

Decree of 16th July 2001 on the Enactment of the Decree on Protection Against Radiation.

(Decree on Protection Against Radiation [This version in force from: 13-03-2002])

History: Government Gazette 2002, 49

We, Beatrix, by the grace of God, Queen of the Netherlands, Princess of Oranje-Nassau, etc. etc. etc.

By recommendation of the Secretary of State for Social Affairs and Employment, J. F. Hoogervorst, on 20 December 2000, Directive for Working Conditions, no. Arbo/Amil/00/84346, also on behalf of Our Minister of Housing, Regional Development and the Environment, and Our Minister of Health, Welfare and Sports, in agreement with Our Minister of Economic Affairs;

Taking into account [Sections, 28, 29, first Paragraph, 30, 31, 32, first and fourth Paragraphs, 34, 35, 37, first Paragraph, 37a, 38a, 67, 69, fourth and fifth Paragraphs, 69a, 69b, 73 and 76 of the Nuclear Energy Act, Section 16 of the Working Conditions Act 1998, Section 37, second Paragraph, of the Individual Health Care Professions Act](#) as well as Directive no. 96/29/Euratom of the Council of the European Union on 13 May 1996 for the determination of basic standards for the protection of the population and employees from dangers associated with ionising radiation (PbEG L 159) and Directive no. 97/43/Euratom of the Council of the European Union on 30 June 1997 concerning the protection of people from the dangers of ionising radiation associated with medical exposure, and for the withdrawal of Directive 84/466/Euratom (PbEG L 180);

On the advice of the Council of State (advice of 27 March 2001, no. W12.01.0024/IV);

In the light of the more detailed report from the Secretary of State for Social Affairs and Employment, J. F. Hoogervorst on 2 July 2001, Directive for Working Conditions, no. Arbo/Amil/01/41134, also on behalf of Our Minister of Housing, Regional Development and the Environment, and Our Minister of Health, Welfare and Sports, in agreement with Our Minister of Economic Affairs;

Have agreed and understood:

CHAPTER 1. DEFINITIONS AND AREA OF APPLICATION

Section 1

1. The following definitions are maintained in this decree and the conditions based on it:

A-employee: the employee that has been exposed, as described in Section 79, second Paragraph;

act: [Nuclear Energy Act](#).

action: the preparation, availability, use, or discharge of an artificial or a natural source, insofar this natural source has been or is being processed for the purpose of its radioactive properties, or the use or availability of a device, except in case of an intervention, accident or radiological emergency situation;

activity: activity as described in Appendix 2;

ambient dose equivalent: ambient dose equivalent as described in Appendix 2;

ambient dose equivalent rate: ambient dose equivalent rate as described in Appendix 2;

appendix: the appendix that is part of this decree;

arbo service: a service as described in the [Working Conditions Act 1998](#);

artificial source: a source other than a natural source or a device;

B-employee: an exposed employee, but different from an A-employee;

chief officer for environmental health: chief officer for government control of public health, responsible for the control of environmental health;

concentration of activity: concentration of activity as described in Appendix 2;

contained source: radioactive substance contained in or attached to solid carrier material, or encapsulated by an enclosure of material, in the understanding that the carrier material or enclosure offers sufficient resistance to prevent, under normal circumstances, any spreading of radioactive substances;

contamination: the presence of radioactive substances in a material, in or on a surface, in an environment, or externally on or internally in an individual;

damage: harmful effects of ionising radiation on people, animals, plants and goods;

damage to health: the estimated possibility of a shorter life expectancy and impaired quality of life because of the negative effects of physical abnormality, cancer and serious genetic effects as a result of exposure to ionising radiation;

discharge: discharge into the soil, air, public sewer system or surface waters;

discharge into the air: the accidental or intentional dispersion of gaseous radioactive substances, or parts of radioactive airborne substances, into the air;

discharge into the public sewer system: the accidental or intentional dispersion of liquid radioactive substances or radioactive substances dissolved in water, or parts of radioactive waterborne substances, into the public sewer system;

discharge into the soil: permanent transfer into the soil (or ordering a third party to transfer into the soil), with the intend to leave in the soil, liquid radioactive substances or radioactive substances dissolved in water, or parts of radioactive waterborne substances, or transferring these substances onto the soil when the liquid penetrates the soil partly, except fertilizers as described in the [Fertilizers Act](#);

discharge in surface waters: the accidental or intentional dispersion of liquid radioactive substances or radioactive substances dissolved in water, or parts of radioactive waterborne substances, into the surface waters;

dose restriction: when designing a plan of action, this is the dose value established as an upper limit for the optimisation process of the protection against ionising radiation during an action, task, profession or a category of these;

effective dose: effective dose as described in Appendix 2;

effective committed dose: effective committed dose as described in Appendix 2;

employee: an individual who works, employed by or under the authority of an employer, or independently;

employer: an individual under the responsibility of whom an action or operation is performed;

equivalent dose: equivalent dose as described in Appendix 2;

expert: an individual who is registered as an expert (with consideration to the task concerned) in a registry as described in Section 7, second Paragraph;

exposed employee: an employee who is exposed as a result of an action at work; the exposure can lead to a dose higher than one of the dose limits described in Section 76;

exposure: being exposed to ionising radiation;

external employee: an A-employee under the responsibility of an employer who is established in another European Union member state, but working on Dutch territory in a zone as described in Section 83, first Paragraph, under a, Part 1°;

indicator instrument: instrument for determination of time or location, or for the measurement, determination or indication of other variables, intended for use with or in the direct vicinity of people;

location: establishment as designated under [Section 1.1, third Paragraph, of the Environmental Management Act](#) or area, where an action or operation is performed;

member of the public: a member of the population inside or outside a location, other than an employee during his/her working hours or an individual undergoing a radiological procedure;

mining: performing actions or operations as part of exploratory or prospecting research, or, as described in [Section 2 of the Law](#) or the [Mining Act 1903](#), the extraction of minerals;

natural source: cosmic radiation or source of natural origin, not a device;

Our Ministers: Our Minister of Housing, Regional Development and the Environment, and Our Minister of Social Affairs and Employment;

open source: source other than a contained source or a device;

operation: the preparation, availability, use, or discharge of a natural source, insofar it has been or is being processed for the purpose of its radioactive properties, except in case of an intervention, accident or radiological emergency situation;

potential exposure: exposure which is not certain to take place, but of which the probability of it occurring and the amount of exposure, if it occurs, can be estimated beforehand;

radiation physician: an individual registered as a radiation physician in the registry as described in Section 7, first Paragraph;

radioactive waste material: radioactive substance which has been designated as such under Section 38, and which is not being discharged;

radiological procedure: medical procedure for which ionising radiation is used, as described in Section 53, first Paragraph;

radiotoxicity equivalent: the activity which leads to an effective committed dose of 1 Sievert for an adult reference, when ingested;

regional director: regional director of the labour inspectorate;

source: device or radioactive substance;

surface contamination: surface contamination as described in Appendix 2;

2. The term “availability” in this decree and the conditions based on it is also understood to denote: manufacture, treatment, handling and storage, except storage for transport purposes.

3. With respect to this decree and the conditions based on it, economic and social factors are taken into consideration in the determination of what is “reasonably achievable”. In addition, the following is taken into account in case of an exposure: the extent to which an exposure and the possibility of such an exposure occurring can be restricted.

Section 2

This decree is not applicable to:

- a. discharge or disposal of radioactive substances to which the prohibitions stated in Sections 35, 37 and 108 do not apply;
- b. the transport of radioactive substances and the transfer of it (or ordering a third party to transfer it) to or from Dutch territory;
- c. the transport of devices which are not in use during transit;
- d. actions involving a device with a maximum high voltage of 5 kV;
- e. exposure to radon and daughter nuclides from the undisturbed earth's crust or from building materials used in buildings;
- f. exposure aboveground to radionuclides from the undisturbed earth's crust or from building materials used in buildings;
- g. radiation as a result of radionuclides naturally present in the human body;
- h. cosmic radiation near the earth's surface;
- i. cosmic radiation in an aeroplane affecting members of the public and employers, other than the aircrew;
- j. exposure to radon and daughter nuclides which are released when natural gas is combusted or blasted off.

Section 3

1. Ambient dose equivalents, the equivalent dose and effective dose are determined in the manners described in appendices 2, 3 and 4.
2. By Ministerial Order, rules may be implemented for methods for the determination of the doses described in the first Paragraph, that are equivalent to those described in the first Paragraph and may be applied instead of those.
3. By Order of Our Minister of Housing, Regional Development and the Environment, the following applies:
 - a. rules may be laid down for the determination of the doses described in the first Paragraph;
 - b. methods may be imposed for the way these doses are checked against the doses described in this decree.
4. By Ministerial Order, rules may be implemented for the methods used to measure activity, concentration of activity, or surface contamination.
5. For the purpose of determining the doses, all effective or equivalent doses are added up that an individual receives as a result of actions and operations, as far as these are regulated by or under this decree, except radiological procedures, by or under the [Nuclear Installations, Fissionable Materials and Ores Decree](#) and by or under the [Fissionable Materials, Ores and Radioactive Substances \(transport\) Decree](#).
6. In order to check the values given in Table 1 and Table 2 of Appendix 1, all activities within a location at any moment in time are weighed and added up as far as they are regulated by or under this decree, by or under the [Nuclear Installations, Fissionable Materials and Ores Decree](#) and by or under the [Fissionable Materials, Ores and Radioactive Substances \(transport\) Decree](#).
7. In contravention to the sixth Paragraph, the activities or concentration of activities in natural sources are not added up to the activities or concentration of activities in artificial sources.

CHAPTER 2. JUSTIFICATION AND OPTIMISATION

Section 4

1. An action is only permitted if it is justified by Our Ministers, or if it falls under a category of actions which has been justified by Our Ministers. Our Ministers only justify an action or a category of actions if the possible damage to health that can occur because of this action or category of actions is outweighed by the economic, social and other benefits that can be obtained from the action or category of actions concerned.
2. By Ministerial Order, rules are implemented in relation to the proclamation of:
 - a. which actions or categories thereof are justified in accordance with the first Paragraph, and
 - b. which actions or categories thereof are not justified in accordance with the first Paragraph.
3. If new, important information about the effectiveness or the consequences of the actions included in it call for revision, the justification of an action may be reviewed. A revision as described in the previous sentence will be in force as soon as is reasonably achievable.
4. In case of an application for a license for or a notification of an action which has been proclaimed justified, there will be a reference to this proclamation in the notification or application.
5. In case of an application for a license for or a notification of an action which has not been proclaimed or has been proclaimed not justified, the application or notification must also include a request for justification of the action concerned. In that case, the application or notification must also incorporate information necessary with consideration to the evaluation of justifying the action, with regards to the economical, social and other benefits of the action concerned and with regards to the damage to health that this action can result in.
6. This Section is not applicable to the justification described in Sections 55, 56 and 57.
7. In addition to the actions or categories of actions justified by Our Ministers in accordance with the first Paragraph, Our Minister of Defence may justify another action or category of actions if this is in the importance of the military. This action or category of action will be proclaimed by Our Minister of Defence in a manner regulated by this Minister.

Section 5

1. The employer must ensure that the effective or equivalent doses of individuals as a result of an action, in relation to the number of exposed people, is as low as is reasonably achievable.
2. On the subject of potential exposure, the employer must ensure that the dose in case of an exposure as well as the possibility of an exposure are as low as is reasonably achievable.

Section 6

1. Without prejudice to Section 48, the employer must ensure that areas within a location where actions are performed are equipped in such a manner, that as a result of the actions, in all, a dose restriction of 1 mSv effective dose in one calendar year is adhered to for people outside that location.

2. In case it is not reasonably achievable to meet the obligation described in the first Paragraph by means of constructional provisions, the obligation has to be met by means of organisational measures.
3. When performing actions that are reported in accordance with Section 21, the employer must ensure that as a result of the actions, in all, a dose restriction of 10 μSv effective dose in one calendar year is adhered to for people anywhere outside the location.
4. Other dose restrictions may be determined by Ministerial Order for the given categories of actions, tasks or functions.

CHAPTER 3. GENERAL REGULATIONS

§ 3.1. Powers of the expert

Section 7

1. The tasks to be performed by a radiation physician in pursuance of this decree are conducted only by an individual who is registered as a radiation physician in a registry designated by Our Minister of Social Affairs and Employment, and who performs his/her tasks in agreement with an arbo service.
2. The tasks to be performed by an expert in pursuance of this decree are conducted only by an individual who is registered as an expert for the execution of the task concerned, in a registry designated by one of Our Ministers.
3. By order of Our Minister of Social Affairs and Employment, demands are laid down in relation to the knowledge and abilities that have to be met in order to be registered as a radiation physician in the registry described in the first Paragraph.
4. By Ministerial Order, demands are laid down in relation to skills and abilities that have to be met in order to be registered as an expert in the registry described in the second Paragraph. These demands may differ for different tasks.
5. Registration with a registry as described in the first and second Paragraphs may be refused or revoked if the demands made by or under the [Law](#) or this decree are not met or not fully met.
6. By Ministerial Order, rules are implemented for:
 - a. the designation and management of registries as described in the first and second Paragraphs;
 - b. the manner of registration;
 - c. the information and documents issued with a request for registration;
 - d. the maximum fee payable for registration;
 - e. the reasons why and the cases in which registration may be refused or cancelled.
7. By Ministerial Order, rules may be implemented for:
 - a. the designation of an organisation as described in [Section 69a of the Law](#);
 - b. the reasons why this organisation may be designated or why the designation may be reviewed or revoked;
 - c. the information and account as described in [Section 69b of the Law](#), provided by the organisation to Our Ministers, and the manner in which this information is provided.

Section 8

1. The employer is provided with personal control measures for the purpose of A- or B-employees by an office for the measurement of exposure. Because the office reads out these control measures, it also has the task of determining to which extent the A- or B-employees have been exposed to ionising radiation. This task is only performed

by an office which has been recognised as such by Our Minister of Social Affairs and Employment.

2. By Order of Our Minister of Social Affairs and Employment, demands are laid down in relation to the quality of service provision, the procedures and the expertise of this service. A condition for recognition under the first Paragraph is that these demands are met.

Section 9

1. The employer must ensure that an action is performed by or under supervision of an expert.

2. By Ministerial Order, a specified level of expertise may be demanded for certain actions.

3. The stipulations in this decree in relation to expertise do not apply to actions for which no notification or license is required.

4. The employer must put in writing the assignment of powers and responsibilities in relation to protection against ionising radiation.

Section 10

1. With consideration to protection against ionising radiation, the employer must in the least ensure that the following is performed by or under supervision of an expert:

a. the plans for actions must be studied in great detail prior to their execution, the risks must be listed and evaluated, and approval must be granted before these actions are commenced;

b. advice must be sought about security measures and techniques to ensure that people are effectively protected;

c. the effectiveness and the correct use of security measures and techniques must be verified regularly, or at least once a year;

d. the accurate operation and the correct use of sources and instruments for measuring ionising radiation must be checked regularly, or at least once a year;

e. these instruments must be calibrated regularly.

2. The employer must ensure that a new or revised source will not be used until an expert has performed an acceptance test, followed by the approval of this expert to make use of the source.

3. As far as the protection of the exposed employee is concerned, the findings of the expert are recorded under the terms of listing and evaluation of risks, as described in [Section 5 of the Directive for Working Conditions 1998](#).

Section 11

1. After consultation with the expert, the employer must specify measures for the prevention of damage and ensure that these measures are taken.

2. With regard to sources, security measures and measuring instruments, the employer must ensure that:

a. the necessary maintenance is carried out on these;

b. the necessary measures are taken to repair or replace inadequate or defect parts thereof, and

c. if necessary, the use of sources is discontinued.

3. The employer must make available financial means and facilities for the suitable protection against ionising radiation, to people representing the Unit for protection against radiation, as described in Section 12, who are responsible for the execution of these protective measures.

Section 12

1. By Ministerial Order, employers, business sectors or locations are designated that have a Unit for protection against radiation and an expert who works in this unit. In addition, regulations are laid down for the tasks, authorities and procedures of the Unit for protection against radiation.
2. In case that pursuant to the first Paragraph, a Unit for protection against radiation is required, the employer must ensure that the Unit for protection against radiation is operational and, in any case, that:
 - a. a sufficient number of experts operate in this unit;
 - b. functional and organisational units are kept separate from production and technical units;
 - c. the Unit advises the employer on the subject of protection against ionising radiation;
 - d. the unit approves an action.
3. Our Ministers may permit a Unit for protection against radiation as described in the first Paragraph to perform tasks for more than one employer.

