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REPORT

**on radon measurements of the supplied sample of the insulating
material: Special RADON Barrier film**
Fair Packaging Sp. z o.o. Sp. k., ul. Gruszowa 21, Galowo, 64-500 Szamotuly

PREPARED BY:

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LABORATORIUM EKSPERTYZ RADIOMETRYCZNYCH IFJ PAN [Radiometric Laboratory at the Institute of Nuclear Physics of the Polish Academy of Sciences], 31-342 Krakow, ul. Radzikowskiego 152 phone: 12 66 28 332 • mobile: 517 904 204 • fax: 12 66 28 458 • e-mail: radon@ifj.edu.pl • [http:// radon.ifj.edu.pl](http://radon.ifj.edu.pl) NIP (VAT EU): 675-000-04-44 • REGON: 000326983 • RIN: RIN-111-61/04

RADIOMETRIC LABORATORY IFJ PAN

SCOPE OF THE ORDER

The measurements were carried out in the Radiometric Laboratory, Henryk Niewodniczański Institute of Nuclear Physics, Polish Academy of Sciences, Krakow (IFJ PAN) as ordered by the company:

Fair Packaging Sp. z o.o. Sp. k., ul.Gruszowa 21, Gałowo, 64-500 Szamotuly

(Order No. 25/2017 dated: 27.10.2017).

The scope of the order included examining the degree of radon permeability in the supplied sample of the insulating material: **Special RADON Barrier** film by determining the following coefficients:

<i>radon transmittance:</i>	P	[m/s]
<i>radon resistance:</i>	Z	[s/m]
<i>radon permeability:</i>	k	[m ² /s]

Radon isotope (Rn-222) concentration was measured according to the *RG Detailed Procedure, 4th issue of 28.09.2015*, applied in LER IFJ PAN.

The samples were measured from 15.11.2017 to 30.11.2017.

MEASURING APPARATUS

- measuring system Rn-BOX
- certified radon source Rn-1025 (manufactured by PYLON) with 52.3 kBq activity; radon production rate of 6,580 mBq/min.
- professional reference radon meters:
 - AlphaGUARD™ PQ2000 PRO (Genitron®)(AG1: S/N 1141)
 - AlphaGUARD™ DF 2000 (Saphymo®) (AG2: S/N: 000053)
- result analysis: DataVIEW ver.: 15.00.00_161220

METHOD OF MEASUREMENT

The measurements were carried out using the Rn-BOX measuring system, (*applying a method used in the SP Swedish National Testing and Research Institute, Building Diagnostics*).

Before the measurement, the material was stored in the laboratory at room temperature and humidity.

The test material with a surface area S was fixed tightly between two chambers K-1 and K-2. The Rn-BOX leak test was carried out. A radon source Rn-1025 was placed inside the chamber K-1. Two meters AlphaGUARD™ Pro PQ2000: AG1 and AG2, manufactured by TRYGON, and AlphaPUMP pumps forcing the air were connected to the chambers with PVC tubes. The AG1 meter was used to measure the concentration of radon C_1 in the K-1 chamber. The AG2 meter recorded concentrations of radon C_2 in the K-2 chamber with volume V . A diagram of the measurement station is shown below:

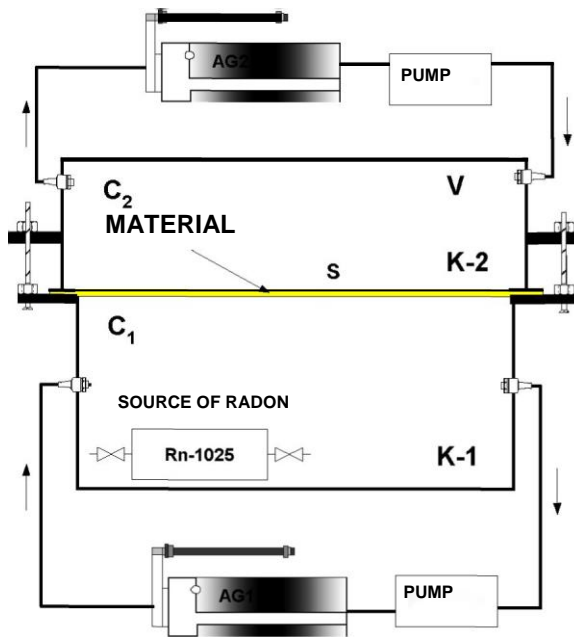
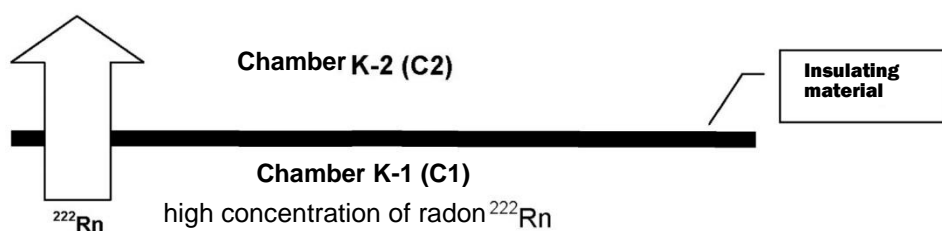


Diagram of the Rn-BOX measuring system



View of the measuring system Rn-BOX and AlphaGUARD PQ 2000PRO

The material was mounted in the Rn-BOX measuring system as follows:



MEASUREMENT CONDITIONS:

Tested material	Special RADON Barrier film
Material thickness [mm]	2.0
Concentration of radon C ₁ [Bq/m ³]	500 622
Concentration of radon C ₂ [Bq/m ³]	61
Pressure [hPa]	980 ÷ 982
Temperature [°C]	26.1 ÷ 26.6
Humidity [%]	28.4 ÷ 31.1

Radon C₁ and C₂ concentration values in the table come from the period of established equilibrium (last 24 hours)

The results of the measurements carried out were used to calculate the coefficients describing the anti-radon properties of the tested material: P (*radon transmittance* [m/s]), k (*radon permeability* [m /s]) and Z (*radon resistance* [s/m]). The calculations were based on 144 measuring points from the area where the radon concentrations C₁ and C₂ reached approximately constant levels.

MEASUREMENT RESULTS: Material: Special RADON Barrier film

	Radon Transmittance		Radon Resistance		Radon Permeability	
	P	U(P)	Z	U(Z)	k	U(k)
Sample	[m/s]	[m/s]	[s/m]	[s/m]	[m ² /s]	[m ² /s]
Special RADON Barrier	< 6.8 10⁻¹¹	-	> 1.5 10¹⁰	-	< 1.4 10⁻¹³	-

An example of the course of radon concentration changes (logarithmic scale) during the test of the material: Special RADON Barrier film is presented in the figure below:

