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Beyond the Surface: Managing Radon Risks

Quick guide

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Summary

This quick guide has been prepared to support social housing providers, local authorities, and retrofit professionals in understanding the importance of radon awareness within retrofit programmes. **Yvonne Power**, Managing Director of **Radon Services Ireland (RSI),** explains what radon is, why it matters for occupant health, how it interacts with building performance, and the steps required to test, manage, and mitigate radon risk.

This guide also outlines key responsibilities and practical actions to support the integration of indoor air quality considerations alongside energy efficiency improvements. This guide is intended as an accessible introduction. For more detailed technical guidance, readers should refer to additional resources on the RISE Knowledge Hub. Readers that would like this document in a more accessible format should contact **rise@turntown.co.uk**.

What is radon?

Radon is a **naturally occurring radioactive gas** formed through the breakdown of uranium in soil and rock. It is present in the ground and can enter properties, regardless of age, construction type, or condition.

It cannot be seen, smelt, or tasted, meaning occupants are typically unaware of its presence without testing. Because of this, radon is often described as **a hidden risk** within buildings, with levels varying significantly between properties - even those located next to each other.

Radon is present throughout the UK, although some geological areas have a much greater potential for elevated indoor concentrations than others.

Why radon matters in retrofit

Radon is a **significant public health risk**, particularly when it accumulates indoors over long periods.

Key risks:

- Second leading cause of lung cancer after smoking.
- Leading cause of lung cancer among non-smokers.
- Increased risk when combined with smoking.
- Radon is estimated to cause over 1,000 lung cancer deaths each year in the UK.

Retrofits and unintended consequences

Installed measures such as insulation and airtightness improvements:

- Reduce uncontrolled ventilation.
- Change how air moves through buildings.
- Can trap radon indoors, increasing concentrations.
- Can reduce natural air leakage, allowing radon concentrations to increase unless appropriate ventilation measures are incorporated.

This makes it essential to balance:

1. Energy efficiency
2. Indoor air quality
3. Ventilation performance

Retrofit should take a **whole-house approach**, ensuring homes/buildings are both energy efficient and healthy.

How radon gas enters buildings

Radon gas enters buildings from the ground beneath them and is drawn inside through natural pressure differences. As warm air rises within a building, it creates a slight vacuum effect that can pull gases from the soil into indoor spaces.

Common entry routes include:

- Cracks in floors and walls.
- Gaps around pipes and service penetrations.
- Cavities and construction joints.
- Drains and ground connections.

Once inside, radon can accumulate over time, particularly in areas where ventilation is limited or airflow is restricted.

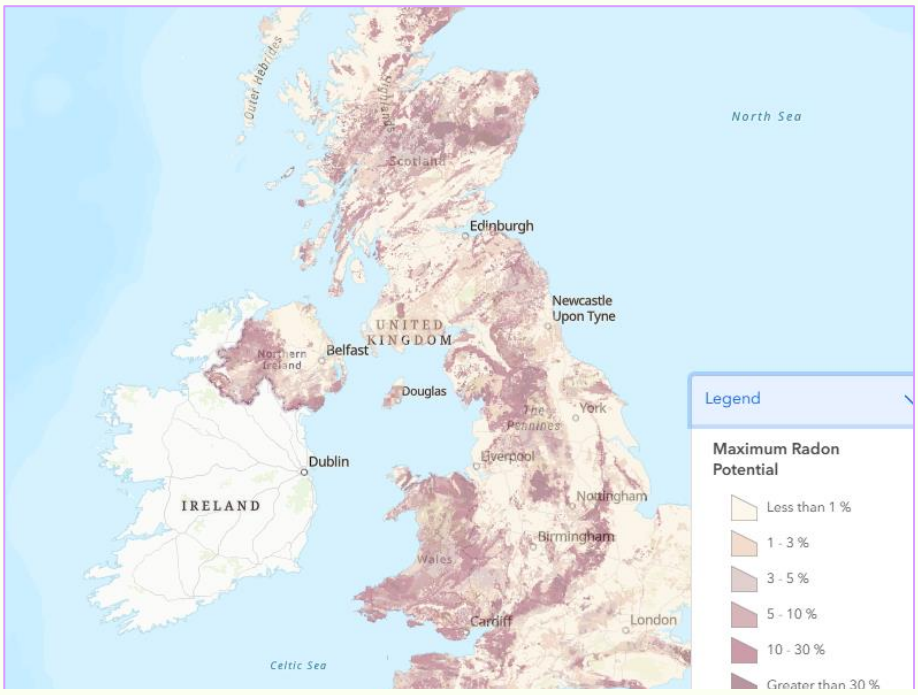

Figure 1: Map of UK with areas affected by Radon with scale to show maximum potential. Source: UKHSA.

Testing and measurement

Testing is the only reliable way to determine whether radon is present in a building. There are no physical signs or immediate symptoms that would indicate elevated levels, which makes measurement an essential first step in managing risk.

Radon is measured in becquerels per cubic metre (Bq/m³), which reflects the level of radioactive activity in the air.

Testing methods

- **Passive detectors** - small, non-powered devices placed in key rooms and returned to an accredited laboratory for analysis.
- **Active monitors** - electronic devices providing real-time data and trend analysis.

