

April 2024

ISLE OF MAN RADON ACTION PLAN

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Executive Summary

Radon is a naturally occurring radioactive gas, present in air indoors and outdoors. Radon gas represents approximately 48% of the general public's radiation exposure, and is therefore the largest contributor. Radon is the second leading cause of lung cancer after smoking. Radon seeps into buildings from the ground and in some locations it can accumulate to a harmful level.

All countries are affected to some degree by radon. There is an international consensus that actions should be taken to minimise the health impact of elevated radon levels in buildings, both in existing buildings and new buildings during their design and construction.

The Isle of Man Government is committed to action to reduce radon exposure at home, at work and elsewhere and so reduce the population's overall risk of lung cancer. The Isle of Man Government follows the UK policy on radon in buildings – and this document represents the Island's commitment to create a Radon Action Plan which adopts the existing UK Action Levels for homes (200 Bq/m³) and workplaces (300 Bq/m³).

The Isle of Man Radon Action Plan will be implemented by the Department of Environment, Food & Agriculture (DEFA) as a collaborative effort with the UK Health Security Agency (UKHSA) radon survey unit, which has the expertise to carry out the majority of the required work programme. DEFA will seek to identify areas where the radon concentration (expressed as an annual average) in a significant number of residential buildings is expected to exceed 200 Bq/m³. A digital Radon Map of the Isle of Man will be produced on our behalf by the UK Health Security Agency.

The Radon Action Plan includes a commitment to the control of radon exposure in workplaces. DEFA will issue information to Isle of Man employers and in particular those with work areas below ground level (e.g. basements or areas partially below ground) where radon levels are expected to be higher. Upon recommendation from the UKHSA, DEFA will also undertake a survey of all of the Isle of Man state schools, due to the many refurbishments and new building works since the first survey of schools in 1989.

1. Introduction

Radon is a naturally occurring radioactive gas which accounts for about half of the radiation exposure of the general public. Radon gas seeps into buildings from the ground and in some locations it can accumulate to a harmful level. This action plan deals with the hazard from elevated radon in air concentrations in buildings (homes and workplaces).

In a recent radon research poll of British adults, 90% of respondents were unaware of radon or any associated health risks.¹

2. Properties of Radon

Radon gas is colourless, odourless and tasteless. Radon comes from the natural radioactive decay of tiny quantities of uranium in earth materials like rocks, soils, bricks and concrete. The amount of radon emanating from the ground under a building is determined by the amount of uranium (and radium) in the near surface rocks and soil, and their permeability. Radon can only be detected by a radiation measurement device.

3. Health Risks from Radon

Everyone is exposed to a least a small concentration of radon gas as they breathe the air in their homes, workplaces and public buildings. Radon levels in a building vary by season, being lower in summer when buildings are generally better ventilated. The form of a building's construction will influence the concentration of radon in the air inside the building.

Radon inhalation is unavoidable, however at higher air concentration there is a greater risk of harm to a person's lungs. The World Health Organisation has categorised radon as a class 1 carcinogen. Elevated radon in air concentrations can cause radiation induced lung cancer (resulting in about 1,100 UK deaths per year, vs smoking causing 35,000). The combination of radon and smoking increases the risk further. There is an international consensus that

¹ www.radonassociation.co.uk Radon Awareness Week 6th – 12th November 2023

actions should be taken to minimise the health impact of elevated radon levels in buildings, both in existing buildings and new buildings during their design and construction.

4. Radon exposure in buildings in the Isle of Man

The Isle of Man Government's former Dept. of Local Government & Environment (DLGE) commissioned the UK National Radiological Protection Board (NRPB) to carry out a radon survey of public sector housing and all of the Isle of Man state schools, over the period of 1989 to 1991.² That survey found 2 properties to be slightly above the NRPB recommended Action Level of 200 Bq/m³ and so they were therefore resurveyed and subsequently found to be slightly under the 200 Bq/m³. No remedial action was therefore required on NRPB advice.

