CURRENT INDOOR RADON SITUATION IN LITHUANIA

Rima Ladygienė, PhD
Radiation Protection Centre
LEGISLATION

National policy on radon is based on the appropriate recommendations of International Commission on Radiological Protection, International Atomic Energy Agency and documents of European Commission, World Health Organization and taking into account national radon survey data

LEGAL DOCUMENTS

- Law on Radiation Protection in Lithuania
- Law on Construction of Republic of Lithuania
- Regulation STR 2.01.01(3):1999 Fundamental building requirements. Hygiene, Health, Environmental Protection
RESPONSIBILITIES

Law on Radiation Protection of 12 January 1999 No. VIII-1019

Chapter VII CONSTRAINTS ON NATURAL RADIATION EXPOSURE

Article 20. Natural Ionising Radiation and its Permitted Levels

1. Natural exposure of members of the population and workers caused by natural radiation in buildings, workplaces and the environment shall be regulated by the Ministry of Health Care.

2. The procedure for measuring natural radiation in buildings and workplaces and for processing the data shall be established by the Ministry of Health Care, and natural radiation in the environment - by the Ministry of the Environment.

Article 21. Natural Radionuclides in Building Materials and Products

2. The Ministry of Health Care shall organise selective testing of radon volume activity in buildings and workplaces.

Hygiene Standard HN85:2011 “Natural exposure. Radiation safety standards” sets the responsibilities for the control of indoor radon in workplaces:

IV. GENERAL PROVISIONS

7. The state radiation protection enforcement and control of permitted levels regulated in this hygiene standard is performed by the Radiation Protection Centre and by the State Nuclear Power Safety Inspectorate (hereinafter - VATESI) (cases where the activities are carried out at the nuclear facility).

9. Radiation Protection Centre and in accordance with the competence VATESI as well, in the case of activities carried out in the nuclear facility, shall get results of conformity to the requirements stated in this hygiene standard from all legal persons and other organizations, their affiliates, that to carried out measurements of conformity.

10. Radiation Protection Centre sums up data of the natural radiation measurements in buildings and workplaces and provides conclusions about the population resulting from exposure to natural radiation.
REFERENCE LEVELS

NEW DWELLINGS
Average annual indoor radon concentration shall not exceed 200 Bq/m³
In workplaces, used 80% and more of working time, the yearly average radon concentration during working hours shall not exceed 200 Bq/m³
In workplaces used less than 80% working time the yearly average radon concentration during working hours shall not exceed 400 Bq/m³

DWELLINGS CONSTRUCTED BEFORE 2011
Average annual indoor radon concentrations in not exceed 300 Bq/m³
In workplaces, used 80% and more of working time, the yearly average radon concentration during working hours shall not exceed 300 Bq/m³
If the workplace is used less than 80% of working time yearly average radon concentration during working hours shall not exceed 1000 Bq/m³
If average indoor radon concentrations in workplaces exceed the levels given earlier, an employer shall immediately notify Radiation Protection Centre
Measurements of indoor radon concentrations shall be performed each year in workplaces where remedial measures have been taken before
METHODOLOGY

Indoor radon measurements performed using E ~ PERM™ electrets
Radon and decay products reduces the electrets potential
The differences between potential before and after exposure allows estimating of indoor radon concentration
Electrets used for measurements in buildings (in two rooms) for at least 21 days during the heating season
Calculation are performed using factors ICRP, 1993. Protection Against Radon-222 at Home and at Work. ICRP Publication 65
Alpha track equipment under installation
INDOOR RADON MEASUREMENT PROTOCOLS

Measurement protocol

Leaflet on radon to accompany the measurement explaining the purpose of the measurement
MEASUREMENT EQUIPMENT

ISO:9001 Quality management system –
certified working instructions “Indoor radon measurement”, “Radon gas in soil”
A different range and purpose indoor radon surveys were performed or are going on in Lithuania starting year 1995

Survey in multi-storey houses and in workplaces in 2001-2004
Survey in region of higher radon risk in Northern part of Lithuania in 2001-2002
Survey in regions with higher conc. of indoor radon in 2002-2007
Children’ and teenagers’ institutions survey in 2002-2003 and 2014 year
Indoor radon mapping, data transference to EC JRC in 2007 till now
Geogenic radon potential map, starting in 2008
PROGRAMS AND INTERNATIONAL PROJECTS RELATED WITH INDOOR RADON

Swedish – Lithuanian co-operation

“Assessment of exposure to population due to radon and its decay products in regions with higher radon risk and evaluation of impact to public health. Proposals for reducing measures” was implemented in 2001-2003

“Distribution of indoor radon in Lithuanian territory and estimation of exposure caused by indoor radon” was implemented in 2007-2008

International projects and data basis

National data available on indoor radon and exposure due to indoor radon were presented to World Health Organization, UNSCEAR, IAEA

Radiation Protection Centre jointed project “European indoor radon map” organized by EC Join Research Centre Institute for Environment and Sustainability and first time data available were sent in 2007

Plans to join project related to geogenic radon potential map of Europe are going on preparation and measurements started by Radiation Protection Centre and Lithuanian Geological Survey in 2008
INDOOR RADON MEASUREMENTS IN DWELLINGS
approx. 3000 measurements, grid 10x10 km, 1 dwelling
NATIONAL INDOOR RADON SURVEY RESULTS
Law on Radiation Protection of 12 January 1999 No. VIII-1019
Chapter VII CONSTRAINTS ON NATURAL RADIATION EXPOSURE
Article 21. Natural Radionuclides in Building Materials and Products
2. The Ministry of Health Care shall organise selective testing of radon volume activity in buildings and workplaces.

