IAF - Radioökologie GmbH

Radionuclide Laboratory | Radiation Safety | Radiological Consultants

Determination of the Radon Diffusion Coefficient and Radon Diffusion Length on a Double Wall Collar

Client:	Fernco GmbH Hessenring 31 37269 Eschwege
Project:	Determination of the Radon Diffusion Coefficient and Radon Diffusion Length on a Double Wall Collar “DN 110” made of EPDM to DIN EN 681-1 (50 Shore A)
Project number:	231004-02
Contractor:	IAF-Radioökologie GmbH
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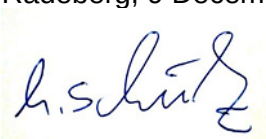
The accreditation is valid for the measurement results of the radon diffusion coefficient of a test specimen (SOP 4-02, 2018-11). The assessments made are based on this measurements results.

Radeberg, 9 December 2023



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1 Introduction

According to the order issued by Fernco GmbH, the radon diffusion coefficient on a Double Wall Collar “DN 110” made of EPDM has to be determined by the IAF-Radioökologie GmbH (IAF) and an assessment has to be made regarding the "radon tightness" of the material.

2 Definition of radon tightness

In order to determine the radon diffusion values, the specimen was installed in a two-chamber measuring system in such a way that radon can migrate from chamber 1 into chamber 2 only if it traverses the sealing system as a result of a diffusion process. The radon concentration developing in chamber 2 is recorded at one-hour intervals. Depending on the radon tightness of the sealing system, the increase in radon concentration in chamber 2 varies, resulting in a plateau value, which forms a steady state between radon migration from the radon reservoir (chamber 1) through the sealing system and radon decay in the measuring chamber (chamber 2) and thus determines the radon diffusion coefficient D, measured in [m²/s]. The diffusion length L_D of the specimen is given by

$$L_D = \sqrt{\frac{D}{\lambda_{Rn}}},$$

with $\lambda_{Rn} = 2{,}1 \cdot 10^{-6} / s$ being the radon decay coefficient. The radon diffusion length L_D is the average length a radon atom passes through the test specimen during its half-life.

A material is rated "radon tight" if its thickness (d) exceeds the radon diffusion length L_D of the material at least by a factor of 3.

$$R = \frac{d}{L_D} \geq 3 \quad .$$

3 Conclusions

The radon diffusion length calculated from the measurement results according to DIN ISO/TS 11665-13:2018-08 and the results of the "radon tightness" are summarized in Table 1.

Table 1: Results of the test for radon tightness

Sealing material	Material thickness of the specimen [d]	Diffusion coefficient [D]	Diffusion length [L_D]	R = d/L_D	Result
Double Wall Collar DN 110 EPDM 50 Shore A	10 mm	< 2,19 · 10-11 m²/s	< 3.2 mm	> 3.1	**R > 3, “radon tight”**