**DECREE ON DOSE LIMITS, REFERENCE LEVELS AND RADIOACTIVE CONTAMINATION**

(UV2)

**UNOFFICIAL TRANSLATION**

*Prepared by the Slovenian Nuclear Safety Administration in December 2018.*

*The official text of the Decree is located on the pages* of [*the Legal Information System*](http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED7605)*.*

***WARNING:*** *The unofficial text of this Act is just an informative work tool, for which the Slovenian Nuclear Safety Administration does not guarantee.*

Based on the seventh paragraph of Article 35, fifth paragraph of Article 37, first paragraph of Article 64 and Article 160 of the Ionising Radiation Protection and Nuclear Safety Act (Official Gazette of the Republic of Slovenia, No. 76/17) the Government of the Republic of Slovenia is issuing

### D E C R E Eon dose limits, reference levels and radioactive contamination

### GENERAL PROVISIONS

### Article 1 (Content of Decree)

### This Decree lays down:

* + dose limits and dose limit-related mandatory measures, the method of calculating dose constraints and their application in planning and optimising radiation activity, and in cases of exposure to ionising radiation by carers and volunteers involved in medical and biomedical research and are aware of the risks;
	+ criteria for classification of exposed workers into two categories;
	+ limit values of radioactive contamination of air, surface and groundwater intended for drinking water, food, radioactive contamination of the human body, working surface areas and living environments, soil, animal feed, products for personal hygiene and care, tobacco and tobacco products, and other products;
	+ reference levels and their application; and
	+ the methodology for determining the suitability of construction materials.
1. This Decree shall transpose the provisions of Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom (OJ L 13, 17. 1. 2014, p.1), last amended with correction (OJ L 72, 17. 3. 2016, p. 6).

### Article 2

**(Use of limit values)**

1. Limit doses and limit values of radioactive contamination apply to the exposure of people in working and living environments, and exposure through artificial and technically modified natural radiation sources. They do not apply to exposure of patients during health examinations or medical treatment.
2. Limit doses are the basis for planning and implementing all organisational, technical, healthcare and other measures needed for protecting individuals against ionising radiation arising from radiation sources, and are the basis for protecting the public.

### Article 3 (Definitions)

Terms used in this Decree shall have the following meanings:

1. **Absorbed dose***D* means the energy absorbed per unit mass:

*D* = d*Ē* / d*m*,

where d*Ē* is the energy imparted by ionising radiation to the matter in the given volume element, d*m* is the mass of the matter in this volume element. Absorbed dose means average dose for tissue or organ. Unit for absorbed dose is the gray and one gray is equal to one joule per kilogram: 1 Gy = 1 J/kg.

1. **Activation** means the process through which a stable nuclide is transformed into a radionuclide because of radiation of the material in which it is contained by particles or high-energy gamma radiation.
2. **Becquerel** (Bq) means the unit of activity. One becquerel means one nuclear transition per second.
3. **Deterministic effects** mean the clinically identified weakening of a radiated organ, tissue or organism due to cell damage. For an individual deterministic effect to occur, dose values at which a deterministic effect occurs are determinable. These dose values are such that their deterministic effect is greater when the dose value is greater.
4. **Effective dose** *E*means the sum of a weighted equivalent dose in all the tissues and organs of the body, from internal and external exposure. It is given by:

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where DT,R is the absorbed dose due to radiation R, averaged over tissue or organ T, the radiation weighting factor wR and the tissue weighting factor wT for tissue or organ T. The values for radiation factors *w*R and tissue weighting factors wT are specified in tables 1 and 2 of Annex II which is a component part of this Decree. The unit for effective dose is the sievert (Sv).

1. **Equivalent dose** HT means the absorbed dose in tissue or organ T weighted by the type and quality of radiation R. It is given by:

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where DT,R is the absorbed dose due to radiation R, averaged over tissue or organ T. When the radiation field is composed of many types and energies with different values wR, the total equivalent dose, HT, is given by:



values of weighting radiation factor wR are given in table 1 of Annex 1 of this Decree. The unit for effective dose is the sievert (Sv);

1. **Evacuation** means the temporary and organised removal of people in emergency situations, from a particular area, to avoid doses which exceed intervention levels.
2. **Index of equivalent dose** means the maximum equivalent dose from an external radiation in a sphere of diameter 30 cm from the prescribed substance, which is equivalent to soft tissue with density 1 g/cm3. If the centre of the observation point is deeper than 1 cm, the index is the depth index. If the centre of the observation point is at a depth of between 0.07 mm and 1 cm, the index is the surface index.
3. **Derived limit doses** mean the limit doses expressed as a derivative of limit doses of radiation quantity, which are calculated from limit doses according to the model. This ensures that it is very unlikely that these limits would be exceeded when derived from limit values.
4. **Iodine prophylaxis** means the consumption of non-radioactive iodine before or immediately after the occurrence of an emergency, to protect the thyroid gland against radiation due to the accumulation of radioactive iodine isotopes.
5. **Contamination** means the unintentional and undesired presence of radioactive substances on surface areas, in solid, liquid or gaseous materials or in a human body.
6. **Internal radiation** means the effect of radiation on an organism by ionising radiation, where the source of radiation is within a body due to entry or activation.
7. **Operative limit levels** mean the easily measurable values for determining protective measures through which the observance of reference values is ensured.
8. **Extremity** means a hand, forearm, foot or ankle.
9. **Committed effective dose** E(τ) means the sum of the committed organ or tissue equivalent doses HT(τ) resulting from an intake, multiplied by the appropriate tissue weighting factor wT. It is given by:

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where τis the period expressed in the number of years for which the dose is integrated. if the period τis not known, a period of 50 years for adults older than 17 years and 70 years for children under 17 years is presumed. The unit for committed equivalent dose is the sievert (Sv).

1. **Committed equivalent dose** HT(*t*τ) means the integral over time (t) of the equivalent dose rate in tissue or organ T that will be received by an individual because of an intake. It is given by:

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where is  the equivalent dose rate in organ or tissue T at time t and τis the period of integration, expressed in years. If the period τis not known, a period of 50 years for adults older than 17 years and 70 years for children under 17 years is presumed. The unit for committed equivalent dose is the sievert (Sv).

