**Radon Dose Conversion Factors**

**In 2017, the ICRP (INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION) has published new dose conversion factors in the ICRP Publication 137, 2017, Occupational Intakes of Radionuclides: Part 3. Ann. ICRP 46(3/4).**

In the Czech Republic, the following dose conversion factors are used in relation to the radon activity concentration (RAC) assuming equilibrium of the factor F 0.4 to the equivalent radon activity concentration (ERAC);

**2.52** nSv/(Bq.m-3.h) for homes, and

**3.12**  nSv/(Bq.m-3.h) for workplaces.

These conversion factors were derived from epidemiological studies using a “dose conversion convention” representing the coefficient of the lifetime risk of fatal lung cancer per radon exposure of 2.83x10-4/WLM (ICRP 65, 1993) and the total detriment of the member of the population expressed as the risk coefficient related to the effective dose of 7.3x10-2/Sv and for workers of 5.6x10-2/Sv (ICRP 60, 1991).

The dose conversion factors shall apply for the:

1. Determination of effective doses for workers at workplaces with increased exposure to radion from natural radiation sources (planned exposure situations) or with increased exposure to radiation from radon (current exposure situations), wherein the reference level is set for an effective dose at 6 mSv/year.
2. Comparison of the level of radiation from various sources of ionising radiation (artificial sources, medical exposure, natural sources, etc.).
3. Combination of various sources of ionising radiation and various exposure pathways for the optimization of radiation protection.

Given that the fact whether and how the radon conversion factors will change has not yet been clear at the time of creation of new legislation in the Czech Republic, a strategic decision was taken not to state them explicitly in legislation, but implement their change in strategic documents of the Office, the so-called “Recommendations”. These recommendations are the methodologies that describe the measurement procedures, which will generate reliable and comparable basis for the assessment of exposure to natural radiation sources and the calculation of effective dose, particularly where the determined reference levels of the RAC are exceeded, and ambient dose equivalent rate.

The reference level for RAC in buildings (COUNCIL DIRECTIVE 2013/59/EURATOM) should not exceed 300 Bq/m3 in the European Union countries. This value already reflected the planned changes and, therefore, the value of reference level for workplaces was reduced to the current value of 300 Bq/m3.

The Czech Republic’s legislation has determined the value of reference level of the RAC for all buildings of 300 Bq/m3.

The reference level is the level of exposure or risk of exposure in an emergency exposure situation or in an existing exposure situation, the exceeding of which is undesirable; reducing the level of exposure or risk of exposure to the reference level cannot be held to constitute an optimisation of radiation protection.

The State Office for Nuclear Safety, after the publication of new dose conversion factors in ICRP Recommendation 137 (December 2017), began preparations for their implementation into existing procedures regulating exposure to radon. However, due to the fact that discussions of new factors, their size and the justification for changes are ongoing at the international level, **the current dose conversion factors will continue to be used for calculating the effective dose from radon** until a clear recommendation will be issued by the European Commission.

Table 1 shows the appropriate dose conversion factors and the corresponding annual effective dose for the standard time spent at the workplace of 2000 hours and at home of 7000 hours for the selected values of RAC at workplaces and in homes. The disequilibrium factor of 0.4 corresponding to the current aerosol composition of the atmosphere in the indoor environment of buildings is assumed.

For comparison, the second table also shows calculations using the dose conversion factor from ICRP Publication 137 (2017).

**Table 1**

**Dose conversion factors**

Effective dose = radon activity concentration (RAC) × time × dose conversion factor

**Current conversion factors for RAC**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type of exposure | RAC (Bq.m-3) | Dose conversion factor  (nSv/Bq.h.m-3) | Time (hr) | Annual effective dose  (mSv) |
| Homes | 300 | 2.52 | 7000 | 5.29 (5.3 mSv) |
| Homes\* | 118 | 2.52 | 7000 | 2.08 (2 mSv) |
| Workplaces | 1000 | 3.12 | 2000 | 6.2 (6 mSv) |
| Workplaces | 300 | 3.12 | 2000 | 1.87 (2 mSv) |

**New conversion factors according to ICRP 137, 2017**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type of exposure | RAC (Bq.m-3) | Dose conversion factor  (nSv/Bq.h.m-3) | Time (hr) | Annual effective dose  (mSv) |
| Homes | 300 | 6.7 | 7000 | 14.07 (14 mSv) |
| Workplaces | 300 | 6.7 | 2000 | 4.02 (4 mSv) |
| Workplaces with increased physical activity; caves | 300 | 13 | 2000 | 7.8 (8 mSv) |

\* Average value of the RAC in the housing stock of the Czech Republic (representative survey, 1992-93)

Reference

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