All aspects on radon

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Case 3

Background

It is long known that radon is a radioactive end product that is harmful if exposed for an extended period of time, and/or if it is found in greater quantity.

Radon is derived from the element uranium that we have quite naturally in the environment, most of them coincide naturally in several steps allowing new atoms of same element occurs. The end product of uranium is radon and radon derivatives. (Uranium-Thorium-> Radium-> Radon-> Radon derivatives)

When radon decomposes, forming radon derivatives, consisting of radioactive metal atoms. From these emitted from ionizing radiation. (Alpha-, Beta-, and Gamma radiation)

It is a little known fact with radon that it is a gas that is completely invisible, smell and tasteless. The only way to know if there is radon is to measure.

Geology

One typical radon source is in the soil, for radon to occur land must contain uranium or radium. Two rocks that are rich in uranium are alum shale and granite. It can be said that the Nordic countries generally have relatively high levels of soil radon.

We have lower radon levels in the ground, where there are sedimentary rocks such as limestone or sandstone.

Some important aspects of assessing soil radon risk, such as: grain size, porosity, water content. This means that one soil containing a high porosity and a lot of air means that radon is drained away. While in slate, which is a compact rock is not of the shipment in the same way so that the radioactivity becomes much higher.

Typically, ground has a radon gas concentration of between 20 000 and 150 000 Bq/m3. If the ground contains alum shale can radon gas content up til 1-2 million Bq/m3.

Provisions

Benchmark for radon in indoor air is set to 200 Bq/m3 according to the National Board of health and general advice. The Municipal Board of health protection may therefore require the landlord to lower radon gas content to a level which does not exceed these guidelines. Of course, one should try to reduce radon gas content to as low a level as possible.

The Food Administration also has a border and benchmark for when water is unfit. This limit is set to 1, 000 Bq/l.

Measurements of radon

Measuring the concentration of radon in indoor air units, the Becquerel per cubic meter (Bq/m3). The implications of this is: A Becquerel is that one atom decays per second in each cubic meter of air. 100 Bq/m3 = 100 disintegration per second per cubic meter of air.

The radiation protection authority issues a procedure in 2008 how to recorded the radon concentration, in order to obtain a uniform approach irrespective of where in Sweden the measurement takes place. The procedure was prepared together with “Boverket”(building and planning), “socialstyrelsen” (social board) and SWEDAC (Board for accreditation and technical control).

The procedure says that the measurement shall be carried out during the colder season "heating season", between October to April. This is because during the warmer season, we have a small difference in temperature between the indoor and outdoor air, with the result that air turnover decreases. An equally bad result if we would make the poll in an unheated house despite the heating season.

The generated test method provides instructions on how the measurement shall be performed:

1 Poll takes place during the heating season. The average temperature under + 10 degrees Celsius. Heating season from 1 October to 30 April.

2 measuring instrument used must be calibrated. The calibration shall be performed by the SSM (radiation protection authority) with a minimum 1-year intervals.

3 in addition to the calibration, the performing measurements ensure that the instrument actually provides the right numbers, so that the instrument provides the precision and accuracy required really. This is by trying the instrument again in the test environment, i.e. Lab.

4 Recommended measuring period is 3 months, the absolute minimum of 2 months, in order to obtain a reliable result.

5 Radon indicators shall be placed in rooms that are used every day, in apartment buildings, measuring all of the apartments which are in contact with the ground. Then it continues up the house by measuring one apartment per floor plan, measurements should correspond to approximately 20% of the floor plan. We must also measure apartments adjacent to elevator or vents, if any, then ground radon can be taken up through these spaces.

6 Meter placement in the room shall be consistent with how the residents live in the room. No location right next to the wall or floor. Equally so to avoid strong heat or high air currents. The best location should be quite central in the room, and a bit up from the floor.

The annual average shall be deemed to be equal to a dwelling, averaged over the measurement period. Radon is presented then as radon gas concentration in Bq/m3.

You can also perform short term measurements from 2-7 days. These documents may not be used as a basis for regulatory decisions or similar, but should only be used in, for example, for advisory purposes the sale of real estate. Also, they should be used only when the time does not permit the measurement for longer periods of time. We can not use these short term measurements when deciding on the harm to health, or apply for grants for measures against radon in the House.

Soil radon:

Soils often contain very high levels of radon, which is usually between 20,000 and 150,000 Bq/m3. If the ground contains alum shale radon gas content can be as high as 1-2 million Bq/m3. The air pressure inside a house is generally lower than outdoors. Is the house leaky can easily radon air sucked into the house.

Radon in building materials:

All stone building materials contain radium, and thus emit radon. Normally, however, radium levels are so small, that radon departure is insignificant, but there are exceptions.

Blue concrete is a type of lightweight concrete. The nucleus of lightweight concrete consists of uranium-rich alum shale, most of them did this building materials emit radon. The name Blue concrete was given because the material has a light blue color. Construction material was used mainly for walls, but also to some extent to the slab foundation, the material was used for house construction between 1929-> mid-1970s. One of the major producers of blue concrete was undertaken by Ytong.

Radon in water:

Major dangers of radon in drinking water, we find in drilled wells. Normally radon gas content in these wells is between 30 and 400 Bq/l, But around 4% of all drilled wells are estimated to have levels of over 1,000 Bq/l, with maximum levels of 10,000 Bq/l. Water that contains more than 1000 Bq/l is classified as unfit for human consumption. We find that if radon in the water has risen, one should always perform a measurement of radon in indoor air quality, since a large part of the radon in the water is released into the ambient air.
We tend to have as a rule of thumb that if radon in water is 1000 Bq/l this gives an injection of radon to the air indoors of about 100 Bq/m3. Risks to drinking water containing radon are considered as relatively small, most people breathe out within an hour, the rest products being transported out the natural way.

