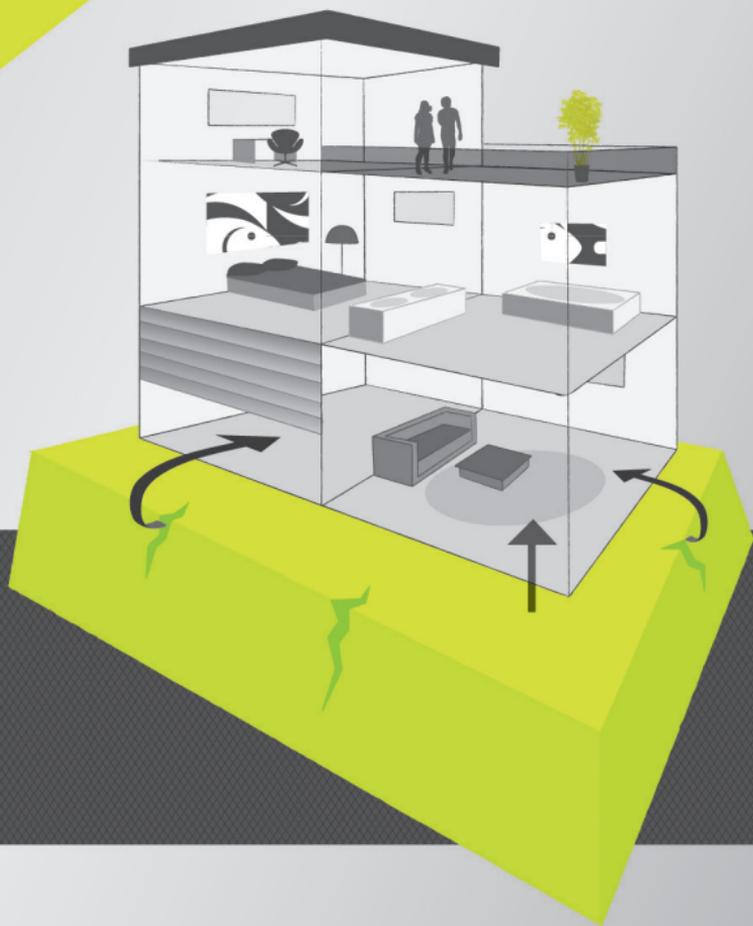




U-SERIES

RADON

RISKS AND HARMFUL EFFECTS

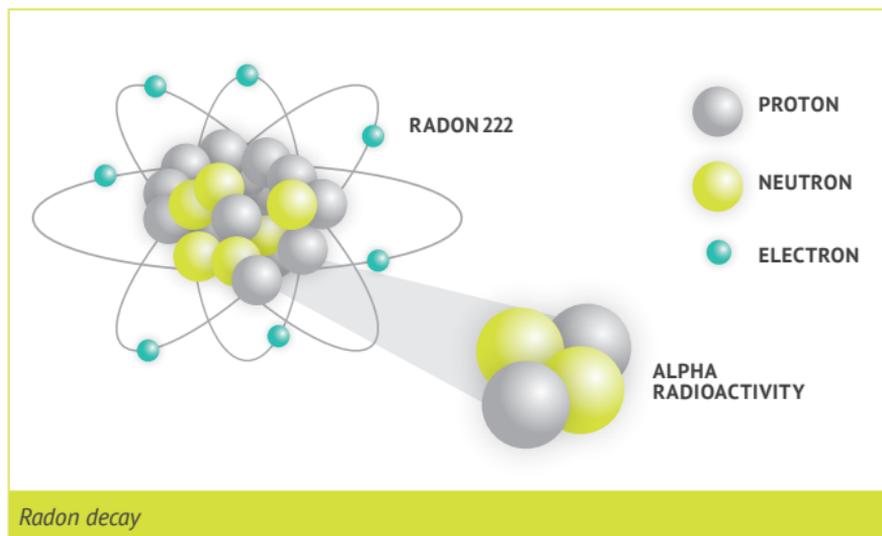




RADON

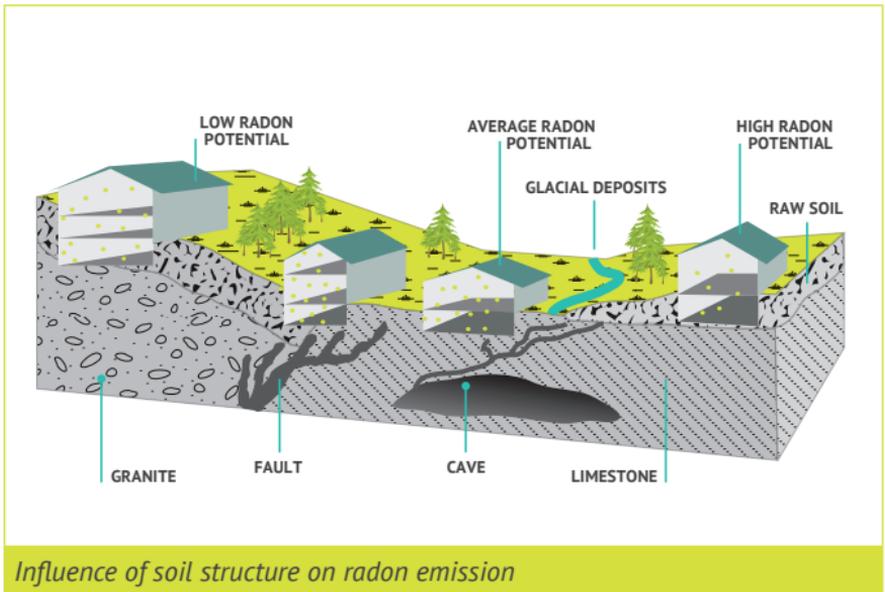
Radon is a radioactive gas found in soil and building materials. The presence of radon is linked to the abundance of natural radioactive minerals in the earth's crust: the two most important isotopic forms are Radon-222, descendant of Uranium-238, and Radon-220, descendant of Thorium-232 and therefore sometimes called Thoron. Once radon has formed, it decays giving rise to descendants or decay products.

Even descendants are radioactive but not gaseous and they can stick to atmospheric dust; during respiration the dust reaches organs and tissues of the respiratory system so here descendants can decay and emit alpha particles.



The concentration in houses varies according to many factors such as soil type, geographical area, building characteristics, domestic facilities layout. Radon tends to accumulate in confined spaces (indoor environments) where, in some cases, it can reach concentrations that represent a danger to the exposed population health.

