Environmental Radon Newsletter

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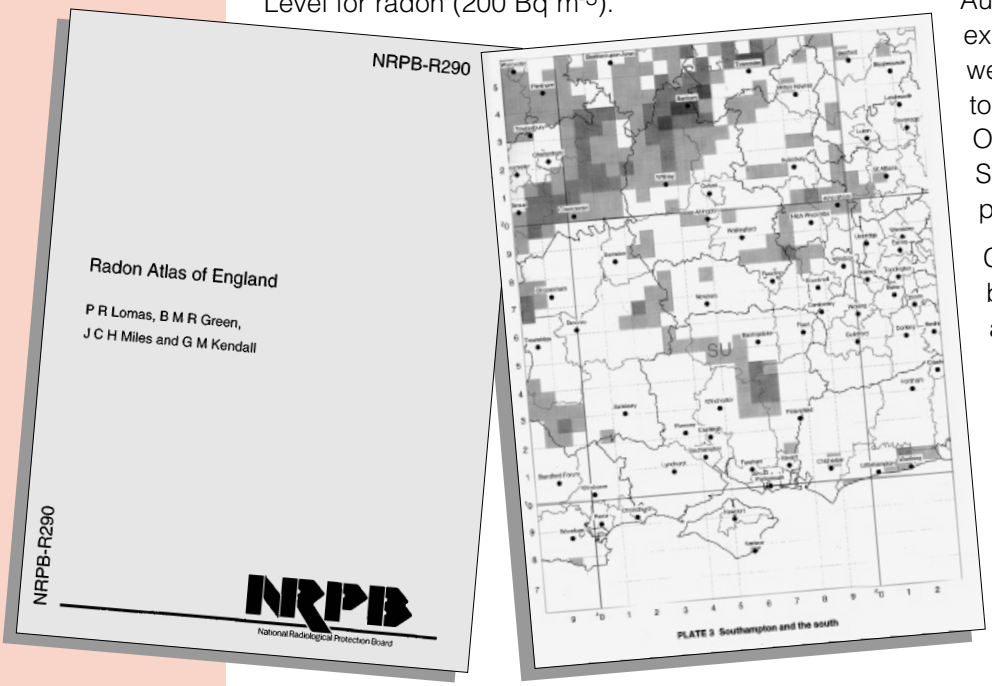
New Liaison Group

A new Local Authority/Department of Environment (DoE) radon liaison group held its first meeting on 18 July 1996. It has a membership drawn from the existing regional Local Authority radon groups, covering both environmental health and building control interests. There are also representatives from the Association of District Councils and the Association of County Councils and DoE. Representatives from the National Radiological Protection Board, the Health and Safety Executive and the Building Research Establishment will attend as appropriate.

Local Authorities in radon Affected Areas which are not currently members of regional radon groups are being encouraged to join one of the existing groups or, if there isn't one conveniently near, to establish a new group.

Radon Atlas of England

The National Radiological Protection Board published a new map of radon in England in April 1996. The map was based on radon measurements in nearly 250,000 houses, mostly funded by the Department of the Environment. The information shown in the map is the estimated proportion of homes above the UK Action Level for radon (200 Bq m^{-3}).



Local Authorities and others have shown a great deal of interest in this map, but have had difficulty in making out from the map exactly how it applies to their areas. To overcome this difficulty, NRPB has now published the same information in an atlas containing ten A4 size colour maps to cover England (a scale of about 1:1,000,000). Local Authority boundaries at district level, as existed prior to April 1996, are shown as well as the county boundaries. Major town names and the 10 km lines of the Ordinance Survey grid are included. Summary data by county are also provided.

Courtesy copies of the Atlas have been sent to county and district authorities and to health authorities in England. Further copies are available from: Radon Survey, National Radiological Protection Board, Chilton, Didcot, Oxon, OX11 0RQ, at a cost of £10 each.

NRPB-R290 Radon Atlas of England by P R Lomas, B M R Green, J C H Miles and G M Kendall.

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Radon in Water: Another Hazard?

Gerry Kendall, National Radiological Protection Board

Breathing air with high levels of radon causes lung cancer. An Action Level for radon in room air has been set at 200 Bq m^{-3}. However, radon is soluble in water and another hazard might, in principle, arise from elevated levels of radon in drinking water.

Radon in water could present a hazard in two ways. The radon can de-gas from the water giving rise to the familiar exposure by inhalation. A given concentration of radon in tap water typically gives rise to a concentration of radon in room air about ten thousand times lower. This means that to give rise to radon in room air at the UK average value of 20 Bq m^{-3} the concentration of radon in water would need to be about 200 Bq l^{-1}. This is much larger than the levels of radon normally encountered in water, and radon in water does not normally contribute significantly to radon in indoor air.

The second potential hazard arises if the water is drunk before the radon de-gasses. Radon can then give rise to doses to the gastrointestinal tract and to other body organs. Ingesting water with 100 Bq l^{-1} of radon leads to an effective dose broadly comparable with that arising from inhaling radon at the UK average radon concentration of 20 Bq m^{-3}. It should, however, be remembered that much of the radon in the water supply to a house will be lost before the water is drunk. In particular, if the water is boiled to make hot drinks virtually all the radon is lost.

For some years there has been an informal but widely known guideline of 100 Bq l^{-1} for radon in UK drinking water. Above this level, a more specific radiological investigation should be undertaken and, if necessary, some form of remedial action should be considered. In fact, most UK public water supplies are far below this guideline. Some other countries have much higher levels of radon in drinking water than does the UK.

Two-thirds of the UK public water supply comes from reservoirs or rivers where radon levels are likely to be of the order of 1 Bq l^{-1}. Groundwater can contain a few tens of becquerels per litre and in isolated cases water supplies have been aerated before being supplied to the public so as to remove radon and other gases.

Radon concentrations above 100 Bq l^{-1} have been found in some private water supplies, particularly in southwest England. This is because the same factors which lead to high radon levels in water will often also give rise to high concentrations in room air. Where high radon levels are found in room air and a house has a private water supply, it is worth considering measurements of radon in the water.

Measuring of radon in water

Action on Radon in Derbyshire Dales

Peter Lilley, Building Control Officer, Derbyshire Dales

Following the mailing of a Radon Awareness leaflet to 3,600 council homes by Derbyshire Dales District Council in 1991, 1,100 tenants requested a free survey. Some forty properties were found to be above the Action Level, with radon concentrations up to 770 Bq m^{-3}.

The Council undertook to carry out remedial works to all these homes, and set up a pilot scheme to remedy a block of four flats with initial radon levels of 750 Bq m^{-3} on the ground floor and 250 Bq m^{-3} at first floor level. This pilot scheme was also used as an exercise to assess:

- The method of removing radon
- The ease of installation
- The least amount of inconvenience to occupants
- The least amount of disturbance to the property

The flats were built in the early 1970s using traditional block and brick, with in situ concrete floors and varying amounts of stone fill over a site sloping about 500 mm. The ground-floor tenants had young children and were extremely concerned about the radon, but adamant that the inside of the property should be undisturbed.

A sub-floor extraction system was designed with a vent pipe taken up in line with the separating wall between flats. The contractor had to break in under the slab where the extract pipe was to be installed and was concerned about movement of the fill below the floor slab.

To limit this problem it was decided that the extract pipe under the floor slab would be one metre long, with its open end protected by stainless steel mesh. Once the pipe was in place the remainder of the hole under the slab was filled with pea gravel. The pipe was laid to slope away from the extractor towards the floor slab.

The layout of the property required two separate pipes being laid and connected into a common pipe outside the building which was then taken to the external extract fan. This fan was housed in a brick vandal proof cabinet, with a space between the cabinet and the wall. The pipe was extended above eaves level and fixed with buffers to eliminate any vibration and noise transference back to the property.