1. **Transmission path** means the path on which a radioactive substance reaches and radiates an individual.
2. **Projected dose** means the assessed dose value received by threatened individuals from the start of an emergency until a particular time thereafter, taking into account all transmission paths and facts for protective measures not being implemented.
3. **Group effective dose** *E*S means the total effective dose *E*i which is or would be received by particular members of the public due to their exposure to ionising radiation:

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The unit for a group dose is the sievert (Sv).

1. **Standard values and relationships** means the values and relationships recommended in chapters 4 and 5 of ICRP Publication 116 (International Commission on Radiological Protection, Publication 116 Conversion Coefficients for Radiological Protection Quantities for External Radiation Exposures, Published by Elsevier Ltd 2010 ISBN 978-1-4557-2858-9; hereinafter: ICRP 116) for the estimation of doses from external exposure, and chapter 1 of ICRP Publication 119 (International Commission on Radiological Protection, Publication 119 Compendium of Dose Coefficients based on ICRP Publication 60, Published by Elsevier Ltd 2012 ISBN 978-1-4557-5430-4; hereinafter: ICRP 119) for the estimation of doses from internal exposure.
2. **Stochastic consequences** mean the statistically identified weakening of radiated cells that can multiply. Stochastic consequences can arise from malignant cancers or heredity consequences in genes and are not dependant on doses. There is no threshold for their occurrence but that occurrence is likely with higher doses.
3. **Tissue weighting factor** wT means the share of the equivalent dose for individual tissues or organ T, used for determining effective doses and without a unit.
4. **Permanent relocation** means the relocation of people and animals from radioactive contaminated areas to which their return is not planned for number of years.
5. **Sediment** means the depositing of radioactive particles from a radioactive cloud due to weight or rainfall on the ground and other terrestrial areas.
6. **Tissue weighting factor** wT means the multiplier of absorbed dose D T,R for tissue or organ T, used for determining effective doses and without a unit. Values of weighting radiation factor wR depend on the types and quality field of external radiation or on the types and quality of radiation emitted by radionuclides after intake.
7. **Intake** means the activity of a radionuclide entering a body from the external environment. The unit is the becquerel.
8. **Sheltering** means the keeping people in closed areas in an emergency for a period of a few days to avoid doses due to external radiation and intake that would exceed the intervention level.
9. **External radiation** means the effect of radiation caused by ionising radiation on an organism, where the source of radiation is outside the body.

### II. LIMIT DOSES

**Article 4** **(Effective dose)**

1. Exposure of an individual may not exceed effective limit doses.
2. For assessing effective doses, standard values and relationships shall apply.
3. Effective dose *E* received by a member of the public in the age group or an exposed group of workers shall be determined as the sum of all contributions from external and internal radiation:

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where:

* *E*z effective dose from external radiation;
* *e*(*g*)j,ing committed effective dose per unit of intake j radionuclide from consumption expressed by Sv/Bq;
* *e*(*g*)j,inh committed effective dose per unit of intake of j radionuclide from inhalation expressed by Sv/Bq;
* *A*j,ing individual intake of j radionuclide by consumption expressed in Bq and
* *A*j,inh individual intake from j radionuclide by inhalation expressed in Bq.
1. For radiating an individual by an external and internal radiation from many radiation sources, the effective dose cannot exceed the effective limit dose values.
2. The committed effective dose values after consumption e(g)j,ing and the committed effective dose after inhalation *e*(*g*)j,inh for members of the public are the values set out in the tables in Annex F and Annex G ICRP 119, and for workers, the values set out in table in Annex A ICRP 119.
3. For external radiation, the operative quantities applicable are set out in section 2.3 of ICRP 116.
4. The committed effective dose values per unit of intake due to consumption or inhalation, for a member of the public or for apprentices and students aged between 16 and 18 years (except for radon and thoron progeny), are set out in the table in Annex F and Annex G ICRP 119. Regarding exposure of a member of the public to ionising radiation, the table in Annex F sets out the values appropriate to different factors of digestion *f1* for babies and the elderly. The table in Annex G ICRP 119 sets out the values of committed effective doses for different models of retaining nuclides in the lungs with suitable value factors for digestion *f1*, for that part of intake which is emptied into the digestive tract. If there is information on the manner and duration of retaining radionuclides in the lungs and digestion factors, the relevant values e(g) j,inh in the table in Annex G ICRP 119 apply, in other cases the methods and durations of retaining radionuclides in the lungs and digestion factors apply which have a higher value e(*g*)j,inh than in the table in Annex G ICRP 119.
5. The committed effective dose value per unit of intake due to consumption or inhalation, for exposed workers and apprentices and students older than 18 years (except for radon and thoron progeny), are set out in the tables in Annex A and Annex B ICRP 119.
6. In the table in Annex A ICRP 119 various digestive factors, *f1* are applied, while in the table in Annex B chemical properties due to the inhalation of soluble or radioactive gases and vapours are applied.

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### Article 5

**(Effective limit dose and equivalent limit doses for exposed workers)**

1. If there is no information on the distribution of equivalent doses in the tissues or body by an external beam radiation, the limit values of the equivalent dose index shall apply instead of the equivalent dose limit values.
2. The limit value of the annual intake for exposed workers shall be calculated based on the committed effective limit dose which an exposed worker receives within 50 years after each intake.

### Article 6 (Categorisation of exposed workers)

1. The provider of radiation activity shall categorise exposed workers into category A, where the annual received effective dose of an individual exceeds 6 mSv, the annual effective dose for eye lenses exceeds 15 mSv or the annual equivalent dose on the skin and extremities exceeds 150 mSv.
2. The provider of a radiation activity shall categorise all exposed workers into category B when they do not satisfy the conditions for category A.

