Environmental Radon Newsletter

SPRING 2000 ISSUE 22

Protection of New Dwellings from Radon

A revised version of Radon: Guidance on Protective Measures for New Dwellings (BR 211) was published by the Building Research Establishment in November 1999*. The guidance defines the geographical areas where radon protection is necessary and gives details of measures that should be incorporated in new buildings in these areas.

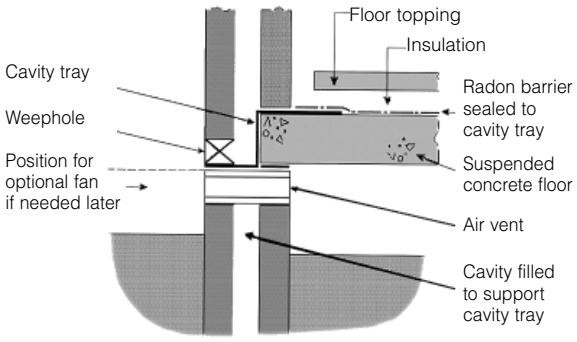
Defining the areas

BR 211 includes two sets of 5 km grid square maps, one produced by the National Radiological Protection Board (NRPB) and another by the British Geological Survey (BGS). Both sets of maps are based on a statistical analysis of the results of radon measurements in houses: the NRPB maps use radon data grouped by 5 km grid squares, and the BGS maps show 5 km grid squares which include geological units found to underlie high radon houses. The guidance explains how the two sets of maps should be used to determine the level of protection needed.

The areas of Cornwall, Devon, Somerset, Northamptonshire and Derbyshire in which radon protective measures are required are updated in the new guidance, which also identifies new areas where protection will be needed. These are parts of the Yorkshire Dales; parts of Wales and the Welsh Border; North Oxfordshire; parts of the Midlands adjacent to the previously delineated areas in Derbyshire; Northamptonshire; parts of Gloucestershire, the Lake District and Northumberland. There are also a few scattered areas in south-east England where these measures need to be applied.

Protective measures

The new guidance brings together the best practice for protecting new homes against radon. Two levels of protection are laid down: a basic level for dwellings in areas where it is estimated that 3-10% of homes will be above the Action Level for radon, and full protection for areas where it is estimated that >10% will be affected. Although the two-level scheme is similar to the scheme previously in operation, the measures required at each level have changed.



Protective measures for a suspended concrete floor

Basic protection involves modifying the design and installation of the damp-proof membrane in the floor, and linking it to a cavity tray in the wall close to the ground. This will require that any penetrations of the membrane necessary to allow mains services to pass through it are effectively sealed. This membrane will form the first line of defence against radon ingress, and also has an incidental benefit of providing a degree of protection from other gaseous contaminants that may be in the ground.

Full protection requires, in addition to the basic measures, installation of means of ventilating air from underneath the floor. If the floor is suspended concrete, airbricks under the floor will provide this ventilation. If the floor is of ground-supported concrete, a radon sump should be provided, which would allow air to be extracted from under the floor if it is later found to be necessary.

A press release on the revised guidance, dated 11 November 1999 can be seen at:

http://pipe.ccta.gov.uk/coi/coipress.nsf

*BR 211: Radon: guidance on protective measures for new dwellings (1999 edition, ISBN 1 86081 328 3, price £26). Copies are available from CRC Ltd., 151 Rosebery Avenue, London, EC1R 4GB.

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: 0171 890 6266/6265 Fax: 0171 890 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: 0171 717 6854 Fax: 0171 717 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)
c/o Environmental Services Department,
Kettering Borough Council
Bowling Green Road, Kettering
Northamptonshire, NN15 7QX.

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, TA1 1HE

A History of Radon

10,000 BC Prehistoric artists in the Altamira caves are exposed to 4,000 Bq m^{-3}, contravening European Union Basic Safety Standards

1556 Agricola recognises that a gas in central European silver mines is causing miners' lungs to rot away - some women have had seven husbands who die of this

1879 A study of miners in the Ore Mountains shows that the lung disease killing miners is cancer, and in some mines it kills 75% of the miners

1900 Dorn discovers 'radium emanation', later called radon-222

1908 Ramsay and Gray isolate the element and study its physical properties

1910 Inhalation of radon is introduced as treatment for rheumatism and gout

1923 The element is named radon (it comes from radium, and is one of the 'noble' gases like neon, argon and xenon)

1940 Rajewski suggests that radon is the cause of high lung cancer rates in some German mines, including one known as the 'death mine'

1951 Bale recognises that it is radon decay products, not radon gas, that give high radiation doses to the lungs

1956 High radon levels are found in some Swedish homes, but are thought to be a local problem caused by particular building materials

1981 High radon levels are found in some UK homes - large scale surveys are started

1983 Research shows that the main source of indoor radon is air in the ground, drawn into buildings by underpressure indoors

1984 US nuclear worker Stanley Watras sets off radiation alarms because he is covered in radioactivity from the high radon level in his home

