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Report on Results

Execution of Radon Diffusion Measurements on
4 Products Made by the Firm Remmers GmbH & Co.

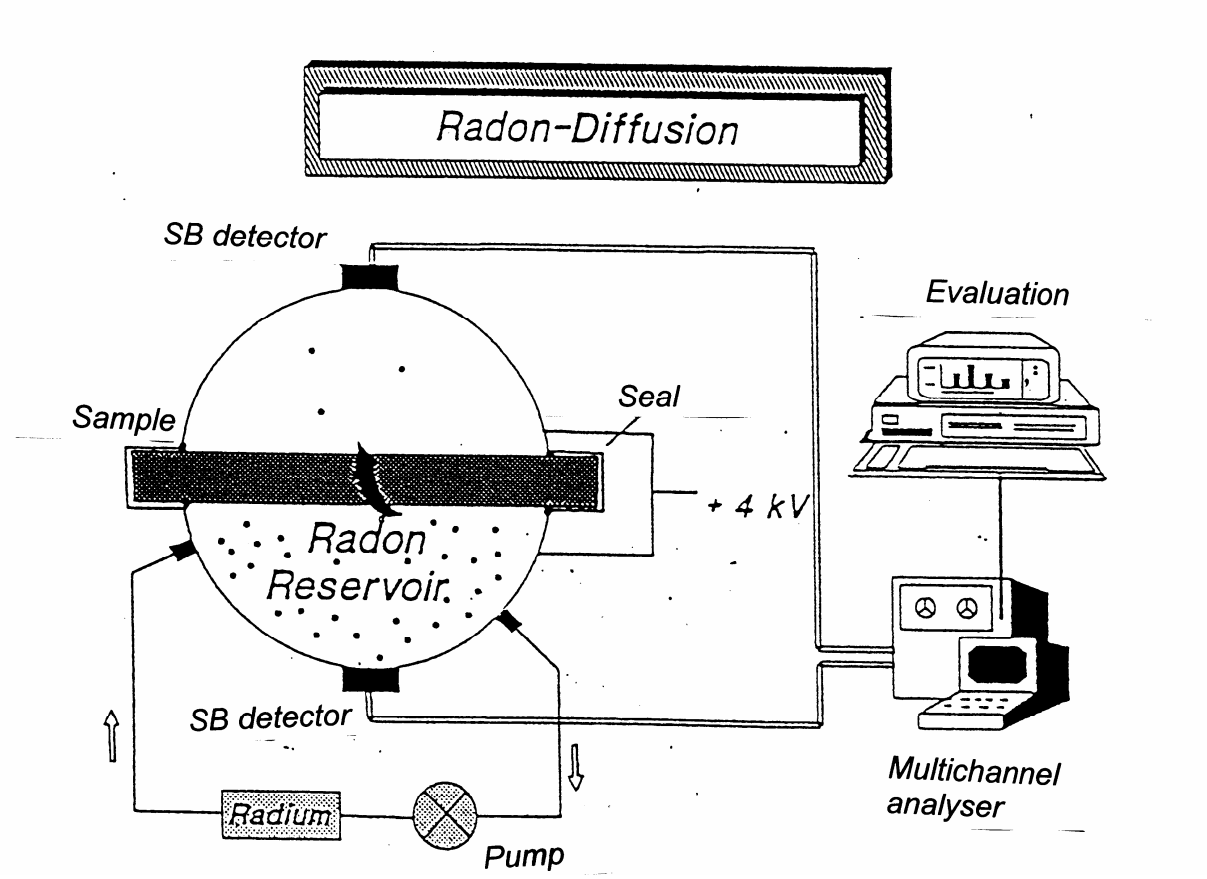
Commissioned by IBSW, Berlin, letter dated 11.7.91, your reference Co/Me, radon diffusion was measured on 4 products made by the firm Remmers.

