

Environmental **Radon** Newsletter

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New radon map of Northern Ireland launched

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The Ardhowen Theatre, situated in a panoramic lakeview setting in the historic island town of Enniskillen, County Fermanagh, was the venue for a seminar to launch the new radon map for Northern Ireland*. The audience was drawn largely from UK central and local government organisations with a few members from the Republic of Ireland. All were welcomed by Councillor Bertie Kerr, Chairman of the Fermanagh District Council (FDC), before listening to a series of presentations from six speakers.

The keynote speaker was Dr Paul Darragh, Consultant in Public Health Medicine in the Public Health Agency for Northern Ireland and a past non-executive director of the Health Protection Board. Dr Darragh covered the science and epidemiology of exposure to radon and underlined the fact that exposure to radon causes an increased risk of lung cancer: this risk multiplies the risk of lung cancer due to smoking.

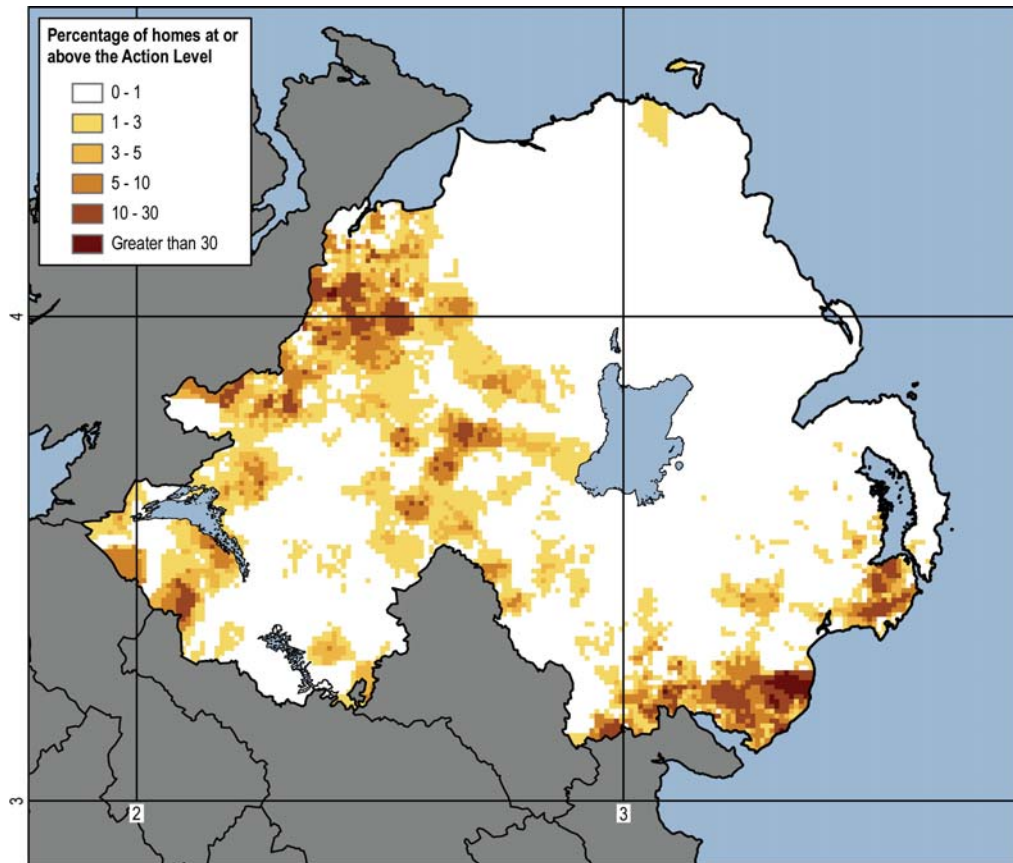
The history of the radon programme in Northern Ireland since the first measurements were made in the 1980's was the subject of a review by Robert Larmour, Northern Ireland Environment Agency (NIEA). The various parts of the programme, funded by NIEA and carried out in partnership with the Health Protection Agency (HPA), have been published as a series of reports which culminated in the issue of the first radon map for the whole of Northern Ireland in 1999.

The fourth Radon in Dwellings report*, see figure, contains the new radon probability map. It was introduced by Martyn Green, HPA. The map provides an estimate of the radon concentration in a dwelling exceeding the radon Action Level of 200 Bq m^{-3} for each 1-km square of the Irish grid in Northern Ireland and is based on the results from measurements in over 23,000 homes. The report contains large-scale maps showing geographical detail such as major roads and

settlements as well as data tables by sub-divisions of the postcode and Local Authority and Health Board areas.