Health Risks

What happens in the body when we are exposing ourselves to radon, the radiation resulting from the radon decay damages tissues in the lungs, which ultimately can lead to lung cancer. The human body has an "external" good protection against radiation, we must therefore obtain the radon in the body — through inhalation – radiation can damage the body.

Fifteen percent of Sweden's lung cancer cases are caused by housing containing radon, this means about 500 people annually just in Sweden. Smokers represent a greater risk than non-smokers to suffer from lung cancer in homes with high levels of radon. Radon comes with the inhaled air to lungs where alpha radiation emitting at decay radon, cause damage that can lead to lung cancer. If you are exposed to radon today, it can take between 15-40 years before lung cancer is detected. The majority of lung cancer cases come from soil radon in the home, but around 2% of these 500 lung cancer cases, came through drinking water.

If we can we reduce radon values exceeding 200 Bq/m2 we would be able to avoid approximately 200 lung cancer cases a year.

Measures

In order to be able to choose which method to use to dispose the radon, both from a technical and economic point of view. One must first determine where and how the radon enters the room air.

Seal

If one suspects that radon is from the ground, one should always start by dense easily accessible places, such as around the floor hatches, through cracks or similar. The seal is made with an elastic sealant that is easy to work with and can tolerate small movements.

Waterproofing

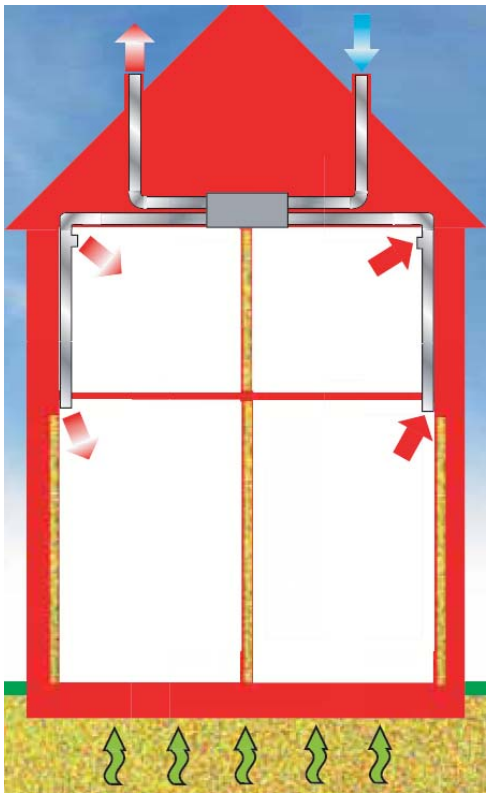
Wallpaper and a plastered blue concrete wall prevents radon to some extent from getting out of the room air. It has also examined the wallpaper of plastic and come to the conclusion that these may reduce radon departure by 10-30%. We shall, however, be wary of using too dense material which reduces the natural moisture migration through the wall.

Ventilation

We can easily reduce radon indoors by reviewing its ventilation. Check the channels and clean them if necessary. Ensure that all vents are open. Ensure that the air in the apartment can move between rooms, in the manner intended.

If elevated radon comes mainly from building materials can we minimize the radon concentration to about half by doubling atmospheric diversity.

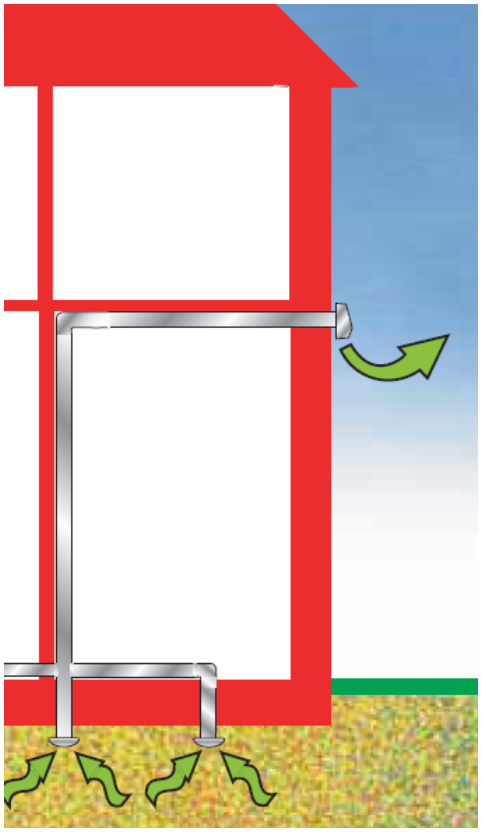
Will radon from the land or building materials reduces the concentration of radon indoors it best by reviewing its ventilation.



Radon suction

Radon suction is a plant which reduces the air pressure in the ground so that the soil air do not enter in the house. A vacuum is created by using a blower that sucks the air from one or more points during house floor pan. Radon section tend for the most part, give a good final result.

Radon suction is used if the house is on the non-permeable soil, for example, rock, bursting stone, etc.



Radon well

Primarily intended for use in land, air, for example, permeable eskers. Digging a 4-5 meters deep hole, which places a fan down into the hole which sucks the air out of radon from the soil, and creates a negative pressure. Air si blown into the soil then printed a stack. One can in this way, lower the air pressure in the soil and thus prevent radon from entering the house.

Radon well is used if the house is on the permeable soil, such as ridge.