Section 13

1. The employer must ensure that an action whereby it is foreseeable that people could be exposed unintentionally to excessive external radiation or excessive internal contamination, may only be performed after expert advice is sought.
2. In case it is the opinion of the expert that the exposure as described in the first Paragraph is occurring or when there is a threat of it occurring, the employer must ensure that the following measures are taken without delay:
 - a. the action must be terminated;
 - b. the dangerous locations must be evacuated;
 - c. the following must be informed:
 - 1°. the radiation physician concerned, in case an employee has been exposed to excessive external radiation or excessive internal contamination;
 - 2°. the local Health Inspector, where a radiological performance is concerned;
 - 3°. the Regional Director, where employment aspects are concerned;
 - 4°. the Chief Officer for Environmental Health, where environmental aspects are concerned;
 - 5°. the Inspector General of Mining, where mining is concerned.
3. The employer may terminate a measure as described under a or b in the second Paragraph, only with the agreement of the expert or with the approval of the people described under c in the second Paragraph.

Section 14

1. The employer must take as many measures as is reasonably achievable to prevent the loss, theft or unintentional dispersion of radioactive substances or devices.
2. The employer must inform in any case the Chief Inspector for Environmental Health and the Regional Director in case of loss, theft or unintentional dispersion of a source. With regard to mining, the employer must also inform the Inspector General of Mining.
3. The employer must ensure that radioactive substances or devices are protected against fire as much as is reasonably achievable.

§ 3.2. Advice and instructions

Section 15

1. The employer must ensure that the individual performing an action and the individual in charge of this action or supervising this action must, in relation to the work location:

- a. be sufficiently educated with regard to the risks involved in ionising radiation;
- b. be informed about the general, accepted methods for protection against ionising radiation and the precautionary measures to be taken, for the action in general, for the assigned task and for each work location where the action is being performed;
- c. be informed about the importance to adhere to the technical, health and administrative regulations.

2. The employer must lay down written instructions with regard to the subjects described in the first Paragraph, and must supply these instructions to people as described in the first Paragraph and to others that could be exposed as a result of the actions.

Section 16

The employer must ensure that women, who could be exposed to ionising radiation as a result of an action, are informed about the following prior to performing these actions:

- a. the necessity to announce a pregnancy at an early stage;
- b. the risks of exposure to ionising radiation for the unborn child because of external radiation or contamination;
- c. the risks for a child who is breastfed by a contaminated mother.

Section 17

The employer must ensure that employers participate in the courses that have been organised for them, and that they follow the instructions that they have been given in pursuance of this decree.

§ 3.3. Instructions for devices and radioactive substances

Section 18

1. The employer must ensure that the following is adhered to in relation to devices:

- a. a shield must be installed that is such, that the damage from the radiation passing through it is kept to a minimum as much as is reasonably achievable, except for the useful rays passing through the point of aperture designated for this.

These shielding requirements do not apply:

- 1°. when testing a device;
- 2°. for x-ray tubes with a maximum high voltage of more than 300 kV, if these tubes are used in an area especially equipped for them, or
- 3°. during repair, maintenance or examination with x-ray tubes positioned in laboratories or trial areas, provided that measurements have been taken in order to prevent damage as a result of external radiation as much as is reasonably achievable;
- b. a tube or another construction to establish the diameter of the useful rays must be used, which guarantees the same level of protection against radiation as the enclosure of a device;
- c. a device and the associated tools and security equipment must be arranged and shielded in such a manner, that there is no need for people to be exposed to the primary rays, unless they are undergoing a radiological procedure;

- d. unless it is not reasonably achievable to do so, measures must be taken in relation to the arrangement and operation of a device in order to prevent damage caused by dispersed radiation;
 - e. measures must be taken to prevent unauthorised people from activating a device;
 - f. each device must be checked regularly in order to verify its correct operation with regard to protection against ionising radiation;
2. Our Minister of Social Affairs and Employment may impose further regulations with regard to the stipulations in this Section.

Section 19

1. Without prejudice to Section 18, the employer must ensure that devices for diagnostic or therapeutic use in radiological procedures or in veterinary practice comply with the following demand in order to protect employees and members of the public: the ambient dose equivalent rate of the radiation passing through the enclosure, with closed aperture, measured at a maximum high voltage and the associated permissible continuous current at a distance of one meter from the focal spot, may not exceed 1 mSv per hour for devices for diagnostic use, or 10 mSv per hour for devices for therapeutic use.
2. The employer must ensure that during a radiological procedure or a veterinary diagnostic or therapeutic procedure with ionising radiation, people (except the individual undergoing the procedure) stand behind a shield which blocks the rays sufficiently or move outside the room where the examination is taking place, or that appropriate personal means of protection are made available to these people.

Section 20

1. The employer must ensure that efficient and clear warning notices or signs with text are mounted on the appropriate locations in situations where the doses described in Section 49 and 76 may be exceeded as a result of actions or operations.
2. The employer must ensure that rooms and areas where actions are performed with open sources, the equipment in these rooms or areas, or the objects used therein are checked regularly for contamination in accordance with the procedures laid down in writing by the employer.
3. The employer must ensure that open and encapsulated sources, when not in use, are stored in an appropriate storage space if this is reasonably achievable.
4. By Ministerial Order, regulations may be laid down in relation to the type, the text and the minimal size of the warning notices or signs as described in the first Paragraph, and where and how these should be mounted.

CHAPTER 4. NOTIFICATIONS, LICENSES, REQUESTS AND PROCEDURES

§ 4.1. Notifications of actions with devices

Section 21

1. The employer must give notification at least three weeks in advance when he/she is going to perform an action with a device, in accordance with Sections 40 and 41.
2. This obligation does not apply where an action is concerned with:
- a. a device for which a license is needed in pursuance of this decree;
 - b. an electron beam valve for visual image display;
 - c. another device than described under a or b, with a maximum high voltage of 30 kV at the most, which causes an ambient dose equivalent rate no higher than 1 µSv per

hour under normal operating conditions, at a distance of 0.1 meter from any reachable exterior surface of the device;

d. another device than described under a, b, or c, which causes an ambient dose equivalent rate no higher than 1 μSv per hour under normal operating conditions, at a distance of 0.1 meter from any reachable exterior surface of the device, and which is of a type that has been approved by Our Ministers on the basis of regulations laid down by Ministerial Order.

Section 22

If the actions that were reported in accordance with Section 21 are no longer performed with the use of a certain device, the employer must give notification of this within three weeks after termination of the action, in accordance with Sections 40 and 42.

§ 4.2. Licenses for actions

Section 23

1. Without a license, it is prohibited to perform an action with:

a. a device for:

1°. industrial radiography;

2°. the processing of products;

3°. educational purposes;

4°. exposure of people and animals for therapeutic purposes;

b. another device than the ones described under a with a maximum high voltage of 100 kV or more;

c. a device which accelerates particles and which can emit ionising radiation with an energy of more than 1 MeV.

2. Furthermore, it is prohibited to perform research or development procedures on a device without a license.

3. The ban as described in the first Paragraph does not apply to:

a. actions with electron microscopes;

b. the storage of devices only for the purpose of trade in these devices;

c. a device which is used for education purposes, which causes an ambient dose equivalent rate no higher than 1 μSv per hour under normal operating conditions, at a distance of 0.1 meter from any reachable exterior surface of the device, and which is of a type that has been approved by Our Ministers on the basis of regulations laid down by Ministerial Order.

Section 24

Without a license, it is prohibited to:

a. administer radioactive substances to people and, insofar the protection of people against ionising radiation is concerned, to animals for the purpose of:

1°. medical or veterinary diagnostics;

2°. therapy or (bio)medical examination;

b. add radioactive substances to products intended for use on or in the direct vicinity of people;

c. perform actions with radioactive substances for the purpose of:

1°. industrial radiography;

2°. the processing of products;

3°. educational purposes and scientific research.

Section 25

1. Without a license, it is prohibited to perform an action which is not a discharge, with a radioactive substance other than those described in Sections 24 or 37.
2. The ban described in the first Paragraph and in Section 24 under c does not apply if, within a location:
 - a. the activity of the radionuclides in the radioactive substance concerned is lower than the value given in Appendix 1, Table 1, or
 - b. the concentration of activity of that substance is lower than the value given in Appendix 1, Table 1.
3. When a radioactive substance contains more than one type of radionuclides, the concentration of activity of the radionuclides is weighed and added up in accordance with the method described in Appendix 3. The stipulations of the second Paragraph, under b, are met if the sum is less than or equal to 1.
4. When more than one action takes place at any time within a location, the activities of the radionuclides in the radioactive substances involved in these actions are weighed and added up in accordance with the method described in Appendix 3. The stipulations of the second Paragraph, under a, are met if the sum is less than or equal to 1.
5. By Ministerial Order, Our Ministers may designate actions with products as described in Section 24, under b, whereby the radionuclides added to these products are not added to the sum as described in the third Paragraph.
6. The bans described in the first Paragraph and Sections 23 and 24 do not apply to actions designated by Ministerial Order that have a limited risk of human exposure.
7. By Ministerial Order, other methods may be designated for defining and testing damage in cases where the concentration of activity described in the second Paragraph, combined with the activity described in the second Paragraph does not give a correct indication of damage that can be caused by the radioactive substances involved in the action.
8. By Ministerial Order, the first Paragraph may be proclaimed applicable in contravention to the second Paragraph, in case the risk of exposure of employees and members of the public is too high.

Section 26

1. The ban laid down in Section 25, first Paragraph, does not apply either to actions concerning an encapsulated source whereby the values given in Appendix 1, Table 1, for activity and concentration of activity are exceeded, if:
 - a. it is of a type approved by Our Ministers, and
 - b. if it can not cause an ambient dose equivalent higher than 1 μSv per hour under normal operating conditions, at a distance of 0.1 meter from any reachable exterior surface of the device.
2. By Ministerial Order, regulations may be laid down in relation to inspections as described in the first Paragraph, under a, and to the storage and removal of encapsulated sources as described in the first Paragraph.

§ 4.3. Indicator instruments

Section 27

In contravention to Sections 24, under b, and 25, it is prohibited:

- a. to add radionuclides to an indicator instrument for luminescent purposes;
- b. to perform actions with an indicator instrument to which radionuclides have been added for luminescent purposes.

Section 28

The bans laid down in Sections 24, under b, and 27 are not applicable:

- a. where it concerns an indicator instrument;
- b. if, for luminescent purposes only, H-3 is or has been used in light cells, or Pm-147 in luminous paint;
- c. if the indicator instrument has a total activity lower than 1 GBq H-3 or 10 MBq Pm-147;
- d. if the indicator instrument complies with the stipulations laid down for the purpose of protection against ionising radiation by Ministerial Order, in relation to its design;
- e. if no repair or maintenance procedures are performed for which the enclosure of those parts of the indicator instrument are removed, that, for luminescent purposes, contain added H-3 in light cells or added Pm-147 in luminous paint; and
- f. if there are no more than 100 indicator instruments in stock, that, for luminescent purposes, contain added H-3 in light cells or added Pm-147 in luminous paint.

Section 29

1. The bans laid down in Section 27 are not applicable:

- a. where it concerns an indicator instrument;
- b. if, for luminescent purposes only, H-3 is or has been used in light cells, or Pm-147 in luminous paint;
- c. if the indicator instrument has a total activity lower than 3 GBq H-3 or 30 MBq Pm-147, and
- d. if it complies with the stipulations laid down for the purpose of protection against ionising radiation by Ministerial Order, in relation to its design.

2. Our Minister of Defence may grant exemption from the bans laid down in Sections 24, under b, 25, first Paragraph, and 27, where indicator instruments are concerned which contain added radionuclides for luminescent purposes, which are in use or are destined for use by the military, and are intended for use under operational circumstances.

Section 30

1. The bans laid down in Sections 25 and 27, under b, do not apply to the storage, use or disposal by high-street traders or private individuals of indicator instruments, which contain less than 56 kBq Ra-226+ for luminescent purposes or less than 0,93 GBq H-3 in luminous paint. Nor do these bans apply for the repair or maintenance of such instruments by the employer, insofar these instruments have been manufactured and brought on the market in the Netherlands prior to the date that this ban came into force.

2. After repair or maintenance procedures on an indicator instrument as described in the first Paragraph, the employer must ensure that:

- a. an ionising radiation warning sign (the design of which is determined by Ministerial Order) is attached in a position visible from the exterior of the instrument;
- b. the sign T 25 or Ra 1.5 for H-3 and Ra-226+ in luminous paint respectively, is marked on a position visible from the exterior of the instrument.

3. The ban laid down in Section 27, under b, is not applicable to indicator instruments which contain added radionuclides for luminescent purposes, if this indicator instrument is stocked for use in an exhibition, or if the employer disposes of it after the exhibition.

4. By Ministerial Order, regulations may be laid down in relation to the stipulations which may be included in a license for actions as described in the third Paragraph.

Section 31

1. After adding radioactive substances to indicator instruments for luminescent purposes, the employer must check whether these indicator instruments comply with the regulations contained in and pursuant to Sections 28 and 29.
2. The employer must note the execution of the checks described in the first Paragraph and the results of these checks in the appropriate records.
3. Our Ministers may grant exemption from the regulations laid down in the first and second Paragraphs in cases where the employer demonstrates satisfactorily to Our Ministers that the checks and records described in the first and second Paragraphs are executed by a third party.
4. The records described in the second and third Paragraphs are to be kept for at least five years.
5. By Ministerial Order, more detailed regulations are laid down in relation to the stipulations in the first, second and third Paragraph.

Section 32

The employer must ensure that an indicator instrument which, for luminescent purposes, contains added H-3 in light cells or added Pm-147 in luminous paint, must bear the following on a location visible from the exterior of the instrument:

- a. a warning sign as described in Section 30, second Paragraph, under a;
- b. where an indicator instrument is concerned as described in Section 29, the sign for T 3 GBq or Pm 30 MBq for H-3 in light cells and Pm-147 in luminous paint respectively.

Section 33

After repair or maintenance procedures on an indicator instrument to which radionuclides have been added for luminescent purposes, the employer must ensure that:

- a. no deviations from the stipulations contained in and pursuant to Sections 28 and 29 have been introduced as a result of these repair and maintenance procedures;
- b. the ionising radiation warning sign, as stipulated under Section 30, second Paragraph, under a, has been attached to a location visible from the exterior of the instrument;
- c. the sign described in Sections 30, second Paragraph, under b, or 32, under b, has been attached.

Section 34

It is prohibited to stock indicator instruments which have not been manufactured in the Netherlands and which contain added radionuclides for luminescent purposes, with the intention to sell these in the Netherlands, if these indicator instruments do not comply with the stipulations contained in and pursuant to Sections 28, 29, 31 and 32.

§ 4.4. Licenses and regulations concerning the disposal of radioactive substances

Section 35

1. It is prohibited to dispose of radioactive substances by means of discharge into the air, the public sewer system or surface waters without a licence.
2. This ban is not applicable if:
 - a. when discharged into the air, the activity of the total amount of discharge of radioactive substances in one calendar year, is lower than 1 radiotoxicity equivalent

for inhalation as described in Appendix 2 when exiting the location via a discharge point.

b. when discharged into the public sewer system, the activity of the total amount of discharge of radioactive substances in one calendar year, is lower than 10 radiotoxicity equivalent for ingestion as described in Appendix 2 when exiting the location via a discharge point.

c. when discharged into the surface waters, the activity of the total amount of discharge of radioactive substances in one calendar year, is lower than 0.1 radiotoxicity equivalent for ingestion as described in Appendix 2 when exiting the location via a discharge point.

3. It is prohibited to discharge radioactive substances into the soil.

4. The ban as described in the third Paragraph is not applicable to discharge into the soil when the amount of discharge of radioactive substances is lower than 10^{-6} radiotoxicity equivalent for ingestion as described in Appendix 2 when exiting the discharge point.

5. The ban as described in the third Paragraph is not applicable to the discharge of process water from mining activities, if the water is discharged by injecting it into a similar soil formation and depth to where the water originated from, and in such a manner that the water does not enter other layers with water streams.