The objectives and different methods of radon risk mapping were described by Jon Miles, HPA, who went on to describe the mathematical background, based on the lognormal distribution, for the new 1-km grid map of Northern Ireland. Gerald Coulter, Building Standards Branch of the Northern Ireland Department for

continued on page 2



Overall map of radon Affected Areas in Northern Ireland (axis numbers are the 100 km co-ordinates of the Irish Grid)

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Radon Affected Area classification © Health Protection Agency copyright [2009]

POINTS OF CONTACT

www.UKradon.org provides general information on radon, and also an estimate of the probability that an individual property in England and Wales is above the Action Level for radon.

Building Research Establishment (BRE)
Garston, Watford, WD2 7JR
www.bre.co.uk/radon

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

Welsh Assembly Government
Department for the Environment,
Sustainability and Housing
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Tel: 0300 0603300

Industrial Pollution and Radiochemical
Inspectorate (IPRI)
Northern Ireland Environment Agency
Klondyke Building, Cromac Avenue
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 Executive Development Department
Housing Division 1
First Floor East, Victoria Quay
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Health and Safety Executive
Health Directorate B6
Rose Court, 2 Southwark Bridge
London, SE1 9HF
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Fax: 020 7717 6717
www.hse.gov.uk/radiation/ionising/radon.htm

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Secretary: Gerald Hudd
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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: 0870 0518551
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
To obtain a report on the requirement for
radon protective measures for building
sites, go to <http://shop.bgs.ac.uk/Georeports>

New radon map of Northern Ireland launched continued

Finance and Personnel, gave a Building Control perspective of radon and how requirements under the Building Regulations help to reduce radon concentrations in new buildings and extensions.

The final presentation was by Neil McColl, HPA, who gave an overview of the current international and national developments aimed at reducing the exposure of humans to ionising radiation due to the presence of radon in buildings. The World Health Organization (see *Environmental Radon Newsletter Issue 61*), the International Commission on Radiation Protection and The United Nations Scientific Committee on the Effects of Atomic Radiation have all recently published reports on radon. In May 2008, the HPA gave advice to the UK government

that basic radon preventative measures should be incorporated in all new buildings in the UK. More recently, HPA has published responses to the recommendations of its independent Advisory Group on Ionising Radiation (see *Environmental Radon Newsletter Issues 60 and 61*) which reviewed recent developments in radon epidemiology and undertook cost benefit analysis of past UK programmes.

The meeting was attended by the press, and was reported on the BBC news website (http://news.bbc.co.uk/1/hi/northern_ireland/8377358.stm).

* *Radon in Dwellings in Northern Ireland: 2009 Review and Atlas Report*, HPA-RPD-061. BMR Green et al. Available as a free download on the NIEA and HPA websites.



Councillor Bertie Kerr (FDC), Martyn Green (HPA), Robert Larmour (NIEA) and Robert McCullagh (FDC), (from left to right). Courtesy of Impartial Reporter Enniskillen

Large-scale laminated radon maps now available

The Health Protection Agency (HPA) is offering A1 size prints (approx 84 x 59 cm) of HPA* and BRE** radon maps to buy. The posters are laminated and orientated either landscape or portrait as appropriate. Published map plates are priced at £71 each, bespoke maps cost £98. Additional copies of either, ordered at the same time, are available at the reduced price of £52 each. There is no VAT to pay, but orders carry £10 postage & packaging charge for UK shipping addresses. Payment can be made by credit/debit card over the phone, by cheque payable to HPA or by formal

Purchase Order. Contact the HPA on 01235 822622 or email david.rees@hpa.org.uk.

* *Indicative Atlas of Radon in England and Wales* HPA-RPD-033. Miles et al 2007.

Radon in Dwellings in Scotland: 2008 Review and Atlas, HPA-RPD-051.

Radon in Dwellings in Northern Ireland: 2009 Review and Atlas, HPA-RPD-061.

** *Radon: guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment)* BR 211 2007.

Eighth UK National Radon Forum

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The Health Protection Agency (HPA) hosted the eighth UK National Radon Forum at its Centre for Radiation, Chemical and Environmental Hazards, Chilton, Oxfordshire on 26 October 2009. Topics covered included the long-awaited report on Radon and Public Health by the independent Advisory Group on Ionising Radiation (AGIR) to the HPA, as well as recent international progress for protection from radon risks.

