




Radiological Protection Institute of Ireland

An Institiúid Éireannach um Chosaint Raideolaíoch

**RPII PROTOCOL FOR THE MEASUREMENT OF
RADON IN HOMES**



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3 Clonskeagh Square,
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October 2010

Scope

In order that the results of radon gas measurements for a home can be compared with the national Reference Level (200 Bq/m³) the radon gas concentration must be determined in accordance with the Radiological Protection Institute of Ireland's measurement protocol as set out here. This protocol also includes the minimum contents of the report to be issued. Separate guidelines are available covering radon measurements in workplaces and long-stay institutions^{1,2}.

Changes introduced in this version of the protocol

The main purpose of this revision to the Measurement Protocol is to provide updated seasonal correction factors for use with radon measurements made in Ireland. The seasonal correction factors used to date have been based on UK data. The revised seasonal correction factors in this Protocol are based on Irish data and their use will result in a more accurate measurement of radon concentrations in Irish homes³.

This revised measurement protocol has also been extended and clarified to include:

- More detailed measurement requirements for homes regarding the placement of detectors
- Clarification regarding use of seasonal correction factors for non-standard measurements.

Measurement procedure

- The annual average radon gas concentration for a home shall be determined using two radon gas measurements, one for the main living area and one for the main bedroom.
- It is preferable that detectors are not placed in the kitchen as detectors are sensitive to temperature, humidity and draughts. If the kitchen is the main living area, the detector should be placed as far from the cooking facilities as possible.
- Detectors should be placed at least one metre above the floor away from windowsills, fireplaces and TV sets.
- The radon gas concentration shall be measured using a detector capable of integrating the radon exposure continuously over a period of not less than 3 months. Suitable devices include, but are not limited to CR-39⁴ alpha track diffusion radon gas detectors.
- The measurement period shall not be less than 3 months or greater than 13 months.
- The average radon gas concentration for a home shall be 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 shall be assumed.

¹ Advice on setting a reference level for radon concentrations in long-stay institutions. www.rpii.ie.

² Guidance notes to assist with the planning of radon surveys in workplaces. www.rpii.ie.

³ Seasonal correction factors are based on: Burke, O., Long, S., Murphy, P., Organo, C., Fenton, D. and Colgan, P.A. Estimation of seasonal correction factors through Fourier decomposition analysis – a new model for indoor radon levels in Irish homes. *Journal of Radiological Protection*. *J. Radiol. Prot.* 30 (2010) 433-443.

⁴ Register Trademark of Columbia Resins

- Where the measurement period is less than 12 months, the seasonal correction factors set out in Appendix 1 shall be applied in order to determine the seasonally adjusted annual average. A worked example of the use of seasonal correction factors is given in Appendix 1.
- It is this seasonally corrected average radon concentration that is compared to the Reference Level of 200 Bq/m³.

Report contents

- The test report issued to the home-owners shall include the measurement period, the actual measured radon gas concentrations at the two measurement locations and the seasonally corrected annual average radon gas concentration for the home.
- Radon gas concentrations shall be given in becquerels per cubic metre (Bq/m³).
- The report shall include the name of the householder, or contact as appropriate and the full address of the building tested.
- The report shall clearly specify: the registered name of the testing service, the date of issue of the report and the person responsible for issuing the report.
- The Reference Level shall be quoted in the report.

Appendix 1
Seasonal Correction Factors Suitable for Use in Irish Homes

January	1.16
February	1.16
March	1.12
April	1.05
May	0.96
June	0.89
July	0.85
August	0.84
September	0.88
October	0.96
November	1.04
December	1.11

- Note:
1. Seasonal correction factors are not applied to radon measurements in workplaces or long-stay institutions.
 2. The seasonal correction factor to be applied to the measurement is obtained by averaging the monthly correction factors given above for the measurement period. The average of the two measured concentrations should be divided by the average seasonal correction factor to determine the seasonally corrected annual average.

For example, a measurement with the following results:

Bedroom: 150 Bq/m³

Living Area: 210 Bq/m³

Has an average radon concentration of:

$$\frac{150+210}{2} = 180 \text{ Bq/m}^3$$

If the measurement period covers the months of April, May and June, the correction is calculated as follows:

$$\frac{1.05 + 0.96 + 0.89}{3} = 0.97$$

The final, seasonally adjusted, average radon concentration is:

$$\frac{180}{0.97} = 186 \text{ Bq/m}^3$$

Note:

- Where measurements are carried out for periods greater than three months, the seasonal correction factors for each of the measurement months should be used to calculate the average correction factor.
- Where the measurement includes 15 or more days of a month, the seasonal correction factor for that month should be included in calculating the average, otherwise it should not be included.
- Some home owners request that more than two rooms be measured, for example, homes where the bedrooms may be on more than one storey or homes of more than two stories. Calculation of the average radon concentration for these homes should include all of the measurements carried out.



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Mission Statement

“To protect people from the harmful effects of ionising radiation, both natural and man-made, through effective regulation, monitoring of the environment and the provision of accurate and timely advice to the public and to Government”