Environmental Radon Newsletter

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Radon in Scotland:
a targeted programme in high radon risk areas

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This short article summarises a three-year programme, started in April 2009 and funded by the Scottish Government, to identify and remediate homes containing high radon concentrations in the high risk areas of Scotland. The programme ended on 31 March 2012 and a final project report is being prepared and will be published as an HPA-CRCE report in summer 2012.

A radon atlas of Scotland was published in April 2009 and updated in July 2011 (see *ERN* Issue 65). It shows radon potential across Scotland and identifies the areas with higher probability of the radon concentration in individual homes exceeding the radon Action Level. The Scottish Government acted on the recommendations of the 2009 report and funded the Health Protection Agency (HPA) to run a three-year programme with the objectives:

- To find homes above the Action Level in the highest radon areas, as identified in the 2009 report
- To encourage the responsible person, normally the owner-occupier or landlord, to carry out radon remedial works in homes known to contain a high radon level.

Partway through the project the programme was refined using the new 2011 map and an extra Scottish region, the Shetland Islands, was added.

The programme concentrated on six Scottish regions which are, in descending order of the number of householders involved, Aberdeenshire (including two houses in Moray), the Orkney Islands, Highland, the Scottish Borders, the Shetland Islands, and Dumfries and Galloway. In each region, there was an initial meeting with representatives of the local council to secure local partnerships. Householders in the highest risk areas were contacted by letter and offered a free radon test. Those accepting were sent measurement kits by post and in due course received a report detailing the results and advising whether action was recommended. Householders found to have high radon levels, that is at or above the Target Level (100 Bq m^{-3}), were invited to local events to discuss the health risks and effective ways to reduce the radon levels in their homes.

Local seminars were held for local professionals involved in housing provision (officers of the council and housing associations, solicitors, estate agents, surveyors, builders, and so on).

The radon team arrives at the Victoria Hall in Ballater for a radon event in November 2010

In most regions, the programme was run as a partnership with the local council, the health board, BRE (Building Research Establishment) and the HPA. The relevant local council became the public face of the programme, with HPA managing the overall programme and logistics. In round terms, over 12,000 householders were invited to participate. Over 6,000 took up the offer and over 1,000 homes above the UK radon Action Level of 200 Bq m^{-3} were identified.

Over 20 days of local events were held which included some 10 seminars. Despite some challenging conditions (see picture), over 600 householders attended the radon advice sessions and received one-to-one advice on how to reduce the radon levels in their homes.

The programme was successful in identifying a large number of homes with high concentrations of radon. This was due in no small part to the policy of working with local partners: in many areas the response rate exceeded 40% and in one, Orkney, it was over 50%. It is too early to judge the success of meeting the second objective, that of encouraging remediation. This will become clearer as time passes and householders who undertake remediation take up the offer of a free confirmatory test.

The 2011 radon map of Scotland identifies some new areas of elevated radon potential, mostly within the central belt of Scotland. The HPA hopes to gain Scottish Government support to undertake a smaller follow-up programme to address these areas.

POINTS OF CONTACT

www.UKradon.org provides general information on radon and details of HPA radon services, including radon risk reports for individual properties in the UK

Radon Survey
Centre for Radiation, Chemical and Environmental Hazards
Health Protection Agency
Chilton, Didcot, Oxon OX11 0RQ
Tel: 01235 822622
email: radon@hpa.org.uk
www.hpa.org.uk/radon

BRE
Garston, Watford WD2 7JR
www.bre.co.uk/radon

Health and Safety Executive
Health Directorate B6
Rose Court, 2 Southwark Bridge
London SE1 9HF
Tel: 020 7717 6854
www.hse.gov.uk/radiation/ionising/radon.htm

Welsh Government
Department for the Environment, Sustainability and Housing
Cathays Park, Cardiff CF10 3NQ
Tel: 0300 060 3300

Industrial Pollution and Radiochemical Inspectorate
Northern Ireland Environment Agency
Gasworks Business Park, Belfast BT7 2JA
Tel: 028 9056 9299
email: IPRI@doeni.gov.uk
www.ni-environment.gov.uk/pollution-home/radiation/radon.htm

Scottish Government
Housing and Regeneration
Victoria Quay, Edinburgh EH6 6QQ
Tel: 0131 244 5575