The forum was opened by John Harrison (HPA) who outlined international developments regarding the risks to health from exposure to indoor radon. Evidence from epidemiological studies of various residential pooling studies from the USA, Europe and China in the last few years have demonstrated a risk from indoor radon at concentrations far lower than had previously been found from earlier studies of uranium miners. New reports have been issued by the United Nations Committee on the Effects of Atomic Radiation (*UNSCEAR, 2006 Report, Volume II, Annex E*), the International Commission on Radiological Protection (*ICRP 2009 Statement on Radon*) and the World Health Organization (*WHO 2009 Handbook on Indoor Radon*, details in *Environmental Radon Newsletter Issue 61*).

Scientific understanding of lung cancer risks from the various latest studies are in good agreement and on these bases there is international scientific consensus for the control of residential radon exposures (workplace exposures are already covered by national and in the case of EU countries, European legislation). WHO proposes national governments set their reference levels, the maximum accepted radon concentration in a residential dwelling, preferably at 100 Bq m⁻³, but no higher than 300 Bq m⁻³ where 100 Bq m⁻³ is not achievable. In addition to these new publications, the independent Advisory Group on Ionising Radiation (AGIR) to the HPA has also recently reported on Radon and Public Health (see *Environmental Radon Newsletter, Issue 60*). There were 16 recommendations from that report, and the HPA responded to these in its Consultation Document on new radon advice (see *Environmental Radon Newsletter, Issue 61*). Jon Miles (HPA) briefly outlined the AGIR report for the Forum audience and Neil McColl (HPA) followed with a summary of HPA's response to the new report (*Consultation Document, Appendix A*).

Mr McColl also spoke about HPA's current radon strategy and potential future options given in the HPA's recent radon consultation.

The HPA continues to:

- **Seek to reduce** the health risks to individuals from radon in existing homes and to reduce the overall number of lung cancers caused by radon by reducing radon levels in new buildings.
- **Provide evidence-based advice** on the health risks from radon, where these risks occur, and how these risks can be cost-effectively reduced.
- **Provide advice to** householders, landlords, employers, professional groups and the public.
- **Work closely with** local bodies, for example social landlords in high radon areas; Health & Safety Executive (HSE), for workplace radon exposures; national, devolved, regional and local government; other health professionals, where risks from smoking and radon overlap.
- **Provide support for these objectives with** radon risk maps for the UK; a validation service for radon measurement; follow-up support for remediation of buildings above the UK radon Action Level; extra support for particularly high homes.

The latest scientific findings not only affect radon policy for residential exposures, but also workplace exposures too. Gareth Thomas (HSE) warned the audience that updated international legislation on workplace radon exposures were likely soon from the International Atomic Energy Agency (IAEA) and European Union. The IAEA Basic Safety Standards Directive regarding radon, due to be published 2010 or 2011, is likely to include radon risk assessment not only for workplaces but in other dwellings or buildings with high occupancy by members of the public. This will thus include for example schools, hotels, residential care homes, prisons, libraries, visitor centres and other public buildings.

Radon hazard assessment in the UK is a legal requirement under the Management of Health & Safety at Work Regulations 1999 (MHSWR). The Ionising Radiations Regulations 1999 (IRR99) apply if the radon concentration is more than 400 Bq m⁻³. Just like homeowners, employers can use the ukradon.org website to identify if their

buildings are in a radon Affected Area. Further guidance and information for workplaces can be found at the HSE and HPA websites (see Points of Contact, Page 2) including specialist advice and services for employers with large buildings or many locations to assess. For the following categories radon risk assessment will usually mean a radon measurement is required, unless the employer can show the location has minimal occupancy (typically less than 50 hours per year):

- across whole of UK - below ground workplaces
- radon Affected Area – ground-floor workplaces

Jane Bradley (HPA) took the audience through the journey a homeowner is likely to experience of the HPA's radon programme; from first identification of whether a home is in a radon Affected Area or not, through the measurement phase (if required), remediation and finally repeat measurement phase to demonstrate the effectiveness of any works that were made. Homeowners should also ideally make further measurements in later years to confirm the continued effectiveness of remedial measures.

Tracy Gooding (HPA) presented the new radon programme for schools and Lee Wagland (Cornwall County) spoke about radon in the new unitary authority of Cornwall County (see *Environmental Radon Newsletter, Issue 61* for further news on both these topics). Yimmy Chow (HPA) presented her preliminary findings on an evaluation and equity audit of the HPA's radon programme. Dr Chow found householders were more likely to remediate when they found the information provided on radon and its risks to be clear and useful. This emphasises the importance of good communication with householders and local stakeholders.

