

# DRYTECH TANK RADON-FREE UNDERGROUND STRUCTURES



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## THE DRYTECH TANK IS A BARRIER TO RADON

The Drytech Tank is impermeable to radon gas. This has been established through tests conducted at SUPSI Institute for Materials and Construction (University of Applied Sciences in Southern Switzerland) which verified the gas permeability of the components in the Tank System.

The Drytech Tank complies with the directives of the WHO (World Health Organization), UFSP-BAG (Federal Office of Public Health), the Basic Safety Standards of the European Union, and SIA which set the radon concentration reference level as 300 Bq/m<sup>3</sup> for rooms regularly occupied by people, as well as the more restrictive limit of 100 Bq/m<sup>3</sup> indicated in the Minergie-ECO requirements in accordance with the Swiss USFP for main rooms.

## TESTING PLAN

In order to verify the effectiveness of the Drytech Tank as a barrier to radon, SUPSI measured the diffusion coefficient of each individual material in the Drytech System: Drytech waterproof concrete, DRYflex Resin and formwork hole plugging systems.

SUPSI created a structure made of up two airtight cells separated by the test specimen material.

The first cell was saturated with gas under pressure, exposing the material to radon. The quantity of gas which then managed to pass through the separation material by osmosis was constantly measured in the second cell.

## MINIMUM THICKNESS FOR RADON IMPERMEABILITY

The diffusion length R indicates how many millimetres (mm) the gas can penetrate the test material.

This number is multiplied by a safety coefficient of 3. The result (3.R) indicates the minimum material thickness required to guarantee radon impermeability.

	R [mm]	3•R [mm]	sVD [mm]
Drytech Concrete	36.7	110.1	≥ 250
DRYflex Resin	13.0	39.0	≥ 250

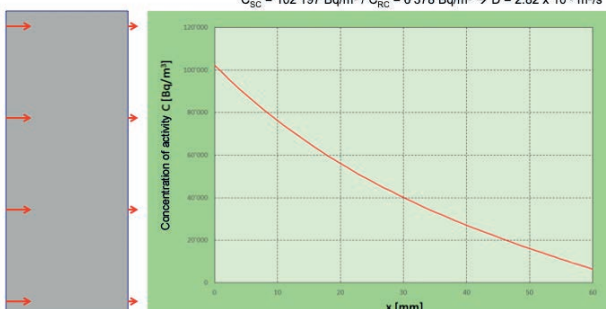
R	Diffusion length of radon gas
3•R	Minimum thickness for impermeability
sVD	Drytech Tank minimum thickness

SUPSI

### Drytech Watertight Concrete

Concrete Type, CEM IV/A-V 32.5 N

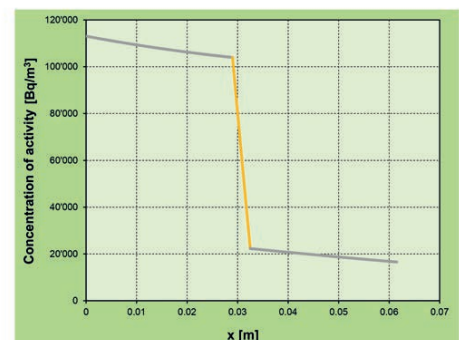
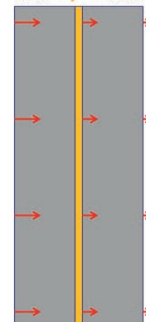
$$C_{RC} = 102'197 \text{ Bq/m}^3 / C_{RC} = 6'378 \text{ Bq/m}^3 \rightarrow D = 2.82 \times 10^{-9} \text{ m}^2/\text{s}$$

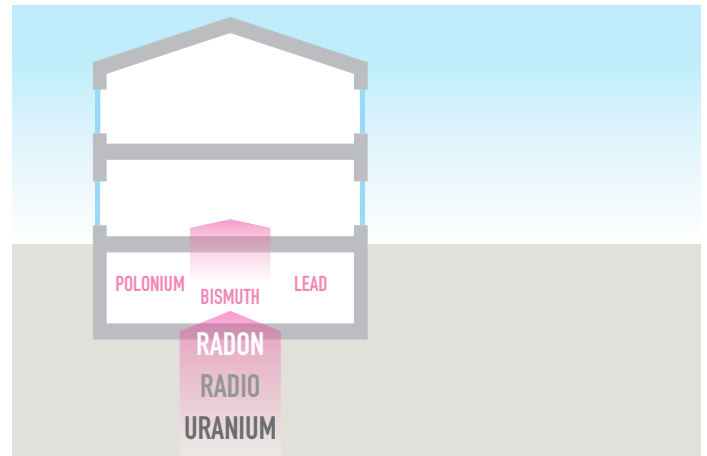


SUPSI

### DRYflex resin

Mortar DryFlex Mortar





### WHAT IS RADON?

Radon is a naturally occurring, colourless, odourless, tasteless noble gas. It is radioactive and present everywhere in the soil, as a result of the decay of radium, which in turn is a result of the decay of uranium present in the soil and rocks.