6. The discharged amounts, expressed in radiotoxicity equivalents, are corrected for physical decay using the correction factors as described in Appendix 2.

Section 36

1. An employer who performs an action must ensure as much as is reasonably achievable, that:

a. the production of radioactive waste material is prevented or limited;

b. sources are reused as such after use;

c. radioactive substances and material that a source consists of are reused after use; or

d. after use, objects, substances and material contaminated with radioactive substances or activated, are processed in such a manner that they can be reused.

2. In the manufacture of sources, substances and materials must be used which cause no harm or as little harm as possible to the environment after use of the source.

3. The employer must ensure that an action is performed as much as possible in a manner whereby protection against damage is guaranteed.

Section 37

1. It is prohibited to dispose of radioactive substances for the purpose of reuse of products or material, or to dispose of radioactive waste, without a license.

2. The ban is not applicable if:

a. the total activity of the radionuclides in the radioactive substances concerned in one calendar year is lower than the value given in Appendix 1, Table 1; or

b. the concentration of activity of that substance is lower than the value given in Appendix 1, Table 1.

3. Section 25, third, fourth, sixth and seventh Paragraph, is similarly applicable.

4. Nor is the ban applicable where encapsulated sources are concerned, that are returned to the party who manufactured or supplied the source.

5. Nor is the ban applicable with consideration to the actual supply of radioactive substances by single transfer to a third party in view of the following:

a. the use, the product reuse or the material reuse of radioactive substances; or

b. the collection of radioactive waste material.

6. Nor is the ban applicable for the delivery to organisations designated by Our Ministers for the intake of confiscated radioactive substances as described in [Section 33, fourth Paragraph, of the Law](#).

7. Nor is the ban applicable to the disposal of radioactive waste material by transferring it to a collection service for radioactive waste material, designated by Our Ministers.

8. Nor is the ban applicable for the transfer to organisations designated by Our Ministers for the intake of radioactive waste material.

9. The fourth to eighth Paragraphs only apply when the employer has made sure that the receiver of the substances holds a license for the action concerned or is otherwise authorised to receive these substances.

Section 38

1. A radioactive substance may be considered a radioactive waste material by Our Minister of Housing, Regional Development and the Environment or the employer, if no use, product reuse or material reuse is intended for this product by Our Ministers or the employer, and the substance is not to be discharged.

2. A radioactive substance will not be considered a radioactive waste if Section 37, second Paragraph, applies.

3. Radioactive waste material must be removed as soon as is reasonably achievable.

4. The regulation laid down in the third Paragraph is not applicable if the radioactive waste material has a radioactive half-life of less than 100 days and is stored for a maximum of two years in an appropriate storage space with a view to the physical decay to waste material as described in Section 37, second Paragraph.

5. It is prohibited to mix radioactive waste material in order to lower the concentration of activity of the substances to values below the ones given in Appendix 1, Table 1.

§ 4.5. Refusal to grant a license

Section 39

Pursuant to this chapter, no license will be granted if:

- a. the conditions laid down in Sections 4, 5, 6 and 48 concerning justification, optimisation and dose limits have not been satisfied;
- b. as a result of the action for which the license has been requested and as a result of other actions inside and outside a location, one of the following doses is exceeded in a member of the public outside this location:

1°. an effective dose of 1 mSv in one calendar year, and taking this into account:

2°. an equivalent dose of 50 mSv in one calendar year on the skin, on average, for any surface of skin of 1 cm² in size;

- c. the action for which the license has been requested is grouped in a category which has been notified as justified under the Ministerial Order as described in Section 4, second Paragraph, but the specific character of this action is not justified under Section 4, first Paragraph.

§ 4.6. Procedural stipulations for notifications

Section 40

1. The notification as described in Sections 21 and 22 will be assessed by Our Ministers, and

- a. if the actions described in these Sections concern applications for medical radiation, by our Minister of Health, Welfare and Sports;

b. if the actions described in these Sections concern mining, by Our Minister of Economic Affairs.

The Employer must submit the notification to Our Minister of Social Affairs and Employment.

2. By Order of Our Ministers, and

a. where applications for medical radiation is concerned, by Our Minister of Health, Welfare and Sports;

b. where mining is concerned, by Our Minister of Economic Affairs;
more detailed regulations may be laid down in relation to the notification, as described in the first Paragraph.

Section 41

1. The notification described in Section 21 must include at least the following:

- a. the name and address of the individual signing the notification;
- b. the name and address of the employer;
- c. the address or the cadastral data of the location;
- d. a description of the action, the area where the action takes place and its purpose;
- e. the maximum effective dose that an individual can receive in one calendar year in any area outside the location, due to the devices located within two metres from any area outside the location.

2. Furthermore, a description of the device used for performing the notified action must be included in the notification.

3. If the dose described in the first Paragraph, under e, will be higher than 10 μSv , the notification must also include a description of the measures for prevention of and protection against damage inside and outside the location.

4. If the action only consists of the storage of a device, only the information described in the first Paragraph, under a to d, is supplied together with information about the type of device in stock.

5. The individual reporting the action is obliged to inform Our Ministers of any changes to the information given at the time of the notification, that have occurred since the notification.

6. By Ministerial Order, more detailed regulations may be laid down in relation to the information in a notification and to situations that require a new notification.

Section 42

The notification described in Section 22 must include at least the following:

- a. the name and address of the individual signing the notification;
- b. the name and address of the employer;
- c. the address or the cadastral data of the location;
- d. an indication of the action;
- e. if applicable, the manner in which the employer disposed of the device;
- f. if applicable, an alteration of the effective dose as described in Section 41, first Paragraph, under e.

§ 4.7. Procedural stipulations for licenses

Section 43

1. The employer must submit the license application for an action as described in Sections 23, first and second Paragraphs, 24, 25, first Paragraph, 35, first Paragraph, and 37, first Paragraph, to Our Minister of Social Affairs and Employment.

2. By Order of Our Ministers, and

- a. where applications for medical radiation are concerned, by Our Minister of Health, Welfare and Sports;
 - b. where mining is concerned, by Our Minister of Economic Affairs;
 - c. where discharge into the surface waters is concerned, by Our Minister of Transport and Public Works;
 - d. where discharge into the surface waters or discharge into the air is concerned, by Our Minister of Agriculture, Nature Management and Fisheries;
- more detailed regulations may be laid down in relation to the license application, as described in the first Paragraph.

3. An application as described in the first Paragraph does not concern the actions performed inside the location by an individual who holds a license for performing the actions concerned on changing locations.

4. The application for a license for an action as described in Section 23, first and second Paragraphs, will be decided upon by Our Ministers, and

- a. if the actions described in these Sections concern applications for medical radiation, by our Minister of Health, Welfare and Sports;
- b. if the actions described in these Sections concern mining, by Our Minister of Economic Affairs.

The employer must submit the application to Our Minister of Social Affairs and Employment.

Section 44

1. The application for a license for an action as described in this decree must include at least the following:

- a. the name and address of the individual signing the notification;
- b. the name and address of the employer;
- c. a description of the location, and the address or the cadastral data of the location; in case of changing locations, an indication of this must be given as clearly as possible;
- d. a description of the action for which a license has been requested and the purpose of this action;
- e. the maximum total effective dose as a result of discharges, as well as of external radiation based on ambient dose equivalents that an individual can receive in one calendar year in any area outside the location, as a result of all of the actions (taken together) that require a notification or licence, inside the location to which the license request applies.
- f. the maximum effective or equivalent dose that employees involved in the actions can receive in one calendar year;
- g. a description of the Organisation for protection against radiation and of the expertise present at the location in relation to the action;
- h. an estimate of the duration of the action;
- i. an overview of all actions inside the location that require a notification or a license, specified according to their nature and size.

2. If the request concerns an action with a device, it must also include a description of the device stating the information related to the ionising radiation the device can emit.

3. If the request concerns an action with radioactive substances, it must also include:

- a. a specification of the radionuclides for which the license is requested;
- b. a specification of the maximum radiotoxicity equivalents to be discharged into the air, the public sewer system, the surface waters or the soil as a result of all the actions that require a license, for the location to which the request applies, expressed in

radiotoxicity equivalents for inhalation or ingestion and weighed for inhalation and ingestion;

c. the radiotoxicity equivalents for which the license to discharge is requested.

4. If the request concerns an action with an encapsulated source, it must also include a specification of the chemical and physical condition and of the manner in which these radioactive substances form an encapsulated source, as well as an indication of the design and quality of the source.

5. Where an action with radioactive substances is concerned, the request must also include a specification of the greatest activity (weighed and added up in accordance with Appendix 3) of radionuclides in the radioactive substances, that is present on the location as described in the first Paragraph, under c.

6. If the ambient dose equivalent as described in the first Paragraph, under e, exceeds 10 µSv or if the radiotoxicity equivalents of the discharged activities represent a dose equal to or higher than 1 µSv, in one calendar year in any area outside the location, the license application must also include a description of the measures taken for the prevention of and the protection against damage inside and outside the location.

7. The licensee is obliged to inform Our Ministers of any changes to the information given at the time of the license application, that have occurred since the license was issued.

8. By Ministerial Order, more detailed regulations may be laid down in relation to the information to be submitted with a license application.

§ 4.8. Inquiry and notifications

Section 45

[Sections 3.5.2 to 3.5.5 of the General Administrative Law Act](#), as well as [Part 13.2 of the Environmental Management Act](#) apply where a decision is to be reached concerning a license as described in Section 23, first Paragraph, under c, except when:

a. the device is only intended for radiological procedures;

b. the device is on board a vehicle, vessel or aircraft which are used as such;

c. the device is intended for use on different locations, and it is the opinion of Our Ministers that the importance of the implementation of [Sections 3.5.2 to 3.5.5 of the General Administrative Law Act](#), as well as [Part 13.2 of the Environmental Management Act](#) does not outweigh the associated drawbacks;

d. a license for a device of the same type concerning the same area has been granted in the past, and it is the opinion of Our Ministers that no more damage is to be expected through use of the requested license than was taken into account at the time the earlier license was granted.

Section 46

1. [Sections 3.5.2 to 3.5.5 of the General Administrative Law Act](#), as well as [Part 13.2 of the Environmental Management Act](#) do not apply where a decision is to be reached concerning a license for performing actions with open sources, if the result of the weighed sum of the activities from the amount of radionuclides, that is present at any time in the radioactive substances involved in the actions, does not exceed 10^4 according to the method described in Appendix 3.

2. The first Paragraph is similarly applicable to encapsulated sources, provided that the result does not exceed 10^7 .

Section 47

1. If [Sections 3.5.2 to 3.5.5 of the General Administrative Law Act](#) apply where a decision is to be reached concerning a license for performing an action with radioactive substances, then, pursuant to this law, the following must be involved, in another than an advisory capacity: the council of the province, the council of the municipality where the action is being or will be performed, or, where a discharge into surface waters is concerned, the department responsible for the qualitative management of the surface waters being used or to be used for discharge.
2. If [Sections 3.5.2 to 3.5.5 of the General Administrative Law Act](#) apply where a decision is to be reached concerning a license for an action with a device, then, pursuant to this law, the following must be involved, in another than an advisory capacity: the council of the municipality where the action is being or will be performed.
3. Our Minister of Social Affairs and Employment will publish a notification in the Government Gazette of the decisions reached for license applications, in case [Sections 3.5.2 to 3.5.5 of the General Administrative Law Act](#) were not applicable.

CHAPTER 5. EXPOSURE OF THE POPULATION

Section 48

1. The employer must ensure that because of actions performed under his/her responsibility, a member of the public does not sustain an effective dose higher than 0,1 mSv in one calendar year in any area outside the location as a result of these actions.
2. This Section does not apply to people rendering help and assistance as described in Section 53, second Paragraph.

Section 49

1. The employer must ensure that because of actions performed under his/her responsibility, a member of the public inside the location does not sustain individual doses higher than the following:
 - a. an effective dose of 1 mSv in one calendar year, and taking this into account:
 - b. an equivalent dose of:
 - 1°. 15 mSv in one calendar year in the lens of the eye, or
 - 2°. 50 mSv in one calendar year on the skin, on average, for any surface of skin of 1 cm² in size.
2. In case of internal contamination, the effective committed dose is allocated to the year the intake took place.
3. This Section does not apply to people rendering help and assistance as described in Section 53, second Paragraph

Section 50

1. The employer must ensure that, in circumstances where a member of the public may be exposed to ionising radiation inside or outside the location as a result of the actions performed under his/her responsibility, calculations are made of the effective or equivalent doses for the appropriate areas, and, if necessary, measurements are taken.
2. The employer must keep records in which the results of these measurements are noted. The employer must use these measurements, if necessary, in order to determine the doses as described in the first Paragraph and Sections 48 and 49.

3. By Ministerial Order, more detailed regulations may be laid down for the content and management of these records and for the length of time that these records are to be kept.

Section 51

In case of an accident or radiological emergency situation inside an employer's location and in case a member of the public has been or may have been exposed as a result of this, inside or outside the location involved, the employer must ensure that this member of the public is individually monitored or that the effective or equivalent doses received by the individual concerned are determined in another way.

CHAPTER 6. MEDICAL RADIATION APPLICATIONS AND PROTECTION

§ 6.1. Definitions and area of application

Section 52

The following definitions are maintained in this chapter and the conditions based on it:

- a. equipment: devices, encapsulated sources and open sources, as well as associated equipment such as development machines and gamma cameras;
- b. attending practitioner: a doctor or dentist under the medical responsibility of whom an exposure to ionising radiation takes place;
- c. population screening: examination of high-risk groups in the population, whereby ionising radiation is used in order to obtain a timely diagnosis;
- d. diagnostic reference levels: dose levels in medical diagnostic radiology and for the use of radiopharmaceutics, quantity of radioactivity to be administered for characteristic examination of groups of patients with standard size or standard phantoms, for globally defined types of devices or equipment;
- e. quality assurance: the planned and systematic activities necessary for sufficient assurance that a structure, system, discipline or procedure operates satisfactorily and conform generally accepted standards;
- f. medical radiological procedure: the procedure from the request of the radiological operation to its execution and the consideration of its findings;
- g. medical legal examination: radiological procedure not on medical grounds but solely for the purpose of insurance technicalities or legal objectives;
- h. medical responsibility: the responsibility that a doctor or dentist has concerning individual radiological procedures, in particular towards justification, optimisation and clinical evaluation of the findings;
- i. Our Minister: Our Minister of Health, Welfare and Sports;
- j. patient dose: the dose in relation to an individual who undergoes an exposure as described in Section 53, first Paragraph;
- k. practical aspects: the actual execution of an exposure as described in Section 53, first Paragraph, which includes: handling and use of radiology equipment, evaluation of technical-physical parameters, as well as evaluation of patient dose, calibration, maintenance of equipment, preparation and administration of radiopharmaceutics and development of films;
- l. radiodiagnostic: concerning in-vivo diagnostic nuclear medicine, diagnostic and dental radiology;
- m. radiological: concerning radiodiagnostic and radiotherapeutic procedures and intervention radiology or other planning radiology or guidance radiology;

n. radiotherapeutic: concerning radiotherapy, including nuclear medicine for therapeutic purposes;

o. referring practitioner: a doctor or dentist who requests a procedure whereby ionising radiation is used.

Section 53

1. This chapter applies to radiological procedures for people who:

- a. undergo an exposure as patients;
- b. take part in population screening;
- c. undergo an occupational medical examination;
- d. undergo a medical legal examination;
- e. take part voluntarily in medical or biomedical research programmes.

2. This chapter also applies to people who knowingly, but not in their professional capacity, give help and assistance to an individual as described in the first Paragraph, who is undergoing an exposure.

§ 6.2. Radiological procedures

Section 54

The employer must ensure that a radiological procedure is only performed under the medical responsibility of an attending practitioner, who is registered in a registry established under [Section 14 of the Individual Health Care Professions Act](#), and who meets the demands concerning expertise laid down by Ministerial Order.

Section 55

1. A type of radiological procedure is not justified if the total conceivable diagnostic or therapeutic advantage, including the direct benefit for the health of the individual undergoing the exposure, and the social benefit, does not compensate for the damage to health that the individual undergoing the exposure can experience, taking into account also the effectiveness, benefits and risks of the alternative techniques available that have the same objective but result in less or no exposure.