### Article 7

**(Limit doses for apprentices, students and pupils)**

1. Aside from effective limit doses, the following effective limit doses shall apply to apprentices, students and pupils, as laid down by the law governing safety against ionising radiation and nuclear safety:
	* for eye lenses 15 mSv per year
	* for the skin 150 mSv per year; this equivalent limit dose shall apply to the dose averaged on any skin area of 1 cm2, regardless of the total area of the skin exposed to ionising radiation.
	* for extremities 150 mSv per year.
2. Dose limits for apprentices, students and pupils, who do not use ionising radiation sources during their studies shall be the same as those for members of the public.

### Article 8 (Dose constraints)

1. Authorised dose constraints or authorised limit values of radiation quantity shall be determined by a competent administrative authority during the procedure for issuing a licence for the performance of radiation activity.
2. The operative dose constraints or values of radiation quantity shall be determined by a provider of radiation activity for the optimisation of radiation protection.
3. Authorised dose constraints or authorised limit values under paragraph 1 of this Article, for individual works in the performance of a radiation activity, shall be determined by measurements of individual and group effective and equivalent doses for workers and members of the public, received from already-performed radiation activities for radiation sources with equivalent working conditions, and on the basis of a comparison of assessments of individual and group effective and equivalent doses that workers and members of the public would receive after implementing additional protective measures.
4. When determining authorised dose constraints or authorised limit values the competent administrative authority shall also consider economic and social acceptability factors of performing a particular radiation activity.

### Article 9 (Determining doses for individuals)

1. An effective dose E for an individual and the equivalent dose HT for an individual’s tissue or organ from exposure to ionising radiation under normal working conditions, and potential exposure to ionising radiation in most risky emergency situations, shall be calculated by applying the equation under paragraph 3 of Article 4 of this Decree.
2. The effective dose *E*z from external radiation shall be calculated on the basis of information on the effective dose rate *Ė*i,z or suitable equivalent doses in the field of external radiation around an individual radiation source and the time of exposure *t*i in this field by the following method:



1. If, due to contamination and discharges of radioactive substances into the environment, intake of individual radionuclides is possible due to consumption or inhalation, the committed effective dose must be added to the effective dose under the preceding paragraph.
2. Information on the effective dose rate *Ė*i,z, during the exposure time *t*i, of radionuclides intake by consumption or inhalation shall be obtained on the basis of projects, technical plans, measurements or otherwise, for areas directly affected by a particular radiation source, at workplaces, in neighbouring areas, in the vicinity of a nuclear or radiation facility or less important radiation facility, and in areas outside such facilities in all directions.

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### Article 10 (Determining group effective dose)

1. A group effective dose ES shall, for an individual radiation source, be calculated from the distribution of the population according to the effective dose dN/dE as follows:



where (dN/dE)dE is the number of individuals receiving an effective dose with the value between *E* and *E* + d*E*.

1. If the number of individuals *N*i in an i population subgroup receiving the average effective dose *Ē*i

is known, ES is calculated as the sum of these doses as follows:

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### Article 11

**(Determining and constraints on doses for carers and volunteers)**

1. If, due to care for a patient, exposure is unavoidable or is due to voluntary participation in medical or biomedical research outside the individual’s occupational activity, the effective dose may exceed the effective dose limit for a member of the public. It cannot be greater than 5 mSv during the treatment period or medical tests.
2. Notwithstanding the provision of the preceding paragraph, an effective dose:
	* for children, under 16 years visiting patients into whose body a radioactive substance entered or came into their area, may not exceed 1 mSv during the treatment period;
	* for adults over 60 years, visiting patients into whose body a radioactive substance entered or came into their area, may not exceed 15 mSv during the treatment period;
	* for other individuals who unknowingly enter an area where there are radioactive patients, it may not exceed 0.3 mSv per year.
3. Notwithstanding the provisions of the preceding paragraph, the authority responsible for radiation safety may approve larger effective dose values for individual cases when medically justified.
4. The method of calculating doses for carers or volunteers participating in medical and biomedical research is the same as the method for calculating doses under Article 9 of this Decree.
5. Carers and volunteers must be informed of the risks of ionising radiation exposure and receive written instructions on actions to be taken to minimise radiation risks.

### Article 12

**(Measures for aircraft crew members)**

1. Air flight carriers shall develop an assessment of radiation protection except:
	* where no crew member flies for more than 100 hours per year; or
	* where the height of flights does not exceed 6 000 m.
2. If the assessment of the radiation protection shows that aircraft crew can receive an effective dose greater than 1 mSv from cosmic radiation, the air flight carrier shall:
	* notify aircraft crew members of health risks from exposure to ionising radiation, including risks to the unborn child and the urgency of a pregnant crew member immediately informing the air flight carrier of the pregnancy;
	* provide individual assessments of effective doses and inform aircraft crew members thereof;
	* adopt organisational and administrative measures by which the exposure of aircraft crew members is optimised to the extent that the collective dose is as evenly distributed between individual crew members as possible;
	* in cases of pregnant aircraft crew members, through organisational and administrative measures, ensure that the effective dose for an unborn child is as low as can be reasonably achieved and that this dose does not exceed the limit dose for a member of the public throughout the remaining period of pregnancy, as set out by the law governing protection against ionising radiation and nuclear safety. If a pregnant woman does not wish to be exposed to ionising radiation, she shall be reassigned to a working post on the ground.
3. If the assessment of radiation protection under paragraph 1 of this Article or individual assessments of doses under point 2 of the preceding paragraph show that aircraft crew members receive an annual effective dose from cosmic radiation higher than 6 mSv, an air flight carrier shall, in addition to measures listed in the preceding paragraph, provide:
	* medical surveillance of aircraft crew members by an authorised provider of medical surveillance;
	* training in radiation protection, including testing and re-training as prescribed for exposed workers.

### LIMIT VALUES OF RADIOACTIVE CONTAMINATION

**Article 13** **(Radioactive contamination)**

Limit values of radioactive contamination of air, surface and groundwater intended for preparing drinking water, food, radioactive contamination of the human body, work surface areas and living environments, land, animal feed, products for personal hygiene and care, tobacco and tobacco products, construction materials and other products are determined by annual limit values for the annual intake of radionuclides into a human organism by consumption or inhalation, effective dose rate 𝐸̇𝑧from external radiation and derived concentration values based on dose limits.