a) Measurement Method

The method used to determine the exhalation of radon the thoron is based on the electrostatic precipitation of the first of their daughter products on the surface of a semiconductor detector. This utilises the face that the polonium 218 and polonium 216 ions that result during alpha disintegration of the parent nuclides are positively charged (stripping effect). The electrodes of the electric field are formed by a metal hemisphere and a metal grid on the bottom of the hemisphere, both on high positive potential, as well as a surface depletion layer detector on earth potential. When the exhaled radon or thoron atoms reach the chamber where they disintegrate, a part of the first daughter products (polonium 218 and polonium 216) are deposited on the detector because of the electric field that has been created. The exhalation rate of radon or thoron from the sample is determined by determining the course of activity concentrations of radon and thoron in the chamber through evaluation of the alpha spectrums of polonium 218 or polonium 216 in several time sequences. To determine the diffusion coefficient of building materials, the sample is placed in a container and sealed off with silicone. With the aid of a pump, radon is led from a dry radium 226 source into the container and continuously mixed with the air in the container. After a constant concentration gradient between the air in the container and the "free" side of the sample is reached, the flux density towards the "free" side can be measured with the method for determining the exhalation rate. The diffusion theory provides the corresponding diffusion coefficients for the geometric form of the

sample. Illustration 1 shows the diffusion and exhalation method set-up. Records of the measurements are found in the enclosure.

The diffusion coefficients D do not depend on the thickness (d) of the material. The diffusion coefficient D can be linked to the diffusion length (relaxation distance) R through the disintegration constant; the equation is: $R^2 = D/Z$.



Ill. 1: Measuring method for determining the radon and thoron exhalation rates and radon diffusion coefficients

There is no standard that defines when a material can be designated "radon tight". According to our scientific knowledge and experience, a material can be designated relatively "radon tight" if its thickness is at least four times the diffusion length. If the diffusion coefficient is less than the detection limit (MDL) of the highly sensitive measuring arrangement (D less than $1 \cdot 10^{-12}$ m²/s), only a minimum thickness at which the material can be deemed "radon tight" can be given for calculation.

b) Results of Measurements

Sample No.	Designation of sample	Thickness (mm)	Diffusion coefficient (m²/s)	Diffusion length (mm)	Result
1	Viscacid Epoxy Color	2	< MDL	< 0.5	radon tight
2	Viscacid Epoxy-flex Coating	3	< MDL	< 0.5	radon tight
3	Rofaplast KB	8	< MDL	< 1	radon tight
4	Viscacid Epoxy Construction Resin	3	< MDL	< 0.5	radon tight

c) Notes on the Results of Measurements

No diffusion of radon was measurable in the radon diffusion examination of the test sample(s), i.e. the examined material(s) in their stated thickness was (were) radon tight.

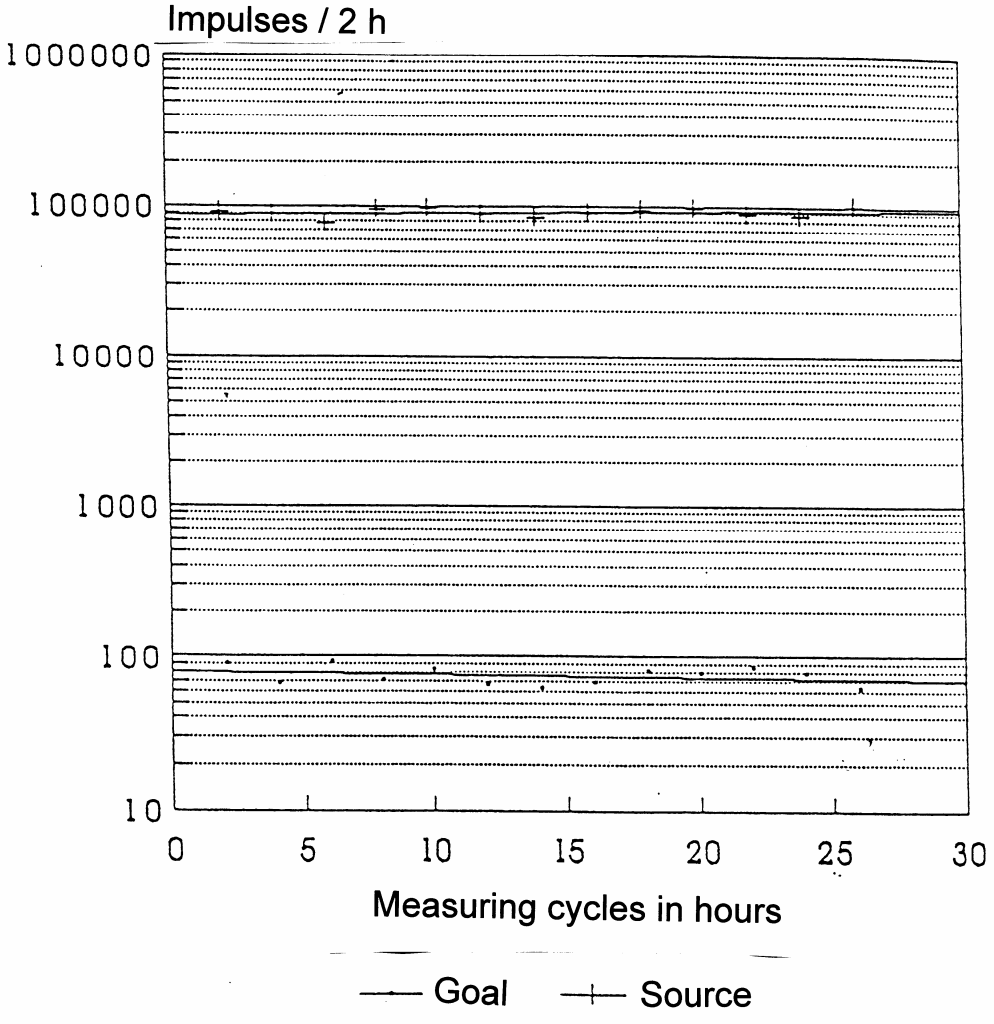
[Signature]