The type of buildings that present the most risks are those built on soils of volcanic origin or highly permeable ones and those presenting construction materials such as tuff, pozzolan, granite. Radon exhales from soil, rocks, building materials and, also transported by water, it accumulates in rooms, especially if they are poorly ventilated.



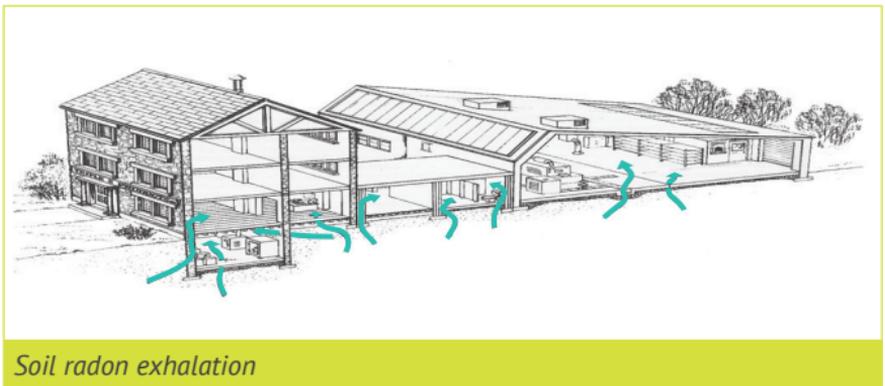
Influence of soil structure on radon emission

In addition, radon can enter buildings through cracks and cavities in walls, passages through pipes, release of water and exhalation from building materials. The concentration of radon in the air is measured in **Bq/m³**:

- Bq is the symbol of the Becquerel measurement unit which represents one radioactive decay per second;
- **Bq/m³** therefore indicates the number of transformations per second that occur in a cubic meter of air. Legal requirements that indicate action level values use this unit of measure.

To solve the problem of the effects of ionizing radiation on the human body, a physical quantity has been introduced:

D = absorbed dose = energy absorbed by the irradiated material per unit mass. In radiation protection the quantity used as an index of potential biological damage due to radiation exposure is the **effective dose** and its unit of measure is the **milliSievert (mSv)**.