### Article 14

**(Limit value of annual intake)**

1. Contamination inside a human body may not exceed limit values of annual intake for a particular radionuclide in a human body, which shall be calculated by the following method:

 and

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where

* MLV is the limit value of the annual intake of radionuclides,
* Em is the effective dose limit and
* *e*(*g*)j,inh and *e*(*g*)j,ing are the committed effective doses per unit of intake from consumption or inhalation.
1. Limit values of annual intake by consumption *MLV*j,ing may be used as the basis for calculating internal radiation due to the intake of radionuclides into an organism by consumption and may not be used for determining the concentration of radionuclides in drinking water and food in a working environment.
2. For the intake of more radionuclides into an organism also exposed to external ionising radiation, the lower limit values of annual intake shall comply with the condition expressed by the following method:



where

* *MLV*i⋅*e*(*g*)i is the effective dose limit of intake of radionuclide i by consumption or inhalation,
* *E*z,m is the effective dose limit from external radiation,
* Σj≠i, is the sum of all limit intakes of j radionuclides from consumption and inhalation excluding i.

### Article 15

**(Derived concentration values)**

1. The derived concentration value of an individual radionuclide in air, water or food shall be calculated as the limit value of the annual intake *MLV*j,inh or *MLV*j,ing, volume of inhaled air Vz (m3), volume of consumed water *V*v (m3) or mass of consumed food *m*h (kg), by the following method:

or

or

,

where IK is derived concentration value.

1. Limit values of contamination may be the same as their derived concentration values if only one transmission path of the radionuclide in question is the cause of contamination. If an area is contaminated with different radionuclides at the same time, lower derived limit values of contamination must be determined, considering the following inequality:

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where *K*i is the concentration of radionuclide i in air or drinking water.

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### Article 16

**(Authorised and operative dose constraints)**

1. If, by technically possible or economically feasible measures, while considering social factors, it is not possible to provide conditions where radioactive contamination is lower than derived limit values of concentration under the preceding Article, the length of time people are exposed to ionising radiation must be reduced by determining authorised or operative dose constraints and values of radiation quantity.
2. Authorised and operative limit values for effective dose rates *Ė*i,z and for derived concentration values *IK* are calculated by applying lower values for individual limit values (*E*m, *MLV* or *E*z,m) by equations under Articles 9, 14 and 15 of this Decree as well as shorter exposure times to ionising radiation or proportionate value of inhaling contaminating air *V*z, consuming contaminating water *V*v or contaminated food *m*h.

### Article 17

**(Limit values of air contamination)**

1. The derived value of concentration of a particular radionuclide in air in a working environment shall be calculated from the effective dose limit *E*m, the committed effective dose per unit of intake *e*(*g*)j,inh, and the volume of inhaled air *V*z during hours worked in a year by the following method:

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where g is a group of an individual and j is a particular radionuclide. For workers categorised into category A of exposed workers, the limit dose of 20 mSv/per year shall apply. For workers categorised into category B of exposed workers, the limit dose is 6 mSv/per year, and the volume of inhaled air 2 400 m3/per year or 1.2 m3/h in 2 000 hours per year.

1. The derived values of concentration in air in a living environment shall be calculated by the method set out in the preceding paragraph, where g refers to the age group of an individual, the value *E*m is 1 mSv/per year and the volume of inhaled air is 7 000 m3/per year or 0,8 m3/h in 8 766 hours per year.
2. The table in Annex H ICRP 119 sets out the committed effective doses per unit of intake for vaporous and radioactive gases for different age groups.
3. The table in Annex C ICRP 119 sets out the effective dose rate per unit of concentration in air for ionising radiation exposure to noble gases.

### Article 18

**(Limit values of surface and groundwater contamination)**

1. The derived value of concentration for an individual radionuclide in surface and groundwater, excluding drinking water, shall be calculated as a quotient between the effective dose limit for a member of the public and the committed effective dose per unit of intake *e*(*g*)j,ing for an individual radionuclide and volume of consumed water per year by the following method:

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where:

* *V*v is volume of consumed water per year which is equal to 0.75 m3 for an adult;
* g is a group of adult individuals; and
1. j is an individual radionuclide.he limit value of radioactive contamination of water used for supplying drinking water shall be determined as a derivative value of radionuclide concentration in water, calculated by the equation in the preceding paragraph, by considering the fact that the value of the effective dose limit *E*m = 0,1 mSv/ per year.
2. Limit values for the annual intake of radionuclides *MLV* into human organisms from consuming drinking water are calculated based on the equation in Article 14 of this Decree, considering the value of the effective dose limit *E*m = 0.1 mSv/per year.
3. The effective dose limit 0.1 mSv/per year under the preceding paragraph does not consider contributions to the effective dose by the presence of tritium 3H, potassium 40K, radon 222RN, 220RN and their decay products.

### Article 19

**(Limit values of the contamination of human body)**

1. The limit value for radioactive contamination of external skin areas and visible mucous tissue of a member of the public shall be 4 Bq per 100 cm2 for alpha activity and 40 Bq per 100 cm2 for beta and gamma activity.
2. There can be no removable contamination on the skin of people in a living environment.
3. Limit values of radioactive contamination of external skin areas and visible mucous tissue of exposed workers may not exceed 8 Bq per 100cm2 for alpha activity and 80 Bq per 100 cm2 for beta and gamma activity.
4. Limit values of internal contamination of a member of the public shall be equal to the limit values for the annual intake of individual radionuclides in a human body under Article 14of this Decree whereby the effective dose limit is *E*m, the values for *e*(*g*)j,inh or *e*(*g*)j,ing are set out in the tables F and G ICRP 119.
5. The limit values of internal contamination of exposed workers are equal to the limit values of the annual intake of individual radionuclides in a human organism under Article 14 of this Decree, whereby the effective dose limit Em is determined according to the categorisation of exposed workers into categories A or B, while e(g)j,inh and e(g)j,ing are set out in the table in Annex A ICRP 119.