2. Our Minister may publish a notification in the Government Gazette stating which types of radiological procedures are prohibited because exposure as a result of these procedures is not justified under the first Paragraph.

Section 56

1. The referring practitioner and the attending practitioner must consider, on the basis of their own responsibilities, whether an individual radiological procedure is justified, taking into account the specific objectives of the exposure and the characteristics of the individual concerned.

2. In contravention to Section 55, second Paragraph, a radiological procedure which has been prohibited under that section may be justified after all in special circumstances; the justification will be decided for each individual case. The individual assessment of the justification described above must be recorded in the medical notes of the individual concerned.

3. An attending practitioner must not allow exposure of the individual as described in Section 53 where an exposure is not sufficiently beneficial, taking into account the damage to the health of the individual undergoing the exposure, the direct benefit for the health of the individual as described in Section 53, first Paragraph, the social benefit and the damage to health that the exposure can result in.

Section 57

The employer must ensure that the attending practitioner focuses specifically on the justification of:

- a. medical legal examination;
- b. medical and biomedical research.

Section 58

The employer must ensure that, in case of an exposure for radiotherapeutic purposes as described in Section 53, first Paragraph, the patient dose is calculated to the target volume and administered in a clinically physically responsible manner for each individual case, considering that the patient dose in the tissue outside the target volume must be as low as possible without affecting the intended radiotherapeutic effect of the exposure.

Section 59

Our Minister promotes the establishment and use of diagnostic reference levels for radiodiagnostic procedures as described in Section 53, first Paragraph, as well as the formulation of relevant protocols.

Section 60

The employer must ensure that, without prejudice to the stipulations in the [Medical Research \(Human Subjects\) Act](#):

- a. a restricted patient dose is determined for subjects who cannot expect any direct personal benefit from the radiological procedure;
- b. an experimental procedure is planned which is aimed at the subject, if the experimental radiological procedure is intended to be beneficial for the subjects.

Section 61

1. Our Minister may decide on dose restrictions for exposure as described in Section 53, second Paragraph.
2. Our Minister may impose regulations concerning exposure as described in the first Paragraph, in agreement with Our Minister of Housing, Regional Development and the Environment.

Section 62

The employer must ensure that an individual or his/her legal representative receives written instructions in case this individual is to undergo an examination or treatment involving the administration of radionuclides. They must also be informed of the risks of ionising radiation before the individual concerned leaves the location, in order to restrict the dose as much as is reasonably achievable for others who are in contact with this individual.

§ 6.3. Regulations for equipment

Section 63

The employer must ensure that:

- a. individuals receiving training on the subjects of radiation applications and protection against radiation participate in elements and aspects thereof;
- b. in case the participation described above takes place under the responsibility of a practitioner, this practitioner is one as described in Section 54;
- c. prior to the participation described under a, written instructions are given to the individual in training about the nature and scope of participation in practical aspects.

Section 64

1. The employer must ensure that the activity to be administered during nuclear medical examination and therapy is measured with a dose calibrator.

2. Our Minister may assign standards for the accuracy of the calibrator described in the first Paragraph.

Section 65

The employer must ensure that written protocols are formulated for each standard radiological procedure for each possible equipment arrangement.

Section 66

The employer must ensure that:

- a. radiotherapeutic procedures are conducted with the close involvement of a clinical physicist;
- b. a clinical physicist is available during standard therapeutic nuclear medical procedures and diagnostic nuclear medical procedures;
- c. for all other radiological procedures, a clinical physicist can be reached for advice on aspects of protection against radiation during radiological procedures.

Section 67

1. The employer must ensure that radiological equipment employed during radiological procedures is used in a responsible manner. Our Minister may lay down rules to that end.

2. The employer must ensure that, for all radiological equipment which is employed:

- a. there is close supervision with regard to protection against radiation;
- b. programmes for quality assurance are executed;
- c. the necessary measures are taken to repair or replace inadequate or defect components of radiological equipment.

Section 68

The employer must ensure that:

- a. in case new equipment is put into use, it must have a device for the indication of the radiation dose during a radiological procedure, if achievable;
- b. a filter is used in an x-ray device used for radiodiagnostic procedures, in order to restrict the radiation load on the patient;
- c. an x-ray device has a manual or automatic diaphragm setting, whereby the borders of the x-rays are visible on the image carrier, unless it concerns mammographic or dental examination.
- d. an x-ray device used for radiodiagnostic procedures is equipped with a diaphragm or tube, so that the x-rays can be restricted to the intended area;
- e. the diaphragm is equipped with a device to indicate the dimensions of the rays prior to the procedure.

Section 69

The employer must ensure that:

- a. an image intensifier or similar technique is used during examinations with fluoroscopy;
- b. examinations with fluoroscopy without provisions for adjustment of the dose rate, are restricted to cases where the circumstances justify such an action;
- c. radiography devices give an acoustic signal each time after five minutes of continuous radiographic action.

Section 70

The employer must ensure that suitable radiological equipment, techniques and peripherals are used for radiological procedures involving:

- a. children;
- b. population screening;
- c. administration of a high dose of ionising radiation to a patient.

Section 71

Prior to performing a radiological procedure, the referring practitioner and attending practitioner must inquire whether a woman is pregnant or breastfeeding.

Section 72

In cases where pregnancy cannot be excluded or where a woman is breastfeeding, special attention must be given to the following, dependent on the type of exposure:

- a. the justification of the exposure, especially in relation to the urgency;
- b. the optimisation of protection against radiation, taking into account the patient dose both for the woman and for the unborn child.

Section 73

1. The employer must ensure that the risk as well as the consequences of an accident or an unintended dose during a radiological procedure are as minimal as is reasonably achievable.
2. The employer must ensure that written instructions and protocols are present near the equipment in order to minimise the risks as described in the first Paragraph.

Section 74

1. The employer must provide Our Minister with data necessary to estimate the median and the dispersal of the effective or equivalent dose during radiological procedures, for the population and other relevant reference groups.
2. Our Minister must lay down regulations in relation to the provision of the data described in the first Paragraph.

Section 75

Our Minister may lay down regulations in order to prevent the unnecessary distribution of radiological equipment.

CHAPTER 7. OCCUPATIONAL EXPOSURE

§ 7.1. Dose limits and classification of employees

Section 76

1. The employer must ensure that, as a result of actions performed under his/her responsibility, the following doses are not exceeded for employees:
 - a. an effective dose of 1 mSv in one calendar year, and taking this into account:
 - b. an equivalent dose of:
 - 1°. 15 mSv in one calendar year in the lens of the eye, or
 - 2°. 50 mSv in one calendar year on the skin, on average, for any surface of skin of 1 cm² in size.
2. In case of internal contamination, the effective committed dose is allocated to the year the intake took place.

Section 77

1. The employer must ensure that, as a result of actions performed under his/her responsibility, the following doses are not exceeded for exposed employees:
 - a. an effective dose of 20 mSv in one calendar year, and taking this into account:
 - b. an equivalent dose of:
 - 1°. 150 mSv in one calendar year in the lens of the eye,
 - 2°. 500 mSv in one calendar year on the skin, on average, for any surface of skin of 1 cm² in size, or
 - 3°. 500 mSv in one calendar year for hands, forearms, feet and ankles.

2. In case of internal contamination, the effective committed dose is allocated to the year the intake took place.

Section 78

1. The employer must ensure that workers younger than 18 years of age are not assigned or do not perform any labour as a result of which they are considered exposed employees.

2. The first Paragraph is not applicable if these employees are older than 15 years of age and if, because of their training, they are obliged to perform actions, in the course of which they undergo an exposure higher than one of the dose limits described in Section 76.

3. The employer must ensure that, as a result of the actions performed under his/her responsibility, the following individual doses are not exceeded for the individuals described in the second Paragraph:

a. an effective dose of 6 mSv per calendar year, and taking this into account:

b. an equivalent dose of:

1°. 50 mSv in one calendar year in the lens of the eye;

2°. 150 mSv in one calendar year on the skin, on average, for any surface of skin of 1 cm² in size, or

3°. 150 mSv in one calendar year for hands, forearms, feet and ankles.

Section 79

1. For monitoring and supervising purposes, the employer must classify exposed employees as A-employees or B-employees.

2. An A-employee is an exposed employee who can receive an effective dose higher than 6 mSv in one calendar year, or an equivalent dose higher than three tenths of the dose limits described in Section 77.

Section 80

1. The employer must ensure that the working conditions for pregnant employees are such, that the equivalent dose for the unborn child as a result of the work is as low as is reasonably achievable and that it is improbable that this dose will exceed 1 mSv between the time that the pregnancy was announced to the employer and the time that the pregnancy ends.

2. The employer must ensure that an employee who is breastfeeding is relieved of actions with a more than slight risk of radioactive contamination of the body, for as long as she continues to breastfeed.

Section 81

1. At the request of the employer and in exceptional circumstances, except radiological emergency situations, the Regional Director, or where mining is concerned the Inspector General of Mining, may grant exemption from the dose limits described in Section 77, provided that:

a. it concerns an A-employee;

b. the exposure takes place on a voluntary basis;

c. the exposure is restricted in time;

d. the exposure only takes place in places to be determined;

e. the effective or equivalent dose which could be received is not higher than five times the values described in Section 77, first Paragraph, under a, and twice the values described in Section 77, first Paragraph, under b, respectively;

f. it does not concern an exposed pupil, student or pregnant woman;

g. it does not concern a woman who is breastfeeding whilst there is a chance of contamination of the body;

- h. the employer explains the exposure beforehand and that he/she discusses the exposure and the risks involved beforehand with the employees involved, the employees' council or staff representation, the radiation physician and the expert, and
- i. the employer advises the employees concerned beforehand about the precautionary measures to be taken during the actions.

2. When a situation as described in the first Paragraph is concluded, the employer must submit a report to the Regional Director, or where mining is concerned the Inspector General of Mining. The report must contain the actions performed, the manner in which protection against radiation was achieved and the effective or equivalent doses received by the employee.

3. The employer must provide the organisation described in Section 91, second Paragraph, and the employee concerned with the result of the dose calculation or qualification according to the second Paragraph.

Section 82

1. If one of the dose limits as described in Section 77 was exceeded as a result of the actions described in Section 81, the employer must ensure that an individual on account of whom an exemption as described in Section 81 was granted, will not be re-exposed to ionising radiation as a result of the actions performed under his/her responsibility until a radiation physician has declared that there are no objections to re-exposure.

2. Unless the radiation physician gives advice to this extent, the employee may not be exempted from his/her usual professional duties or put to work elsewhere without his/her permission because the dose limits as described in the first Paragraph have been exceeded.

§ 7.2. Regulations for work locations

Section 83

1. If necessary in view of the protection against ionising radiation, the employer must ensure that:

a. a place is considered a controlled access area if:

1°. the dose that an employee could receive is equal to an effective dose higher than 6 mSv in one calendar year or an equivalent dose higher than three tenths of the dose, described in Section 77, first Paragraph, under b, or

2°. there is a chance that radioactive substances may be spread from this place in such a way, that people could receive a dose higher than an effective or equivalent dose, as described in Section 76;

b. a place is considered a supervised area if the effective dose that an employee could receive is higher than 1 mSv in one calendar year and lower than 6 mSv in one calendar year, or if the equivalent dose is higher than the one described in Section 76, under b, and lower than the one described under a, point one.

2. The employer must ensure that appropriate supervision of the working conditions is in place in controlled access areas and supervised areas with consideration to protection against ionising radiation.

3. The employer must ensure that the scope and quality of the measures for the protection against ionising radiation are focused on the risks involved in the sources and the relevant actions.

Section 84

- 1.** In relation to a controlled access area, the employer must ensure that:
 - a. the area is defined and access is restricted to individuals authorized by him/her to have access, and that the area is monitored according to the procedures determined by him/her;
 - b. measures have been taken with regard to circumstances in which there is a considerable risk of spreading of radioactive substances; these measures also relate to the access to and exit from the area by individuals and goods;
 - c. taking into account the nature of the sources present and actions involved, a monitoring system of the working location is in place;
 - d. clear warning notices and signs in relation to the area and the risks of ionising radiation are affixed to the appropriate locations;
 - e. individuals working in the area have been given written labour instructions, focused on the risks of ionising radiation associated with the sources present and the actions to be performed inside the area.
- 2.** By Ministerial Order, more detailed regulations may be laid down in relation to a controlled access area as described in the first Paragraph.

Section 85

- 1.** In relation to a supervised area, the employer must ensure that:
 - a. taking into account the nature of the sources present and actions involved, a monitoring system of the working location is in place;
 - b. clear warning notices and signs with text in relation to the area and the risks of ionising radiation are affixed to the appropriate locations;
 - c. individuals working in the area have been given written labour instructions, focused on the risks of ionising radiation associated with the sources present and the actions to be performed inside the area.
- 2.** By Ministerial Order, more detailed regulations may be laid down in relation to a supervised area as described in the first Paragraph.

Section 86

For the purpose of the execution of Sections 84 and 85, the employer must take measurements within the supervised and controlled access areas of the following, where appropriate:

- a. the dose rates, with a specification of the nature and quality of the radiation in question, or
- b. where open sources are present, the concentration of activity in the air and the surface contamination, with a specification of the nature and the physical and chemical condition and form thereof.

§ 7.3. Qualification of exposure

Section 87

- 1.** The employer must provide an exposed employee with suitable and personal dose control measures, obtained by the employer from an office for the measurement of exposure, as described in Section 8.
- 2.** The employer must ensure that the exposed employee wears the personal dose control measures in the correct place or places on the body during the times of possible exposure, and that these dose control measures are sent periodically to the office for the measurement of exposure as described in the first Paragraph, so that they can be read out.

3. The employer must ensure that the office for the measurement of exposure determines to which extent these individuals have been exposed to ionising radiation on the basis of the data obtained from the dose control measures.
4. The employer must ensure that a suitable system for dose regulation exists for all cases in which exposed employees can incur a relevant, internal contamination under conditions that are normal for the work situation.
5. The employer must immediately notify the Regional Director and, where mining is concerned, the Inspector General of Mining, in case an employee is overexposed.
6. Our Minister of Social Affairs and Employment may lay down more detailed rules with regard to the stipulations in this Section.

Section 88

1. The Regional Director or, where mining is concerned, the Inspector General of Mining or, where the military is concerned, an authority appointed by Our Minister of Defence, may grant exemption from the stipulations in Section 87 if it is impossible or very difficult to measure exposure to ionising radiation on the basis of personal control measures, or if the effective or equivalent dose is determined in another way.
2. Stipulations are imposed in relation to the exemption as described in the first Paragraph, which state that the effective or equivalent dose must be estimated on the basis of individual measurements on other exposed employees, or on the basis of area monitoring as described in Section 86, or, in case of aircrew, in a manner as described in Section 111, first Paragraph, under b, or in another manner.

Section 89

1. In case an employee has been or may have been exposed to ionising radiation during an action, the employer must ensure that the effective or equivalent doses are determined, which have been received by the employee concerned.
2. In case an employee has been or may have been exposed to ionising radiation during a radiological emergency situation, the employer responsible for the action which has caused the radiological emergency situation, must ensure that individual monitoring is put into place or that the effective or equivalent doses received by the employee concerned are determined in another manner.

§ 7.4. Data recording of exposed employees

Section 90

The employer must ensure that for every individual exposed employee, the following details are recorded:

- a. name, date of birth and sex;
- b. classification in the categories for A- or B-employee;
- c. the measured or determined doses on the basis of Sections 87 to 89;
- d. the results of area monitoring which have been used for the calculation of the effective or equivalent doses;
- e. in case of exposure as described in Sections 81 and 89, the reports in relation to its circumstances and the measures put in place.

Section 91

1. A dose recording system exists for the storage of results of the measured or determined doses, as described in Sections 87, 88, and 89.
2. Our Minister of Social Affairs and Employment appoints an organisation responsible for the management of the system described in the first Paragraph, and may lay down more detailed regulations in relation to the structure of the system.

3. The organisation described in the second Paragraph must keep the recorded data at least until the individual whom the data refer to has reached or would have reached the age of seventy five, but at least for thirty years after this individual has finished with the actions.

4. By Order of Our Minister of Social Affairs and Employment, more detailed regulations may be laid down for the access to and management of the recording system.