As well as formal presentations and discussions, forum attendees had a chance to view additional interesting research in the form of posters from the Building Research Establishment and the Defence Science and Technology Laboratory. There were also stands and exhibits from ProTen Services Limited, Airtech Environmental Systems, Landauer Europe and Icopal Monarflex Geo Membranes.

If you would like to receive notice of the next UK National Radon Forum, usually held on an annual basis, then please email or telephone the Radon Survey, HPA (see Points of Contact, Page 2).

Remediation Case Study Series

1. Internal mini sump system

Chris Scivyer, Building Research Establishment, ScivyerC@bre.co.uk
Sue Hodgson, Health Protection Agency sue.hodgson@hpa.org.uk and

Over the years the Building Research Establishment, funded by various government departments, has carried out extensive studies to develop a range of practical and cost effective radon reduction methods. Case studies from this work and cases from other sources will be featured in forthcoming issues of this newsletter to aid those advising on radon solutions.

A two bedroom bungalow in Devon was built in 1988 before the requirement for radon protective measures was introduced for new homes in radon Affected Areas. It was constructed with rendered concrete block work cavity walls with an in-situ concrete ground floor and is typical of many homes built during that period. The annual



Case study bungalow with internal sump system

average radon concentration for the bungalow was estimated from a validated three-month test and found to be high at 2,800 Bq m⁻³. The population-weighted indoor annual arithmetic mean radon concentration for Devon is 72 Bq m⁻³ (from *National Radiation Exposure in UK Dwellings NRPB-R190, 1988*).

Visual inspection of the property revealed no obvious radon entry routes. The fill used below the concrete floor slab was found to be relatively permeable when excavated. Previous experience has shown that for radon levels exceeding 750 to 1,000 Bq m⁻³ where the soil is capped by an in-situ concrete floor, a sump system would provide the greatest indoor radon reduction.

The layout of the bungalow lent itself to an internally excavated mini-sump system. The sump (approximately 45 x 45 x 45 cm) was conveniently located beneath the floor within a cupboard located centrally in the bungalow. The figure shows a diagram of an internal sump system, similar to that installed in the bungalow. Pipe work from

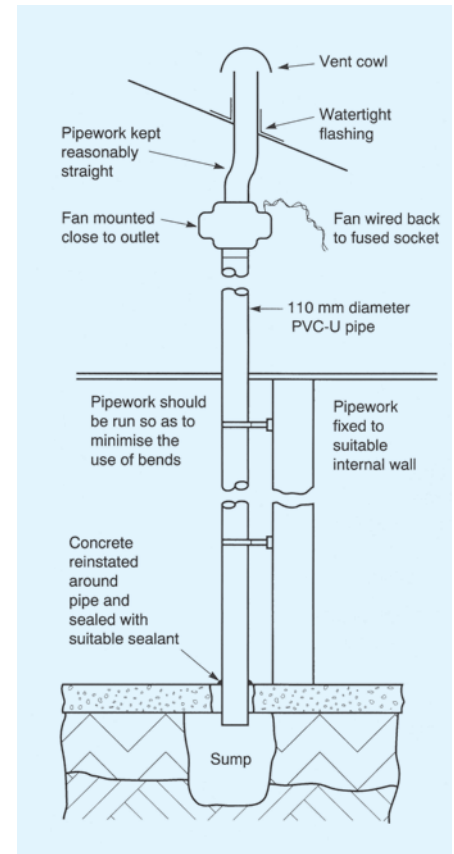
the sump was routed up to a non-stalling 75 watt centrifugal inline duct fan in the roof space and the exhaust taken out through the slope of the roof via a tile vent, see photo.

Radon Reduction

A substantial radon reduction was achieved, from 2,800 Bq m⁻³ to less than 50 Bq m⁻³, with the fan running at full speed. This was very successful but the noise of the fan was noticeable in the silent hours. Thereafter, further modifications were made to reduce the noise level as follows:

- Pipework was disconnected from a lightweight partition wall
- Rigid fan couplings were replaced with flexible ones
- An insulation quilt was wrapped around the loft mounted fan
- The fan speed was reduced to half

There was a substantial reduction in noise from the fan and after further testing the radon level was essentially the same, less



Internal sump system with internal pipework

than 50 Bq m⁻³. It should be noted that this was a particularly successful remediation in a straightforward case. Most efforts at remediation result in smaller reductions in concentration, usually less than a factor of 10.

Cost

An estimated cost for installation in a similar house at current prices, is given in the table.

	£
Equipment costs	400 - 600
Labour costs approx 2 man days	280 - 350
Total cost, excluding VAT	680 - 950

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