Average indoor radon concentrations measured in 1995-1998 was 44 Bq/m³ and exposure was up to 0.55 mSv per year.

During year 2011-2015 measurements in the same 11 municipalities show increase of indoor radon up to 44 percent (due saving energy measures and new dwellings constructed).

Average indoor radon concentration (according data of 2015) is 79 Bq/m³, this results in an annual 1.4 mSv for public exposure.

In terms of the latest internationally recognized methodology, the average exposure for the population would reach up to 2.0 ± 0.4 mSv per year.

This would represent more than 60 percent of public exposure from all sources of ionizing radiation received during the year.
MEASUREMENTS OF RADON RISK

Using risk evaluation methodology of Nordic Countries

No areas of radon risk in Lithuania
NO REAL INDOOR RADON PROBLEM

Hygiene Standard HN 85:2011 “Natural exposure. Radiation safety standards” sets the regulation rules for the control of indoor radon in workplaces:

IV. GENERAL PROVISIONS

7. The state radiation protection supervision and control of permitted levels regulated in this hygiene standard is performed by the Radiation Protection Centre.

In general indoor radon problem not exist in Lithuania

The indoor radon levels are low in buildings and only few buildings with indoor radon activity higher that 300 Bq/m³ were measured during past 20 years

For that reason, there is no need for special measures regarding reduction actions of indoor radon and special companies that are able to do it

Monitoring of the indoor radon in Lithuania showed no radon prone areas and no need to carry out measurements at the time of sale/purchase of existing buildings

For that reason there is no requirement for $^{222}\text{Rn}$ measurement at the time of the selling of new constructed buildings
BUILDING CODES

Law on Construction of Republic of Lithuania,
Article 4. Basic requirements for construction

1. The building (or part thereof) must be designed and constructed in such a way that during an economically reasonable life of the building according to its intended use complies with Regulation (EU) No. 305/2011 the essential requirements for construction works.

A REGULATION STR 2.01.01 (3): 1999 Fundamental building requirements. HYGIENE, HEALTH, ENVIRONMENTAL PROTECTION

10. An essential requirement "Hygiene, health and the environment” determines that the building must be designed and constructed so as not to constitute a threat to the structure or to the people staying (hereinafter - people) for the following reasons:

10.2. dangerous particles or gases in the air;
10.3. dangerous radiation.

16. Air quality regulation is associated with contaminants, including limitation or elimination of gamma radiation inside the building, in order to provide an appropriate structures of internal environment for the population and the health of building users. In this case, it takes into account the following criteria:

16.7. radon and radioactive substances emitting gamma radiation.
Measurements in workplaces

Performed in 2004 at 20 entities where basement was used for daily purposes (canteens, health departments, shopping centres, education institutions)

Max indoor radon concentrations were 176 Bq/m³, average 65 Bq/m³

2005-2015 in randomly selected workplaces or by asking of entities
106 working places were measured, 84±16 Bq/m³ average concentration

Working places – education institutions (schools, kindergartens), libraries, buildings of local municipalities, buildings of embasies, offices, private factory of plastic etc.

Levels higher than 300 Bq/m³ were measured in 2015 at one entity

Upgrading list of workplaces in 2016 (new workplaces in restaurants, spa, private business etc.)
Measurements in schools and kindergartens in 2014

Lithuanian Seimas announced 2014 as a Children's Health Year
RSC, supporting this initiative and in collaboration with the Vilnius City Public Health Office, conducted a indoor radon measurements in Vilnius children's education institutions
Investigations were carried out in 15 premises where children spend a lot of time
A study to select dwellings that correspond to risk criteria was performed by questioner
Indoor radon concentration was from $57 \pm 2 \text{ Bq/m}^3$ up to $167 \pm 5 \text{ Bq/m}^3$ (while the reference level is 200 Bq/m$^3$)
In one childcare facility basement room in which the painting classes are placed measured indoor radon concentration was 258 Bq/m$^3$. Considering that in this room there is no permanent educational activities, no remedial measures are needed
From radiation protection point of view, no indoor radon reduction measures at Vilnius children's educational institutions are necessary

Radiacinės saugos centras
Stakeholders and public information
Future plans

New national radon action plan
(to address long-term risks from radon exposures)
will be approved according requirements of Council Directive 2013/59/EURATOM of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionizing radiation and IAEA GSR Part 3 before February 2018