Section 92

1. The employer must ensure that the result of individual monitoring, as described in Sections 87, 88, and 89, is sent to the organisation mentioned in Section 91 without delay. The employer must indicate where the individual dose meter has been worn or in which manner the internal contamination was determined.

2. The employee has access to the data concerning his/her exposure.

Section 93

1. The employer must ensure that the result of individual monitoring, as described in Sections 87, 88, and 89, is supplied to:

- a. the arbo service;
- b. the employee concerned;
- c. the expert;
- d. where an A-employee is concerned, the radiation physician.

2. The employer must report the result of individual monitoring, as described in Section 89, without delay to the individuals or service as described in the first Paragraph and to the Regional Director or, where mining is concerned, the Inspector General of Mining, on whose work terrain an emergency situation has occurred.

Section 94

1. It is prohibited for an employer, whose organisation is established in the Netherlands, to have an employee without a valid radiation passport and personal control measure perform actions as an A-employee in another member state of the European Union.

2. The radiation passport is issued, on request, to the employer on behalf of his/her employee by Our Minister of Social Affairs and Employment or by an organisation appointed by him to this extent.

3. When the employee returns to the Netherlands, the employer must report the data from the radiation passport without delay to the organisation described in Section 91.

4. Our Minister of Social Affairs and Employment may lay down more detailed rules with regard to the stipulations in this Section, that are related to the type of the radiation passport, the request for a passport, the costs, the loss or going missing of the radiation passport and other matters.

Section 95

1. It is prohibited for the employer to have an external employee work under his/her responsibility in the Netherlands or on the Dutch continental shelf, if this employee does not have a valid radiation passport, which has been issued by a government organisation in the member state of the employer of the external employee, by the order of whom the external employee performs actions.

2. The employer must record the result of monitoring as described in Sections 81, 87, 88, and 89, in the radiation passports without delay after termination of the actions or operations.

§ 7.5. Medical supervision

Section 96

1. The employer must ensure that A-employees are supervised by a radiation physician.
2. The employer must ensure that all data at his/her disposal, that the radiation physician needs in order for him/her to gain insight into the state of health of the individuals under his/her supervision and to form an opinion about the conditions in the working area as far as these conditions could influence the state of health of these individuals, are supplied to the radiation physician.
3. The medical supervision described in the first Paragraph comprises:
 - a. a medical examination which takes place before an individual is appointed A-employee and the purpose of which is to check whether the employee is suited for his/her job;
 - b. periodic examinations, with at least one check-up per year in order to establish whether the A-employee is still fit to perform his/her duties;
 - c. examination of individuals who are no longer employed as A-employees, if and for as long as the radiation physician deems necessary.
4. If the radiation physician deems it necessary, the medical examination must be followed up by measures by the employer concerning the protection of the employee's health.

Section 97

1. The employer must ensure that a radiation physician uses the following classification in relation to the suitability of A-employees when appointing them A-employees on the basis of the medical examination:
 - a. suitable;
 - b. suitable under certain conditions, or
 - c. not suitable.
2. The radiation physician must inform the examined individual without delay and in writing of the classification of suitability as described in the first Paragraph.
3. The individual who has undergone the examination may submit a request to Our Minister of Social Affairs and Employment or, where mining is concerned Our Minister of Economic Affairs for a new examination within six weeks after receiving the information as described in the second Paragraph. The Minister concerned informs the examined individual, the radiation physician and the employer in writing of the decision on a new examination.

Section 98

An employee may not be deployed in a specific job as an A-employee if the medical examination as described in Section 97, first Paragraph, has revealed that he/she is not suitable for this job.

Section 99

An individual must also be examined by a radiation physician if there is a reason for an examination because of an exposure whereby dose limits have been exceeded or because of a radiological emergency situation.

Section 100

1. The employer must ensure that medical notes are kept, in which at least the following is recorded for each individual A-employee:
 - a. the nature of the job;
 - b. the results of the examinations as described in Sections 96 and 97;
 - c. the results of monitoring as described in Section 95, second Paragraph;

- d. where applicable, the data in relation to a radiological emergency situation.
2. The employer must ensure that the medical notes, as described in the first Paragraph, are kept at least until the individual whom the notes refer to has reached or would have reached the age of seventy five, but at least for thirty years after this individual has finished with the actions.

CHAPTER 8. EXPOSURE TO NATURAL SOURCES

§ 8.1. Area of application

Section 101

The stipulations in this decree relating to actions with radioactive substances are similarly applicable to operations, except for Sections 27 to 34 and Chapter 6, and insofar this chapter does not deviate from those stipulations.

§ 8.2. Reports and licenses

Section 102

1. Our Ministers will publish a list of those operations in the Government Gazette, for which the values listed in Tables 1 and 2 could possibly be exceeded whilst these operations are carried out.

2. Before the employer carries out an operation on the list described in the first Paragraph, he/she must check whether this operation must be reported pursuant to Section 103, or whether a license is required for this operation pursuant to Section 108.

Section 103

1. The employer must report an operation, which is not a discharge, prior to carrying out this operation, pursuant to Section 40.

2. This obligation does not apply within a location if:

a. an operation is concerned whereby:

1°. the activity of the radionuclides in the natural sources concerned is always lower than the values listed in Appendix 1, Table 1, or

2°. the concentration of activity in the natural sources concerned is lower than the value listed in Appendix 1, Table 1, or

b. an operation is concerned for which a license is required in accordance with Section 107.

3. Section 25, third, fourth, sixth, seventh and eighth Paragraph, is similarly applicable.

4. It may be decided by Ministerial Order that in cases as described in this Order and in view of protection against radiation, the second Paragraph is not applicable.

5. The obligation stipulated in the first Paragraph does not apply for operations involving natural sources, in case the license application as described in this decree contains information as described in Section 105 about these sources.

6. It may be decided by Ministerial Order in which cases exemptions from the obligations described in the first Paragraph apply in relation to the operations involved, if such an operation has already been reported by another employer and the stipulations determined in the Order have been met.

Section 104

When an operation reported pursuant to Section 103 is no longer carried out, the employer must notify this within four weeks after ending the operation, pursuant to Section 40.

Section 105

- 1.** The notification, as described in Section 103, must contain at least the following:
 - a. the name and address of the individual signing the notification;
 - b. the name and address of the employer;
 - c. the address or cadastral data of the location;
 - d. a description of the operation, the area of the operation and its objective;
 - e. for product reuse or material reuse, or for destination as waste, the final destination of the material and an estimate of the effective doses in one calendar year, that individuals can receive as a result of the final destination and the process route;
 - f. a specification of the natural sources involved and of the radionuclides in these sources.
- 2.** By Ministerial Order, more detailed regulations may be laid down in relation to the information a notification must contain and to the situations in which a new notification is mandatory.

Section 106

- 1.** The notification of an operation, as described in Section 104, must contain at least the following:
 - a. the name and address of the individual signing the notification;
 - b. the name and address of the employer;
 - c. the address or cadastral data of the location;
 - d. an indication of the operation;
 - e. if applicable, a change in the information as described in Section 105, first Paragraph, under e.
- 2.** By Ministerial Order, further regulations may be laid down in relation to the information contained in this notification.

Section 107

- 1.** It is prohibited to perform an operation other than a discharge without a license.
- 2.** The prohibition laid down in the first Paragraph does not apply within a location, if:
 - a. the activity of the radionuclides in the natural sources concerned in the operation is lower than the values listed in Appendix 1, Table 1, or
 - b. the concentration of activity in the natural sources concerned in the operation is lower than ten times the value listed in Appendix 1, Table 1.
- 3.** Section 25, third, fourth, sixth, seventh and eighth Paragraph, is similarly applicable.
- 4.** It may be decided by Ministerial Order that in cases as described in this Order and in view of protection against radiation, the second Paragraph is not applicable.

Section 108

- 1.** Without a license, it is prohibited to discharge natural sources or to perform an operation as a result of which natural sources are discharged.
- 2.** The prohibition laid down in the first Paragraph does not apply if the activity of the radionuclides listed in Appendix 1, Table 2, that are to be discharged in one calendar year, is lower than the value given for the radionuclide in this table when it leaves the location.
- 3.** Section 25, third, fourth, sixth, seventh and eighth Paragraph, is similarly applicable.
- 4.** It may be decided by Ministerial Order that in cases as described in this Order and in view of protection against radiation, the second Paragraph is not applicable.

Section 109

- 1.** Section 43 is similarly applicable for a license application as described in Sections 107 and 108. The application must contain at least the following:
 - a. the name and address of the individual signing the application;
 - b. the name and address of the employer;

- c. the address or cadastral data of the location;
- d. a description of the operation, the area of the operation and its objective;
- e. for product reuse or material reuse, the final destination of the material and an estimate of the effective doses in one calendar year, that individuals can receive as a result of the final destination and the process route;
- f. a specification of the natural sources involved and of the radionuclides in these sources.

2. By Ministerial Order, further regulations may be laid down in relation to the information contained in an application.

Section 110

1. In case Our Ministers deem this necessary in view of justification and optimisation, regulations may be laid down by Ministerial Order in relation to the execution of operations referred to in this Order, that are reported in accordance with Section 103.

2. By Ministerial Order, regulations may be laid down in relation to product reuse or material reuse and storage of waste from natural sources, for categories of cases in which the concentration of activity combined with the total activity of the natural sources concerned exceeds the value given in Appendix 1, Table 1.

3. Section 25, third, fourth, seventh and eight Paragraph, is similarly applicable.

§ 8.3. Aircrew

Section 111

1. In contravention to Sections 102 to 110, the employer must ensure the following in relation to an employee who is part of an aircrew:

- a. that the employee is informed about the risks of cosmic radiation prior to his/her appointment as an aircrew member;
- b. that the size of the effective dose the employee will receive as a result of cosmic radiation is measured via a method determined by Our Minister of Social Affairs and Employment;
- c. that, in case an effective dose of 6 mSv in one calendar year could be exceeded, a reviewed work schedule is determined and implemented in compliance with the stipulations in Section 5, and the employee concerned is classified as A-employee.
- d. that the effective dose received by the employee as a result of cosmic radiation, together with the effective doses received as a result of actions performed under the responsibility of the employer, do not exceed 20 mSv in one calendar year.

2. Sections 15, 16, 79, 80, 90, 91, 92, second Paragraph, and 96 to 100 are similarly applicable.

3. This Section does not apply to flights whereby the aeroplane reaches a height of less than 8 kilometres only.

4. Our Minister of Social Affairs and Employment may lay down more detailed regulations in relation to the stipulations in this Section.

CHAPTER 9. INTERVENTION

Section 112

1. An intervention must only take place in case the anticipated reduction of the damage and the harmful social and communal consequences of the radiation is sufficient to justify the damage, the harmful social and communal consequences and the costs of the intervention.

2. The form, size and duration of the intervention must be such, that the benefit of the reduction of the damage to health to be achieved, taking into account the damage that will be caused by the intervention itself, is as great as is reasonably achievable.

Section 113

1. Our Minister of Housing, Regional Development and the Environment, and:
- a. where the military is concerned, Our Minister of Defence;
 - b. where applications for medical radiation are concerned, Our Minister of Health, Welfare and Sports;
 - c. where industrial safety is concerned, Our Minister of Social Affairs and Employment;
 - d. where mining is concerned, Our Minister of Economic Affairs;
 - e. where discharge into the surface waters is concerned, Our Minister of Transport and Public Works;
 - f. where discharge into the surface waters or discharge into the air is concerned, Our Minister of Agriculture, Nature Management and Fisheries;
- must ensure that teams are available for technical and medical intervention and for the removal of radioactive contamination, and that these teams are adequately equipped for the execution of these tasks.
2. The members of these teams must be adequately educated for the execution of their tasks.

Section 114

Sections 87, 89, 90, 92, 93 and 96 are similarly applicable for the teams as described in Section 113, first Paragraph, on the understanding that the obligations described therein are with the individual under the responsibility of whom the intervention is being executed.

Section 115

The employer must ensure that arrangements are made to prepare for an intervention, in case a radiological emergency situation occurs inside a location. The employer must make an intervention plan for each location and test the plans on a regular basis.

Section 116

1. If a radiological emergency situation arises inside a location, the employer must immediately take all the appropriate steps to minimise the consequences of the situation.
2. The employer must immediately notify the mayor of the municipality where the radiological emergency situation arises.
3. The employer must immediately make a provisional assessment of the circumstances and the consequences of this situation, and report this to the Mayor and to Our Minister of Housing, Regional Development and the Environment.
4. The employer must ensure that full cooperation is given to an intervention executed by a managing body.

Section 117

1. Our Ministers, described in Section 113, must lay down rules in relation to the execution of the interventions, each of them insofar as the matters described in that Section are concerned.
2. The individual under the responsibility of whom the intervention is executed, must ensure that the consequences and the effectiveness of an intervention are determined and registered.

Section 118

1. Sections 48, 49 and 77 are not applicable in case of intervention in a radiological emergency situation.

2. In case of an intervention in a radiological emergency situation, the following values are to be maintained for employees and relief workers as the dose restriction for the effective dose for:

life saving work: 750 mSv

securing important material interests: 250 mSv

supporting or carrying out measurements, evacuation, iodine prophylaxis, and law, order and security: 100 mSv

3. The values for life saving work given in the second Paragraph are only to be exceeded if this is necessary in order to save human lives or secure important material interests, if the employer or relief worker concerned has been informed of the risks of the intervention by the employer, and if the intervention is carried out voluntarily.

4. Section 113, second Paragraph, and Section 114 are similarly applicable to employees and relief workers who are responsible during an intervention for the tasks described in the second Paragraph.

Section 119

1. Our Ministers, described in Section 113, each of them insofar as the matters described in that Section are concerned, or the employer, may regard a situation as a situation that can lead to long term exposure as a result of a radiological emergency situation or of an earlier action or operation.

2. In case the situation as described in the first Paragraph comes under the responsibility of an employer, Our Ministers may force the employer to carry out the intervention.

3. In a case as described in the first Paragraph and insofar it is necessary in view of the danger of exposure, the individual under the responsibility of whom an intervention is being carried out, must take care of the following:

a. defining the area concerned;

b. introducing a monitoring system for exposure;

c. carrying out the intervention, in accordance with a plan of action approved by Our Minister concerned;

d. controlling the access to the defined area or the use of locations or buildings inside these areas.

4. In relation to an intervention in a case as described in the first Paragraph, this decree is similarly applicable, except Paragraphs 4.2 to 4.4 and Sections 39, under b, 48, and 114 to 118.

CHAPTER 10. ADMINISTRATION, FURTHER REQUIREMENTS AND EXEMPTIONS

Section 120

1. An employer who carries out operations must keep records of these operations.

2. The records must contain at least the following:

a. the name of the legal person and the responsible expert;

b. the place where the actions are performed;

c. a description of the nature and scope of the actions.

3. By Ministerial Order, more detailed regulations must be laid down for the content of the records and for the length of time that these records are to be kept.

Section 121

1. The individual who performs actions as described in Section 43, third Paragraph, inside a location, must keep records of these actions.

2. The records must contain the following:

- a. the name of the licensee and the number of the license granted for the actions concerned;
- b. the point in time or the period of time within a calendar year in which the actions have been performed;
- c. the place, the nature and scope of the actions;
- d. the maximum increase of the effective dose (because of the actions), that people can receive in any area outside the location.

3. In case the individual who is going to perform actions as described in Section 43, third Paragraph, inside a location, takes shots or utilises radioscapy as part of non-destructive research, the total number of shots and number of hours of radioscopic research inside this location have to be noted in the records as well. For the application of this stipulation, the number of shots is equated to the number of films used for that purpose.

4. In case the individual who is going to perform actions (as described in the third Paragraph) inside a location, has a reasonable notion that the total number of shots taken inside the location will exceed a total of 3300 in one calendar year, he/she must immediately notify Our Minister of Housing, Regional Development and the Environment, and the customer. For the application of this stipulation, eight hours of radioscapy is equated to one shot.

5. The individual who keeps the records as described in the first Paragraph, must keep the documents that the records consist of for at least 5 years after the calendar year to which they refer.

6. In this Section and the conditions based on it, the definition of radioscapy is the following: the production of a visually perceivable image by means of ionising radiation via a radiation detector from a device or instrument, by converting the produced signal into a video signal, which is displayed on a monitor.

