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IAF - Radioökologie GmbH

Laboratory for radionuclide analysis I Radiological expertise I Consulting

Determination of the radon diffusion coefficient and the diffusion length of a "Type ED" sealing insert

Client:	KRASO GmbH & Co. KG Baumannweg 1 46414 Rhede
Project name:	Determination of the radon diffusion coefficient and the diffusion length of a "Type ED" sealing insert
Project number:	200330-09
Contractor:	IAF-Radioökologie GmbH
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German Accreditation Body
D-PL-11201-01-00

The accreditation is valid for the result s of radon measurements in buildings shown (SOP 4-02, 2018-11). The evaluations contained in the report are based on these results.

Radeberg, 11/05/2020

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IAF - Radioökologie GmbH
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Determination of the radon diffusion coefficient and the diffusion length of a "Type ED" sealing insert

1 Task

According to the order placed by KRASO GmbH & Co. KG, IAF-Radioökologie GmbH (IAF) is to determine the radon diffusion constant of a "Type ED" sealing insert and to carry out an assessment with regard to radon tightness.

2 Measuring method

To determine the radon diffusion constants, the sealing insert was installed in a 2-chamber measuring system in such a way that radon can only migrate from chamber 1 into chamber 2 if it traverses the sealing system as a result of a diffusion process. The developing radon concentration in chamber 2 is recorded in 1-hour intervals using a radon monitor. The increase in radon concentration in chamber 2 varies depending on the radon tightness of the sealing system. This results in a plateau value, which represents a dynamic equilibrium between radon migration from the radon reservoir (chamber 1) through the sealing system and radon decay in the measuring chamber (chamber 2) and determines the radon diffusion constant D, measured in [m_d/s]. The diffusion length L_D of the test element is given by

$$L_D = \sqrt{\frac{D}{\lambda . R_n}}$$

where $\lambda R_n = 2.1 \cdot 10^{-6} / s$ is the radon decay constant. The diffusion length L_D is a measure of the average distance a radon atom penetrates through the tested element during its half-life. A sealing system is considered "radon-proof" if the thickness (d) of the material is at least 3 times its radon diffusion length (L_D)

$$R = ,$$

otherwise the sealing system is to be designated as "not radon-proof".

3 Measurement results and evaluation

The diffusion length as calculated from the measurement results and the result of the radon tightness test are summarised in Table 1.

Table 1: Result of the performed radon tightness test

Sealing material	Material thickness of the specimen [d]	Diffusion constant [D]	Diffusion length [L_D]	Test parameter R = d/L_D	Assessment
Sealing insert „Type ED"	20 mm	$2.8 \cdot 10^{-11}$ m²/s	3.7 mm	5.5	R> 3, radon tight

The test result "radon-proof" also applies to the sealing inserts of type DD, Uni DD, DD/GR, TD-X, SD30 and SD60.

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