



Radon in the UK Workplace Employers' Duties Under the Ionising Radiation Regulations 2017 for Radon (IRR17)

A Short Overview

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Introduction

Radon is a naturally occurring radioactive gas that can pose significant risks to health when accumulated in the workplace environments. In response to these risks, the Ionising Radiation Regulations 2017 (IRR17)¹ were established to ensure the protection of workers from the harmful effects of ionising radiation, including radon. This document aims to outline the key duties of employers under IRR17 to manage and mitigate radon hazards in the workplace.

Understanding Radon and its risks

Before delving into the specific duties of employers, it is essential to comprehend the nature of radon and the associated risks. Radon is a colourless, odourless gas formed from the decay of uranium found in rocks and soil. While it is ubiquitous in the environment and usually present at low levels within normal outdoor air, it can accumulate to dangerous levels within buildings. When inhaled, radon, and its associated decay products, can damage lung tissues. This increases the risk of lung cancer over time, particularly with prolonged and/or elevated exposure. Therefore, monitoring and controlling radon levels in the workplace is a legal requirement for safeguarding employees' health.

In the UK it is estimated that there are over **1,000 premature deaths per year**² due to radon exposure and it is the second largest cause of lung cancer after smoking. Radon, and its associated decay products, contribute approximately half of your annual radiation dose from all sources. Most of your individual radon exposure is when you are inside buildings.

What Radon levels should we be concerned about?

In theory any exposure to radon carries an increased risk of cancer (there is no safe level). Radon already contributes, on average, to around 50% of our lifetime radiation exposure. In the UK, the average indoor radon level is approximately 20 Bq m⁻³. The UK Health Security Agency (UKHSA) recommend a target level of 100 Bq m⁻³ in domestic homes and an action level of 200 Bq m⁻³ as an annualised average³.

The legal threshold for radon in the workplace is set within the IRR17 at a 300 Bq m⁻³ annualised average (the 300 Bq m⁻³ threshold). However, dependant on occupancy and individual exposure this could change for example if you have a pregnant employee.

Where radon is identified, it should be reduced to as low as reasonably practicable (ALARP) with several employers choosing to mitigate to levels below 100 Bq m⁻³ where possible. Even at 100 Bq m⁻³ you are still 5 times over the UK indoor average.

¹ <https://www.legislation.gov.uk/ukxi/2017/1075/contents>

² <https://www.hse.gov.uk/radiation/ionising/radon.htm>

³ <https://www.ukradon.org/information/level>

Where should testing for Radon gas be carried out?

Unless you have carried out radon testing, you can never be confident of the radon levels.

Employers should carry out a radon risk assessment and suitable conduct radon investigations at “any workplace where its location and characteristics suggest that elevated levels may be found and significant exposures to employees and/or other persons are possible.” For most locations this means within a ‘Radon Affected Area’ as identified on the latest radon maps⁴ or where elevated radon could be anticipated such as within below ground building basement areas. Other locations where radon could be elevated include any underground works (e.g. mining, quarrying, tunnelling) or where groundwater supplies are brought into buildings without adequate pre-treatment (radon dissolves in water).

It should be noted that high radon levels have been found within areas not within ‘Radon Affected Areas’. Therefore, it is best to discount the presence of radon on the basis of good quality test data.

The findings of the radon risk assessment should be documented and acted upon where necessary as detailed below.

It is good practice to update the radon risk assessment from time to time if your place of work is within a ‘Radon Affected Area’ and/or the building has undergone alteration that may have influenced radon levels. A good example is when a building has updated insulation or where a new or modified ventilation system has been installed.

What Radon testing should be done?

This will be specific to the particular location and the objectives of the investigation. There are several investigation methods used by a radon specialist to build up a suitable data set and evidence base to inform a risk assessment. This can vary from grab sampling using highly accurate instruments to longer term passive monitoring.

For the purposes of initial screening of existing workplaces, it is normal practice to conduct passive testing in a number of rooms (preferably all occupied rooms) over a 90 day period. Shorter testing periods are possible, 10 days for example, however the results are deemed as indicative due to the high variability of radon concentrations over a typical year.

Testing should be conducted using passive radon detectors from validated laboratories or suitable and calibrated electronic monitoring instruments.

Paragraph 409 of the Health and Safety Executive (HSE) Approved Code of Practice(ACoP)⁵ states “monitoring equipment should normally be tested and thoroughly examined at least once every year”. While this only applies to the IRR17, it is strongly recommended that any testing done for the purposes of workplace investigation follows the ACoP advice so that data obtained can be considered within a subsequent Radiation Risk Assessment if found necessary.

⁴ <https://www.ukradon.org/information/ukmaps>

⁵ <https://www.hse.gov.uk/pubns/books/l121.htm>



Employer Duties Under IRR17 (Radon focus)

The IRR17 prescribe a series of employer responsibilities to ensure that radon exposure in the workplace is adequately controlled. The Health and Safety Executive (HSE) has also issued an Approved Code of Practice (ACoP) which should be used in conjunction with the Regulations.

These duties can be summarised as follows:

1. Application of the IRR17 for Radon

The IRR17 Regulations (Regulation 3 (1)(b)) apply to any work (other than a practice) carried out in an atmosphere containing radon 222 above the 300 Bq m⁻³ threshold. For the purposes of the Regulations, an employer includes a self-employed person and an employee includes a self-employed person and a trainee.

A place of work can include visits to properties with radon, or indeed employee homes, where they are allowed to work from home.

Regulation 4 (1) also extend to exposure of ionising radiation of persons other than employer's employees. It is considered that knowingly allowing persons into an atmosphere containing radon gas at an annual average activity concentration in air exceeding 300 Bq m⁻³ would meet this criterion.

