornwall with 81% whereas only 33% of respondents identified Northamptonshire as a high risk area.

In addition, 52% of respondents skipped the question about the Action Level. Of those who were confident enough to answer it, 69% got it right at 200 Bq m<sup>-3</sup> (only 33% of all respondents). Only 6% were aware that more than 500 people die each year from exposure to radon in the home.

Although there is clearly a lack of awareness amongst Construction Professionals, 46% believe they are informed of the risks. However, the highest awareness score was just 11 out of 17, with only 6% of respondents scoring 9 or more.

These results clearly indicate a low level of radon awareness amongst Construction Professionals, which needs to be rectified in order to aid the identification and remediation of buildings with high radon levels.

## POINTS OF CONTACT

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# The Problems of Radon in Caving: Education, Education and Science

*Clark Friend*, Department of Geology, Oxford Brookes University

The concept of radon as an underground hazard does not figure very highly in the risk assessments of many people in the caving world. Why is this? Those engaged in caving and related activities (such as mine exploration) can be divided into two groups: those caving as a recreation far outnumber those engaged as professionals. For professionals, caves become workplaces, and before any caving activities are undertaken they must, by law, consider radon in their risk assessments and act appropriately. Those caving as a recreation do so willingly and accept the associated hazards of their chosen sport - which are many.

Some caving risks, such as drowning, are immediately obvious to all, whilst others are intangible, such as Weil's Disease. 'What is that?' many will say - it is a nasty disease spread by rat urine that can get into cave water from farmland drainage. People planning a caving trip generally take note of the risks that are obvious and ignore those that are intangible, largely on the basis that 'it won't happen to me'.

The immediate risks encountered in an underground void depend on three main factors. First, the ability level of the individuals in a party: poor climbing skills or poor use of technical equipment can lead directly to a dangerous situation. Second, the hazards of the void itself: rockfalls, for instance, sometimes take little to trigger them. Third, the cave or mine environment: flooding or bad air can put a party in jeopardy. When planning a trip, a prudent leader will give consideration to water levels in streamways and the current weather, and will also attempt to understand something about the skills of the persons in the party. It is highly unlikely that Weil's disease or radon will be even mentioned when talking to the party.

Radon comes firmly in the 'intangible' category of risks and is ignored by the majority, for various reasons. First, they do not know of any caver who has died from a radon-related illness, and the National Caving Association\* (NCA) is not aware of any data that suggests there is a high death rate from radon-induced lung cancer among retired cavers - they have normally died of other causes!

Second, it is very difficult for individuals to obtain information about radon concentrations in any particular cave. There is no national database and there are very few caves that have had any radon measurements. Of all the parts of Britain that have caves, Derbyshire has the best radon data, largely through the exemplary efforts of the County Council in support of its outdoor centres.

Third, one of the major activities of some cavers is digging out choked passages. This generally tends to be done in still, airless conditions and so radon levels could build up. But these activities are not always planned, so it is difficult to assess the risks.



**Digging activities in a new passage in Ogof y Dynion, Penwyllt, South Wales.**

Photo courtesy of C. Grimmitt.

This does not mean that the caving world is complacent about radon. The NCA has long recognised radon exposure as one of the potential underground hazards. To this end the NCA, with the help of National Radiological Protection Board (NRPB) and the Health and Safety Executive, produced an advisory booklet *Radon Underground* in 1996 and keeps its members updated on the nature and extent of the risks. Also the NCA administers training courses for nationally validated qualifications covering professional activities. Radon awareness and compliance with the law forms a part of these courses.

Even when radon data are available, interpreting them is not always easy. Caves with only one entrance, and therefore a relatively restricted airflow, are the most straightforward. Deeper areas of these caves are likely to be still and to permit a build up of radon. In more complex cave systems, with multiple entrances at different levels, understanding how airflow affects radon is a major scientific problem. For example, in South Wales the major cave system Ogof Ffynnon Ddu, part of a National Nature Reserve and designated a Site of Special Scientific Interest in its own right, has passages totalling over 80 kilometres. There are at least five entrances at different altitudes and the resulting airflow is very complicated. It is immediately apparent that getting a full understanding of radon throughout this cave system would be impossible.

Useful data can nevertheless be obtained. The Countryside Council for Wales, with the help of NRPB and the South Wales Caving Club, carried out a winter and summer investigation of radon concentrations in parts of the Ogof Ffynnon Ddu system. Fifty etched track detectors were installed in the system for a month in December 1998 and again in August 1999 (see table). The extremely high concentrations approaching 20,000 Bq m<sup>-3</sup> which were reported in a previous study

were not observed. But the data showed that the airflow directions at the entrances were not always as predicted.

Air appears to be emerging from the lowest entrance of the system almost continuously, as expected. At the higher entrances, against the predictions, air enters in winter and in summer air exits or is variable in direction. Internally, there are sites that in winter have very low radon concentrations that can only be explained by the ingress of fresh air. These low concentrations are not found in the summer results, again indicating that ingress of fresh air to some parts of the system is very variable.