During this early radon survey work, the DLGE had given consideration to the possibility of higher radon concentrations being found in buildings located in the former mining areas of Laxey and Foxdale. Subsequently the survey found that the former mining areas did not have particularly higher radon levels than elsewhere on the Isle of Man, although the data set was certainly limited.

More recently in 2017, DEFA obtained the following general radon data for Isle of Man homes from the Public Health England (PHE) radon survey unit. The PHE data set has results for 81 IOM homes, the number of homes above the 200 Bq/m³ action level is 2. The arithmetic mean of the 81 IOM results is 45 Bq/m³ and geometric mean of results is 29 Bq/m³ (statistically most properties are closer to this lower level).

There are other IOM data sets held by other radon measurement laboratories in the UK, including one study³ based on 285 IOM homes reporting a mean of 48 Bq/m³. These are independently generated data sets held on confidential UK databases and the Isle of Man Government has no knowledge of the location of the properties concerned.

In summary, the Isle of Man Government has no 'area specific' information that identifies a radon problem anywhere in the Isle of Man, there are some properties with a radon concentration above the action level, but their locations are presently unknown. DEFA has made a 'working assumption' based on available information that the percentage of Isle of Man homes above the 200 Bq/m³ Action Level is within a band of 0.3% to 1%.

² Radioactivity Monitoring on the Isle of Man, Isle of Man Government Laboratory Reports 1989 to 1991.

³ Grainger et al. Phys. Med. Biol. 45, p2247 (2000)

5. UK Government strategy and action on radon

The UK National Radon Action Plan⁴ describes the UK national radon strategy and arrangements for managing exposure to radon in homes and workplaces. It fulfils relevant requirements in the 2013 European Union Basic Safety Standards Directive on protection against ionising radiation (EURATOM, 2013). The UK National Radon Action Plan includes the following:

- The principal aim to reduce radon exposure at home, at work and elsewhere and so reduce the overall risks of lung cancer;
- The UK's recommended Action Level for remedial work in homes is 200 Bq/m³, which represents the annual average radon concentration in the home;
- A target level has been set to achieve below 100 Bq/m³ for radon remedial measures in homes;
- The UK's radon Action Level for workplaces is 300 Bq/m³, as an annual average radon concentration, which has recently been reduced from 400 Bq/m³, to comply with an EU Directive;
- 'Affected areas' are categorised as those parts of the British Isles where potentially more than 1% of homes have radon concentrations at or above the Action Level
- New buildings in radon affected areas should be constructed with protective measures to prevent radon ingress;
- An online UK radon risk map www.ukradon.org - presently the Isle of Man is not included

6. Isle of Man Government legislation on radon

6.1 Radon in buildings

The Department of Environment, Food & Agriculture (DEFA) has a legal obligation to take a series of actions on radon. The Department's obligations being as stated in the Ionising Radiation (Basic Safety Standards and Justification of Practices) Regulations 2019 (Part 4 - Radon)⁵. This legislation uses the term 'Radon Action Plan' in reference to all of the radon control measures which DEFA must implement in partnership with the relevant stakeholders.

The Action Plan also takes into account the relevant issues identified in Annex XVIII to the Basic Safety Standards Directive. There is therefore a list of items to be considered in preparing the Radon Action Plan to address the long-term risks from radon exposure as referred to in Articles 54, 74 and 103⁶.

⁴ UK National Radon Action Plan (Dec. 2018) Public Health England, CRCE, Chilton, Didcot, Oxfordshire OX11 0RQ

⁵ See Appendix 2

⁶ See APPENDIX 3

6.2 Radon in new buildings

DEFA has been given a statutory obligation in relation to preventative measures for radon ingress into new buildings⁷ whereby Regulation 11 states: 'the Department must exercise its functions to ensure that appropriate measures are in place to prevent radon ingress into new buildings'.

Building designers and construction companies have duties to ensure buildings they design or construct are safe for future occupancy, normally this forms part of Building Regulation compliance. The existing Isle of Man Building Regulations (2014), Schedule 1 Part C, stipulate a requirement for site preparation and resistance to contaminants. 'In this requirement "contaminant" means any substance which is or may be harmful to persons or buildings including substances which are corrosive, explosive, flammable, radioactive or toxic'.