1986 World Health Organisation recommends action to reduce high radon concentrations in homes

1987 UK Action Level of 400 Bq m^{-3} is introduced, Building Regulations are changed for parts of southwest England to reduce radon levels in new houses

1988 BEIR-IV report shows that the lung cancer risks from radon are higher than previously thought

1990 UK Action Level is reduced to 200 Bq m^{-3}, Cornwall and Devon are mapped

1990-1999 400,000 UK homes are measured, rest of UK is mapped, Building Regulations are updated

1998 ICRF study of lung cancer in Cornwall and Devon gives radon risk estimates similar to those from the miner studies

1999 Radon preventive measures for new houses revised and updated for high radon areas in the UK

Properties of Radon

- Produced by radium (which comes ultimately from uranium)
- Atomic number 86
  Atomic weight 222
- Colourless, odourless gas
- Noble gas (chemically unreactive)
- Half-life 3.82 days
- Emits alpha particles
- Units: bequerels per cubic metre of air - Bq m^{-3}
- Very dilute in normal air - carried around by air movement
- Decays to short-lived decay products, also alpha emitters
- Absorbed by fats, oils and charcoal

Sparklets bulbs for injecting radon into carbonated water

One Hundred Years of Radon

Jon Miles, National Radiological Protection Board

It was in 1900 that Friedrich Ernst Dorn discovered that radium, apart from being highly radioactive, emanated a gas which was radioactive itself. At first this was a laboratory curiosity, but it was not long before this 'radium emanation' (later known as radon-222) was found to be present naturally in air.

In the early years of the century, radioactivity was new and exciting, and the dangers of it were not understood. Doctors experimented by attempting to treat all kinds of illnesses with radium, radon and other radioactive materials. Some of these experiments went disastrously wrong, but faith in the health-giving powers of radiation took a long time to fade.

Early on, it was reported that the springs around the silver mines of Jachmov (now in the Czech republic) had a therapeutic effect, particularly on rheumatism. It was found that the springs contained radium and radon, and the world's first radioactive spa was built around them. The spa continues in use to this day.

But it had been known for centuries that the miners in these mines died young, their lungs 'rotting away'. Late in the 19th century the miners' disease was recognised as lung cancer, and early in the 20th century it was found that the mines with the high death rates were the ones with high radon levels.

Epidemiological studies of miners in many countries confirmed the relationship between radon and lung cancer, and over the next few decades restrictions on the exposure of miners to radon were brought in around the world.

It is only over the past 20 years or so that it has been realised that buildings above ground could also build up high radon concentrations, by sucking air out of the ground. Epidemiological studies have shown the risk of exposure to radon in the home is similar to the risk of exposure in mines, and measures to limit exposures in homes and above-ground workplaces have followed.

Radon Information for House Sales

Daryl Dixon, National Radiological Protection Board

As awareness of radon has became more widespread, NRPB has received an increasing number of enquiries about whether specific properties are in radon Affected Areas. The increase has also been fuelled by the professional responsibilities of solicitors and surveyors: for instance, the Royal Institution of Chartered Surveyors (RICS) has advised its members that radon should be mentioned in valuation or pre-purchase reports for all houses in radon Affected Areas.

Although the Affected Areas are outlined in the Radon Atlases published by NRPB, some companies and people require an authoritative statement in writing. In response to this demand, a search service was launched in April 1998 that provides a single page report with a definitive statement about whether a house is in a radon Affected Area.

To date, over 800 searches have been conducted for houses in many parts of the country. Searches were requested by solicitors, chartered surveyors, members of the public and Local Authorities. About a third of the search requests received were for properties not in Affected Areas, which was undoubtedly welcome news, both for the purchaser and the vendor.

The table lists the postcode areas with the largest numbers of requests. The radon Affected Areas which were identified first (the southwest, Northamptonshire and Derbyshire) are well represented, but significant numbers have also been received from areas such as Lincolnshire, Gloucestershire and Oxfordshire.

If no measurement of radon has been made in a house that is for sale, and the house is found to be in an area with significant radon problems, a 'radon bond' may be arranged. If it turns out after the sale of the house that there is a high radon level, the bond allows the purchaser to install remedial measures at the expense of the vendor (see *Environmental Radon Newsletter 15*).

Numbers of requests for radon searches

Postcode area	Number of requests
Northampton	76
Plymouth	62
Truro	55
Lincoln	36
Sheffield	32
Llandudno	29
Exeter	28
Gloucester	28
Leicester	28
Oxford	27
Bath	24
Derby	24

A radon bond is an unwelcome complication for a house vendor. The question therefore arises as to how vendors' interests can best be served during the sale process. If a search shows that a house is not in a radon Affected Area, there is no problem. But all unmeasured properties in radon Affected Areas will be suspect, and a radon bond could be requested.

One way out of this difficulty is to have a radon measurement carried out before the property is put on the market. Since the great majority of houses in radon Affected Areas are below the Action Level, a vendor is very likely to gain the reassurance of a low result from a radon measurement arranged prior to purchase. Some professionals are now advising clients about the benefits of a measurement before sale. Because radon measurements usually take three months to carry out (and another month to get the result), vendors need to plan well in advance.

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.