7. The first Paragraph does not apply if the estimated number of shots per calendar year is less than 100.

Section 122

1. The individual performing the actions must comply with further requirements concerning the regulations determined by or under this decree.

2. Further requirements are imposed that are solely related to the protection of employees against ionising radiation as a result of actions:

- a. by the Inspector General of Mining, where mining is concerned;
- b. by a civil servant appointed to that end by Our Minister of Social Affairs and Employment where other actions are concerned.

3. In case these further requirements do not concern the protection of employees against ionising radiation when they are performing actions, they must be laid down by the Chief Inspector for Environmental Health, or by the Inspector General for Health, insofar the interests are concerned that they are responsible for, or where mining on the continental shelf is concerned, the Inspector General of Mining.

4. Further requirements concerning the interests described both in the second and in the third Paragraph must be laid down by the collective government bodies described in these Paragraphs.

Section 123

1. In special cases, Our Ministers and Our Minister of Health, Welfare and Sports, where radiological procedures are concerned, and of Defence, where the military is concerned, and of Economic Affairs, where mining is concerned, may grant exemption from the regulations described in Paragraph 3.3 and Sections 120 and 121.

2. The exemption may be subject to regulations.

CHAPTER 11. TRANSITIONAL AND FINAL PROVISIONS

Section 124

1. In case Our Ministers deem this absolutely essential in the interest of protection against ionising radiation and if it is their opinion that they cannot wait for an amendment of this decree, they may lay down regulations by Ministerial Order that deviate from this decree but with a tenor as described in this decree. Such a regulation will expire one year after it comes into force, or, in case an amendment of the stipulation concerned in this decree has come into force within this period of time, at the time that this amendment comes into force. By Ministerial Order, Our Ministers may extend the term only once, by a maximum of one year.

2. The values given in Appendix 1, Tables 1, 2 and 3, and in Appendix 4, may be amended by Ministerial Order.

Section 125

[This Section amends the Decree on Protection Against Radiation and the Decree on Radioactive Substances (Registration) and the costs of Licensing Authorities for the Nuclear Energy Act.]

Section 126

[This Section amends the Mining Regulation Continental Shelf.]

Section 127

1. A license which has been granted before the date that this decree comes into force pursuant to:

a. [Section 29 of the Law](#), in conjunction with [Section 6](#) and [7 of the Decree on Protection Against Radiation Nuclear Energy Act](#), according to the stipulations in that Decree until the date that this Decree comes into force;

b. [Section 34 of the Law](#), in conjunction with [Section 8 of the Decree on Protection against Radiation Nuclear Energy Act](#), according to the stipulations in that Decree until the date that this Decree comes into force, or

c. [Section 26 of the Mining Act Continental Shelf](#), in conjunction with [Section 167 of the Mining Regulations Continental Shelf](#), according to the stipulations in that Decree until the date that this Decree comes into force, will be based on Sections 23, 24, 25 or 108 of this Decree after the date this Decree comes into force.

2. An action with a device for which a license has been granted (prior to the date that this Decree comes into force) by or under [Section 34 of the Law](#), in conjunction with [Section 8, first Paragraph, under b, of the Decree on Protection Against Radiation Nuclear Energy Act](#), according to the stipulations of that Decree until the date that this Decree comes into force, is expected to be reported according to Section 21 of this Decree.

3. An employer who performs an action or an operation with a radioactive substance, for which no license is required pursuant to [Section 29 of the Law](#), in conjunction with [Section 6, first and second Paragraphs](#), and [Section 7, first and second Paragraphs, of the Decree on Protection Against Radiation Nuclear Energy Act](#), according to the stipulations of that Decree until the date that this Decree comes into force, or under [Section 34 of the Law](#), but for which he/she does require a license by or under this Decree, must submit a request in accordance with Section 43 of this Decree, within 12 months after this Decree comes into force. Until Our Ministers have made a decision concerning that request, the action is considered to have been performed in accordance with this Decree.

4. An employer who carries out an operation for which no notification or license is required by law, until the date that this Decree comes into force, but for which notification is required according to Chapter 8 of this Decree, must report the operation prior to a point in time to be determined by Our Ministers. Until that point in time, the operation is considered to have been reported in accordance with this Decree.

5. An employer who carries out an operation for which a license has been granted in accordance with the law until the date that this Decree comes into force, but for which a notification is required according to Chapter 8 of this Decree, is considered to have reported the operation in accordance with Section 103 of this Decree. The stipulations included in the licence will remain valid after the date that Chapter 8 of this Decree comes into force.

6. A device as described in [Section 34 of the Law](#), in conjunction with [Section 4, second Paragraph, of the Decree on Protection Against Radiation Nuclear Energy Act](#), according to the stipulations in that Decree until the date that this Decree comes into force, respectively an operation with a radioactive substance as described in [Section 29 of the Law](#), in conjunction with [Section 6, third Paragraph, of the Decree for Protection Against Radiation Nuclear Energy Act](#), according to the stipulations in that Decree until the date that this Decree comes into force, will be considered a device that has been approved in accordance with Section 21, second Paragraph, under d, of this Decree, respectively an operation of a type, that has been approved in accordance with Section 26, first Paragraph, under a, of this Decree.

7. Operations to which the first and second Paragraphs apply and that are deemed not justified in pursuance of Section 4, or that are classified in a category that is deemed not justified, will be considered justified from the date that this Decree comes into force.

Section 128

A decision is taken in accordance with the regulations pursuant to the [Decree on Protection Against Radiation Nuclear Energy Act](#), according to the stipulations in that Decree until the date that this Decree comes into force, about the requests for licenses pursuant to [Section 29 of the Law](#), in conjunction with [Sections 6 and 7 of the Decree on Protection Against Radiation Nuclear Energy Act](#), according to the stipulations in that Decree until the date that this Decree comes into force, and declarations of a device in pursuance of [Section 72 of the Decree on Protection Against Radiation Nuclear Energy Act](#), that have been made prior to the date that this Decree comes into force.

Section 129

For the consideration of a complaint or appeal that was begun prior to the date that this Decree comes into force against licenses as described in Section 127, that have been granted or refused in accordance to the Sections of the [Decree on Protection Against Radiation Nuclear Energy Act](#), according to the stipulations in that Decree until the date that this Decree comes into force, the Sections of this [Decree on Protection Against Radiation Nuclear Energy Act](#) and the stipulations laid down pursuant to those Sections remain in force, on the understanding that a new decision is taken according to this Decree in case a complaint or appeal leads to the cancellation of the decision to grant a license after the date that this Decree comes into force.

Section 130

1. Section 122 of this Decree applies to the individual who, on the date that this Decree comes into force, had an obligation to fulfil another demand as described in [Section 75](#) in conjunction with [Section 82b of the Decree on Protection Against](#)

[Radiation Nuclear Energy Act](#), according to the stipulations in that Decree until the date that this Decree comes into force; the further demand will be based on Section 122 after the date that this Decree comes into force.

2. Section 123 of this Decree applies to an exemption that has been granted, prior to the date that this Decree comes into force, pursuant to [Section 77](#) in conjunction with [Section 82d of the Decree on Protection Against Radiation Nuclear Energy Act](#), according to the stipulations in that Decree until the date that this Decree comes into force; this exemption will be based on Section 123 after the date that this Decree comes into force.

Section 131

After this Decree comes into force:

- a. the Order of 31 August 1987 about recognition of the Central Organisation for Radioactive Waste N.V. as collection service will be based on Section 37, seventh Paragraph, of this Decree;
- b. the Decree on Creation of Centralised System for Storage of Radiological Data and the Radiation Passport Decree will be based on Sections 91 and 94 of this Decree;
- c. the Orders under [Section 25, first Paragraph](#), in conjunction with [Section 81, first Paragraph of the Decree on Protection Against Radiation Nuclear Energy Act](#), according to the stipulations in that Decree until the date that this Decree comes into force, will be based on Section 8, first Paragraph, of this Decree;
- d. the Order on the Designation of Electron Microscopes Nuclear Energy Act 1998 will be based on Section 21, second Paragraph, under d, of this Decree;
- e. the Order on the Designation of Smoke Alarms Nuclear Energy Act 2000-II will be based on Section 26, second Paragraph, of this Decree.

Section 132

1. An individual who has been recognised as a physician responsible for medical supervision under [Section 34, first Paragraph, of the Decree on Protection Against Radiation Nuclear Energy Act](#), according to the stipulations in that Decree until the date that this Decree comes into force, will be considered a radiation physician registered in the registry as described in Section 7, first Paragraph, until a date to be determined by Ministerial Order.
2. An individual who has a diploma in a course of the levels as described in the Order on the Recognition of Courses for Experts of Radioactive Substances and Devices, according to the stipulations in that Order until the date that this Decree comes into force, and the Directive of 20 November 1984 on the Recognition of Courses for Experts of Radioactive Substances and Devices, will be considered an expert registered in the registry as described in Section 7, second Paragraph, until a date to be determined by Ministerial Order.
3. A course, which has been recognised according to the Order on the Recognition of Courses for Experts of Radioactive Substances and Devices, according to the stipulations in that Order until the date that this Decree comes into force, and the Directive of 20 November 1984 on the Recognition of Courses for Experts of Radioactive Substances and Devices, is recognised as a course as described in the second Paragraph until a date to be determined by Ministerial Order.
4. Our Ministers and Our Minister of Health, Welfare and Sports may recognise a course as described in the second Paragraph until a date to be determined by Ministerial Order.

Section 133

[This section amends the Nuclear Installations, Fissionable Materials and Ores Decree.]

Section 134

[This Section amends the Fissionable Materials, Ores and Radioactive Substances (transport) Decree.]

Section 135

[This Section amends the Decree Nuclear Energy Act 1981.]

Section 136

This decree comes into force on a point in time to be determined by Royal Decree. This point in time may differ for the different Sections or parts thereof.

Section 137

This Decree is quoted as: Decree on Protection Against Radiation.

Order and instruct that this Decree and the associated explanatory memorandum is published in the Government Gazette.

Tavernelle, 16 July 2001

Beatrix

The Secretary of State for Social Affairs and Employment,
J. F. Hoogervorst

The Minister of Housing, Regional Development and the Environment,
J. P. Pronk

The Minister of Health, Welfare and Sports,
E. Borst-Eilers

Published on the sixth of September 2001

The Minister of Justice
A. H. Korthals

Appendix 1. Limits for exemption and decontrol

For the utilisation of Table 1A, the following is important:

1. Nuclides with the suffix «+» or «sec» in Table 1 represent parent nuclides, that are in equilibrium with their daughter nuclides as described in Annex A with Table 1. In that case, the values given in Table 1 only relate to the parent nuclide, but the ingrowing daughter nuclides have already been allowed for. In other words: where there is an equilibrium, only the value of the parent nuclide is used for assays.
2. Table 1 gives the values for the concentrations of activity and the total activity for approximately 800 different radionuclides. Of these, approximately 400 radionuclides

were not included in Directive 96/29 or in the Memorandum of the Commission, but these have been calculated by the National Radiological Protection Board (NRPB) in the UK (NRPB-R306) and they have been added for the sake of completeness. Annex A with Table 1 has been extended for this reason as well. The values for the concentration of activity and the total activity are equally applicable for the application of Sections 25, 26 and 37.

3. In Appendix 3, a number of natural radionuclides from this table have been described that are exempt from summation in the Netherlands during testing of natural sources. For this reason, these do not need to be determined.

4. After the explanation in each Section, there is an explanation in which the reasons are examined why the exemption values are the same as the decontrol values.

5. For reasons of legibility, the powers of the values in the table are indicated with the notation 1E, which means that, for example, 10⁻⁴ and 10⁴ are printed as 1E-4 respectively 1E+4.

6. In case a radionuclide is not included in Table 1, this radionuclide has been exempted from the obligation for notification or license, and also from the weighed summation from activities, concentration of activities or any other quantity (as described in Section 25, seventh Paragraph) given in Appendix 3.

Table 1. Limits for exemption and decontrol for artificial and natural sources for concentration of activity and activity

Radionuclide	Concentration of activity (Bq g ⁻¹)	Activity (Bq)
H-3 (incl. OBT ¹)	1E+6	1E+9
Elementary H-3	1E+6	1E+9
Be-7	1E+3	1E+7
Be-10	1E+4	1E+6
C-11	1E+1	1E+6
C-11 monoxide	1E+1	1E+9
C-11 dioxide	1E+1	1E+9
C-14	1E+4	1E+7
C-14 monoxide	1E+8	1E+11
C-14 dioxide	1E+7	1E+11
N-13	1E+2	1E+9
Ne-19	1E+2	1E+9
O-15	1E+2	1E+9

F-18	1E+1	1E+6
Na-22	1E+1	1E+6
Na-24	1E+1	1E+5
Mg-28+	1E+1	1E+5
Al-26	1E+1	1E+5
Si-31	1E+3	1E+6
Si-32	1E+3	1E+6
P-32	1E+3	1E+5
P-33	1E+5	1E+8
S-35	1E+5	1E+8
S-35 (organic)	1E+5	1E+8
S-35 (vapour)	1E+6	1E+9
Cl-36	1E+4	1E+6
Cl-38	1E+1	1E+5
Cl-39	1E+1	1E+5
Ar-37	1E+6	1E+8
Ar-39	1E+7	1E+4
Ar-41	1E+2	1E+9
K-40	1E+2	1E+6
K-42	1E+2	1E+6
K-43	1E+1	1E+6
K-44	1E+1	1E+5
K-45	1E+1	1E+5
Ca-41	1E+5	1E+7
Ca-45	1E+4	1E+7
Ca-47	1E+1	1E+6
Sc-43	1E+1	1E+6
Sc-44	1E+1	1E+5
Sc-44m	1E+2	1E+7

Sc-46	1E+1	1E+6
Sc-47	1E+2	1E+6
Sc-48	1E+1	1E+5
Sc-49	1E+3	1E+5
Ti-44+	1E+1	1E+5
Ti-45	1E+1	1E+6
V-47	1E+1	1E+5
V-48	1E+1	1E+5
V-49	1E+4	1E+7
Cr-48	1E+2	1E+6
Cr-49	1E+1	1E+6
Cr-51	1E+3	1E+7
Mn-51	1E+1	1E+5
Mn-52	1E+1	1E+5
Mn-52m	1E+1	1E+5
Mn-53	1E+4	1E+9
Mn-54	1E+1	1E+6
Mn-56	1E+1	1E+5
Fe-52	1E+1	1E+6
Fe-55	1E+4	1E+6
Fe-59	1E+1	1E+6
Fe-60+	1E+2	1E+5
Co-55	1E+1	1E+6
Co-56	1E+1	1E+5
Co-57	1E+2	1E+6
Co-58	1E+1	1E+6
Co-58m	1E+4	1E+7
Co-60	1	1E+5
Co-60m	1E+3	1E+6
Co-61	1E+2	1E+6
Co-62m	1E+1	1E+5
Ni-56	1E+1	1E+6
Ni-57	1E+1	1E+6
Ni-59	1E+4	1E+8
Ni-63	1E+5	1E+8

Ni-65	1E+1	1E+6
Ni-66	1E+4	1E+7
Cu-60	1E+1	1E+5
Cu-61	1E+1	1E+6
Cu-64	1E+2	1E+6
Cu-67	1E+2	1E+6
Zn-62	1E+2	1E+6
Zn-63	1E+1	1E+5
Zn-65	1E+1	1E+6
Zn-69	1E+4	1E+6
Zn-69m	1E+2	1E+6
Zn-71m	1E+1	1E+6
Zn-72	1E+2	1E+6
Ga-65	1E+1	1E+5
Ga-66	1E+1	1E+5
Ga-67	1E+2	1E+6
Ga-68	1E+1	1E+5
Ga-70	1E+3	1E+6
Ga-72	1E+1	1E+5
Ga-73	1E+2	1E+6
Ge-66	1E+1	1E+6
Ge-67	1E+1	1E+5
Ge-68+	1E+1	1E+5
Ge-69	1E+1	1E+6
Ge-71	1E+4	1E+8
Ge-75	1E+3	1E+6
Ge-77	1E+1	1E+5
Ge-78	1E+2	1E+6
As-69	1E+1	1E+5
As-70	1E+1	1E+5
As-71	1E+1	1E+6
As-72	1E+1	1E+5
As-73	1E+3	1E+7
As-74	1E+1	1E+6
As-76	1E+2	1E+5
As-77	1E+3	1E+6
As-78	1E+1	1E+5