Additionally the current UK Building Regulations state 'natural contaminants also include the radioactive gas radon although the specific approach for assessing and managing the risk it poses is different from other contaminants.'

The implementation of this Radon Action Plan will have implications for new building developments. This will be of particular significance should the outcome of the Radon Action Plan identify a radon affected area (i.e. with potentially more than 1% of homes with radon concentrations above 200 Bq/m³). In a designated radon affected area, preventative measures to reduce radon ingress into new buildings should be considered at the design stage. Also, awareness that some building materials can be a minor source of radon can assist those carrying out risk assessment work.

7. Radon in the workplace

This Radon Action Plan encompasses the control of radon exposure in workplaces. The Management of Health and Safety at Work Regulations (2003) requires the assessment of health and safety risks and this should include radon. Employers have a duty to manage any occupational exposure. The potential radon exposure of anyone with access to the workplace must also be risk assessed. Any workplace where a measured radon concentration is above an annual average of 300 Bq/m³ should be notified to the Health and Safety Inspectorate.

Radon exposure is more likely in workplaces located in radon affected areas (i.e. areas where more than 1% of homes are potentially above the Action Level). The forthcoming Radon Map will be of assistance to employers. The map produced from the home measurement data can be used to indicate whether adjacent workplaces should be monitored for radon.

DEFA will issue information to Isle of Man employers which will be of particular relevance to those with work areas below ground level (e.g. basements or areas partially below ground).

⁷ See Appendix 2

Any basement workplace in the Isle of Man that is occupied for more than 50 hours per year should have its radon level checked. Employers will also be provided with information about the radon measurement service providers in the UK, who can supply the small and lightweight radon detectors by postal delivery and return.

DEFA has accepted the advice from the UKHSA (formally PHE) that all of the Isle of Man state schools be surveyed, due to the many refurbishments and new building works since the first survey of schools in 1989. When assessing radon risks in schools, the premises are considered a workplace for staff, while the students are considered members of the public (with correspondingly lower annual dose limits than employees).

8. Isle of Man Government strategy to reduce radon exposure

The Isle of Man Government is committed to action to reduce radon exposure at home, at work and elsewhere and so reduce the population's overall risk of lung cancer.

The Isle of Man Government policy on radon in buildings - is stated in this Radon Action Plan which adopts the existing UK Action Levels for homes (200 Bq/m³) and workplaces (300 Bq/m³).

The only realistically practical way for DEFA to take the necessary action, is to employ the services of the UK Health Security Agency (UKHSA) radon survey unit who have experience of this work throughout the UK. The most important outcome from the proposed radon project will be the creation of a digital Radon Map of the Isle of Man. The Radon Map is a prerequisite for most of the follow on work required and will be available for the public to use.

In January 2021, the following requirements for the Radon Action Plan were agreed between DEFA, our Director of Public Health & the UKHSA radon experts:

- It would be appropriate for the IOM to adopt the existing UK Action Levels for homes and workplaces
- DEFA should commission a radon survey of homes to obtain the radon data necessary for production of a predictive Radon Risk Map
- All IOM schools should be surveyed in the early phase of the plan
- Homes, workplaces and publically accessible buildings require assessment
- DEFA should obtain an Isle of Man Radon Risk Map as a prerequisite to most further actions
- UKHSA will produce a Radon Risk Map (in collaboration with the Cartographic Section of the Department of Infrastructure who hold MANNINGIS data together with property information)
- The digital Radon Map will need to be accessible to the public
- Stakeholders should be informed of the Radon Action Plan

9. Radon remediation in Isle of Man buildings

In the UK, radon remediation work is carried out by private contractors. A radon remediation specialist can design and install a system to lower the level of radon in a building. There are two private sector radon contractor associations: the UK Radon Association and the Radon Council. These and other organisations provide short duration or online training courses in radon remediation for professionals in the Building Sector.⁸

There is limited information available on existing Isle of Man capacity for radon remediation works. DEFA will be giving consideration as to what assistance could be given to assist home owners to interpret their results from a survey, consider appropriate remedial works, and to enable upskilling of local building contractors for radon remediation work.

