

The rate of radon remediation in Ireland 2011–2015: Establishing a base line rate for Ireland's National Radon Control Strategy



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ABSTRACT

Radon is the greatest source of radiation exposure to the public. In Ireland, it is estimated that approximately 7% of the national housing stock have radon concentrations above the Reference Level of 200 Bq m⁻³. A radon test can be carried out to identify homes with radon levels above the Reference Level. However there is no health benefit associated with radon testing unless it leads to remediation.

Surveys to establish the rate of remediation in Ireland, that is the proportion of householders who having found levels of radon above the Reference Level proceed to carry out remediation work have been carried out in 2011 and 2013. Reasons for not carrying out remediation work were also investigated. In 2015 the survey was repeated to establish the current rate of remediation and reasons for not remediating. This report presents the results of that survey. It also compiles the data from all three surveys to identify any trends over time.

The rate of remediation is an important parameter in estimating the effectiveness of programmes aimed at reducing radon levels. Currently the rate of remediation is 22% and the main reasons householders gave for not remediating were not certain there is a serious risk and concern about the cost of the work. In Ireland, this figure of 22% will be now used as a baseline metric against which the effectiveness of its National Radon Control Strategy will be measured over time.

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1. Introduction

The health benefit associated with radon testing is only realised when high radon levels are identified and reduced through remediation work. However not all householders who find high levels of radon in their homes will carry out remediation work.

Surveys carried out in 2011 (RPII, 2011) and 2013 (RPII, 2013)¹ found that less than 25% of householders carry out remediation work. These surveys also looked into the reasons why householders choose not to remediate. Cost was found to be the main reason householders gave for not remediating. The survey was repeated in 2015 to establish the current rate of remediation amongst householders who test their home and find that they have levels of radon above the Reference Level of 200 Bq m⁻³. As in previous surveys, reasons for not remediating are investigated.

The rate of remediation is the proportion of householders with radon concentrations above the national Reference Level who

undertake work to reduce their radon levels, out of the total population of those with high radon concentrations. It is an important parameter that will be used as one of the metrics to assess the effectiveness of the National Radon Control Strategy (NRCS) over its lifetime (DOELG, 2014). For example, a change in the rate of remediation can be used to gauge the success or otherwise of elements of the NRCS.

The NRCS is a four year government strategy aimed at minimising the exposure to radon gas for people in Ireland. For year one of the NRCS, the baseline metric for the rate of remediation in Ireland is established through this survey. The rate of remediation is also used to estimate the cost effectiveness of programmes aimed at encouraging radon testing and remediation (Pollard and Fenton, 2014). It can be repeated periodically to assess the effectiveness of the NRCS as it is implemented.

2. Method

The EPA offers a radon measurement service to the public in Ireland. To compare radon measurement results for homes with the national Reference Level of 200 Bq m⁻³, the radon gas

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¹ The Radiological Protection Institute of Ireland (RPII) merged with the Environmental Protection Agency (EPA) in August 2014.

concentration must be determined in accordance with the measurement protocol (EPA, 2016a) summarised below:

- The annual average radon gas concentration for a home is determined using two radon gas measurements, one for the main living area and one for the main bedroom.
- The radon gas concentrations are measured using a CR-39 detector held in a two-part polypropylene holder. The holder acts as a simple radon diffusion chamber, excluding radon decay products and dust, limiting access of moisture but allowing the entry of radon gas. The composition of the detectors is polyallyldiglycol carbonate.
- The average radon gas concentration for a home is calculated as the arithmetic mean of the measured values for the main living area and the main bedroom corrected for seasonal variation. Equal occupancy between the two locations is assumed.
- The alpha particles emitted following the decay of radon in the detector chamber leave tracks on the CR-39 detector. On return to the laboratory, the detectors are chemically etched in 6.25 M sodium hydroxide at 98 °C for 1 h. The track density is then counted and converted to radon concentration.

The EPA has a database comprising some 60,000 radon measurements made in homes across the country since establishing its radon measurement service in the early 1990s (EPA, 2015a). Each year the service measures nearly 2000 homes for radon. As such the EPA's database is the largest dataset of radon measurements made in private houses in Ireland.