Se-70	1E+1	1E+6
Se-73	1E+1	1E+6
Se-73m	1E+2	1E+6
Se-75	1E+2	1E+6
Se-79	1E+4	1E+7
Se-81	1E+3	1E+6
Se-81m	1E+3	1E+7
Se-83	1E+1	1E+5
Br-74	1E+1	1E+5
Br-74m	1E+1	1E+5
Br-75	1E+1	1E+6
Br-76	1E+1	1E+5
Br-77	1E+2	1E+6
Br-80	1E+2	1E+5
Br-80m	1E+3	1E+7
Br-82	1E+1	1E+6
Br-83	1E+3	1E+6
Br-84	1E+1	1E+5
Kr-74	1E+2	1E+9
Kr-76	1E+2	1E+9
Kr-77	1E+2	1E+9
Kr-79	1E+3	1E+5
Kr-81	1E+4	1E+7
Kr-81m	1E+3	1E+10
Kr-83m	1E+5	1E+12
Kr-85	1E+5	1E+4
Kr-85 2	1E+5	1E+10
Kr-85m	1E+3 ²	1E+10
Kr-87	1E+2	1E+9
Kr-88	1E+2	1E+9
Rb-79	1E+1	1E+5
Rb-81	1E+1	1E+6
Rb-81m	1E+3	1E+7
Rb-82m	1E+1	1E+6
Rb-83+	1E+2	1E+6
Rb-84	1E+1	1E+6
Rb-86	1E+2	1E+5
Rb-87	1E+4	1E+7

Rb-88	1E+1	1E+5
Rb-89	1E+1	1E+5
Sr-80	1E+3	1E+7
Sr-81	1E+1	1E+5
Sr-82+	1E+1	1E+5
Sr-83	1E+1	1E+6
Sr-85	1E+2	1E+6
Sr-85m	1E+2	1E+7
Sr-87m	1E+2	1E+6
Sr-89	1E+3	1E+6
Sr-90+	1E+2	1E+4
Sr-91	1E+1	1E+5
Sr-92	1E+1	1E+6
Y-86	1E+1	1E+5
Y-86m	1E+2	1E+7
Y-87+	1E+1	1E+6
Y-88	1E+1	1E+6
Y-90	1E+3	1E+5
Y-90m	1E+1	1E+6
Y-91	1E+3	1E+6
Y-91m	1E+2	1E+6
Y-92	1E+2	1E+5
Y-93	1E+2	1E+5
Y-94	1E+1	1E+5
Y-95	1E+1	1E+5
Zr-86	1E+2	1E+7
Zr-88	1E+2	1E+6
Zr-89	1E+1	1E+6
Zr-93+	1E+3	1E+7
Zr-95	1E+1	1E+6
Zr-97+	1E+1	1E+5
Nb-88	1E+1	1E+5
Nb-89 (2.03 h)	1E+1	1E+5
Nb-89 (1.01 h)	1E+1	1E+5
Nb-90	1E+1	1E+5
Nb-93m	1E+4	1E+7
Nb-94	1E+1	1E+6
Nb-95	1E+1	1E+6

Nb-95m	1E+2	1E+7
Nb-96	1E+1	1E+5
Nb-97	1E+1	1E+6
Nb-98	1E+1	1E+5
Mo-90	1E+1	1E+6
Mo-93	1E+3	1E+8
Mo-93m	1E+1	1E+6
Mo-99	1E+2	1E+6
Mo-101	1E+1	1E+6
Tc-93	1E+1	1E+6
Tc-93m	1E+1	1E+6
Tc-94	1E+1	1E+6
Tc-94m	1E+1	1E+5
Tc-95	1E+1	1E+6
Tc-95m+	1E+1	1E+6
Tc-96	1E+1	1E+6
Tc-96m	1E+3	1E+7
Tc-97	1E+3	1E+8
Tc-97m	1E+3	1E+7
Tc-98	1E+1	1E+6
Tc-99	1E+4	1E+7
Tc-99m	1E+2	1E+7
Tc-101	1E+2	1E+6
Tc-104	1E+1	1E+5
Ru-94	1E+2	1E+6
Ru-97	1E+2	1E+7
Ru-103	1E+2	1E+6
Ru-105	1E+1	1E+6
Ru-106+	1E+2	1E+5
Rh-99	1E+1	1E+6
Rh-99m	1E+1	1E+6
Rh-100	1E+1	1E+6
Rh-101	1E+2	1E+7
Rh-101m	1E+2	1E+7
Rh-102	1E+1	1E+6
Rh-102m	1E+2	1E+6
Rh-103m	1E+4	1E+8
Rh-105	1E+2	1E+7

Rh-106m	1E+1	1E+5
Rh-107	1E+2	1E+6
Pd-100	1E+2	1E+7
Pd-101	1E+2	1E+6
Pd-103	1E+3	1E+8
Pd-107	1E+5	1E+8
Pd-109	1E+3	1E+6
Ag-102	1E+1	1E+5
Ag-103	1E+1	1E+6
Ag-104	1E+1	1E+6
Ag-104m	1E+1	1E+6
Ag-105	1E+2	1E+6
Ag-106	1E+1	1E+6
Ag-106m	1E+1	1E+6
Ag-108m+	1E+1	1E+6
Ag-110m	1E+1	1E+6
Ag-111	1E+3	1E+6
Ag-112	1E+1	1E+5
Ag-115	1E+1	1E+5
Cd-104	1E+2	1E+7
Cd-107	1E+3	1E+7
Cd-109	1E+4	1E+6
Cd-113	1E+3	1E+6
Cd-113m	1E+3	1E+6
Cd-115	1E+2	1E+6
Cd-115m	1E+3	1E+6
Cd-117	1E+1	1E+6
Cd-117m	1E+1	1E+6
In-109	1E+1	1E+6
In-110 (4.9 h)	1E+1	1E+6
In-110 (69.1 min)	1E+1	1E+5
In-111	1E+2	1E+6
In-112	1E+2	1E+6
In-113m	1E+2	1E+6
In-114	1E+3	1E+5
In-114m	1E+2	1E+6
In-115	1E+3	1E+5
In-115m	1E+2	1E+6

In-116m	1E+1	1E+5
In-117	1E+1	1E+6
In-117m	1E+2	1E+6
In-119m	1E+2	1E+5
Sn-110	1E+2	1E+7
Sn-111	1E+2	1E+6
Sn-113	1E+3	1E+7
Sn-117m	1E+2	1E+6
Sn-119m	1E+3	1E+7
Sn-121	1E+5	1E+7
Sn-121m+	1E+3	1E+7
Sn-123	1E+3	1E+6
Sn-123m	1E+2	1E+6
Sn-125	1E+2	1E+5
Sn-126+	1E+1	1E+5
Sn-127	1E+1	1E+6
Sn-128	1E+1	1E+6
Sb-115	1E+1	1E+6
Sb-116	1E+1	1E+6
Sb-116m	1E+1	1E+5
Sb-117	1E+2	1E+7
Sb-118m	1E+1	1E+6
Sb-119	1E+3	1E+7
Sb-120 (5.76 d)	1E+1	1E+6
Sb-120 (15.89 m)	1E+2	1E+6
Sb-122	1E+2	1E+4
Sb-124	1E+1	1E+6
Sb-124m	1E+2	1E+6
Sb-125	1E+2	1E+6
Sb-126	1E+1	1E+5
Sb-126m	1E+1	1E+5
Sb-127	1E+1	1E+6
Sb-128 (9.01 h)	1E+1	1E+5
Sb-128(10.4 min)	1E+1	1E+5
Sb-129	1E+1	1E+6
Sb-130	1E+1	1E+5
Sb-131	1E+1	1E+6
Te-116	1E+2	1E+7
Te-121	1E+1	1E+6
Te-121m	1E+2	1E+6
Te-123	1E+3	1E+6

Te-123m	1E+2	1E+7
Te-125m	1E+3	1E+7
Te-127	1E+3	1E+6
Te-127m	1E+3	1E+7
Te-129	1E+2	1E+6
Te-129m	1E+3	1E+6
Te-131	1E+2	1E+5
Te-131m	1E+1	1E+6
Te-132	1E+2	1E+7
Te-133	1E+1	1E+5
Te-133m	1E+1	1E+5
Te-134	1E+1	1E+6
I-120	1E+1	1E+5
I-120m	1E+1	1E+5
I-121	1E+2	1E+6
I-123	1E+2	1E+7
I-124	1E+1	1E+6
I-125	1E+3	1E+6
I-126	1E+2	1E+6
I-128	1E+2	1E+5
I-129	1E+2	1E+5
I-130	1E+1	1E+6
I-131	1E+2	1E+6
I-132	1E+1	1E+5
I-132m	1E+2	1E+6
I-133	1E+1	1E+6
I-134	1E+1	1E+5
I-135	1E+1	1E+6
Xe-120	1E+2	1E+9
Xe-121	1E+2	1E+9
Xe-122+	1E+2	1E+9
Xe-123	1E+2	1E+9
Xe-125	1E+3	1E+9
Xe-127	1E+3	1E+5
Xe-129m	1E+3	1E+4
Xe-131m	1E+4	1E+4
Xe-133m	1E+3	1E+4
Xe-133	1E+3	1E+4
Xe-135m	1E+2	1E+9
Xe-135	1E+3	1E+10
Xe-138	1E+2	1E+9

Cs-125	1E+1	1E+4
Cs-127	1E+2	1E+5
Cs-129	1E+2	1E+5
Cs-130	1E+2	1E+6
Cs-131	1E+3	1E+6
Cs-132	1E+1	1E+5
Cs-134	1E+1	1E+4
Cs-134m	1E+3	1E+5
Cs-135	1E+4	1E+7
Cs-135m	1E+1	1E+6
Cs-136	1E+1	1E+5
Cs-137+	1E+1	1E+4
Cs-138	1E+1	1E+4
Ba-126	1E+2	1E+7
Ba-128	1E+2	1E+7
Ba-131	1E+2	1E+6
Ba-131m	1E+2	1E+7
Ba-133	1E+2	1E+6
Ba-133m	1E+2	1E+6
Ba-135m	1E+2	1E+6
Ba-137m	1E+1	1E+6
Ba-139	1E+2	1E+5
Ba-140+	1E+1	1E+5
Ba-141	1E+1	1E+5
Ba-142	1E+1	1E+6
La-131	1E+1	1E+6
La-132	1E+1	1E+6
La-135	1E+3	1E+7
La-137	1E+3	1E+7
La-138	1E+1	1E+6
La-140	1E+1	1E+5
La-141	1E+2	1E+5
La-142	1E+1	1E+5
La-143	1E+2	1E+5
Ce-134	1E+3	1E+7
Ce-135	1E+1	1E+6
Ce-137	1E+3	1E+7
Ce-137m	1E+3	1E+6

Ce-139	1E+2	1E+6
Ce-141	1E+2	1E+7
Ce-143	1E+2	1E+6
Ce-144+	1E+2	1E+5
Pr-136	1E+1	1E+5
Pr-137	1E+2	1E+6
Pr-138m	1E+1	1E+6
Pr-139	1E+2	1E+7
Pr-142	1E+2	1E+5
Pr-142m	1E+7	1E+9
Pr-143	1E+4	1E+6
Pr-144	1E+2	1E+5
Pr-145	1E+3	1E+5
Pr-147	1E+1	1E+5
Nd-136	1E+2	1E+6
Nd-138	1E+3	1E+7
Nd-139	1E+2	1E+6
Nd-139m	1E+1	1E+6
Nd-141	1E+2	1E+7
Nd-147	1E+2	1E+6
Nd-149	1E+2	1E+6
Nd-151	1E+1	1E+5
Pm-141	1E+1	1E+5
Pm-143	1E+2	1E+6
Pm-144	1E+1	1E+6
Pm-145	1E+3	1E+7
Pm-146	1E+1	1E+6
Pm-147	1E+4	1E+7
Pm-148	1E+1	1E+5
Pm-148m+	1E+1	1E+6
Pm-149	1E+3	1E+6
Pm-150	1E+1	1E+5
Pm-151	1E+2	1E+6
Sm-141	1E+1	1E+5
Sm-141m	1E+1	1E+6
Sm-142	1E+2	1E+7
Sm-145	1E+2	1E+7
Sm-146	1E+1	1E+5

Sm-147	1E+1	1E+4
Sm-151	1E+4	1E+8
Sm-153	1E+2	1E+6
Sm-155	1E+2	1E+6
Sm-156	1E+2	1E+6
Eu-145	1E+1	1E+6
Eu-146	1E+1	1E+6
Eu-147	1E+2	1E+6
Eu-148	1E+1	1E+6
Eu-149	1E+2	1E+7
Eu-150 (34.2 a)	1E+1	1E+6
Eu-150 (12.6 h)	1E+3	1E+6
Eu-152	1E+1	1E+6
Eu-152m	1E+2	1E+6
Eu-154	1E+1	1E+6
Eu-155	1E+2	1E+7
Eu-156	1E+1	1E+6
Eu-157	1E+2	1E+6
Eu-158	1E+1	1E+5
Gd-145	1E+1	1E+5
Gd-146+	1E+1	1E+6
Gd-147	1E+1	1E+6
Gd-148	1E+1	1E+4
Gd-149	1E+2	1E+6
Gd-151	1E+2	1E+7
Gd-152	1E+1	1E+4
Gd-153	1E+2	1E+7
Gd-159	1E+3	1E+6
Tb-147	1E+1	1E+6
Tb-149	1E+1	1E+6
Tb-150	1E+1	1E+6
Tb-151	1E+1	1E+6
Tb-153	1E+2	1E+7
Tb-154	1E+1	1E+6
Tb-155	1E+2	1E+7
Tb-156	1E+1	1E+6
Tb-156m (24.4 h)	1E+3	1E+7
Tb-156m (5 h)	1E+4	1E+7
Tb-157	1E+4	1E+7
Tb-158	1E+1	1E+6

Tb-160	1E+1	1E+6
Tb-161	1E+3	1E+6
Dy-155	1E+1	1E+6
Dy-157	1E+2	1E+6
Dy-159	1E+3	1E+7
Dy-165	1E+3	1E+6
Dy-166	1E+3	1E+6
Ho-155	1E+2	1E+6
Ho-157	1E+2	1E+6
Ho-159	1E+2	1E+6
Ho-161	1E+2	1E+7
Ho-162	1E+2	1E+7
Ho-162m	1E+1	1E+6
Ho-164	1E+3	1E+6
Ho-164m	1E+3	1E+7
Ho-166	1E+3	1E+5
Ho-166m	1E+1	1E+6
Ho-167	1E+2	1E+6
Er-161	1E+1	1E+6
Er-165	1E+3	1E+7
Er-169	1E+4	1E+7
Er-171	1E+2	1E+6
Er-172	1E+2	1E+6
Tm-162	1E+1	1E+6
Tm-166	1E+1	1E+6
Tm-167	1E+2	1E+6
Tm-170	1E+3	1E+6
Tm-171	1E+4	1E+8
Tm-172	1E+2	1E+6
Tm-173	1E+2	1E+6
Tm-175	1E+1	1E+6
Yb-162	1E+2	1E+7
Yb-166	1E+2	1E+7
Yb-167	1E+2	1E+6
Yb-169	1E+2	1E+7
Yb-175	1E+3	1E+7
Yb-177	1E+2	1E+6

Yb-178	1E+3	1E+6
Lu-169	1E+1	1E+6
Lu-170	1E+1	1E+6
Lu-171	1E+1	1E+6
Lu-172	1E+1	1E+6
Lu-173	1E+2	1E+7
Lu-174	1E+2	1E+7
Lu-174m	1E+2	1E+7
Lu-176	1E+2	1E+6
Lu-176m	1E+3	1E+6
Lu-177	1E+3	1E+7
Lu-177m	1E+1	1E+6
Lu-178	1E+2	1E+5
Lu-178m	1E+1	1E+5
Lu-179	1E+3	1E+6
Hf-170	1E+2	1E+6
Hf-172+	1E+1	1E+6
Hf-173	1E+2	1E+6
Hf-175	1E+2	1E+6
Hf-177m	1E+1	1E+5
Hf-178m	1E+1	1E+6
Hf-179m	1E+1	1E+6
Hf-180m	1E+1	1E+6
Hf-181	1E+1	1E+6
Hf-182	1E+2	1E+6
Hf-182m	1E+1	1E+6
Hf-183	1E+1	1E+6
Hf-184	1E+2	1E+6
Ta-172	1E+1	1E+6
Ta-173	1E+1	1E+6
Ta-174	1E+1	1E+6
Ta-175	1E+1	1E+6
Ta-176	1E+1	1E+6
Ta-177	1E+2	1E+7
Ta-178	1E+1	1E+6
Ta-179	1E+3	1E+7
Ta-180	1E+1	1E+6
Ta-180m	1E+3	1E+7
Ta-182	1E+1	1E+4
Ta-182m	1E+2	1E+6