Radon South West Committee
Secretary: Gerald Hudd
Malabar, Hillfarrance, Taunton
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Derbyshire Radon Steering Group
c/o Environmental Health Department
Derbyshire Dales District Council
Town Hall, Matlock, Derbyshire DE4 3NN

The Radon Council Limited
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Middlesex TW17 8AD
Tel: 01932 221212
email: info@radoncouncil.org
www.radoncouncil.org

Laboratories validated by the HPA for making measurements of radon concentrations in homes are listed at www.hpa.org.uk/radonvalidation

For a risk report where there is no valid postcode, the building footprint is larger than 25 m or for plots of land, visit shop.bgs.ac.uk/Georeports

Report on IRPA13

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The International Radiation Protection Association (IRPA) holds an international congress every four years, and 13–18 May saw the 'radiation Olympics' arrive in Glasgow.

Some 1,500 scientific delegates, from 77 countries, together with about 200 exhibitors, were treated to more than 350 oral presentations and over 1,000 posters covering many aspects of radiation biology, dosimetry, legislation, measurement and control at the 13th International Congress of IRPA, held in Glasgow. Subjects ranged from nuclear medicine to the aftermath of the March 2011 earthquake and tsunami in eastern Japan, with its consequences for the Fukushima Dai-ichi nuclear power plant. Delegates often had up to six parallel sessions from which to choose, so forward planning from the timetable and map was essential!

Radon had its own twin sessions on the morning of Thursday 17 May, the first classed as 'technical' and the second as a 'seminar', although similar ground was covered in both. For instance, the results of national surveys and the state of radon controls were reviewed. The UK is in a privileged position as our national survey of radon homes has produced a detailed radon potential map. Many other countries have undertaken few measurements or are wrestling with the implications of using short-term measurements – some of only a few minutes' duration – or trying to relate average radon concentrations for an administrative area with the incidence of cancer. The pitfalls of not using case–control epidemiological studies were clearly presented, along with an emphasis on the implications of smoking habits on radon-related lung cancer and the cost-effectiveness of various programmes to reduce its incidence.

The posters on radon provided an opportunity to show a topic in more detail than was possible in an oral presentation. They were available to view during the week in two, two-day blocks that allowed the delegates to discuss the work with the authors in an informal setting. The results of surveys of radon in buildings and underground workplaces in many countries were displayed, with results of mitigation (including where the primary source was from building materials or radium contamination of the land).

One of the main benefits of bringing together delegates from different areas of radiation protection is to share experiences, compare the approaches taken by different industries, and talk to the regulators and decision-makers directly. For instance, in the NORM (naturally occurring radioactive material) sector, radon is an 'elephant in the room' as controls are often based around wastes and residues from industrial activities such as mining and oil production, and doses from radon remain steadfastly high. It is interesting to note that the radon prevention methods for new buildings in naturally radon-prone areas (lapped and sealed membranes and/or sumps) are not considered adequate when dealing with a brownfield site and NORM.

The organisers are to be congratulated on an interesting (and exhausting) week. Podcasts of key sessions, posters, presentations and full papers (presentations only) will be available at **www.irpa13glasgow.com/information/downloads**. Radon was mostly covered in area 10 and NORM in area 8, including one presentation and one poster from the Health Protection Agency:

TS10c.7 Long-term programme to measure and mitigate radon gas in English schools – progress review and lessons learnt

P10.69 Analysis of radon remedial measures.

Chris Perks, Landauer Europe, cperks@landauer-fr.com

There was a schools event run by the Society for Radiological Protection (SRP) which attracted nearly 30 schools (1,200 year-9 students) to an exhibition and the 2nd John Dunster memorial lecture given by Professor Peter Marsden, Head of Medical Physics at University College London Hospitals NHS Trust, entitled *The Importance of Radiation in Medicine*. The exhibition included several displays concerned with radon and one company gave out kits so that schools could make radon detectors using yoghurt pots and cling film!

Remediation Case Study Series

5. Communal externally excavated mini-sump system

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This is the fifth in a series of case studies which have originated from work done by BRE (Building Research Establishment) or others, demonstrating a range of practical and cost-effective radon reduction methods.

