

Environmental **Radon** Newsletter

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Radon on a Shoestring

TECHNICAL TIPS

How *not* to reduce radon levels

It seems logical to reduce radon levels by increasing ventilation: let the fresh air carry away the pollution. Unfortunately, it doesn't usually work. Because radon is drawn in from the ground by warm air rising indoors, only ventilation at ground floor level will help.

It's no good reducing radon levels when they are already low, as they usually are on a sunny day. To make a real difference, you need to increase ventilation at night in the middle of winter. Because of security and draughts, no-one would advise leaving ground floor windows ajar at night, especially in cold weather. Fitting uncloseable trickle vents to downstairs windows is another possibility, though radon measurements show that this is not very reliable. Perhaps people find ways to close their 'uncloseable' vents when it gets cold.

Somerset seminars for builders

Local authorities in Somerset held two seminars for builders in 1995 to explain the principles and practice of radon remediation. The seminars attracted about 100 attendees, and will be followed up by two or three more in 1996. They are part of a coordinated programme organised by the Somerset Radon Campaign Steering Group (see address overleaf), which meets twice a year. The Steering Group contributed to the recent publicity campaign in the county, linking radon with an initiative to discourage smoking. The campaign obtained a response of 30% of those targeted, a high rate for such a campaign.

Stephen Young, Principal EHO, and Cathryn Humphries, EHO, Bath City Council



The Roman baths

In 1992 radon levels above the recommended threshold for workplaces were found in some of the Council's own premises in the centre of Bath. After dealing with the immediate need for remedial action, a longer term problem had to be confronted. How prevalent was radon in the district and how were Members of the Council to be persuaded to provide funding to find out? This article explains how a preliminary screening survey was organised despite limited finances.

Background

The 1987 IEHO Radon Survey gave no results in Bath above the Action Level for houses (400 Bq m^{-3} at the time, since reduced to 200 Bq m^{-3}). However, in 1991 high radon levels were found in the Roman baths in the centre of the city. Bath is one of the most densely populated non-metropolitan districts in England and the need for further testing could not be ignored. The Environmental Health Section, as protector of public health, felt duty bound to carry out a screening survey of the entire authority. However, as a budget of only £4000 was granted by Committee, cost effectiveness was paramount.

Preliminary survey

The implementation of a survey of the entire authority area presented a number of practical problems. In particular, house measurements paid for by Department of

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Radon on a Shoestring

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Environment are confidential to the householder, so the survey had to be organised and paid for by Bath City Council. The city's unique characteristic of having a large investment estate of freehold properties proved to be invaluable. The estate has properties scattered throughout the authority area and this, together with public sector housing, provided a means to sample most of the area, although it was recognised that this would not constitute a statistically valid survey.

The decision was taken to involve colleagues from the Housing and Engineering Departments as liaison with these departments was necessary in any event. It was agreed with managers that the detectors could be placed during routine visits to houses. This meant that the monetary and human resource costs of the survey could be minimised.

The officers were briefed by an independent expert on where and how to place the detectors. A total of 200 track etch detectors were purchased for £4000 including analysis. The detectors were placed in January 1995 so that results could be obtained for a three month period during the winter. From 150 detectors eventually issued, 137 results were obtained. Despite

reminders some officers failed to collect the detectors after three months. In this respect the briefing failed to convey the importance of the survey to these officers. In addition, some of the detectors were wrongly placed despite strict instructions. It was disappointing that despite our efforts a complete return was not achieved. However, enough detectors were returned to provide meaningful results and allow identification of several locations of concern.

Conclusion

The survey was completed at a cost of £4200 to the Environmental Health Section. The relatively minor overspend of £200 was funded from within existing budgets. The exercise has served to demonstrate, if only in general terms, the incidence of radon problems throughout the authority. Most importantly its findings can be used to justify the allocation of further funding. This will enable a statistically valid survey to be implemented which can concentrate upon those locations where elevated radon levels were discovered.

The opinions expressed in this article are those of the authors and do not necessarily reflect those of Bath City Council.

Radon Council

In 1990 the Parliamentary Select Committee on Indoor Pollution called for an industry-led approach to the radon problem. In response the Radon Council was formed as a non profit making, self-regulatory body for the radon industry. Members and observers of the Council include industry, local authorities, universities and official organisations such as the Building Research Establishment, the Health and Safety Executive, the National Radiological Protection Board, the Ministry of Defence, the Royal

Institute of British Architects, the Royal Institute of Chartered Surveyors and the Royal Society of Health.