Privatdozent Dr. G. Keller

Enclosure: Record(s) of measurements

Radon Diffusion Measurement

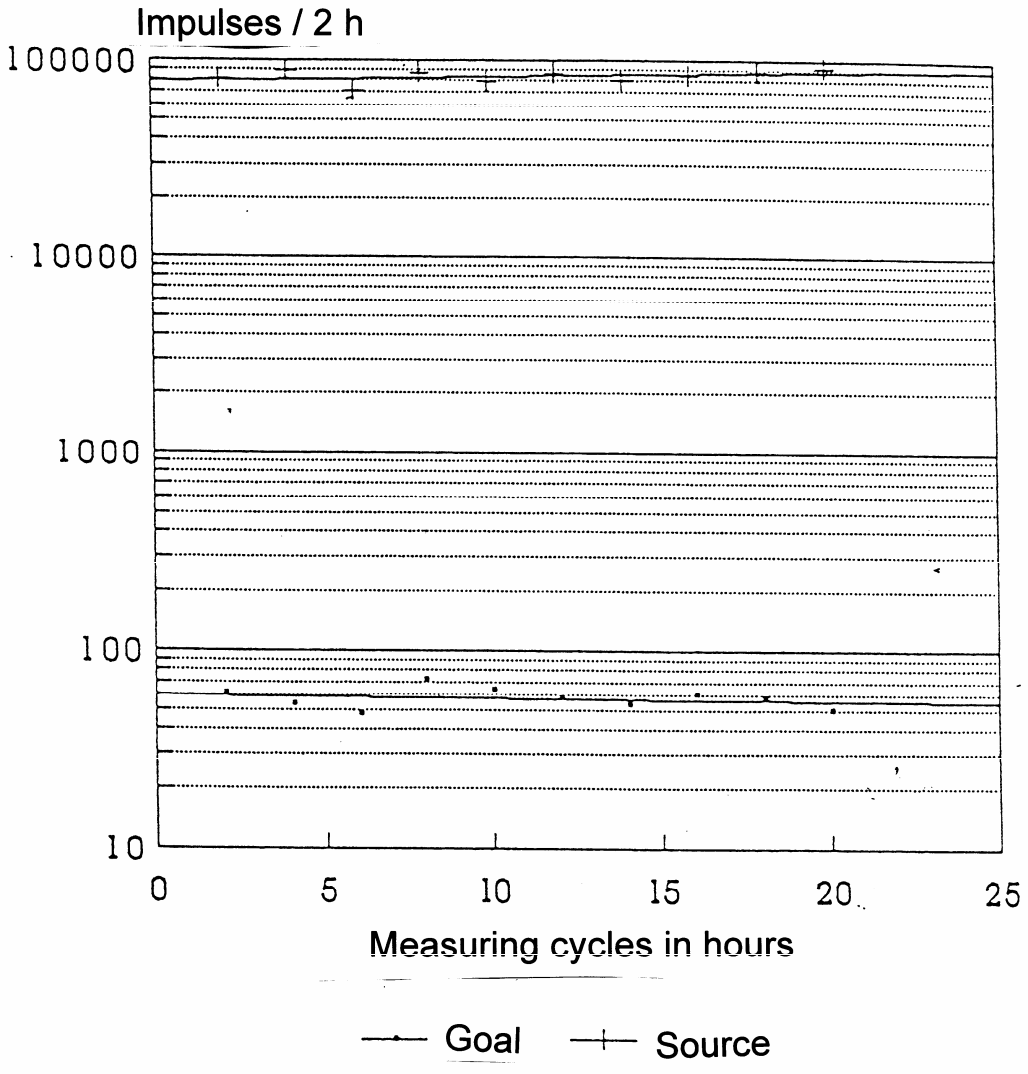
Sample: Visacid Epoxy Color