A terrace of four bungalows was built during the 1970s in Cornwall, set on steeply sloping ground with bungalow 1 at the top of the slope and bungalow 4 at the bottom (see Figure 1). The terrace was constructed with rendered concrete block-work cavity walls and suspended timber ground floor, and concrete covering of the soil below. There is a 750 mm step approximately halfway across each bungalow resulting in an upper and lower ground floor level in each bungalow. There is a further 750 mm step between each bungalow, resulting in a drop in level of about 6 metres between bungalows 1 and 4.

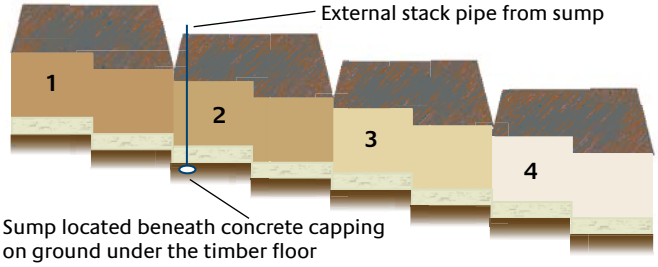

Figure 1 Bungalows stepped down a sloping site

After taking up a free radon test organised by a government measurement programme in 1992, the tenants of bungalow 2 informed their landlord, a housing association, of their above Action Level radon result. The association asked BRE for advice to reduce radon levels in bungalow 2. In order to gain greater understanding of radon reduction within terraces of houses, BRE funded the installation of a sump and fan system in bungalow 2. Further information was required by BRE on the radon levels in the other bungalows, before and after the sump system was installed. The association approached the other tenants in the terrace and radon measurements were made in each home (see the table).

A communal approach to remediation was possible because all four dwellings were owned by one housing association. The system installed comprised a single externally excavated mini-sump system extracting from a sump beneath the concrete which covers the soil beneath the upper ground floor of bungalow 2 (see Figure 2).

No problems were encountered during installation of the system. However, maintaining the system long term posed potential problems. At present all four properties are owned by a single landlord. Potential problems may arise if bungalow 2 was sold, as the new owner could switch off the fan. This would unfortunately result in radon levels increasing again in all four properties. To ensure that the system continues to work, the landlord is funding the running cost for the occupiers of bungalow 2. Since installation,

Bungalow	Seasonally corrected annual average radon concentration (Bq m^{-3})		Radon reduction factor
	Before remediation	After remediation	
1	447	20	22
2	610	35	17
3	1666	84	20
4	187	56	3

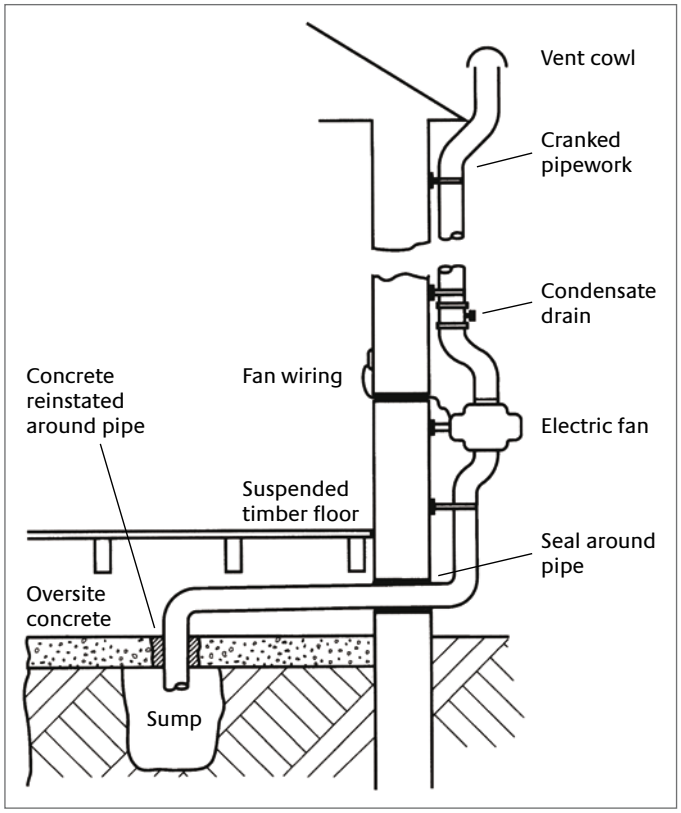

Figure 2 Sump and fan installation beneath suspended timber floor

the system has performed well and no additional enhancements have been necessary. The fan did fail, however, after 15 years and was replaced. The properties have been tested periodically, every 10 years or so since remediation, and radon levels have remained below the UK Action Level (200 Bq m^{-3}).