The Radon Council has published a code of practice for the industry and two editions of *The Radon Manual*, which addresses the training needs of local government, industry, and education. A list of approved contractors is also published. The address of the Council is given in Points of Contact.

Radon Remedies for Suspended Timber Floors

Paul Welsh, Building Research Establishment

Over the past 10 years the Building Research Establishment (BRE) has been testing different methods used to reduce indoor radon concentrations in existing homes. Recent research has led to the publication of a BRE report on remedies for suspended timber floors*

A typical suspended timber floor is shown in Figure 1. The depth of the underfloor space can vary from only a few centimetres to more than one metre, and the soil may either be exposed or covered by a layer of concrete or polyethylene. In affected homes, radon usually travels from the soil into the underfloor space, from where it can move up into the living areas. The aim of most remedies is to prevent this flow and so reduce the quantity of radon entering the house.

The simplest and often cheapest remedy is to increase the level of natural underfloor ventilation through the use of airbricks (see Figure 1). Sometimes this involves only unblocking existing vents (by moving away soil or plants for example) but more often requires the installation of new vents. This method usually reduces indoor radon levels by about 50%. Apart from the radon problem, it is important to ensure the underfloor space has adequate ventilation to control moisture levels in the floor timbers and prevent them from rotting.

If the original level of natural ventilation appears sufficient, or increasing it does not produce the reduction required, there are three main options available. These are the sump, mechanical underfloor ventilation and positive ventilation.

If the soil is covered with a layer of concrete or polyethylene a sump system can be used in the same way as for a solid concrete floor (Environmental Radon Newsletter 1). This type of system is the most effective of all techniques. A sump will not be as effective if the soil is exposed. Although steps can be taken to cover it this often proves costly and disruptive.

Mechanical underfloor ventilation provides an alternative to the sump for homes where the soil is exposed. This method uses an electric fan to ventilate the underfloor space (see Figure 2). The fan may be installed so

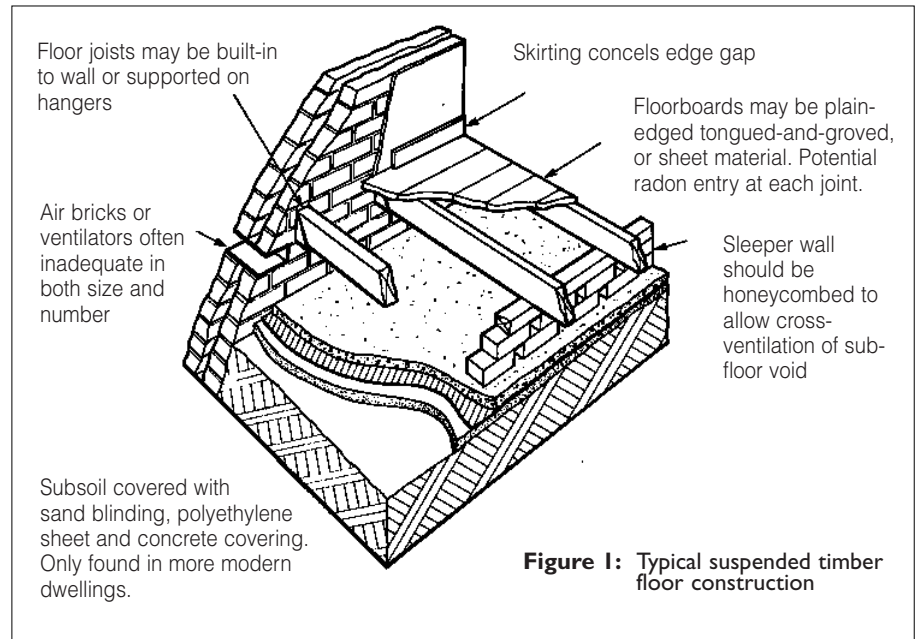


Figure 1: Typical suspended timber floor construction

that it blows air into the underfloor space or extracts air from it. This technique produces larger reductions than natural ventilation, typically 60%, but up to 90% in some houses with high radon levels.

The third possibility, positive ventilation (Environmental Radon Newsletter 2) can be used in all homes, regardless of construction method. A typical reduction for this method is about 60%.