Soil radon exhalation



HEALTH IMPACT OF RADON

Exposure to radon and its decay products is the main source of exposure to ionizing radiation. The linearity between an increased exposure to radiation and an increased risk of cancer is proven and there is also an interaction effect between radon and cigarette smoke: the two factors do not add up, but they multiply between them.

The damage caused by radon exposure is usually repaired by biological mechanisms. In some cases, ionizing radiation from radon descendants, which stick to inhaled dust, kills cells, but there is a possibility that cell damage is degenerative and that the cell retains its reproductive capacity and gives rise to a tumor process.

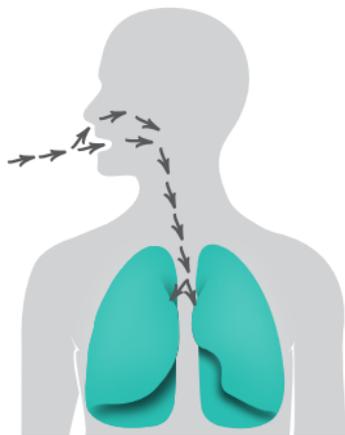
The path of alpha radiation is very short, so there is no possibility of other organs being affected, so the only potential risk is lung cancer.

The main health effect is therefore an increased risk of lung cancer. Radon is carcinogenic: the International Agency for Research on Cancer (IARC) has classified radon in Group 1 which contains 95 substances all declared carcinogenic to humans.

The probability of contracting a cancer is proportional to the concentration in the air of radon decay products and the time spent in various living environments (houses, schools, workplaces, etc.). Radon is the number one cause of lung cancer among non-smokers, according to EPA estimates. Overall, radon is the second leading cause of lung cancer.

Radon is responsible for about 21,000 lung cancer deaths every year. About 2,900 of these deaths occur among people who have never smoked (EPA).

The risk of developing lung cancer increases with increasing radon concentration, exposure time and, most importantly, when combined with smoking. There is not a safe concentration below which the probability of contracting a cancer is zero. The level of concentration achieved in buildings depends on many factors, including the type of building and the number of air changes, which in turn depends on the degree of natural or artificial ventilation.



Entry into the lungs of radon and its decomposition products



RADON IN HOMES

The radon concentration in homes can be assessed by a comparison with the reference levels recommended by the main international organizations: the World Health Organization (WHO) recommends a reference level between 100 and 300 Bq/m³ and the International Commission on Radiological Protection (ICPR) recommends a reference level not exceeding 300 Bq/m³.

Radon has a very high diffusion rate in the air and through building materials, cracks, interstices, pipes and conduits; It is odorless, colorless and tasteless: the only way to assess its concentration is to measure it.

The dosimeter inside the Radon Test Kit is a CR-39 closed type trace detector with a polystyrene diffusion chamber. The dosimeter emits no substances or radiation and requires no power supply.

Our laboratory is ISO 9001: 2015 certified and the analysis results are CEI EN ISO/IEC 17025:2018 accredited. To verify the quality of its devices and analysis, our laboratory performs periodic calibrations and participates in international intercomparisons.

The detector must be placed in the environment in which you want to measure the radon concentration away from heat sources (radiators, electrical devices, direct sun) and water pipes. The dosimeter can be suspended with the cable tie or placed on a non-

expiring surface such as a piece of furniture, a shelf, etc. and it should not be moved during the entire exposure period.

The best rooms to consider when assessing the radon level in a home are the bedroom and the living room; it is recommended to avoid rooms with the presence of water (such as bathrooms or kitchens).

In a building the radon level generally varies between one floor and the other: on the lower floor or on underground floors, where the contact with the ground is more important, it is more likely to find higher concentration levels of radon.



In the case of a house distributed on a single floor, a measurement in one room is generally sufficient; for multi-storey houses it is advisable to make a single measurement on the lower inhabited floor.

It is understood that measurements can be performed in several rooms spread over several floors of the house, in order to conduct more precise investigations.

To avoid overestimating or underestimating the exposure concentration - remember that radon is affected by the degree of ventilation in the premises - it is advisable to take measurements in winter and to avoid long periods when the premises are uninhabited.





U-SERIES SRL

VIA FERRARESE, 131

I-40128 BOLOGNA

TEL: +39 051 6312418

INFO@U-SERIES.COM

WWW.U-SERIES.COM