10. Miscellaneous radon issues

A number of issues concerning alternative sources of potential radon exposure will be kept under review, although there is no evidence that they should be a problem in the Isle of Man

- Radon in public or private drinking water supplies
- Radon and thoron emitted from building materials
- Radon or thoron generation from specialist industrial processes

11. Public and stakeholder communication on radon

Initial discussions with the UKHSA indicate it would be appropriate for DEFA to liaise with some of the key local stakeholders. DEFA will publish the Radon Action Plan and invite comments from relevant stakeholders.

DEFA is working in cooperation with the Department of Education, Sport and Culture on the survey of radon levels in schools.

DEFA has a legal obligation to issue public information on the potential risk from radon in Isle of Man homes and workplaces. There is a DEFA webpage giving details of the potential hazard from radon and the proposed survey of Isle of Man schools and homes.

There is an annual Radon Awareness week in the UK organised by the UK Radon Association and the public can also access a number of online sources of information on radon.^{9 10}

12. Forward plan for action on radon

As at the date of publication of this plan (February 2024) the Department is actively working on finalising plans for a residential survey in the Isle of Man, in order to create a Radon Map of the Island.

⁸ www.radoncouncil.org

⁹ www.ukradon.org

¹⁰ www.radonassociation.co.uk

It also plans to undertake a survey on Government Workplaces, in order to gather information about Radon exposure at work.

The UKHSA radon experts will carry out the necessary Isle of Man radon survey work in a similar manner to radon surveys in the UK. They anticipate that Isle of Man home owners and tenants will respond to an invitation to participate in a radon survey. Based on experience in the UK, the UKHSA have recommended that invitations be issued to 1400 home owners/tenants which would be expected to produce 700 participants.

The timetable for the commissioned radon survey work will be dependent on the availability of the UKHSA services from January 2024, and a start date likely to get good participation from local home owners/tenants.

There will be a joint letter from DEFA and the UKHSA to Isle of Man residents (potentially 1400 households) inviting them to participate in the IOM radon survey.

The UKHSA will receive and collate positive responses for participation in the radon survey.

Radon detectors will be posted to IOM homes for a 3 month recording period (more accurate results will be obtained by avoiding mid-summer placement when homes are most ventilated).

In parallel to the radon survey, the following actions are necessary:

- the provision of advice to employers regarding basement working and the availability of the UKHSA and other commercial radon survey providers to check their radon levels;
- notification of the Radon Action Plan to stakeholders;
- the provision of information to the public on the potential risk from radon in Isle of Man homes and workplaces;
- exploring ways in which DEFA can assist property owners with obtaining advice in interpreting Radon results and considering remedial action;
- considering potential training opportunities for local construction workers in undertaking Radon mitigation activities and
- a webpage explaining the Radon Project with an enquiry address Radonproject@gov.im

The Radon Action Plan should be reviewed at intervals of no more than five years.

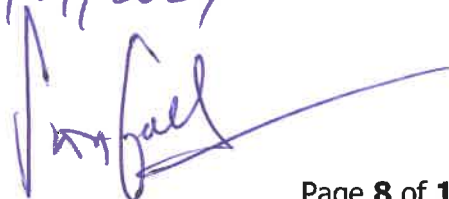
This Action Plan has been approved by DEFA Chief Officer as below:

Name: SCOTT GALLACHER

Role: CHIEF OFFICER

Date: 17/04/2024

Signature



Appendix 1

Terms and Expressions

Becquerel (symbol Bq) The unit of the amount or activity of a radionuclide. Describes the rate at which transformations occur. 1 Bq = 1 transformation per second.

Becquerel per cubic metre of air (symbol Bq m⁻³) The amount of a radionuclide in each cubic metre of air. Often referred to as the activity concentration.

Mitigation The reduction in the radon level by mechanical or other means. Mitigation does not imply the complete removal of radon.

Radon The radionuclide Rn-222 and its progeny, as appropriate.