Finally, it is of paramount importance to ensure that a remedy does not raise the moisture content of any floor timbers. For this reason covering the floor with an impermeable material is not recommended. Large gaps such as those where services pass through the floor can be sealed, but usually any radon reduction from such action will be small.

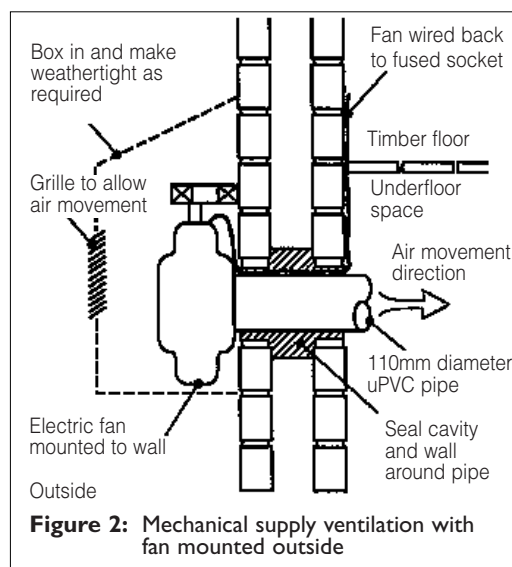


Figure 2: Mechanical supply ventilation with fan mounted outside

*Protecting dwellings with suspended timber floors: a BRE guide to radon remedial measures. Report number BR270. Available from the BRE Bookshop, address in Points of Contact.

Swedish Radon Programme

Gun Astri Swedjemark, Swedish Radiation Protection Institute (SSI), Stockholm

Sweden has a substantial radon problem because of unfavourable geology. The radon programme started in 1979 when the Swedish Radon Commission was formed, and has been pursued determinedly with a programme of measurements and mitigations, partly financially supported by the authorities.

Measurement protocols

There are two separate measurement protocols - one for legal purposes and one recommendation for short-term advisory measurements such as when buying and selling houses. For legal purposes, integrated measurements over at least two months during the heating season are required. Measurement companies may be accredited, but this is voluntary. The authorities are now discussing the certification of radon measurement consultants.

Dwellings

Local authorities and private individuals pay for radon measurements. Consequently there are no centrally held statistics on the number of dwellings and workplaces measured and these data must periodically be requested by SSI. The last such request was for the period up to 1992, when 151,600 dwellings and workplaces had been measured. Combined with measurements by others, radon levels for about 240,000 buildings were known by 1992. Since then, a further 50,000 – 100,000 dwellings and workplaces have been measured. In 1992 some 15,000 dwellings had been mitigated, about half of those found to be above 400 Bq m⁻³. A further 10,000 dwellings are estimated to have been mitigated since then.

Workplaces

Systematic surveys of above-ground workplaces have been started. Schools and nurseries have already been investigated and generally mitigated where necessary. Few other workplaces above ground have been mitigated yet.



Gun Astri Swedjemark

New buildings

The average radon level in dwellings built since 1981 is half of that in older dwellings. This is because construction methods have improved and because concrete made from radium-rich alum shale was banned in 1975.

Water

Recently there has been great interest in radon levels in drinking water. In 1984 it was recommended that reduction of radon levels should be considered

when the concentrations were above 100 kBq m⁻³. Radon levels above 1000 kBq m⁻³ are positively recommended for reduction. About 10,000 private wells are estimated to have radon concentrations exceeding 1000 kBq m⁻³. Some public water plants also have high concentrations.

New Strategy

SSI has recently recommended an updated strategy to reduce radon concentrations indoors based on a risk estimate of 300 – 1500 lung cancer cases a year in a population of 8.5 million. The aim is to decrease the average radon concentration in the Swedish housing stock to 50 Bq m⁻³, half the current average, as soon as possible. Most of the recommendations from SSI have been adopted by the government. A radon publicity campaign started in 1995, with articles in the press and new information leaflets.

The measures adopted include two levels: a recommendation and a legal limit. The recommended maximum radon gas level in existing dwellings and workplaces is 200 Bq m⁻³, and the limit is 400 Bq m⁻³. The limit for radon in new buildings is 200 Bq m⁻³. When the radon concentration is above 400 Bq m⁻³ the owners of single-family houses can receive a grant for half of the cost of remediation up to SEK 15,000 (about £1500).

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