European Radon Solutions Database

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Existing Buildings

Case Study

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Type	**RECONSTRUCTION OF FLOORS IN COMBINATION WITH SOIL DEPRESSURIZATION**
Country	Czech Republic

Illustration

Front view of a house

After removing of existing floors and lowering of soil surface, the drainage layer of coarse gravel was laid. In the drainage layer flexible perforated pipes were placed. Pipes were laid along walls in order to stop radon from entering the dwelling through the wall-floor joint.

The drainage layer was covered with concrete slab with a geotextile underneath. Radon-proof insulation was applied when concrete had sufficient strength.

Description

Radon remedial measure was installed into a house, which was built approximately 100 years ago. The external dimensions of the house are 16,0 x 8,3 m. Brick bearing walls have the thickness from 300 to 450 mm. The house has no cellar. The ground floor of the house contains three habitable rooms: kitchen + dining area, bedroom and room for children. In the bedroom and in the kitchen were timber floors placed directly on the soil, in other rooms the floors are made of in-situ concrete.

Old and untight timber floors in the bedroom and in the kitchen were removed. They were replaced by new floors with a drainage layer, in which flexible perforated pipes were laid. Under the room for children one perforated tube was drilled from the chase excavated in the kitchen. Perforated pipes are connected to the vertical exhaust pipe, which is inserted into a free flue and ends with a roof fan above the chimney.

Selection

This form of mitigation was chosen, because the reconstruction of floors was necessary not only from the radon point of view. This solution solves at the same time radon problems and higher dampness of walls and provides the house with new floors.

Pre-installation Diagnosis

Parameters of the soil around the house:

Third quartile of radon concentration in the soil gas (obtained from 15 measurements around the house from the depth 0,8 m)	71 kBq/m^3
Mean permeability of the soil around the house	high
Radon risk category of foundation soils	high

Changes of radon concentration and of soil permeability with depth:

Depth (m)	Soil gas radon concentration (kBq/m^3)	Soil permeability (m^2)
0,50	71,4	$7{,}0.10^{-12}$
0,90	85,1	$2{,}7.10^{-12}$
1,20	98,4	$9{,}0.10^{-12}$
1,50	99,2	$3{,}7.10^{-12}$

Permeability of the sub-floor layer and radon concentration in the sub-floor layer:

Sub-floor layer beneath:	Permeability (m^2)	Radon concentration (kBq/m^3)	
		before remediation	after remediation
Room for children	$> 1{,}0.10^{-11}$	30,4	14,6

Radon reduction achieved

Radon concentration before remediation has been measured by track detectors with the exposition time of one year. Radon concentration after remediation has been measured by one-week measurements.

Room	Radon concentration (Bq/m^3)		Effectiveness (%)
	Before remediation	After remediation	
Kitchen + dining area	1758	30	98
Bedroom	1760	27	98
Room for children	1830	47	97

Radon concentration has decreased in all rooms below the action level 400 Bq/m^3. The effectiveness of the system varies in different rooms between 97 and 98 %, which means that indoor concentration decreases to 3 % up to 2 % of the initial values.

Problems

No problems occurred during installation.

System enhancements

To minimise negative effects of the soil ventilation the fan is switched to intermittent operation. Operating periods are adjusted according to continuous measurements of indoor radon concentration.

Further Information

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