Radon Action Level The reference level for the activity concentration of radon in UK homes. Its value, expressed as the annual average radon gas concentration in the homes, is 200 Bq m⁻³.

Radon Affected Areas Parts of the country with a 1% or more probability of present or future homes being above the Action Level.

Reference level The level of activity concentration above which it is judged inappropriate to allow exposures to occur as a result of that exposure situation, even though it is not a limit that may not be exceeded.

Remediation See mitigation.

Thoron The radionuclide Rn-220 and its progeny, as appropriate.

Appendix 2

IONISING RADIATION (BASIC SAFETY STANDARDS AND JUSTIFICATION OF PRACTICES) REGULATIONS 2019

PART 4 – RADON

8) Indoor exposure to radon

(1) The Department must set a reference level for the exposure of members of the public to indoor radon concentrations. The reference level for the annual average radon activity concentration in air must not exceed 300 Becquerels per cubic metre.

(2) In this regulation, “reference level” means the level of activity concentration above which optimisation of radiation protection for members of the public must be prioritised.

9) Requirement to make available to the public information regarding radon

The Department must ensure that information on—

- (a) indoor radon exposure and associated health risks;
- (b) the importance of performing radon measurements; and

(c) the technical means available for reducing existing radon concentrations,
is made available to the public.

10) Radon action plan

(1) The Department must establish a national plan ("the action plan") addressing long-term health risks from any source of radon ingress (whether from soil, building material or water) to—

(a) dwellings;

(b) buildings with public access; and

(c) workplaces.

(2) The action plan must—

(a) take into account relevant issues identified in Annex XVIII to the Basic Safety Standards Directive; and

(b) be updated at intervals of no more than five years.

11) New buildings

The Department must exercise its functions to ensure that appropriate measures are in place to prevent radon ingress into new buildings.

12) Areas of high radon concentration

The Department must identify areas where the radon concentration (expressed as an annual average) in a significant number of buildings is expected to exceed the relevant reference level set under regulation 8.

Appendix 3

Annex XVIII to the Basic Safety Standards Directive;

ANNEX XVIII

List of items to be considered in preparing the national action plan to address long-term risks from radon exposures as referred to in Articles 54, 74 and 103

(1) Strategy for conducting surveys of indoor radon concentrations or soil gas concentrations for the purpose of estimating the distribution of indoor radon concentrations, for the management of measurement data and for the establishment of other relevant

parameters (such as soil and rock types, permeability and radium-226 content of rock or soil).

(2) Approach, data and criteria used for the delineation of areas or for the definition of other parameters that can be used as specific indicators of situations with potentially high exposure to radon.

(3) Identification of types of workplaces and buildings with public access, such as schools, underground workplaces, and those in certain areas, where measurements are required, on the basis of a risk assessment, considering for instance occupancy hours.

(4) The basis for the establishment of reference levels for dwellings and workplaces. If applicable, the basis for the establishment of different reference levels for different uses of buildings (dwellings, buildings with public access, workplaces) as well as for existing and for new buildings.

(5) Assignment of responsibilities (governmental and non-governmental), coordination mechanisms and available resources for implementation of the action plan.

(6) Strategy for reducing radon exposure in dwellings and for giving priority to addressing the situations identified under point 2.

(7) Strategies for facilitating post construction remedial action.

(8) Strategy, including methods and tools, for preventing radon ingress in new buildings, including identification of building materials with significant radon exhalation.

(9) Schedules for reviews of the action plan.

(10) Strategy for communication to increase public awareness and inform local decision makers, employers and employees of the risks of radon, including in relation to smoking.

(11) Guidance on methods and tools for measurements and remedial measures. Criteria for the accreditation of measurement and remediation services shall also be considered.

(12) Where appropriate, provision of financial support for radon surveys and for remedial measures, in particular for private dwellings with very high radon concentrations.

(13) Long-term goals in terms of reducing lung cancer risk attributable to radon exposure (for smokers and non- smokers).

(14) Where appropriate, consideration of other related issues and corresponding programmes such as programmes on energy saving and indoor air quality. EN L 13/66 Official Journal of the European Union 17.1.2014