### Article 20

**(Limit values for the contamination of working environment)**

1. Limit value of removable radioactive contamination surface areas in a controlled area and external sides of protective clothing shall be 400 Bq per 100 cm2 for alpha activity and 4 000 Bq per 100 cm2 for beta and gamma activity.
2. Limit values under the preceding paragraph do not include solid contamination when it is established with certainly that there is no danger of spreading the contamination or absorption into the skin.
3. If radioactive contamination is found on surface areas in a controlled area, on equipment, clothes and undergarments, limit values of removable radioactive contamination on surface areas in a controlled area and on the external side of protective clothing shall be 40 Bq per 100 cm2 for alpha activity and 400 Bq per 100 cm2 for beta and gamma activity.
4. Limit values of removable and bound radioactive contamination in inaccessible areas shall be equal to 0.4 Bq per 100 cm2 for alpha activity and 4 Bq per 100 cm2 for beta and gamma activity.
5. If technological processes ensure that there is no danger of spreading the removable contamination from inaccessible areas, the contamination may exceed limit values set out in the preceding paragraph.

### Article 21

**(Limit values for the contamination of surface area)**

1. Limit value of radioactive contamination of surface areas of a living and working environment which is not a controlled area, shall be 4 Bq per 100 cm2 for alpha activity and 40 Bq per 100 cm2 for beta and gamma activity.
2. Surface areas under the preceding paragraph include surface areas of the floor, premises and of equipment, objects of general use, undergarments and personal clothing on which there may be no removable radioactive contamination.
3. The limit value of the effective dose rate of external radiation *Ė*z or of equivalent dose rate index from radioactive contaminated surface areas in living and working environments which are not part of a controlled area, shall be equal to 1 μSv/h at a distance of 10 cm from the surface area.
4. The limit values of the equivalent dose rate of external radiation Ėz or of the equivalent dose rate index from radioactive contaminated surface areas in living and working environments, which are not part of a controlled area, shall be equal to 0.1 μSv/h at a distance of 1 m from the surface area.
5. Individual specific activities on surface areas of soil smaller than 1 m2 may exceed limit values under paragraph 1 of this Article by up to ten times, but the average radioactive contamination of areas up to 10 m2 may not exceed limit values.
6. Individual specific activities on surface areas that are not soil and which are smaller than 100 cm2 may exceed limit values under paragraph 1 of this Article by up to ten times, but the average radioactive contamination of areas up to 1 000 cm2 may not exceed limit values.

### Article 22

**(Limit values of work clothing contamination)**

The limit value of radioactive contamination of work and protective clothing, bedding and undergarments in medical institutions and laboratories washed in public laundrettes, and the external sides of packages containing radioactive substances and sent by public transport, shall be 40 Bq per 100 cm2 for alpha activity and 400 Bq per 100 cm2 for beta and gamma activity.

### Article 23

**(Limit values of food and animal feed contamination)**

1. Limit values for food contamination are equal to derived concentration values which shall be calculated by the following method:

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where:

* + *E*m is the effective dose limit for a member of the public;
	+ *m*h is the mass of food consumed per year;
	+ g is the reference a group of the public; and
	+ j is an individual radionuclide.
1. The calculation under the preceding paragraph for the mass of consumed food in the value of 250 kg per adult shall be accepted when the mass and consumed food for the reference group of the public is not known.
2. If food is contaminated with many radionuclides, the value of food contamination shall be determined by considering the following inequality:

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where *K*j is the concentration of radionuclide j in food.

1. If, using technically possible or economically feasible measures and taking into account social factors, it is not possible to provide conditions in which radioactive contamination of food is lower than derived limit values, the competent authority shall, in accordance with the regulation governing coordinated action between ministries and bodies working in the field of food or animal feed safety, ensure that risk analysis processes include reducing the quantity of contaminated food to ensure that the annual effective dose limit is not exceeded.

### Article 24

**(Limit values of contamination for medicine, personal hygiene and care products)**

1. Limit values for the annual intake of radionuclides into a human organism from medicines which are not radio-pharmaceuticals is equal to the annual value limit for the intake of radionuclides into the human body from the consumption of drinking water.
2. Limit values for the contamination of products linked to personal hygiene and care, beauty, care products for the face and body, and children’s toys are equal to limit values for radioactive contamination of water intended as drinking water.

### Article 25

**(Limit values for the contamination of tobacco and tobacco products)**

The limit value for the radioactive contamination of tobacco and tobacco products is 37 Bq of alpha activity per kilogram of tobacco and tobacco products.

### Article 26

**(Limit values for the contamination of other products)**

1. The limit value for radioactive contamination from a radionuclide whose half-life is longer than 60 days shall, for liquid or dust substances in general use, be equal to the limit values for the radioactive contamination of surface and underground water not intended for drinking, by taking the volume of 1 m3 and replacing it with substance of 1 000 kg.
2. If the half-life of a radionuclide is shorter than 60 days, limit values for radioactive contamination from this radionuclide are ten times greater than the limit values for the radioactive contamination of liquid or dust substances under the preceding paragraph.
3. Limit values of radioactive contamination of solid compact objects intended for general use shall be equal to 100 times the limit value of radioactive contamination of surface and groundwater, whereby limit values of the effective dose rate of an external radiation 𝐸̇𝑧 shall be equal to 1 μSv/h at a distance of 10 cm from the surface of an object and 0.1 μSv/h above the background of natural radiation at a distance of 1 m from the surface of objects.
4. Notwithstanding the provisions under paragraph 1 and 2 of this Article, for natural radionuclides the limit values set out in the preceding paragraph shall apply.

