REGULATION OF THE COUNCIL OF MINISTERS

of 18 January 2005

on ionizing radiation dose limits [1)]

On the basis of Article 25 paragraph 1 of the Act of Parliament of 29 November 2000 - Atomic Law (Polish O.J. of 2004 No 161, Item 1689 and No 173 Item 1808) the following regulation is adopted:

§ 1.

Regulation defines the ionizing radiation dose limits, indices that enable the determination of doses used for exposure assessment and methods and frequency of exposure assessments for:
1) workers;
2) members of the public.

§ 2.

1. Dose limit for workers expressed in terms of effective dose shall be equal to 20 mSv per calendar year, subject to § 3 (1).
2. Dose referred to in paragraph 1 may be exceeded in a given calendar year up to the value of 50 mSv, under the condition that its sum total value would not exceed 100 mSv in 5 consecutive calendar years.
3. Dose limit expressed in terms of equivalent dose per calendar year shall be equal to:
   1) 150 mSv – for eye lens;
   2) 500 mSv – for skin, as value averaged over any 1 cm^2 of skin exposed to radiation;
   3) 500 mSv – for hands, forearms, feet and shins.

§ 3.

1. Female worker, from the moment when she notifies the head of organizational entity of her pregnancy, shall not be employed in conditions which would result in the effective dose for unborn child in excess of 1 mSv.
2. Breast-feeding female shall not be employed in conditions of exposure to internal and external contamination.

§ 4.

1. Dose limit values, established in § 2, shall apply for students, apprentices and trainees aged 18 and more years.
2. For students, apprentices and trainees aged from 16 to 18 years the dose limit expressed in terms of effective dose, subject to § 3, shall be equal to 6 mSv per calendar year, whereas the dose limit expressed in terms of equivalent dose per calendar year shall be equal to:
   1) 50 mSv – for eye lens;
   2) 150 mSv - for skin, as value averaged over any 1 cm^2 of skin exposed to radiation;
   3) 150 mSv - for hands, forearms, feet and shins.
3. For students, apprentices and trainees under the age of 16 years the dose limit values established in § 5 shall be applied.
4. Individuals under the age of 18 years may be employed in exposure conditions exclusively for the purposes of education or vocational training.

§ 5.

1. For members of the public, the dose limit expressed in terms of effective dose shall be equal to 1 mSv per calendar year, whereas the dose limit expressed in terms of equivalent dose per calendar year shall be equal to:
1) 15 mSv – for eye lens;
2) 50 mSv - for skin, as value averaged over any 1 cm^2 of skin exposed to radiation.
2. Dose referred to in paragraph 1 may be exceeded in a given calendar year under the condition that its sum total value would not exceed 5 mSv in 5 consecutive calendar years.

§ 6.

1. Exposure of workers and members of the public shall be assessed on the basis of received effective doses and equivalent doses, which shall be determined taking into consideration the quantities and values of the indices that enable the determination of doses used for exposure assessment, established in Annex to the regulation.
2. While determining effective doses, their values shall be reduced by the values of natural background ionizing radiation dose for a given area, taking into account the actual time of exposure. If natural background radiation in unknown, than its value shall be assumed to be 2.4 mSv per calendar year.
3. The doses for workers shall be determined on the basis of dosimetric measurements.

4. Determination of the doses for members of the public shall include:

1) assessment of the doses related to external irradiation, indicating, where appropriate, the assumed values of radiation quality factor;

2) assessment of the radioactive material intake into human body, taking into account the nuclide type, activity and concentration, and also – whenever appropriate – nuclide's physical and chemical form.

5. Whenever there are the groups of members of the public, whose exposure to ionizing radiation source related to a given practice involving artificial or natural sources of ionizing radiation may be recognized as uniform and representative for the population the most exposed to this radiation source, hereinafter referred to as "reference groups", than during the determination of the doses for members of the public the doses for these groups of people shall be determined.

6. Determination of doses for the reference group shall not take into account the extreme behavior of the members of this group.

7. Selection criteria for the reference groups, characteristic features of these groups and the frequency of dose determination for reference groups shall be established on a case-by-case basis by the President of National Atomic Energy Agency in the licence for conducting the specified practice involving the exposure to ionizing radiation.

8. While conducting the exposure assessment referred to in Article 24 of the Act of Parliament of 29 November 2000 – Atomic Law, the President of National Atomic Energy Agency shall keep records of the results of dose assessment for reference groups, together with the criteria and characteristic features referred to in paragraph 7.

§ 7.

1. Assessments of the workers' exposure shall be performed for each calendar year, contingent on the doses determined on the basis of measurements referred to in § 6(3), performed in periods up to 3 months long, and in the event of employment period shorter than 3 months – after the termination of this period.

2. Exposure assessment for the members of the public shall be performed annually.
3. In radiological emergency conditions, the exposure assessment for workers and members of the public shall be performed with frequency enabling the determination of measures and activities, which are necessary for health protection.

§ 8.

This Regulation shall enter into force after 14 days following its publication[2].