A 70-watt centrifugal duct fan was used with electricity costs estimated at £39 a year including Economy 7. Once the work had been completed, passive detectors from NRPB were again used for a 3 month period. These showed that the remedy had been very successful, with radon levels in the flats reduced to 18 Bq m^{-3} on the ground floor and 10 Bq m^{-3} on the first floor.

The Council then turned to remedying the remaining houses. The tenants main fears were the costs of running the system and disturbance whilst the work was in progress. It was possible to partially dispel their fears by discussing the results and costs of the pilot scheme.

The same system was used for most of the rest of the properties, but a separate fan was installed for each ground floor flat resulting in smaller fans and fan housings. They were also provided with off switches in the flat and with an isolation switch in the fan housing allowing maintenance without the need to enter the property.

Some of the houses requiring remediation had timber ground floors and these required a different remedy. A passive system was used. The existing air vents passing through the perimeter walls into the underfloor void were relined to eliminate possible leakage into the walls construction. Additional vents were installed with sealed sleeves between inner and outer surfaces of the wall.

The timber floors were overlaid with plywood and these were glued and screwed to the existing ground floor floorboards. Mastic sealing was carried out around all room edges. A carpet fitter was present to take up and relay carpets as the work progressed.

The costs of the remedies varied, being about £1,200 for a mechanical extract system under a solid floor and about £800 for a increased natural ventilation system under suspended floors.

All the properties were re-tested to establish the new radon level. The reduction in levels was very effective, with 83% of the homes now below 100 Bq m^{-3} and 17% below 20 Bq m^{-3}. The highest level after the radon remedial works was 130 Bq m^{-3}, well below the Action Level.

Surveys throughout the UK

Martyn Green, National Radiological Protection Board

The attention given to radon matters in England this summer has tended to overshadow the continuing programmes of work being carried out in other parts of the United Kingdom. These are mainly undertaken by NRPB on behalf of Government Departments, but also some Local Authorities, other organisations and individual householders.

Affected Areas were declared in Scotland and Northern Ireland in 1993 and in Wales in 1996. In all three countries, work is now in progress to produce radon maps within the next year or so. The objective of the maps is to indicate any further areas, in addition to the Affected Areas already identified, with a significant proportion of homes with elevated radon levels.

In addition, schemes are in place to respond to requests for information about radon from organisations and individual members of the public and to undertake measurements on behalf of householders, landlords and councils. For householders in the highest risk areas, the cost is met by the relevant Government Department and there is no charge to the householder. The current number of results available for each of the countries given in the table. The number will increase considerably as the mapping programmes, described below, are completed.

A programme to produce a radon map of Scotland was started in 1995. Much of Scotland is sparsely populated and it is not practical to survey these areas at the same sampling density as England. The survey is based on a density of 4 measurements in each 10 km square of the Ordnance Survey grid containing a significant population. Fewer measurements will be undertaken in sparsely populated squares.

In May 1996, maps based on 5 km squares of the Ordnance Survey Grid were published for the previous Welsh districts of Alyn and Deeside and Delyn (now in Flintshire), Glyndwr (now in Denbighshire), Radnorshire (now in Powys), Ynys Mon (now called Anglesey) and Preseli Pembrokeshire and South Pembrokeshire (now Pembrokeshire). Work has now commenced to complete the map of Wales on the basis of 5 measurements in each 5 km grid square.

The radon map for Northern Ireland is also being completed at a density of 5 measurements in each 5 km grid square. This is in addition to the individual invitations, offering free radon measurements, sent to all householders in the Affected Area declared in 1993.

In all the surveys, measurements are undertaken entirely by post. In each dwelling, the time-integrated concentrations are determined with passive radon detectors in the main living area and an occupied bedroom. The measurement period is normally 3 months. A confidential letter informs the householder of the result and its significance and advice is provided on whether action is required.

On current progress, about a third of a million individual homes in the UK will have been measured for radon by the end of the present phase.

Country	Number of results	Number identified above the Action Level
Scotland	5,700	220
Wales	4,000	170
Northern Ireland	11,000	380

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