### REFERENCE LEVELS

**Article 27**

**(Reference level for existing exposure and in emergencies)**

1. Notwithstanding the provisions on reference levels for equivalent doses, the reference level for the equivalent dose shall be 20 mSv per year for existing exposure and 100 mSv (acute or annual) for exposure in emergency situations.
2. In certain cases, reference levels lower than the level set out in the preceding paragraph may apply as follows:
	* for exposure in emergency situations, the administrative authority competent for nuclear safety may recommend reference levels lower than 100 mSv when it is possible to provide suitable protection or without incurring excessive costs;
	* for special situations of existing exposure related to ionising radiation sources or transmission paths, the competent administrative authority may determine a reference level lower than 20 mSv per year.
3. The administrative authority competent for nuclear safety shall also determine appropriate reference levels for the transition from exposure in emergency situations to existing exposure, in particular at the end of long-term anti-measures such as relocation. This should consider the prevailing conditions and social criteria, which can include:
	* for exposures below or equal to 1 mSv per year: general information on the level of exposure, without specific consideration of individual exposures;
	* exposure up to including 20 mSv per year: specific information to enable individuals to manage their own exposure, if possible;
	* for exposure, up to and including 100 mSv per year: assessment of individual doses and specific information on radiation risks and on available measures to reduce exposure.

### Article 28(Construction material)

1. The reference levels for external exposure due to gamma radiation from construction materials in indoor areas shall be 1 mSv per year. This value constitutes additional exposure to existing exposure from a natural outdoor environment.
2. Construction materials from which the reference level for external exposure referred to in the preceding paragraph of this Article can be exceeded are listed in Annex 2 to this Decree.
3. Before the sale of construction material set out in the preceding paragraph, the material needs to be measured for specific activities of radionuclides Ra-226, Th-232 or their decay product Ra-228, and K-40. Based on measured values, the specific activity index shall be calculated in accordance with Article 30of this Decree.
4. Construction materials under paragraph 2 of this Article may be freely used if the specific activity index value for gamma radiation is calculated based on Article 30 of this Decree. This applies to larger materials smaller than 1 (bricks, cement and similar) and materials used for paving smaller than 6 (tiles and similar).
5. In a case where the values of the specific activity index are greater than the values under the preceding paragraph, it shall also be necessary to assess the external exposure of individuals before the material is used, to ensure the limit values under paragraph 1 of this Article are not exceeded.
6. The calculation of dose received by individual needs to consider other factors such as density, thickness of the material and factors relating to the type of building and the intended use of the material (bulk or superficial).

### Article 29

**(Specific activity index for building materials)**

1. The specific activity index for gamma radiation in construction materials is calculated by using the following equation:

I = CRa226/300 Bq/kg + CTh232/200 Bq/kg + CK40/3000 Bq/kg,

where CRa226, CTh232 and CK40 are the activity concentrations of correspondent radionuclides (in Bq/kg) in the building material.

1. The index under the preceding paragraph refers to the gamma radiation dose without considering the natural background in the building constructed from the construction material in question.

### Article 30

**(General criteria for ordering protective measures)**

1. Where there is a possibility that an individual could receive significant doses in a short period of time because of nuclear or radioactive disaster, actions need to be taken, regardless of all the circumstances, to prevent drastic consequences. Values of individual criteria and methods for acting are given in table 1 in Annex 3 of this Decree.
2. In the case of nuclear or radiological disaster, it shall be necessary to carry out protective measures to reduce risks caused by the stochastic consequences of ionising radiation exposure.The values of individual criteria and methods of acting are provided in the Table 2 in Annex 3 to this Decree.
3. It shall be necessary to reduce risks to members of the public from the intake of food, milk and drinking water or from using contaminated products.The received effective dose, when considering all transmission paths, shall not exceed one tenth of values given in table 2 in Annex 3 to this Decree.
4. In a case where it shall not be possible to provide replacement food and water, it shall be permitted to consume food and water until replacement food or water are provided, subject to the condition that the projected dose does not exceed values in table 2 in Annex 3 to this Decree.
5. Risks from using contaminated vehicles, equipment and other objects need to be reduced. It shall be necessary to ensure that the received effective dose does not exceed the 1/10value as given in table 2 in Annex 3 to this Decree.

### Article 31

**(Operative intervention levels)**

1. For operative decision-making about protective measures and for providing compliance with general criteria under the preceding Article, the operative intervention levels (hereinafter: OIL) in Annex 4 shall be applied.
2. OIL1, OIL2 and OIL3 for dose rate from sediment shall be used to determine where, because of sediment, it is necessary to evacuate, relocate or restrict the use or distribution of local products, forest fruits (mushrooms, etc.), milk from free-range cows, rainwater and food for animals that could be contaminated.
3. The value of OIL4 shall be used for assessing whether the level of radioactive contamination of skin requires medical examination or additional medical measures.
4. The values of OIL7 expressed as concentration (Bq/kg) of two typical radionuclides (131I and137Cs) shall be used as an indicator for determining whether food, milk and water are safe for human consumption without taking a complete radionuclide analysis.
5. OIL8 is used for the assessment if the concentration of radioactive iodine in the thyroid gland of an individual requires additional medical examination and monitoring.

### Article 32

**(Dose limits for operators of protective measures)**

1. During the implementation of protective measures as part of the rehabilitation of the consequences of emergency situations, it shall be necessary to retain occupational exposure below limit values where possible, as these are set by the law governing ionising radiation protection and nuclear safety.
2. In cases where the condition in the preceding paragraph cannot be complied with, the following conditions shall apply:
	* reference levels for emergency occupational exposure shall be determined, generally below the effective dose of 100 mSv.
	* in special situations, to save life, to prevent severe radiation-induced health effects, or to prevent the development of catastrophic conditions, the reference level for the effective dose from external radiation of emergency workers may be set above 100 mSv, but not higher than 500 mSv;
	* the reference levels for individual tasks during the implementation of the protective measures are laid down in Annex 5, which is an integral part of this Decree. For measures not referred to in the first or second point of this paragraph, the effective dose of individual participating in the implementation of protective measures, including Police and civil protection units, rescuers, drivers and others, cannot exceed the limit dose for exposed workers specified in the Act governing the protection against ionizing radiation and nuclear safety.
3. Reference levels refer to the effective dose from external radiation during emergency situations and the committed dose from the intake of radioactive material at the same time, and do not include the dose an individual receives after an emergency by living in the area where special limitations do not apply.
4. The operators of intervention measures who are likely to carry out measures in relation to which the effective dose of 100 mSv may be exceeded, shall be informed in advance clearly and in detail of related health risks and of available protective measures. They must also know that they are participating in the performance of these measures voluntarily.
5. When implementing rehabilitation measures such as repairs of a facility, buildings, the collection and disposal of waste and decontamination of an area and equipment, dose limits for exposed workers shall apply to workers performing rehabilitation actions as laid down by the act governing protection against ionising radiation and nuclear safety.
6. Women in reproductive are may not be intentionally exposed to radiation where the dose is greater than 20 mSv, while pregnant and nursing women may not participate in the performance of protective measures in the field.
7. Radiological surveillance shall be provided for all the operators of protective measures. When needed, personal dosimetry or assessment of individual’s doses shall be made.
8. For all providers of protective measures, it shall be necessary to provide personal healthcare as laid down by the regulation governing the provision of healthcare surveillance of exposed workers.