Despite these variations, mean concentrations can be derived which allow radon exposures to be estimated. Using the maximum mean concentration obtained, 3094 Bq m<sup>-3</sup>, and converting to radiation dose, a 10 hour underground trip in the Ogof Ffynnon Ddu system yields a calculated dose of 0.12 mSv. Given that the recommended limit for a member of the public is 1 mSv, this dose would be reached after about 80 hours of caving in the system. It would seem that the way forward is to collect this type of data where possible and to use cave or mine system means to get some form of 'average' dose to use in a risk assessment. As more data become available, the model used can be progressively changed.

The recent changes to the Ionising Radiations Regulations mean that caving activities have to be reassessed. In many individual cases though, it will not be a matter of re-education, but education for the first time. The NCA is working on this problem through its Radon Working Party and disseminating information through its publications and the Regional Councils.

Radon concentrations in traverses (1) and (2) in Ogof Ffynnon Ddu				
Traverse	December		August	
	(1)	(2)	(1)	(2)
Sampling points	21	14	19	27
Mean, Bq m <sup>-3</sup>	1946	2876	3094	2667
Minimum, Bq m <sup>-3</sup>	210	1120	2500	1370
Maximum, Bq m <sup>-3</sup>	3780	3800	3510	3670

\* The nationally recognised governing body of caving and mine exploration. The NCA is constituted from Regional Caving Councils and specialist groups such as the British Cave Research Association (BCRA) and Pengelly Trust.

*Radon Underground*. 24 pages. £3.00, National Caving Association. 1996. Available from NCA at <http://web.ukonline.co.uk/nca/order.htm>

# Reports of Radon Potential

*Simon Wood*, National Radiological Protection Board

There is a widespread myth that high radon levels only occur in granite areas, leading to comments such as, "Radon is a problem associated with granite, we're on limestone", or "Derbyshire doesn't have any radon, that's just found in South West England". These statements are untrue. For example, levels of over five times the radon Action Level have been found in Derbyshire. However, these are typical of opinions voiced by professionals involved in house transactions.

This sort of confusion has led solicitors, home-owners and others to call for a simple definitive report stating whether a property is situated in a radon Affected Area, and if so, what is the probability of there being a radon problem.

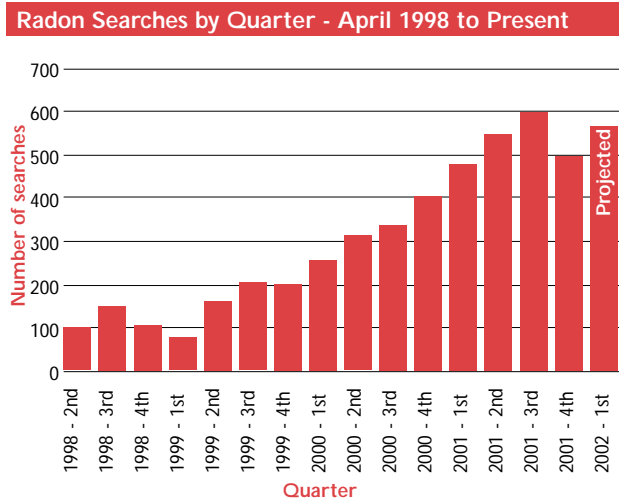
Because of the extensive mapping carried out for England and Wales based upon radon tests within these countries, the National Radiological Protection Board (NRPB) is able to offer such a report.

Reports of radon potential, or 'radon searches', have been carried out by NRPB since April 1998. Published information about Radon Affected Areas in England and Wales was available prior to this date, in the form of NRPB reports R291, R293 and R303, but the need for definitive advice in report form soon became apparent.

Time constraints, the risk of confusion, and the requirement of detailed property information such as Land Registry plans meant that it was not possible to simply offer such expertise over the telephone. The Report of Radon Potential was created in order to address the need for expert opinion, while also ensuring that this opinion was factually based and expertly checked.

The Search itself is a report, based upon the grid reference of the property (either supplied by the enquirer or derived from site plans or the postcode). The grid reference locates the property within an individual 5 km grid square, each of which falls within one of five different bands of radon potential.

Each band is classified according to the probability of having levels of radon greater than the recommended Action Level of 200 Bq m<sup>-3</sup>. These bands range from non-Affected Areas (<1%) to those where over 30% of homes exceed the Action Level.



Additional information about test results by local government region and postcode division is also provided, together with a copy of the Department of the Environment, Food and Rural Affairs' *'Radon Guide for Home-buyers and Sellers'*.

Solicitors request the vast majority (roughly 90%) of reports, with homeowners, architects, and construction engineers making up the bulk of the rest. As roughly 80% of searches are for properties within radon Affected Areas, the inference is that the majority of requests come from those who have strong suspicions that a property falls within a such an area.

Searches are particularly useful for existing properties, while those who require information about building regulations in relation to new construction or conversions are advised to consult the Building Research Establishment.

Searches have proved to be a popular service of the NRPB (see figure) The number of Searches carried out per month has risen steadily since their introduction to a current total of over 200 per month.

This rise has come about without the benefit of advertising, due to the many repeat customers and the rising profile of radon as an important factor in the home buying process. Assuming the housing market remains buoyant, this need for definitive advice will continue to increase.

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.