No detectable diffusion

Radon Diffusion Measurement

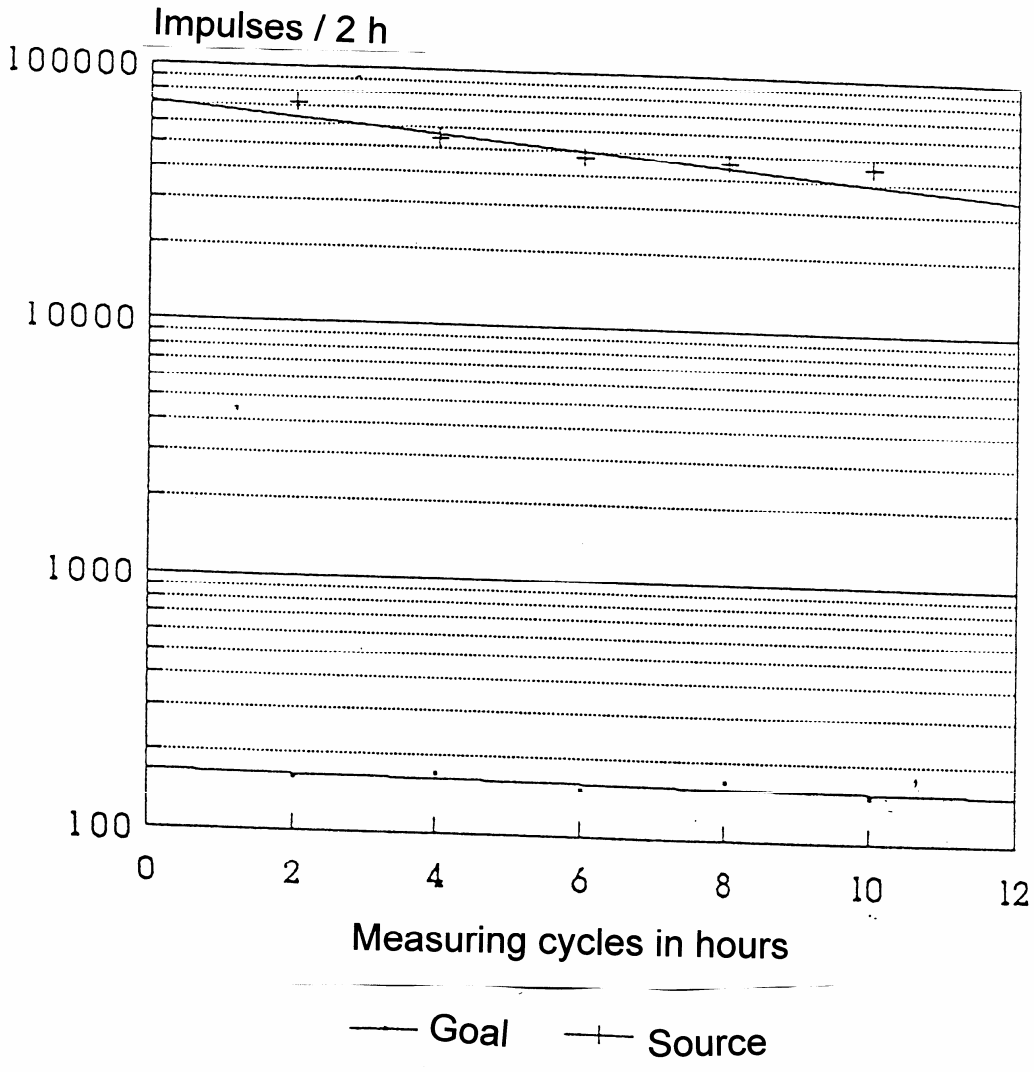
Sample: Viscacid Epoxyflex Coating



No detectable diffusion

Radon Diffusion Measurement

