Radon in buildings

Improving radiation protection in practice

Radon-222 (generally called 'radon') is a radioactive gas produced by the radioactive decay of uranium-238, which is present in variable concentrations in most rocks and soils.

Radon is constantly released from the ground into outdoor air where it quickly dilutes to harmless concentrations. However, when radon enters a closed space such as a building, it can sometimes accumulate to high concentrations. Buildings with high radon levels are often in areas with a particular geology, such as granites and shales with a high uranium content.

Long-term exposure due to radon has been shown to increase the risk of lung cancer. The relationship between exposure due to radon and exposure due to tobacco smoke is greater than additive but less than multiplicative. This means that current smokers are at greater risk of lung cancer from radon than former smokers or people who have never smoked.

Where the radon levels are of concern for public health, a national radon action plan is required.

Challenges

To be effective, a national radon action plan requires cooperation among several authorities and agencies, including those with responsibilities related to radiation protection, public health and building standards. National authorities should consider the benefits of integrating programmes to reduce exposure due to radon in buildings with those for energy efficiency and indoor air quality.

Public information and awareness are essential components of a national radon action plan. It is important that a radon measurement service is available nationally and that employers and the public are encouraged to have radon measurements carried out. Sometimes these measurements are offered free-of-charge or are available through an accredited and approved commercial measurement service.

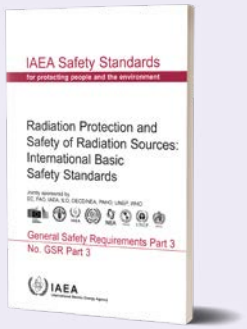
High concentrations of radon in a building can be reduced through corrective measures. These measures are well developed in many States and

IAEA
International Atomic Energy Agency

Visit:
www.iaea.org/topics/radiation-protection/radon

Email:
Radiation-Protection-Group.Contact-Point@iaea.org

What do the IAEA Safety Standards say?



In 2014, the IAEA has published the *General Safety Requirements Part 3: Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards*. This is often referred to simply as the BSS. The BSS is jointly sponsored by eight international organizations with responsibilities in various areas of radiation protection.

The requirements in the BSS take account of the most recent scientific evidence relating to exposure due to radiation. The BSS is used by many States as the basis for their national regulations dealing with radiation protection and safety.

The BSS places a responsibility on the government to: "provide information on levels of radon indoors and the associated health risks and, if appropriate, … establish and implement an action plan for controlling public exposure due to radon indoors."

Control of radon to protect people in homes and other buildings used as workplaces is managed through the use of reference levels for radon concentrations in air. In establishing reference levels, the national authority must first understand the extent to which people are exposed (i.e. the distribution of radon concentrations from a particular source within the population) as well as the ability to reduce exposures and the associated economic and societal consequences.

In the case of homes, the reference level should not exceed an annual average activity concentration of 300 becquerels per cubic metre (Bq/m^3). In the case of workplaces, where the occupancy rate is typically three times less than that for homes, the reference level should not exceed an annual average activity concentration of 1000 Bq/m^3.

Guidance on managing exposure of the public due to radon can be found in the Safety Guide *Protection of the Public against Exposure Indoors due to Radon and Other Natural Sources of Radiation (SSG-32)*. Guidance on managing occupational exposure of workers due to radon can be found in the Safety Guide *Occupational Radiation Protection (GSG-7)*.

In addition to the IAEA, the BSS is jointly sponsored by the European Commission, the Food and Agriculture Organization of the United Nations, the International Labour Organization, the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development, the Pan American Health Organization, the United Nations Environment Programme and the World Health Organization.

are proven to work. Care needs to be taken with thermal retrofitting of existing buildings to improve energy efficiency: reducing ventilation rates also decreases the overall air quality in the building and can increase indoor radon concentrations.

Preventing radon accumulation in new buildings is normally cheaper than identifying existing buildings with high radon concentrations and applying corrective measures. Such an approach is often highly cost-effective compared with other public health interventions.

Building materials can be a source of both indoor radon and gamma radiation. Establishing and applying standards for the concentration of radionuclides in building materials can control the radiation exposure of those who live in or use the building.

How does the IAEA support Member States?

The IAEA supports its Member States in the implementation of all aspects of the Safety Standards through the organization of national and regional workshops and other training events. Online webinars are also regularly organized.

20-03038E