

Radon barriers

(July 2023) (Third issue)



Question

What are NHBC's requirements for membranes intended for use as radon barriers.

Considerations

Statutory requirements for the UK's nations concerning radon are contained in the following:

- For England - Approved Document C 'Site preparation and resistance to contaminants and moisture' (2004 Edition incorporating 2004, 2010 and 2013 amendments), Section 2, Cl.'s 2.39 and 2.40
- For Scotland - Technical Handbook - 'Domestic' (June 2023 Edition), Standard 3.2 and Cl.'s 3.2.0, 3.2.1 and 3.2.2
- For Wales - Approved Document C 'Site preparation and resistance to contaminants and moisture' (2004 Edition incorporating 2004 and 2010 amendments), Section 2, Cl.'s 2.39 and 2.40
- For Northern Ireland - The Building Regulations (Northern Ireland) 2012, Part C, Regulations 25 and 26.

Guidance on appropriate protective measures is deferred to BRE Report BR 211 'Radon - Guidance on protective measures for new buildings' in the respective documents under Cl. 2.40 for both England and Wales, and Cl. 3.2.2 for Scotland.

For Northern Ireland, Explanatory Note 3 to the Regulations notes Part C (*Site preparation and resistance to contaminants and moisture*) requirements reference revised designated radon affected areas included in the Northern Ireland Environment Agency publication 'Radon in Dwellings in Northern Ireland: 2009 Review and Atlas. However, further reference is required to the Building Regulations (Northern Ireland) 2012 Technical Booklet C 'Site preparation and resistance to contaminants and moisture' October 2012 and Cl. 3.11 that defers to guidance on protective measures being given in BRE Report BR 413 'Radon: guidance on protective measures for new dwellings in Northern Ireland' (albeit with exclusions). However, the last edition of BRE Report BR 413 was superseded by the 2015 Edition of BRE Report BR 211 (see Section 1 'Introduction').

BRE Report BR 211 has now been released as a 2023 Edition titled 'Radon - Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects)'. This now supports building regulations for all UK nations and supersedes previous relevant BRE guides, i.e. BRE Reports BR 211:2015, BR 376:1999 and BR 413:2001. Its guidance should now be followed.

Section 3 'Protective measures' of the 2023 Edition of BRE Report BR 211 includes the following:

In areas with an increased radon potential, sufficient protection will be provided by a well-installed and inspected radon membrane. This gas-tight membrane is known as 'basic radon protection'.

Section 6.2.1 'Barriers' provides further guidance as follows:

A membrane of 300 microns polyethylene sheet is adequate to provide damp-proof protection and should provide some protection against radon entry. British Standard 8485:2015 + A1:2019 states that a polyethylene membrane material less than 400 microns is unlikely to withstand construction damage post installation. It is generally accepted that the robustness of a gas-resistant membrane is more critical to its performance than its permeation rate to challenge gases, therefore it is advisable to use a membrane of 400 microns or above according to construction conditions identified by the design.

The membrane can be constructed with other materials that match or better the airtightness and waterproofing properties offered by a proprietary radon membrane. Alternative materials that can prove suitable include prefabricated welded barriers, modern flexible sheet roofing materials, self-adhesive bituminous-coated sheet products, liquid coatings and asphalt.

*BRE Report BR 211:2023 advises further that a typical radon transmission rate for a radon resistant membrane would be 12*10⁻¹²m²/s.*

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Answer

Cl. 4.1.7 of NHBC Standards Chapter 4.1 requires hazardous ground conditions to be satisfactorily managed, including by the use of suitably designed precautions.

Relative to radon, NHBC's position for suitable protective measures and particularly on membranes is that guidance of BRE Report BR 211 should be followed, i.e. a minimum, 400 micrometre (1600 gauge) polyethylene be used across the footprint of the building, which includes bridging cavities and sealing of all laps and penetrations.

Where protective measures are required for both radon and other hazardous gases, for example methane or carbon dioxide, it should not be assumed a radon barrier will be effective in such circumstances and further specialist advice should be sought. Also see Appendix G of BS 8485:2015+A1:2019.

BRE Report BR 211 also advises under Section 6.2.1 that some manufacturers market radon barriers manufactured from recycled products and notes these should be checked they provide the same or a better level of protection and longevity as that of 400 micrometre (1600 gauge) virgin polyethylene. NHBC is aware of such products, however they should not be used on sites where NHBC Buildmark Warranties are required.

Further guidance can be found under Chapter 7 of *CIRIA C801 Hazardous ground gas - a site management guide*.

Note: This Technical Guidance is subject to a transitional period. It will exist only until 31st December 2023 whereafter reference to BRE Report BR 211:2023 will occur in NHBC Standards 2024 Chapter 4.1 and this Technical Guidance will be withdrawn.