### TRANSITIONAL AND FINAL PROVISIONS

**Article** **33
(End of validity)**

On the day, this Decree enters into force, the Decree on dose limits, radioactive contamination and intervention levels (Official Gazette of the Republic of Slovenia, No. 49/04 and 76/17 – ZVISJV-1) shall cease to apply.

###

### Article 34 (Entry into force)

This Decree shall enter into force the fifteenth day after its publication in the Official Gazette of the Republic of Slovenia.

No. 00725-3/2018
Ljubljana, 14th March 2018
EVA 2017-2711-0059

**Government of the Republic of Slovenia**

**dr. Miroslav Cerar**

**PRESIDENT**

**ANNEX 1**

 **Radiation weighting factors and tissue weighting factors**

**Table 1:** Radiation weighted factor

|  |  |
| --- | --- |
| **Radiation type** | **wR** |
| Photons | 1 |
| Electrons and muons | 1 |
| Protons and charged pions | 2 |
| Alpha particles, fission fragments, heavy ions | 20 |
| Neutrons, En < 1 MeV | Enačba. |
| Neutrons, 1 MeV ≤ En ≤ 50 MeV | Enačba. |
| Neutrons, En > 50 MeV | Enačba. |
| Note: All values refer to radiation of the body or to internal radiation from a source within the body. |

**Table 2:** Tissue weighting factors

|  |  |
| --- | --- |
| **Tissue** | **wT** |
| Bone marrow (red) | 0.12 |
| Colon | 0.12 |
| Lungs | 0.12 |
| Stomach | 0.12 |
| Breast | 0.12 |
| Remainder tissues (\*) | 0.12 |
| Gonads | 0.08 |
| Bladder | 0.04 |
| Oesophagus | 0.04 |
| Liver | 0.04 |
| Thyroid | 0.04 |
| Bone surface | 0.01 |
| Brain | 0.01 |
| Salivary glands | 0.01 |
| Skin | 0.01 |

(\*) wT for remaining tissues (0.12) is used for the arithmetic average dose of 13 organs and tissues for each gender, namely adrenals, extrathoracic (ET) region, gall bladder, heart, kidneys, lymphatic nodes, muscle, oral mucosa, pancreas, prostate (male), small intestine, spleen, thymus, uterus/cervix (female).

### ANNEX 2

**Framework list of types of construction materials which can cause excessive exposure to gamma radiation**

|  |  |
| --- | --- |
| Naturally occurring material | Shale |
| Building materials or additives to natural volcanic origin, such as:* granitoides (such as granites, syenite and orthogneiss),
* porphyries;
* tuff;
* pozzolana (pozzolanic ash);
* lava.
 |
| Materials resulting from processing | Materials incorporating residues from industrial that produce naturally occurring radioactive material, such as:* fly ash;
* phosphogypsum;
* phosphorus slag;
* tin slag;
* copper slag;
* red mud (residue from aluminium production);
* residues from steel production.
 |

### ANNEX 3

**General criteria and example of action**

**Table 1:** General criteria for absorbed doses received in a short period of time where action needs to be taken in every situation to prevent drastic consequences

|  |  |
| --- | --- |
| **Generic criteria** | **Example of action** |
| Acute external radiation exposure (<10 hours): |
| Bone marrowa | 1 Gy | Projected dose:* necessary to take immediate measures (even in difficult conditions) to reduce the dose above general criteria
* warn and inform the public
* act for immediate decontamination
 |
| Embryo | 0.1 Gy |
| Tissueb | 25 Gy per 0.5 cm |
| Skinc | 10 Gy |
| Acute internal radiation exposure (30 days) d: |
| Bone marrow | 0.2 Gy per radionuclide Z≥902 Gy per radionuclide Z≤89 | Dose already received:* conduct immediate medical examination and take appropriate measures
* contain contamination
* where possible, eliminate radionuclides from the body
* provide information for long-term monitoring of individuals’ health
* provide psychological support
 |
| Thyroid | 2 Gy |
| Lungs | 30 Gy |
| Colon | 20 Gy |
| Embryo | 0.1 Gy |

A Dose for bone marrow is the average absorbed dose for internal organs (bone marrow, lungs, small intestine, gonads, thyroid gland) and eye lens, weighted in terms of the biological effectiveness of radiation for deterministic effects occurring because of a uniform beam radiation field.

B Dose per 100 cm2 of tissue at the depth of 0.5 cm because of closeness to the source (radioactive source in a hand or pocket).

C Dose per 100 cm2 of skin, 0.4 mm deep.

D Dose which would prevent determined effects in 30 days at 5 % exposure.

**Table 2:** General criteria for acting in case of nuclear or radiological disaster with the intention of preventing stochastic consequences:

|  |  |
| --- | --- |
| **General criteria:** | **Example of action** |
| The projected dose in seven days exceeds: |
| * Deqv, thyroid e
* Def f
* Deqv,embryog
 | 50 mSv100 mSv100 mSv | Possible immediate or early measures:* iodine prophylaxish
* sheltering, evacuation, decontamination or limiting contamination, limitations on the intake of water, food and milk, informing and

controlling the public |
| Projected dose exceeds: |
| * Def
* Deqv,embryo
 | 100 mSv/per year 100 mSv for the whole period of embryo’s  development | Possible early and general measures:* temporary move, decontamination, replacing

water, food and milk, informing and controlling the public. |
| Received dose which exceeds: |
| * Def
* Deqv,embryo
 | 100 mSv/per month 100 mSv for the whole period of embryo’s development | Long-term medical monitoring:* examinations based on the received equivalent dose of the affected body, consultation
* consultation, individual treatment;
 |

e Deqv. thyroid gland Equivalent dose for thyroid gland

f Def effective dose

g Deqv,embryo Equivalent dose per embryo

h If dose was caused by radioactive iodine, this measure must be carried out before or immediately after discharge or a short time after inhaling radioactive iodine. In cases of lower projected doses,

only sheltering can be ordered.