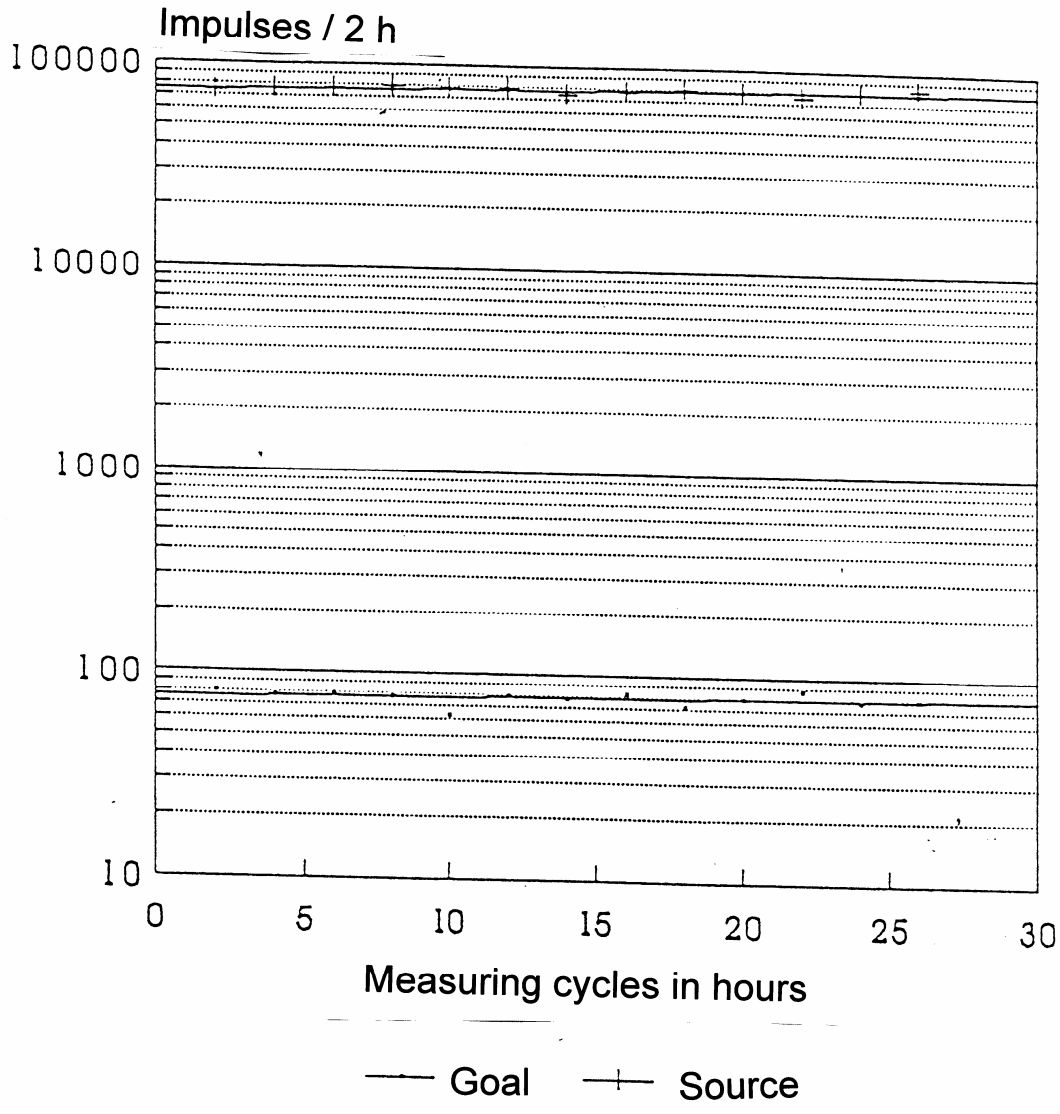
Sample: Rofaplast KB



No detectable diffusion

Radon Diffusion Measurement

Sample: Epoxy Construction Resin



No detectable diffusion