Radon seeps into a building through cracks in the foundations or masonry in contact with the ground.

Radon concentration is measured in Becquerel per m<sup>3</sup>. 1 Bq indicates the decay of 1 radionuclide per second.

The radon concentration level in indoor rooms can be easily measured using special devices available on the market.

### HEALTH EFFECTS OF RADON

Radon decay products and aerosols are deposited in the lungs when breathing. From here they emit ionizing radiation, damaging the immediate surrounding lung tissue and giving rise to a potentially carcinogenic process.

### PREVENTION IN NEW BUILDINGS

In the event there is a proven radon risk, the measures which must be taken to prevent the diffusion of the gas from exceeding the limits laid down in the WHO guidelines include the construction of the foundation slab and walls in contact with the soil using waterproof concrete in water-tightness class 1 (according to SIA 272).

Of course, waterproofing must also be guaranteed for the construction details.

The test for the formwork hole closure system was based on a comparison of the gas exhalation rate in a monolithic concrete sample and a concrete sample drilled axially and closed with the Drytech System.

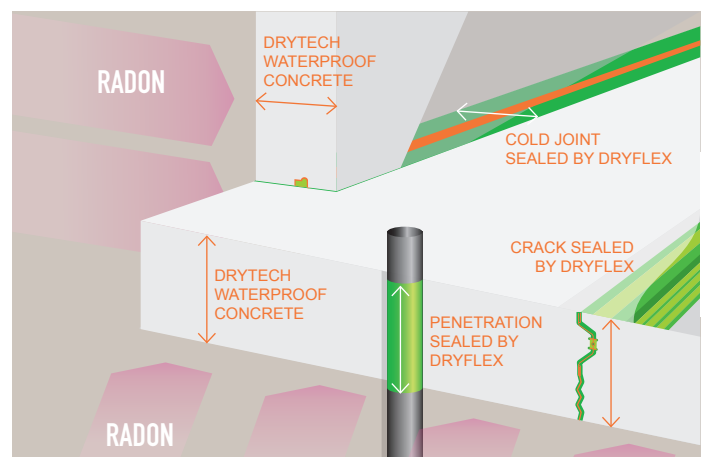
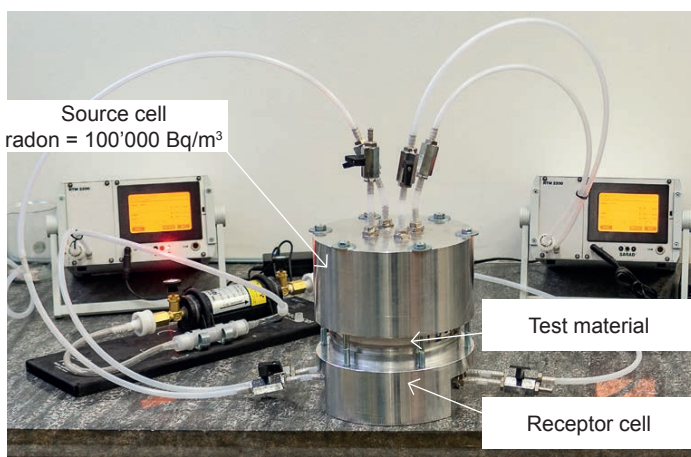
The exhalation rate measured for the test piece with the formwork hole was lower than that of monolithic concrete and therefore it has been successfully demonstrated that the Drytech formwork hole closure system is impermeable to radon gas.

	E [10 <sup>-3</sup> x Bq/s·m <sup>2</sup> ]
Monolithic concrete	0.93
Formwork hole Closure Drytech	0.74
E Radon exhalation rate	

### FIELD TESTS

At the same time, a series of field tests were carried out for 90 days, measuring radon concentrations with dosimeters in basements without ventilation constructed with the Drytech Tank located in 14 buildings.

The empirical tests replicated the results of the experimental tests, confirming the impermeability of the Drytech Tank to radon.



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Waterproofing System Engineering

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