Environmental Radon Newsletter

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The Housing Health and Safety Rating System: two years on

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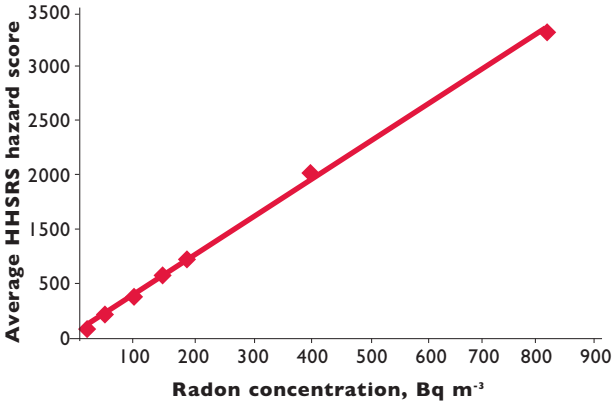
In 2004 Tim Braund gave a preview of a fundamental change to the way housing conditions were to be assessed (see Environmental Radon Newsletter 39). The Housing Health and Safety Rating System* (HHSRS) was introduced in April 2006 as the statutorily prescribed method for assessing housing conditions in England. The HHSRS replaced the fitness standard, which was derived and arguably little changed from a standard of 1919.

The underlying principle of the HHSRS is that any residential premises should provide a safe and healthy environment for any potential occupier or visitor**. HHSRS moved away from a building-focussed fitness standard, which looked at whether a building was free from serious damp or had a satisfactory water supply, to a risk-based approach, which:

- Takes into account the frequency of a hazardous occurrence and the potential severity of the outcome
- Recognises that there are a range of possible outcomes
- Allows a comparison of different hazards found in dwellings.

Assessing both the likelihood of the hazard together with the severity of the outcome gives a truer indication of the hazard's importance. Radon causes lung cancer, which either kills you (Class I harm, 90% of the time) or leaves you with a severe condition (Class II harm, 10% of the time). A radon concentration of 200 Bq m^{-3} was assigned a probability of occurrence of harm of 1 in 1000, which weighs heavily in the HHSRS scoring system. Radon at 200 Bq m^{-3} comes only second in importance to excessive cold.

In the HHSRS system, hazard scores are used to place dwellings into hazard bands. For bands A, B and C it is mandatory to take some form of enforcement action; for bands D and below the action becomes discretionary. A radon concentration of 200 Bq m^{-3} produces a hazard score of 910, which places a dwelling in a category D band; a score of 1000 would tip the dwelling into a C band.



So at what concentration does radon become a Band C issue? The figure shows average hazard score against radon concentration. This has an almost linear relationship, with the equation: Hazard score = 58 + 4.08 x (radon concentration). With a score of 1000, the radon concentration for enforcement is approximately 230 Bq m^{-3}.

Perhaps this is all too academic; certainly the grant applicants who approach South Hams District Council for help with radon problems tend not to qualify for financial assistance; a common problem throughout radon Affected Areas. Perhaps the time has come for other local authorities to follow the recent example of West Devon Borough Council and offer some radon monies without a means test. I fancy drawing up a risk assessment to target those householders who are most at risk from radon, and seeing whether my Council can put some monies into non-means-tested remediation. As for enforcement action, I have yet to hear of any enforcement action being taken under HHSRS for radon.

** The Housing Health and Safety Rating System (England)* Regulations 2005 (SI 2005 No. 3208), HMSO, London.

*** Housing Health and Safety Rating System Guidance (Version 2),* Office of the Deputy Prime Minister, 2004.

Note: the views expressed in this article do not necessarily reflect the views of South Hams District Council.

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Laboratories validated by HPA for making measurements of radon concentrations in homes are listed at: www.hpa.org.uk/radiation/services/radon/validation.htm

To obtain a report on the requirement for radon protective measures for building sites, go to http://shop.bgs.ac.uk/Georeports

To obtain an estimate of the probability that an individual property in England and Wales is above the Action Level for radon, go to www.UKradon.org

Spurious results from passive radon detectors

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The placement instructions that the Health Protection Agency provides with passive radon detectors for measurements in homes are straightforward: householders are asked to place one in the main living area and one in an occupied bedroom, on a shelf or piece of furniture. They are asked to keep them away from draughts or sources of heat.

