

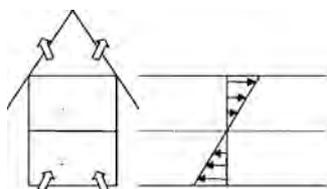
MITIGATION APPROACH ON REDUCING THE NEUTRAL PRESSURE PLANE STAND-ALONE OR COMBINED WITH OTHER METHODS

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ABSTRACT

Radon risk reduction requires that mitigation systems should be cost-effective. Standard mitigation systems are well known, such as ASD, PSD, sealing, etc. Under natural conditions, the ground floor is subject to negative air pressure and the upper story to positive pressure. Such conditions are conducive to high radon concentrations as they encourage infiltration of the gas into the building through cracks, fissures and passages in the basement. Mitigation by reducing the neutral pressure plane is a simple method to reduce the radon concentration. To lower the neutral axis, we install small wall ventilators or passive ventilation through pressure differential balancing (in the window or in the wall). This method could also increase the efficacy of all other remediation systems.

INTRODUCTION



The neutral pressure plane is variable and depends on the inhabitant's behavior and the building type. In Switzerland high radon concentration up to 1,000,000 Bq/m³ or 27,000 pCi/l at a depth of 3 meters in the soil has been measured.

(Johner H. U. and Roserens G. A. 1998).

Radon entry routes: cracks, holes and gaps are vs: diffusion, water, buildings material, almost the major contributor to the radon concentration in dwellings. The quantity of air mixed with radon passes through a fissures or openings is mathematically complex to determine.

$$q_{V-\text{inf}} = C_d A \left[\frac{2}{\rho} \Delta p \right]^{\frac{1}{2}} \qquad q_{V-\text{inf}} = C_{\text{inf}} (\Delta p)^n$$

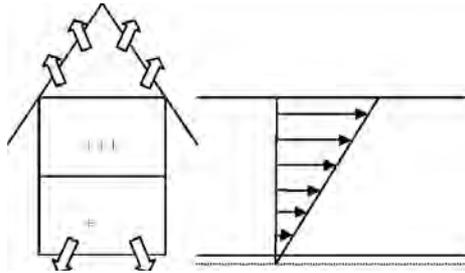
An important point to bear in mind, however, is that this quantity is related to the difference in pressure.

HVAC - HRV AND RADON

Test and adjust your HVAC system.

Depressurization should be avoided (more radon $f_x(\Delta p)$ and risk of backdrafting).

If the building uses an HVAC system, it is necessarily to adjust it and reduce the negative air pressure or better to tend to have a slightly positive pressure 0 to 1 Pa (0-to 0.00014 psi).



MORE OR LESS AIRTIGHT HOUSES - WITHOUT HVAC - HRV

Energy saving: buildings have an airtight shell. This prevents warm air from escaping and cold air from entering the home. The external envelope of a building should be as airtight as possible.

Energy efficient house: make it airtight.

For standard new houses measured: ca. 0.15 ACH

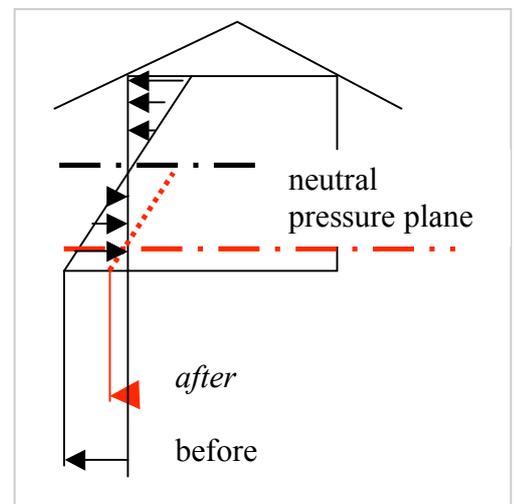
Blower Door test for new green buildings: max. 0.6 ACH at 50 Pascals differential pressure

Natural ventilation:

If you open a window at the lowest position you will lower the neutral pressure plane. You can not justify the radon reduction with the dilution effect. In fact lowering the neutral pressure axis is much more important (reducing the vacuum effect). In winter the owners would open the window only few minutes daily, it is not enough to see a radon reduction in average.

Drill a hole in the external wall, but you will get an uncontrolled quantity of air and cold, depending on the orientation of the wall, the wind etc. . . (an unacceptable situation).

To regulate the air quantity to lower the neutral axis, we use a small fan, blowing from outside to inside to control the air flow quantity (not to be confused with the house pressurization).



