

REGULATORY CONTROL OF NATURAL IONIZING SOURCES IN LITHUANIA:
EXPERIENCE BASED ON INDOOR RADON MONITORING

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Abstract

The situation in legislation of protection against risks from natural sources of ionizing radiation in Lithuania is described. The requirements of new standards came into conflict with the real situation which has not been evaluated before implementation of these standards. On the basis of recommendations of ICRP Publication 60 and results of indoor radon survey new action levels are being established.

Lithuania is establishing its radiation protection legislation based on recommendations of ICRP Publication 60. For long years Lithuania has been using standards and regulations of Soviet Union. After re-establishing independence Soviet radiation protection standards remained in force. Lack of knowledge and experience in creation of legislation in radiation protection was the main reason for it. On the other hand, according to ICRP Publication 60 the new legislation based on new principles of radiation protection was to be created. It was not possible to implement practically until the Basic Safety Standards [1] were published. Now creation of Lithuanian Law of Radiation Protection and Basic Radiation Protection Standards is under way. It is planned to have the Radiation Protection Law in the middle of 1998 and Basic Radiation Protection Standards in the end of 1997.

Some standards regarding special fields of radiation protection have been created and approved earlier. These standards are the most important in limitation of exposure both of public and personnel and they were implemented before approval of the above mentioned Law and Standards. One of standards of such kind is HN40-1994 "Limits of Population Exposure to Natural Ionizing Radiation Sources", approved in 1994 [2]. The aim of this standard is to minimise exposure of humans inside buildings.

Two types of levels have been established by this standard: maximum permissible concentrations of natural radionuclides (Ra-226, Th-232 and K-40) in building materials and maximum permissible concentrations of indoor radon.

Indoor radon situation in Lithuania was entirely unknown in 1994. The measurements of indoor radon concentrations have not been started then because necessary equipment was not available in any research or regulatory institution. When determining maximum permissible concentrations of indoor radon the results from similar in geological conditions countries have been used. Since it was decided that indoor radon concentrations in Lithuania should be rather low the appropriate regulatory levels have been established and approved: 100 Bq/m³ for existing buildings and 50 Bq/m³ for new ones. These levels are very low in comparison with other countries and action levels recommended by [1].

The program of indoor radon survey started in 1995. This program is performed with the technical and methodical help of the Swedish Radiation Protection Institute (SSI). The aim of this program is to clear up the general indoor radon situation in Lithuania and to find out the radon prone areas according to ICRP Publication 65 [3].

The measurements for determination of indoor radon situation are performed in randomly selected detached houses during heating season. The E-Perm electrets by Rad Elec Inc. are used as

monitoring devices. The measurements are carried out in two used rooms nearest to the soil (Survey of building materials used and manufactured in Lithuania proved that building materials is not an important source of indoor radon). Duration of one measurement- more than 3 weeks. Multi-storeyed (block) houses have been excluded from survey because indoor radon concentrations in such houses tend to be lower.

Some regions of special interest have been selected in co-operation with the Lithuanian Geological Survey. The indoor radon concentrations in these regions are expected to be higher than average ones for Lithuania. One of the most interesting region is located in the northern Lithuania where karst phenomena take place.

The detailed results of measurements in randomly selected houses are described in [4].

The arithmetic mean value of indoor radon concentrations in 350 randomly selected houses and 30 specially selected houses (in karst region) are 55 and 125 Bq/m³. The maximum permissible concentration of indoor radon in existing houses established by [2] is exceeded in 16 % randomly selected houses and in 48 % of houses in karst region. In such case remedial actions ought to be taken in more than 70,000 detached houses all around Lithuania. This number for a country with 3.8 million of population and more than 50 % of population living in multi-storeyed (block) houses is extensively high.

The minimum action level for indoor radon recommended by [1] is 200 Bq/m³. Percentage of randomly selected houses and ones in karst region with indoor radon concentrations exceeding this level is 4.4 and 25 %, appropriately. Remedial actions should be taken in approximately 19,000 detached houses. After discussions it was decided to establish single action level both for existing and constructed houses- 300 Bq/m³. In such case 11,000 detached houses will need remedial actions. This number is rather high, social and economic factors taking into account. However, the Basic Radiation Protection Standard is being created with the idea that it will be in force in future, then social and economical factors will be modified in Lithuania.

According to estimations based on the results of the above-mentioned survey and [3], the average annual effective dose caused by indoor radon in Lithuanian detached houses is equal to 0.83 mSv. The newly established action level will cause the annual effective dose of 4.5 mSv. Even in the first case indoor radon as a dose-causing factor is of the same importance as medical procedures. In order to be aware about situation connected with medical exposure dose the measurements of patients undergoing x-ray examinations have been started. Probably, modified recommended levels of doses of medical exposure will be suggested for inclusion into the above-mentioned standards.

It is only one example of problems any country implementing new requirements and recommendations of radiation protection can encounter.

References

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- [3] Protection against Radon at home and at Work. ICRP, Oxford, New York, Frankfurt, Seoul, Sydney, Tokio (1993).
- [4] MORKUNAS G., MASTAUSKAS A., "Indoor Radon Concentrations in Lithuania", Protection Against Radon at Home and at Work (Proc. European Conference, 1997), Prague (1997) 148-151.