### ANNEX 4

### Values of operational intervention levels (OIL)

Given OIL are determined based on the reference level at 100 mSv. When using lower reference levels, the OIL needs to be proportionately reduced.

|  |  |  |  |
| --- | --- | --- | --- |
| **OIL** | **Quantity** | **Value** | **Measures** |
| **OIL1***measurements in the environment* | Gamma radiation dose rate at1 m from the surface area | 1000 µSv/h | Immediate protective measures, with the intention of preventing deterministic radiation effects.Immediately:a* distributing and consuming of iodine tabletsb
* immediate safe evacuation
* decontaminating evacueesc
* restricting unintentional consumptiond
* stopping consumption of locally produced foode, forest fruits (mushrooms, etc.), milk from freely grazing cows
* registration, radiological and health examination of evacuees

In the first days:* assessing doses received and of the need for

medical examination, advice and continued monitoring. |
| **OIL2***measurements in the environment* | Gamma radiation dose rate at 1 m from the surface area: | 100 µSv/h | Immediate protective measure, with the intention to prevent deterministic radiation effects.Immediately:* preparing for temporary relocation, restricting unintentional consumption prior to relocationd
* stopping consumption of locally produced food, forest fruits (mushrooms, etc.), milk from freely grazing cows, rainwater and animal feed

Within a week or the first monthg* registering members of the public in the area
* temporary relocating, starting with the most endangered
* assessing doses received and of the need for medical examination, advice and continued monitoring.
 |
| ≤ 10 days after stopping a reactorh | 100 µSv/h |
| > 10 days after stopping a reactor | 25 µSv/h |

a Some of the listed actions will be automatically activated when declaring a general emergency.

b Cannot slow down the evacuation.

c If immediate decontamination is not possible, evacuees must be advised to change clothing and take a shower as soon as possible.

d Warn evacuees not to eat, drink or smoke and to keep their hands away from their mouths until they

have washed.

e Locally produced food includes food produced directly in a contaminated open area and consumed within a few weeks.

f Necessary to restrict the use of water used undiluted for drinking. Other sources (wells, tanks, rivers) will have lower concentrations of radionuclides due to dilution and their use is restricted if OIL7 is

exceeded.

g Areas with dose rate of equal magnitude to OIL1 need to be identified within one week; areas where OIL2 is exceeded must be identified within one month.

h Time from stopping a reactor to taking the measurements Used also in cases of discharges from the pool for spent fuel.

|  |  |  |  |
| --- | --- | --- | --- |
| **OIL** | **Quantity** | **Value** | **Measures** |
| **OIL3***measurements in the environment* | Gamma radiation dose rate at 1 m from the surface area/source | 1 µSv/h | General protective measures intended to reduce doses affecting the public in a wider area.Immediately:* stopping consumption of locally produced food, forest fruits (mushrooms, etc.), milk from freely grazing cows, rainwater and animal feed until inspected for OIL7 values
* stopping the movement of potentially contaminated goods

In a few days and after one week* immediately replacing essentiali, locally produced food, milk and rainwater and relocating the public if possible
* registration and assessing doses received from consumption of locally produced food, milk and rainwater, and the assessment of the need for medical examination, advice and

continued monitoring |
| **OIL4***measurements of contaminated skin* | Gamma radiation dose rate at 10 cm from the skin | 1 µSv/h | Immediately:* consuming iodine tables (if not yet taken)
* immediately decontaminating skinc and restricting unintentional consumptiond
* registration and health examination of evacuees
* calming down workers examining/moving contaminated people that they are safe if observing general protective principles against infection

In a few days:* assessing doses received and of the need

for medical examination, advice and continued monitoring. |
| **OIL5** | There are no OIL5 and OIL6 for historic reasons! |
| **OIL6** |
| **OIL7***measurements of contaminated water,**food or milk* | Typical radionuclides | * stopping consumption of non-essential local produce, food and rainwater
* immediately replacing essential, locally produced food, milk and rainwater and relocating members of the public if possible
* registration and assessing doses received from consumption of locally produced food, milk and rainwater, and the assessment of

the need for medical examination, advice and continued monitoring |
| I-131j | 1000 Bq/kg |
| Cs-137 | 200 Bq/kg |
| **OIL8***measurement s of**contaminated* | Dose ratek upon contact with the skinbefore a thyroid (one to six days after exposure) | Immediately:* consuming iodine tables (if not yet taken)
* restricting unintentional consumptiond
* registration and taking records of measured dose rates by the thyroid
 |
| Age ≤ 7 years | 0.5 µSv/h |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Age > 7 years | 2 µSv/h | In a few days:* assessing doses received by the thyroid and

assessing the need for medical examination, advice and continued monitoring |

i Restricting consumption of essential food that could result in malnutrition and other health complications.

j OIL is exceeded if one of the limitations is exceeded (I or Cs).

K The difference between measured dose rate and the background is considered.

|  |  |
| --- | --- |
| **Type of measure** | **Reference level** |
| * saving lives,
* preventing the melting of the reactor core,
* preventing the large discharge of radioactive substances,
 | 500 mSv |
| * preventing serious health injuries,
* protection against large group dose preventing serious damage,
* correcting the nuclear reactor’s safety systems,
* monitoring dose rate,
 | 100 mSv |
| * short tasks related to restoring the original state,
* immediate performance of protective measures,
* sampling in the environment,
 | 50 mSv |
| * longer tasks related to establishment of the original state,
* routine work in interventions,
* works, not directly related to an exceptional event
 | 20 mSv |