The great majority of householders comply with these instructions, and so receive reliable results. Occasionally we find results that are difficult to explain, such as wildly different results from the two detectors sent to the same house. In such cases we contact the householder to ask about the details of detector placement. Often it emerges that the householder had decided to run a little experiment, by placing one detector where they think radon concentration might be higher, such as in a cellar sealed with a trapdoor, or next to the gap under a skirting board. One even admitted to sealing a detector in a biscuit tin along with a lump of uranium ore.

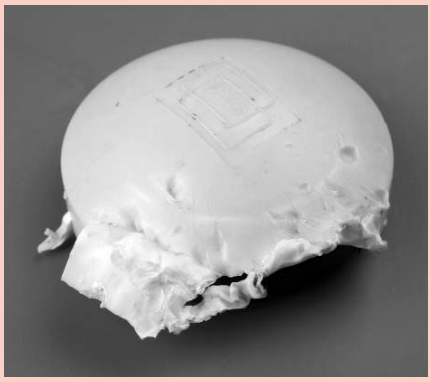
There may also be cases of deliberate dishonesty, when a householder places the detectors other than in the property specified, with the intention of obtaining a misleading result.

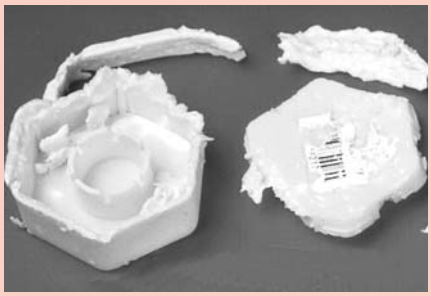
Because the detectors are in place for three months, there is a significant risk of them being lost or thrown away ("this air freshener doesn't smell of anything"). We find that about 10% of detectors are never returned.

The detectors are quite robust, and can withstand being trodden on, but experience shows that they cannot withstand being run over by a car or being shot. If detectors are run through a washing machine or chewed by a determined dog, we discard the results. When we receive detectors back after exposure, we check them to see whether they have been tampered with. The detectors are difficult to open without damage, and even more difficult to reassemble with all of the parts properly aligned, so tampering is easily spotted.

The examples given here are taken from our experience over 25 years, issuing over a million passive radon detectors. Fortunately, such problems are quite rare.

This detector was placed so close to a fire that it actually became charred. The fumes from burning plastic would be the greatest hazard in this case. Heating the detector to such a high temperature also destroys the signal on the CR-39 element inside.

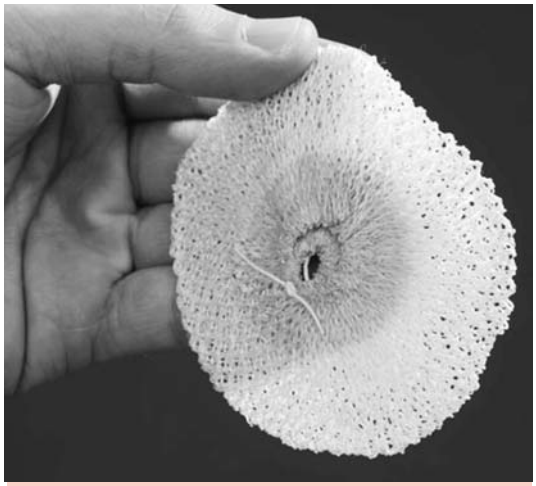




The detector above was chewed by a dog, making the radon measurement unusable. Another dog made a more thorough job of destroying the detector below. Babies have also been known to chew on the detectors, though with less dramatic effects. In such cases householders are generally more worried about the effect on the baby or the dog, rather than on the detector. Fortunately passive radon detectors contain no toxic materials: the holder is made from polypropylene (as used to make kitchen bowls) and the radon detecting element inside is made from CR-39 (as used to make spectacle lenses).

This is the standard detector pack as issued to households. Although the radon detectors are inside a polythene bag, inside a padded envelope, radon diffuses through these and into the detectors. This is a great advantage for us when monitoring radon in homes, since householders may not open the pack immediately on receipt, but leave it lying around for days or weeks. Even under these circumstances, the detectors will accurately record their radon exposure.

The possible disadvantage to this continuous recording of radon exposure is that any exposure received in transit will also be recorded. To evaluate this potential problem, the HPA carried out experiments by sending detectors on return trips through the postal system, including to the parts of the country with the highest indoor radon concentrations. The exposures that occurred in transit were negligible compared with the exposures received in homes.