Long-term testing averages seasonal variations in radon concentration, providing a more representative annual result.

When to test

Testing is particularly important:

1. Before retrofit works
2. After major renovations or changes to ventilation
3. In radon-affected areas
4. Where there are concerns about indoor air quality *(see figure 2)*
5. Before purchasing properties, following installation of mechanical ventilation systems.

Understanding radon risk levels

Radon risk is determined by measuring concentration levels within a building. While there is no completely risk-free level, UK guidance provides thresholds to help determine when action is needed.

Radon Level (Bq/m³)	Interpretation of concentration levels
Below 100	Low risk (target level)
100-200	Elevated - monitoring or improvements may be considered
Above 200	Action recommended (UK Action Level)
Above 300	Workplace reference level

Figure 2 Explains radon level with interpretation of concentration levels. Source: UKHSA.

The general principle is to reduce radon exposure as far as reasonably practicable, ideally to below 100 Bq/m³ where achievable. There is no completely

safe level of radon. The objective is to reduce exposure as far as reasonably practicable.

Managing and reducing radon

Radon can usually be managed effectively once it has been identified. In the short term, increasing ventilation - such as opening windows or improving airflow - may help to reduce concentrations temporarily. However, these measures are not suitable as long-term solutions.

Sustainable mitigation typically requires more targeted interventions. These are designed to either prevent radon from entering the building or safely remove it before it can accumulate indoors.

Common mitigation solutions include:

- **Radon sump systems**, which extract gas from beneath the building and vent it externally.
- **Positive Input Ventilation (PIV)** systems to improve internal air circulation.
- **Subfloor ventilation improvements** to reduce gas build-up below floors.
- **Balanced ventilation strategies** integrated into overall building design.

The most appropriate approach will depend on the building type, construction, and measured radon levels. Mitigation should always be evidence-based and considered as part of a wider retrofit strategy. Mitigation systems should be inspected and maintained periodically to ensure continued effectiveness.

Roles and responsibilities

Radon management involves a range of stakeholders, each with a role to play in ensuring safe indoor environments.

Landlords and housing providers:

- Ensure properties are safe to occupy.
- Consider radon within health and safety duties.
- Take action where elevated levels are identified.

Local authorities:

- Monitor risks under housing regulations.
- Enforce action where necessary.

Retrofit professionals:

- Integrate radon awareness into project design.
- Balance energy performance with ventilation.

Residents and occupants:

- Seek information about testing and risks.
- Be aware of mitigation measures in place.
- Maintenance of existing radon fans.

Indoor Air Quality (IAQ)

Indoor air quality (IAQ) is influenced by a range of factors, of which radon is just one. Effective retrofit projects should consider **the indoor environment as a whole**, recognising that improvements to a building's energy performance can also affect ventilation and the movement of indoor pollutants.

Key indoor air quality factors include:

- Radon
- Carbon dioxide (CO_2)
- Moisture and condensation
- Mould
- Volatile Organic Compounds (VOCs)
- Fine particulate matter (PM2.5)

A balanced approach to retrofit considers energy efficiency, ventilation, moisture management, and indoor air quality together *(see figure 3)*. Taking these factors into account helps create homes that are **comfortable**, **healthy**, and **perform effectively** over the long term.

Figure 3: Example retrofit lifecycle showing when radon assessment, testing, mitigation and ongoing monitoring should be considered. Source: RSI.

What happens next

Once radon has been considered within a retrofit project, it becomes part of a structured process that supports both compliance and long-term building performance. Initially, testing establishes a **intial understanding** of radon levels within the property. This allows risks to be identified and informs decisions around ventilation and mitigation strategies. Where elevated levels are detected, **appropriate measures** can be specified and incorporated into the retrofit design.

Following installation, it is important to verify that the building is performing as intended. This typically involves retesting to confirm that radon levels **remain within recommended levels**. In some cases, ongoing monitoring may also be appropriate, particularly for larger housing portfolios.

Taking this structured approach ensures that retrofit programmes deliver not only energy efficiency improvements, but also safe and healthy indoor environments for occupants.

Next steps

You should now have a clear understanding of radon and its importance within retrofit programmes.

Immediate actions

1. Integrate radon awareness into early project planning.
2. Undertake radon testing where appropriate.
3. Review ventilation strategies alongside energy efficiency measures.

Ongoing actions

- Plan and implement mitigation measures where required.
- Retest properties after retrofitting works.
- Monitor indoor air quality over time.
- Maintain records of radon testing / mitigation and building safety information.

For further guidance, refer to UK Health Security Agency (UKHSA) resources, the **RISE Knowledge Hub**, and relevant retrofit best practice materials.

Relevant resources:

For Radon guidance:
Homepage – Radon Solutions Ireland
UK maps of radon – UKHSA website
UK National Radon Action Plan – Public Health England

For retrofit and building standards:
BRE Home – Building Research Establishment (BRE)
CIBSE TM40 – Health and wellbeing in building services
PAS 2035:2019 / PAS 2035:2023 - TrustMark
Part C - Site preparation and resistance to contaminants and moisture
BS 5250:2021 - Management of moisture in buildings

For related RISE Content:
Silent threat: understanding radon – RISE Podcast