The table shows that bungalow 3 had the highest indoor radon level and so would have been a more logical location for the sump system. Despite this, the sump system has given a considerable reduction in the radon levels of all four bungalows. This reduction is impressive considering that the bungalows are stepped up a very steep sloping site. This trial demonstrates that several dwellings can be remediated simultaneously using a single sump and fan system, resulting in savings in both installation and running costs.

This case study was first published in 2003 as part of the European Commission funded contract ERRICCA 2 European Radon Research and Industry Collaboration Concerted Action. It is available at ***www.worldradonsolutions.info/casestudies*** *along with information on many other radon remediation methods from around the world.*

A national radon action plan?

Neil McColl, Health Protection Agency, neil.mccoll@hpa.org.uk

The latest European Union (EU) draft Directive on Basic Safety Standards (BSS) for ionising radiation includes a proposal for member states to have national radon action plans.

The EU is currently considering updating Directive 96/29/Euratom on Basic Safety Standards (BSS) for ionising radiation. The update will take account of the latest guidance from the International Commission on Radiological Protection as well as output from other bodies such as the International Atomic Energy Agency. One of the proposed changes is to incorporate radon more completely, and to consider radon at home as well as in workplaces.

While many of the requirements of the revised BSS are intended to apply to employers and regulators, radon requires some special consideration and there are actions that might apply to a range of bodies, ranging from these formal organisations, through to landlords and householders.

While the draft Directive is still being considered by EU member states, it is an appropriate time to look at one important new element that is proposed – the national radon action plan.

The draft Directive would require each EU member state to prepare a national plan for radon. While the Directive would not stipulate in detail what must be in the plan, the very last annex of the draft Directive does include a list of elements that members states should consider including. These elements are outlined broadly in the panel.

Many elements of this list are already in place within the UK and will be familiar to the UK radon community. Subject to adoption of the Directive, the Health Protection Agency will be working to support the development of the UK national action plan for radon.

You can find the draft Directive at

http://ec.europa.eu/energy/nuclear/radiation_protection/doc/com_2011_0593.pdf

You can keep up to date with the progress of the Directive on the HSE website:

http://www.hse.gov.uk/aboutus/europe/euronews/dossiers/radiationprotect.htm

- Strategy for radon surveys; a national database of radon; other relevant parameters (geological data, soil gas measurements, radium-226 levels, etc)
- Information to establish radon-prone areas or buildings
- Strategy for radon in new buildings, including radon exhalation from building materials
- Basis for radon reference levels for existing and new buildings
- Types of workplace and public-access buildings where measurements are needed
- Radon reduction strategy for homes, particularly in radon-prone areas
- Financial support for radon surveys and for remedial measures, especially where very high radon levels are found
- Guidance on radon measurement and remediation techniques
- Criteria for the accreditation of measurement and remediation services
- Awareness strategy on radon and smoking for decision makers and the public
- Long-term goals to reduce lung cancer risk from radon exposure
- Established responsibilities, structure and resources to achieve, audit and review the action plan

Radon in the news

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The past few months have seen a varied degree of media coverage of radon.

As ever, local newspapers and websites across North America dedicated considerable column inches to the subject of radon as details of shock high readings crept into the public domain and domestic find-and-fix programmes rolled ever onward.

Closer to home, work to reduce radon levels in Jersey also attracted attention in the past few months. The island's health authority funded a round of testing earlier this year, widespread testing had not been done on the island since 1998. In recent weeks islanders have been urged to return their test kits to the Health Protection Agency for analysis. To read more about the programme visit http://www.bbc.co.uk/news/world-europe-jersey-17788943.

In Norway radon made news around Stavanger when a council official claimed that the gas leads to as many deaths across the whole of the country as car accidents. For more information visit http://theforeigner.no/pages/news/norway-radon-accident-death-rate-equal/.

And finally, radon earned itself a surprising role in recent weeks in reflections on dark matter. Theoretical physicists in America produced calculations claiming that we are bombarded by dark matter once every few minutes and then considered if those interactions could lead to an increased cancer risk. The conclusion was no – and that radon posed a much greater risk to health. For more information visit http://www.msnbc.msn.com/id/47210057/ns/technology_and_science-space/.

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