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upon the test : **Radon diffusion coefficient of the BELGACOAT polymer coating carried out in accordance with the K124/02/95 method**

Client:

BelgaPlastics NV
Gontrode Heirweg 142
9090 Melle
Belgium

Date of issue: 9.7.2018

Approved by:

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Prof. Ing. Martin Jiránek, CSc.
head of OL 124 laboratory

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The measurement of the radon diffusion coefficient of the Belgacoat polymer coating was performed in accordance with the requirements for determination of the radon diffusion coefficient stated in the K124/02/95 test method. The test was carried out during the period from 22.6.2018 to 9.7.2018.

Test samples

Test samples were cut from the material handed by the client (Frank Putteneers) on 20.6.2018. The samples were registered with marks 30/18/J (1 to 3) by M. Jiránek. The test samples were 160 mm in diameter and their thickness varied from 0,54 mm to 0,89 mm.

Test method

Radon diffusion coefficient was measured according to the accredited method K124/02/95 (method C of ISO/TS 11665-13). The tested sample is placed between two containers. Radon diffuses from the lower container, which is connected to the radon source, through the sample to the upper container. When the steady state concentration profile within the sample is reached, the growth of radon concentration in the upper container is measured. From the known time dependent curve of the radon concentration increase in the upper container the radon diffusion coefficient can be calculated. The test method was approved by the State Office for Nuclear Safety on 6.8.1998.

Laboratory conditions

Belgacoat – material
Steady state radon concentration in the lower container: 35,1 ± 1,3 MBq/m^3
Radon supply rate into the upper container: 6,9 ± 1,2 Bq/m^{3}s

Measuring device: radon monitor RDA 200 (N12), micrometer (N11)
Laboratory temperature: 21 ± 2°C
Relative humidity of air in the laboratory: 38% ± 4%
Pressure difference between the lower and the upper containers: 0 Pa

Test results

The results of performed tests are compiled in the following table:

TESTED MATERIAL	RADON DIFFUSION COEFFICIENT D (m^2/s)	
	mean value	**uncertainty**
Belgacoat	$6{,}5.10^{-12}$	$\pm\ 0{,}6.10^{-12}$

The stated uncertainty of the measurement is the uncertainty with the coefficient k = 2, which for the normal distribution corresponds to the probability of coverage approx. 95 %.

Using the determined value of the radon diffusion coefficient *D* the following parameters of the waterproofing material can be calculated:

Radon diffusion length in the material $\boldsymbol{l} = \sqrt{\frac{D}{\lambda}} = \sqrt{\frac{6{,}5.10^{-12}}{2{,}1.10^{-6}}} = 1{,}76.10^{-3}$ m

Radon resistance of the material $\boldsymbol{R_{Rn}} = \frac{\sinh d/l}{\lambda.l} = \frac{\sinh 0{,}77/1{,}76}{2{,}1.10^{-6}.1{,}76.10^{-3}} = 122$ Ms/m

Radon transmittance of the material $\boldsymbol{T_{Rn}} = \frac{1}{R_{Rn}} = \frac{\mathbf{1}}{122.\mathbf{10^6}} = 8{,}18.10^{-9}$ m/s

where $\lambda = 2{,}1.10^{-6}$ s^{-1} is the radon decay constant and *d* is the mean thickness of the material [m].

Recommendation

Applicability of the tested material for a radon-proof product can be in a particular case considered in accordance with national building codes or standards.

The test was performed by: Prof. Ing. Martin Jiránek, CSc.
The report was prepared by: Prof. Ing. Martin Jiránek, CSc.

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test specialist

end of the report