In July 2015, a questionnaire with three tick box type questions was sent to householders (customers of the EPA) who had measured radon concentrations in excess of the national Reference Level of 200 Bq m⁻³. This was accompanied by a short letter explaining why the survey was being undertaken and a prepaid return addressed envelope was included. Participants for the survey were selected on the basis that:

- They are all private householders who had radon measurements over 200 Bq m⁻³ between 1st January 2013 and 31st December 2014 (546 householders)
- They had agreed that the EPA could contact them again (172 householders),

A list of 172 households matching the above criteria was generated from the Laboratory Information Management System (LIMS) database of the EPA's Radon Measurement Service. As part of its service the EPA offers free post remediation measurement (PRM) to householders with high radon concentrations who subsequently carry out radon remediation. Twenty four of the 172 households (14%) listed had already completed a PRM with the EPA and therefore it was known they had already carried out remedial work. In light of this it was considered unnecessary to contact them further but these householders were taken into account in the final calculation of remediation rate. The remaining 148 householders were surveyed to determine if they had carried out remedial work. The survey participants meeting the above criteria had measured a range of radon concentrations from 202 to 5185 Bq m⁻³. The distribution of radon concentrations found in these homes can be seen in Fig. 1. Thirteen per cent of the homes have radon levels greater than 800 Bq m⁻³. National figures published by the EPA show that since the early 1990s, 2% of all homes tested were found to radon levels exceeding 800 Bq m⁻³ (EPA, 2015a). The higher % of homes in this survey with radon levels exceeding 800 Bq m⁻³ reflects the fact that EPA awareness campaigns have focussed on High Radon Areas (HRAs). A HRA is an area where it is predicted that more than 10% of homes will have radon concentrations above the 200 Bq m⁻³

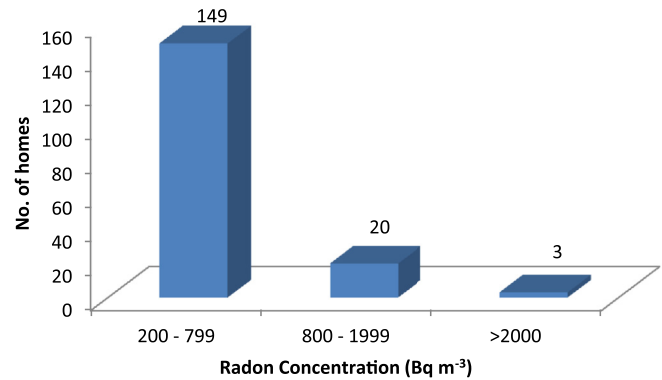


Fig. 1. Distribution of radon concentrations in homes meeting survey criteria.

national Reference Level. HRAs were identified in Ireland following a National Radon Survey of Ireland (Fennell et al., 2002) and a map displaying HRAs in Ireland is available on the EPA's website (EPA, 2016b).

Three EPA awareness campaigns took place during 2013 and 2014², the period during which participants had measured the radon levels in their homes.

The total number of householders who carried out remediation was calculated by adding the number of householders who had completed a PRM from the EPA's Radon Measurement Service LIMS database and the number of householders who replied in the survey that they had carried out remediation. This total is then divided by 172 (the number of householders meeting the survey criteria) and used to determine the rate of remediation.

The main aim of this survey was to establish the rate of remediation amongst householders in Ireland that is householders who had carried out any work to reduce the radon levels in their home. While this can yield important strategic information, it is also recognised that an individual householder considering remediation requires more detailed information on what is involved in radon remediation before deciding to proceed with the work. For this reason the EPA also carries out a second survey which seeks information on the common methods and costs of remediation in Ireland (EPA, 2015b). This information is made available to householders with radon levels above the Reference Level, including those in this study and is published on the EPA's website.³

3. Discussion

3.1. Survey responses

Of the 148 questionnaires sent, a total of 96 valid replies were received (90 returned the questionnaire by post, 6 replied by telephone), giving a 65% response rate. It should also be noted that not all of the respondents answered all of the survey questions.

The responses to each question in the survey are detailed below:

Q1 Have you undertaken work in your home to reduce the radon level?

As mentioned earlier 24 householders were not sent the

² Mayo (November 2014), Kilkenny (March 2014), Louth (April 2013).

³ In the 2015 survey on Common methods and costs of remediation in Ireland, the average cost of installing an active sump in Ireland was estimated to be €925. It takes about half a day to install the sump and it is successful first time around in about 75% of homes. (EPA, 2015b).

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