Should testing identify radon levels above the 300 Bq m⁻³ threshold in any workplace then the IRR17 Regulations apply. There is no set length of time in which the threshold must be exceeded.

2. Notification to the HSE

Regulation 5 requires any employer engaging in activities where radon concentrations exceed the 300 Bq m⁻³ threshold to notify the HSE. By notifying the HSE, the employer confirms the implementation of arrangements to ensure compliance with IRR17.

3. Radiation Risk Assessment

Employers must produce a suitable and sufficient radiation risk assessment if employees are exposed to radon concentrations that exceed the 300 Bq m⁻³ threshold as detailed within Regulation 8. This assessment must address paragraphs 70 and 71 of the IRR17 ACoP and show that workplace radon exposure meets ALARP principles.

Importantly the 'Radiation Risk Assessment' focuses on the nature of the ionising radiation and exposure (dose) to which anyone can be exposed and how this will be managed. This is significantly different from a 'radon risk assessment' which determines radon levels within a building, typically for the purposes of compliance monitoring, mitigation and for informing the radiation risk assessor of anticipated radon levels.

The Radiation Risk Assessment should be carried out by a competent person or persons and would be expected to include competent advice from a Radiation Protection Adviser.

4. Radiation Protection Advisor

Regulation 14 mandates that any employer working in radon levels above the 300 Bq m⁻³ threshold must appoint and consult with a Radiation Protection Adviser (RPA). The RPA must be certified under RPA2000⁶ and deemed suitable by the employer, which generally involves confirming that the RPA has experience advising on the application of IRR17 for radon. The RPA must be engaged in writing the scope of their appointment and detailing the scope of the advice which the radiation protection adviser will give.

5. Restriction of exposure

Employers must take all necessary steps to restrict, so far as is reasonably practicable the extent to which its employees and other persons are exposed to ionising radiation as per Regulation 9. For radon, this is normally done by implementing radon mitigation measures to reduce radon to acceptable levels and below the radon threshold.

This could also be achieved by the careful control of exposure of individuals and limiting their access and time in 'designated areas' as defined in Regulation 17. This can place a significant burden on the employer and ideally should be secondary to effective mitigation.

6. Maintenance of mitigation systems

An employer must ensure that mitigation systems where implemented are operational, suitably maintained and tested pursuant to Regulation 11. Note that radon will continue to emit from the surround soils into the building. Once radon is identified it will need to be managed for the lifetime of the building (while it is in use and occupied).

7. Regular testing for radon

To ensure that radon levels remain below the 300 Bq m⁻³ threshold it is necessary to test the air for radon levels from time to time. The frequency of such testing should be considered within the risk assessment and may also be triggered by modification to the workplace that could result in a change in radon levels, such as modification or alteration of air management systems or increased insulation for heat retention.

The above summary of radon specific requirements within the IRR17 are just some of the regulations and others may well apply to the workplace.

⁶ <https://www.rpa2000.org.uk/>

Radon Mitigation Options

There are several methods that can be applied to reduce radon levels in the workplace and selecting the most appropriate for particular buildings and the workplaces areas should be done on a site-specific basis, considering a range of factors from the radon levels. Factors such as occupational behaviour, structural and foundation design, existing heating and air management controls are just some examples.

For slightly elevated radon levels, and a small office area, then localised sealing of obvious cracks and pathways from the floor and provision of a positive input ventilation system can be a suitable and cost-effective solution. However, where radon levels are high ($>1,000 \text{ Bq m}^{-3}$), it is usually necessary to retrofit active radon sumps to draw out radon and safely exhaust to outside air before it enters the building.

It is recommended that a specialist radon mitigation company is engaged to carry out such works. It should be born in mind that several phases of mitigation may be necessary on some buildings to reduce the radon levels to below the desired threshold due to the complexity of radon behaviour and interaction with building specific features and functions.

Radon Compliance Monitoring

The amount of radon compliance monitoring required and how often it needs to be repeated is site specific and there is no 'set' minimum. Currently, as recommended by the UKHSA, a 90 day test period is required to provide a suitable test period for considering radon levels. If a suitable number of test locations are completed annually this would likely be consider sufficient. Longer periods between testing might be acceptable for lower 'pre-mitigation' radon settings.

As with the initial building investigation, testing should be conducted using passive radon detectors from validated laboratories or suitable and calibrated electronic monitoring instruments. It's becoming increasingly common to employ both methods so that suitable data is available quickly to employers and the costs for providing electronic monitoring is reducing with the advent of a number of Internet of Things (IoT) type devices which can be linked to Building Information Modelling (BIM) systems and remotely monitored.

Failing to comply with IRR17

There have been a number of recent radon cases where the HSE has taken action against employers that have resulted in the issue of Improvement Notices and Notifications of Contravention. There has also been a sizeable fine of £50,000 issued to a school in Bath.

It should be noted that the HSE will also charge the employer for their time under a Fee For Intervention (FFI) where there is a material breach of health and safety law.



Conclusion

IRR17 set forth essential responsibilities and duties for employers to manage the risks associated with radon exposure in the workplace.

Adhering to these regulations not only ensures compliance but also demonstrates a commitment to worker health and safety.

Resources

For additional information on radon and workplace safety, employers can refer to the following resources which are free to access on the internet:

- Statutory Instrument 2017 No. 1075 Health and Safety - The Ionising Radiation Regulations 2017
- Health and Safety Executive (HSE) – Working with ionising radiation - Ionising Radiation Regulations 2017 Approved Code of Practice and guidance L121 (Second Edition 2018) ISBN 978 0 7176 6662 1

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