The airflow is managed between outside and inside. In the winter time it is not imperative to warm up the cold air because the quantity is minimal and sufficient to equilibrate the pressure difference.

In many cases is also possible to install a simple grill in the window or in the wall to reach the same effect. Noise and dust: use a device with sound insulation to reduce the outside noise and an air filter.

REDUCING THE NEUTRAL PRESSURE PLANE COMBINED WITH OTHER METHODS

This method increases the effect of traditional mitigation such as: active soil depressurization, passive soil depressurization, crawlspace depressurization, crawlspace airing, hollow floor depressurization, hollow wall depressurization and basement depressurization.

CONCLUSIONS

Throughout the world, houses are different, climate is not the same and behavior may play an important role. It is very important to pursue and to analyze alternatives and to test the limits of these other possibilities. The focus is on developing low-cost mitigation systems.



World Radon Solutions Database

Existing Buildings

www.worldradonsolutions.info

Existing Buildings

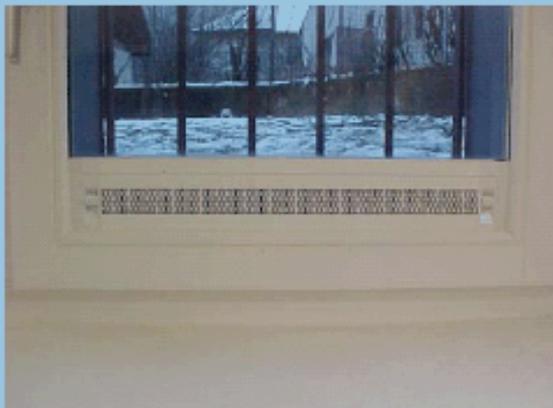
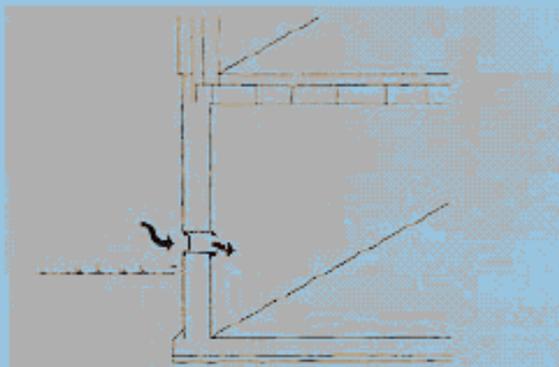
Case Study

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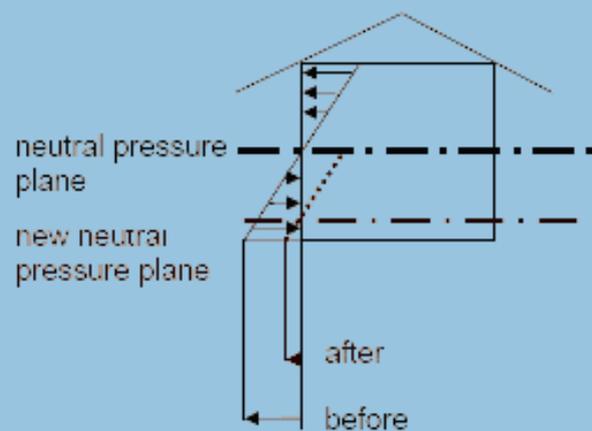
Type Reduction of the depression.

Country Switzerland

Illustration



Depressurising the bottom of the building through convection



Description

Every building has a pressure difference from top to bottom. The pressure difference has various causes. Reduce as much as possible this underpressure

Selection

Premises in the basement.

Pre-installation Diagnosis

Measure the radon concentration with a continuous monitor. Open a window slightly 2 days and compare the radon concentration before, during and after the test
It is better to effect this simulation in the cold period.

Radon reduction achieved

Radon reduction from 850 Bq/m³ down to 200 Bq/m³

Problems

Noise and dust: use a device with sound insulation to reduce the outside noise and an air filter.

System enhancements

Window or wall ventilators for installation in living rooms, bedrooms and work areas

Further Information

More information about this system in the "Swiss Radon Guide" could be bought or downloaded from our website WWW.CH-RADON.CH
www.bag.admin.ch/strahlen/ionisant/radon/pdf/d/Radonhandbuch-en.pdf

or direct from
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WITH A WALL FAN WHEN JUST ONE AREA NEEDS TO BE REMEDIATED

(20-60m³/h preheating not necessary)