Annex to the regulation of the Council of Ministers
of 18 January 2005 (Item 168)

QUANTITIES AND VALUES OF INDICES ENABLING THE DETERMINATION OF DOSES USED FOR EXPOSURE ASSESSMENT

1. Effective dose E (in sievert Sv), as the sum of equivalent doses from external and internal exposure H_T in all tissues (organs) listed in Table 1, taking into account relevant weighting factors, is defined as:

$$E = \sum_T w_T \cdot H_T = \sum_T w_T \sum_R w_R D_{T,R}$$

where:

$D_{T,R}$ - is the absorbed dose (in gray Gy) in tissue (organ) T from radiation R,

w_T - is the weighting factor for tissue (organ) T, according to Table 1,

w_R – is the weighting factor for radiation R, according to Table 2; in the case of neutron radiation, w_R factor may be described also by a continuous function, defined by the formula:

$$w_R = 5 + 17 \cdot \exp\{ -[\ln (2E)]^2/6\}$$

where E - denotes neutron energy (in mega-electronvolt MeV); when the type of considered radiation or its energy are not included in Table 2 or are unknown, than the value of radiation weighting factor w_R may be approximated by the averaged radiation quality factor [redacted] at the 10 mm depth in ICRU sphere[1] calculated as:

$$\bar{Q} = \frac{1}{\bar{D}} \int_0^\infty Q(L) D(L)\, dL ,$$

where: D - denotes absorbed dose (in gray) at the point of averaging Q value,

L - denotes unlimited linear energy transfer per 1 micrometer of the charged particle path in water (in kilo-electronvolt per micrometer, keV/μm),

D(L)dL - denotes absorbed dose at the point of interest, with unlimited linear energy transfer between L and L+dL,

Q(L) - denotes radiation quality factor at the point of interest, dependent on L value as given in Table 3.

2. Effective dose E received in a specified time is established as the sum of effective dose E_z from external exposure and of committed doses from radioactive nuclide intake in the same time, determined for 50-year period from the moment of intake or – in case of children – for the period from the moment of intake until reaching the age of 70, subject to paragraph 3. For the determination of dose limits the term "specified time" denotes, depending on the criterion assumed, one year or 5 years. Effective dose (in sievert) for an individual from age group g is defined as:

$$E = E_z + \sum_j e(g)_{j,p} J_{j,p} + \sum_j e(g)_{j,o} \cdot J_{j,o}$$

where: $e(g)_{j,p}$ and $e(g)_{j,o}$ - denote unit committed effective doses for individuals from age group g, i.e. committed effective doses (in sievert) received by such individuals as the result of the intake by ingestion (index p) or inhalation (index o) of unit nuclide j activity (i.e. one becquerel, Bq). These doses, depending on the way of nuclide transfer into alimentary tract and from alimentary tract to body fluids, which is defined by the value of f_1 factor and by lung absorption rate (which may be fast F, moderate M, and slow S), are given in Tables 4-7, separately for members of the public and the workers; lung absorption type and f_1 values used for the calculation of committed effective doses from chemical compounds are given in Tables 8 and 9.

$J_{j,p}$ and $J_{j,o}$ – denote the activities (in becquerel) of nuclide j for the intake by ingestion (index p) or by inhalation (index o).

3. If equivalent dose from internal exposure in tissue or organ received in unit time, i.e. time derivative of this dose, is known, than committed equivalent dose received in time τ is defined as:

$$H_T(\tau) = \int_{t_0}^{t_0+\tau} \dot{H}_T(t)\, dt$$

where: t_0 is the moment of nuclide intake; if τ value is undefined, than the time of integration should be taken as 50 or 70 years, according to the criteria given in paragraph 2.

4. If the exposure is caused by airborne noble gases, excluding the radon, than the effective dose rate values are determined by multiplying the time-averaged radioactive concentration [Bq/m^3] by the time spent in the gas plume [in days, d] and by relevant conversion factor from Table 10.

5. If the internal exposure is caused by airborne radon and radon daughter nuclides, than the committed effective dose is determined by measurement or by the calculation of potential alpha energy. Potential alpha energy is defined as the total energy of alpha particles emitted during the decay of radon (^{222}Rn) daughters in radioactive series down to lead ^{210}Pb (but excluding this nuclide) and the decay of thoron (^{220}Rn) daughters in radioactive series ending with stable lead isotope ^{208}Pb, and is expressed in joule (J).

This exposure is evaluated by converting measured concentration of potential alpha energy, expressed in joule times hour per cubic meter (Jhm^{-3}), into effective dose in sievert, using the following conversion factors:

radon in home	1.1 Sv/Jhm^{-3}
radon in workplace	1.4 Sv/Jhm^{-3}
thoron in workplace	0.5 Sv/Jhm^{-3}.

[1)] Regulation constitutes the transposition of Directive 96/29/Euratom of 13 May 1996 on basic safety standards for health protection of workers and members of general public against ionizing radiation, O.J. L 159 of 20.06.1996, p. 1.

[2] Upon the entry into force of this Regulation, the regulation of the Council of Ministers of 28 May 2002 on ionizing radiation dose limits shall cease to have effect. The latter continued to be valid under Article 4 of the Act of Parliament of 12 March 2004 on the amendments to the Atomic Law act and to the act on fiscal charge (Polish O.J. No 70 Item 632).

[1] Sphere of tissue-equivalent material, of 30 cm diameter and 1 g cm^{-3} density, with the following mass composition: oxygen 76.2%, carbon 11.1%, hydrogen 10.1% and nitrogen 2.6%