An unused gas mantle like the one above was the cause of some alarm. Radon measurements were made in the living room and bedroom of a house in a low-radon part of the country. The bedroom result was 10 Bq $m^{-3,}$ but the living room result was 16,000 Bq m^{-3}. Because such a result was so unlikely, it was suspected that the detector had been placed in some high-radon location such as under a floor. However, the householder was adamant that it had been placed on top of a cupboard, consistent with the HPA placement instructions.

A member of HPA staff visited the property, armed with an active radon monitor and a gamma-ray monitor. He found a piece of radioactive cloth on top of the cupboard where the radon detector was placed. The cloth was identified as an unused gas mantle, as used in traditional gas lights and camping gas lights. Such mantles are made from cloth soaked in thorium nitrate and other chemicals to make them glow brightly when hot. When a mantle is first used in a gas light, the cloth burns away, leaving a rigid but fragile structure.

Thorium is the precursor of an isotope of radon (radon-220, also known as thoron) which has a half-life of only one minute. In general thoron does not give significant radiation doses to people, because of its very short half-life. The HPA radon gas detectors are designed to measure radon-222, which has a 3.8 day half-life, and is insensitive to thoron. In this case, because the radon detector was lying directly on top of the gas mantle, some thoron was able to enter the detector. Experiments in the laboratory confirmed that placing a passive radon detector on top of the gas mantle caused a spurious high result, but a detector a short distance away gave a low result.

Local Council programmes on radon in workplaces

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Providing radon advice and measurement services to employers is an important part of the work of the Health Protection Agency (HPA). Discussing these matters with employers has helped the HPA to understand employers' requirements and to develop appropriate procedures and advice.

Workplace radon initiative	County	Status
Open day for employers	Derbyshire	Occasional event
County-wide programme	Devon	Under consideration
Structured programme	Gloucestershire	Under development
Mailings to employment sectors	Somerset	250 per quarter during 2008
Small numbers of free monitors	Devon	One-off budget
Issue RAW booklet with inspection reports	Northampton	Ten inspectors to issue booklets
Provide RAW booklet during general inspections	Northampton	250 copies of booklet provided
Meetings with employers	Northampton	Occasional event

The framework for protection of employees is set by the Ionising Radiations Regulations, which are enforced by the Health and Safety Executive (HSE) or the Environmental Health Department of the Local Council, depending on the type of workplace. The workplaces in which radon is most likely to be a problem are smaller offices and other similar premises, where the regulations are generally enforced by Environmental Health Officers (EHOs). The HPA therefore aims to maintain close contact with Councils on developments in radon protection.

As the HSE promotes its new programme of initiatives and priorities on radon at work (see issue 47 of this newsletter), radon issues in workplaces are gaining increasing attention at regional meetings and discussions on radon. This has coincided recently with the publication of the new *Indicative Atlas of Radon in England and Wales** which includes specific advice to employers: 'For ground floor workplaces, measurements should be carried out in all premises located in a radon Affected Area'.

These initiatives appear to have significantly raised awareness about the need to consider radon at work, with a noticeable increase recently in requests from Councils for information and support for local publicity programmes. Resources that the HPA can provide include a Radon at Work (RAW) information booklet for employers which provides a convenient and accessible source of advice on protection issues and measures. This booklet is provided by the HPA in information packs to employers and in bulk quantities to support enforcement initiatives.

Several Councils have contacted the HPA recently about proposed enforcement initiatives of various types in their local area, as listed below, and RAW booklets are being provided in support of all of these. Councils in Northamptonshire are particularly active following the inclusion of radon as an element of the HSE Strategic Programme Fit 3 (see issue 52).

In addition, the HPA are giving bound folders of radon information to inspectors who may become involved in discussion with employers. These resources complement the training that many EHOs will have received at special training days such as those run by the Radon South West Steering Group.

The HPA is taking the opportunity offered by the central Government programmes on domestic radon to raise the question of workplace radon with Councils. Planning meetings for forthcoming campaigns seek to include, where practicable, measures to raise radon awareness amongst local employers. This is seen as an important development that recognises the potential for radon exposure both at home and at work.

* *Indicative Atlas of Radon in England and Wales.* J C H Miles, J D Appleton, D M Rees, B M R Green, K A M Adlam and A H Myers. HPA-RPD-033, 2007.

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