European Radon Solutions Database

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Existing Buildings

Case Study

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Type	**SUB-SLAB DEPRESSURIZATION BASED ON PERFORATED TUBES DRILLED FROM CELLAR**
Country	Czech Republic

Illustration

Front view of a house

Drilling of perforated tubes from the cellar into the sub-floor region

All drilled tubes are connected with a PVC-U exhaust pipe to a fan. A silencer is mounted between the fan and the outlet.

Description

Radon remedial measure was installed into a very old house, which was built in 1891. The external dimensions of the house are 12,5 x 9,0 m. Brick and stone bearing walls have the thickness from 450 to 600 mm. The house has a partial cellar that is located under the entrance hall and bathroom. The ground floor of the house contains four habitable rooms: kitchen, living room, bedroom and grandmother room. In the bedroom and in the living room there is a timber floor. Other floors are made of in-situ concrete.

The soil ventilation system consists of four perforated tubes that were drilled from the cellar in the sub-floor layer beneath the habitable rooms (each tube beneath one room). Perforated tubes are connected to a fan that is located in the cellar. The exhaust outlet is placed on the external wall.

Selection

Simple sump system is not suitable for this house, because internal foundations and partial cellar divide the underfloor space into several compartments. A possible alternative could be a multi sump system, however we have preferred the system based on perforated pipes, because it ensures better pressure distribution under timber floors in the bedroom and in the living room.

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)	49 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	99,4	$2{,}5.10^{-12}$
0,90	147	$> 1{,}0.10^{-11}$
1,20	191	$4{,}0.10^{-12}$
1,50	226	$1{,}1.10^{-12}$

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
Bedroom	$> 1{,}0.10^{-11}$	40,1	2,0
Kitchen	$> 1{,}0.10^{-11}$	26,7	2,5
Grandmother room	$> 1{,}0.10^{-11}$	31,6	0,2

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	1266	245	81
Living room	1982	190	90
Bedroom	1600	197	88
Grandmother room	1156	115	90

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 81 and 90 %, which means that indoor concentration decreases to 19 % up to 10 % of the initial values.

Problems

No problems occurred during installation.

The location of the exhaust outlet on the external wall can cause problems during winter. Warm air going out from the outlet can condense on the grille, which may cause wetting of the external wall.

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

For further information contact Martin Jiránek: jiranek@fsv.cvut.cz, or by writing to:
ČVUT, fakulta stavební, Thákurova 7, 166 29 Praha 6, Czech Republic

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