Ta-183	1E+2	1E+6
Ta-184	1E+1	1E+6
Ta-185	1E+2	1E+5
Ta-186	1E+1	1E+5
W-176	1E+2	1E+6
W-177	1E+1	1E+6
W-178+	1E+1	1E+6
W-179	1E+2	1E+7
W-181	1E+3	1E+7
W-185	1E+4	1E+7
W-187	1E+2	1E+6
W-188+	1E+2	1E+5
Re-177	1E+1	1E+6
Re-178	1E+1	1E+6
Re-181	1E+1	1E+6
Re-182 (64 h)	1E+1	1E+6
Re-182 (12.7 h)	1E+1	1E+6
Re-184	1E+1	1E+6
Re-184m	1E+2	1E+6
Re-186	1E+3	1E+6
Re-186m	1E+3	1E+7
Re-187	1E+6	1E+9
Re-188	1E+2	1E+5
Re-188m	1E+2	1E+7
Re-189+	1E+2	1E+6
Os-180	1E+2	1E+7
Os-181	1E+1	1E+6
Os-182	1E+2	1E+6
Os-185	1E+1	1E+6
Os-189m	1E+4	1E+7
Os-191	1E+2	1E+7
Os-191m	1E+3	1E+7
Os-193	1E+2	1E+6
Os-194+	1E+2	1E+5
Ir-182	1E+1	1E+5
Ir-184	1E+1	1E+6
Ir-185	1E+1	1E+6
Ir-186 (15.8 h)	1E+1	1E+6

Ir-186 (1.75 h)	1E+1	1E+6
Ir-187	1E+2	1E+6
Ir-188	1E+1	1E+6
Ir-189+	1E+2	1E+7
Ir-190	1E+1	1E+6
Ir-190m(3.10 h)	1E+1	1E+6
Ir-190m (1.2 h)	1E+4	1E+7
Ir-192	1E+1	1E+4
Ir-192m	1E+2	1E+7
Ir-193m	1E+4	1E+7
Ir-194	1E+2	1E+5
Ir-194m	1E+1	1E+6
Ir-195	1E+2	1E+6
Ir-195m	1E+2	1E+6
Pt-186	1E+1	1E+6
Pt-188+	1E+1	1E+6
Pt-189	1E+2	1E+6
Pt-191	1E+2	1E+6
Pt-193	1E+4	1E+7
Pt-193m	1E+3	1E+7
Pt-195m	1E+2	1E+6
Pt-197	1E+3	1E+6
Pt-197m	1E+2	1E+6
Pt-199	1E+2	1E+6
Pt-200	1E+2	1E+6
Au-193	1E+2	1E+7
Au-194	1E+1	1E+6
Au-195	1E+2	1E+7
Au-198	1E+2	1E+6
Au-198m	1E+1	1E+6
Au-199	1E+2	1E+6
Au-200	1E+2	1E+5
Au-200m	1E+1	1E+6
Au-201	1E+2	1E+6
Hg-193	1E+2	1E+6
Hg-193m	1E+1	1E+6
Hg-194+	1E+1	1E+6
Hg-195	1E+2	1E+6
Hg-195m+ (organic)	1E+2	1E+6
Hg-195m+ (inorganic)	1E+2	1E+6

Hg-197	1E+2	1E+7
Hg-197m (organic)	1E+2	1E+6
Hg-197m (inorganic)	1E+2	1E+6
Hg-199m	1E+2	1E+6
Hg-203	1E+2	1E+5
Tl-194	1E+1	1E+6
Tl-194m	1E+1	1E+6
Tl-195	1E+1	1E+6
Tl-197	1E+2	1E+6
Tl-198	1E+1	1E+6
Tl-198m	1E+1	1E+6
Tl-199	1E+2	1E+6
Tl-200	1E+1	1E+6
Tl-201	1E+2	1E+6
Tl-202	1E+2	1E+6
Tl-204	1E+4	1E+4
Pb-195m	1E+1	1E+6
Pb-198	1E+2	1E+6
Pb-199	1E+1	1E+6
Pb-200	1E+2	1E+6
Pb-201	1E+1	1E+6
Pb-202	1E+3	1E+6
Pb-202m	1E+1	1E+6
Pb-203	1E+2	1E+6
Pb-205	1E+4	1E+7
Pb-209	1E+5	1E+6
Pb-210+	1E+2	1E+4
Pb-211	1E+2	1E+6
Pb-212+	1E+1	1E+5
Pb-214	1E+2	1E+6
Bi-200	1E+1	1E+6
Bi-201	1E+1	1E+6
Bi-202	1E+1	1E+6
Bi-203	1E+1	1E+6
Bi-205	1E+1	1E+6
Bi-206	1E+1	1E+5
Bi-207	1E+1	1E+6
Bi-210	1E+3	1E+6
Bi-210m+	1E+1	1E+5
Bi-212+	1E+1	1E+5

Bi-213	1E+2	1E+6
Bi-214	1E+1	1E+5
Po-203	1E+1	1E+6
Po-205	1E+1	1E+6
Po-206	1E+1	1E+6
Po-207	1E+1	1E+6
Po-208	1E+1	1E+4
Po-209	1E+1	1E+4
Po-210	1E+2	1E+4
At-207	1E+1	1E+6
At-211	1E+3	1E+7
Fr-222	1E+3	1E+5
Fr-223	1E+2	1E+6
Rn-220+	1E+4	1E+7
Rn-222+	1E+1	1E+8
Ra-223+	1E+2	1E+5
Ra-224+	1E+1	1E+5
Ra-225	1E+2	1E+5
Ra-226+	1	1E+4
Ra-227	1E+2	1E+6
Ra-228+	1	1E+5
Ac-224	1E+2	1E+6
Ac-225+	1E+1	1E+4
Ac-226	1E+2	1E+5
Ac-227+	1	1E+3
Ac-228	1E+1	1E+6
Th-226+	1E+3	1E+7
Th-227	1E+1	1E+4
Th-228+	1	1E+4
Th-229+	1	1E+3
Th-230	1	1E+4
Th-231	1E+3	1E+7
Th-232	1E+1	1E+4
Th-232sec	1	1E+3
Th-234+	1E+3	1E+5

Pa-227	1E+3	1E+6
Pa-228	1E+1	1E+6
Pa-230	1E+1	1E+6
Pa-231	1	1E+3
Pa-232	1E+1	1E+6
Pa-233	1E+2	1E+7
Pa-234	1E+1	1E+6
U-230+	1E+1	1E+5
U-231	1E+2	1E+7
U-232+	1	1E+3
U-233	1E+1	1E+4
U-234	1E+1	1E+4
U-235+	1E+1	1E+4
U-235sec	1	
U-236	1E+1	1E+4
U-237	1E+2	1E+6
U-238+	1E+1	1E+4
U-238 sec	1	1E+3
U-239	1E+2	1E+6
U-240	1E+3	1E+7
U-240+	1E+1	1E+6
Np-232	1E+1	1E+6
Np-233	1E+2	1E+7
Np-234	1E+1	1E+6
Np-235	1E+3	1E+7
Np-236 (1.15 10⁵ a)	1E+2	1E+5
Np-236 (22.5 h)	1E+3	1E+7
Np-237+	1	1E+3
Np-238	1E+2	1E+6
Np-239	1E+2	1E+7
Np-240	1E+1	1E+6
Pu-234	1E+2	1E+7
Pu-235	1E+2	1E+7
Pu-236	1E+1	1E+4
Pu-237	1E+3	1E+7
Pu-238	1	1E+4
Pu-239	1	1E+4
Pu-240	1	1E+3
Pu-241	1E+2	1E+5
Pu-242	1	1E+4
Pu-243	1E+3	1E+7

Pu-244	1	1E+4
Pu-245	1E+2	1E+6
Pu-246	1E+2	1E+6
Am-237	1E+2	1E+6
Am-238	1E+1	1E+6
Am-239	1E+2	1E+6
Am-240	1E+1	1E+6
Am-241	1	1E+4
Am-242	1E+3	1E+6
Am-242m+	1	1E+4
Am-243+	1	1E+3
Am-244	1E+1	1E+6
Am-244m	1E+4	1E+7
Am-245	1E+3	1E+6
Am-246	1E+1	1E+5
Am-246m	1E+1	1E+6
Cm-238	1E+2	1E+7
Cm-240	1E+2	1E+5
Cm-241	1E+2	1E+6
Cm-242	1E+2	1E+5
Cm-243	1	1E+4
Cm-244	1E+1	1E+4
Cm-245	1	1E+3
Cm-246	1	1E+3
Cm-247	1	1E+4
Cm-248	1	1E+3
Cm-249	1E+3	1E+6
Cm-250	E-1	1E+3
Bk-245	1E+2	1E+6
Bk-246	1E+1	1E+6
Bk-247	1	1E+4
Bk-249	1E+3	1E+6
Bk-250	1E+1	1E+6
Cf-244	1E+4	1E+7
Cf-246	1E+3	1E+6
Cf-248	1E+1	1E+4
Cf-249	1	1E+3
Cf-250	1E+1	1E+4

Cf-251	1	1E+3
Cf-252	1E+1	1E+4
Cf-253	1E+2	1E+5
Cf-254	1	1E+3
Es -250	1E+2	1E+6
Es -251	1E+2	1E+7
Es -253	1E+2	1E+5
Es -254	1E+1	1E+4
Es -254m	1E+2	1E+6
Fm-252	1E+3	1E+6
Fm-253	1E+2	1E+6
Fm-254	1E+4	1E+7
Fm-255	1E+3	1E+6
Fm-257	1E+1	1E+5
Md-257	1E+2	1E+7
Md-258	1E+2	1E+5

¹OBT = including organically bound tritium.

² Two different values apply for the activity of Kr-85. The value 1E+10 in this row only applies to summations of consumer items like lamps and starters to which small quantities, maximally 1E+4 Bq of Kr-85 have been added, and for which, during normal use, a dose of 50 mSv on the skin in one calendar year cannot be exceeded.

Annex A with Table 1. List of the nuclides described under point 1 this Appendix that are in secular equilibrium with their daughter nuclides.

(The value in brackets is the reduction fraction for nuclide decay.)

Parent nuclide	Daughter nuclide(s)
Mg 28 +	Al 28
Ti 44 +	Sc 44
Fe 60 +	Co 60m
Ge 68 +	Ga 68
Rb 83 +	Kr 83m
Sr 80 +	Rb 80
Sr 82 +	Rb 82
Sr 90 +	Y 90
Y 87 +	Sr 87m

Zr 93 +	Nb 93m
Zr 97 +	Nb 97
Tc 95m +	Tc 95 (0,04)
Ru 106 +	Rh 106
Ag 108m +	Ag 108 (0,089)
Sn 121m +	Sn 121 (0,776)
Sn 126 +	Sb 126m
Xe 122 +	I 122
Cs 137 +	Ba 137m
Ba 140 +	La 140
Ce 134 +	La 134
Ce 144 +	Pr 144
Gd 146 +	Eu 146
Pm 148m +	Pm 148 (0,046)
Hf 172 +	Lu 172
W 178 +	Ta 178
W 188 +	Re 188
Pt 188 +	Ir 188
Ir 189 +	Os 189m
Re 189 +	Os 189m (0,241)
Os 194 +	Ir 194
Hg 194 +	Au 194
Hg 195m +	Hg 195 (0,542)
Pb 210 +	Bi 210, Po 210
Pb 212 +	Bi 212, Tl 208 (0,36), Po 212 (0,64)
Bi 210m +	Tl 210
Bi 212 +	Tl 208 (0,36), Po 212 (0,64)
Rn 220 +	Po 216
Rn 222 +	Po 218, Pb 214, Bi 214, Po 214
Ra 223 +	Rn 219, Po 215, Pb 211, Bi 211, Tl 207
Ra 224 +	Rn 220, Po 216, Pb 212, Bi 212, Tl 208 (0,36), Po 212 (0,64)
Ra 226 +	Rn 222, Po 218, Pb 214, Bi 214, Po 214, Pb 210, Bi 210, Po 210
Ra 228 +	Ac 228
Ac 225 +	Fr 221, At 217, Bi 213, Po 213 (0 978), Tl 209(0 0216), Pb 209 (0 978)
Ac 227 +	Fr 223(0 0138)
Th 226 +	Ra 222, Rn 218, Po 214
Th 228 +	Ra 224, Rn 220, Po 216, Pb 212, Bi 212, Tl 208 (0,36), Po 212 (0,64)
Th 229 +	Ra 225, Ac 225, Fr 221, At 217, Bi 213, Po 213 (0,978), Pb 209 (0,978)
Th 232sec	Ra 228, Ac 228, Th 228, Ra 224, Rn 220, Po 216, Pb 212, Bi 212, Tl 208 (0,36), Po 212 (0,64)
Th 234 +	Pa 234m
U 230 +	Th 226, Ra 222, Rn 218, Po 214
U 232 +	Th 228, Ra 224, Rn 220, Po 216, Pb 212, Bi 212, Tl 208 (0,36), Po 212 (0,64)

U 235 +	Th 231
U 238 +	Th 234, Pa 234m
U 238sec	Th 234, Pa 234m, U 234, Th 230, Ra 226, Rn 222, Po 218, Pb 214, Bi 214, Po 214, Pb 210, Bi 210, Po 210
U 240 +	Np 240m
Np 237 +	Pa 233
Am 242m +	Am 242
Am 243 +	Np 239

Annex B with Table 1. Radionuclides, for which the activity respectively the concentration of activity of the instable daughter nuclides must be added up to those of the parent nuclide for calculation of the dose

The radionuclides listed in the table below have daughter nuclides with physical half-lives of 10 days or less, that contribute 10% or more to the dose and that have not been included in Annex 1 of Directive 96/29 and, therefore, not in Table 1A either. Nor have these daughter nuclides been calculated in the equilibriums contained in Table 1B. Therefore, they must be included in the summation when calculating doses. In addition, the ratio between the parent nuclide and the daughter nuclide are given by equilibrium.

Parent nuclide	Daughter nuclide	Ratio
Sc-44m	Sc-44	0,986
Zn-72	Ga-72	1
Se-81m	Se-81	1
Br-80m	Br-80	1
Tc-95m	Tc-95	1
Pd-100	Rh-100	1
Cd-117	In-117m	0,92
	In-117	0,5124
Cd-117m	In-117	1
	In-117m	0,01
In-117m	In-117	0,47
Sn-110	In-110 (short half-life)	1
Sn-128	Sb-128	1
Sb-127	Te-127	0,824
Sb-129	Te-129	0,775
Te-116	Sb-116	1
Ce-137m	Ce-137	0,99
Nd-136	Pr-136	1
Nd-139m	Pr-139	1
	Nd-139	0,12

Ho-164m	Ho-164	1
Er-161	Ho-161	1
Yb-166	Tm-166	1
Yb-178	Lu-178	1
Lu-177m	Lu-177	0,21
Os-182	Re-182	
Ir-195m	Ir-195	0,04
Pt-200	Au-200	1
Au-200m	Au-200	0,18
Pb-211	Bi-211	1
	Pb-214	1
	Bi-214	1
	Po-214	1
At-207	Bi-203	0,1
Fr-222	Ra-222	1
Ac-226	Th-226	0,828
	Ra-222	0,828
Pa-227	Ac-223	0,85
	Fr-219	0,85
	At-215	0,85
	Bi-211	0,85
	Tl-207	0,85
Pa-228	Ac-224	0,02
Pu-245	Am-245	1
Pu-246	Am-246	1
Am-240	Np-236	1
Cm-238	Am-238	0,9
Cm-250	Bk-250	0,14

Table 2. Decontrol values for discharge of radionuclides into water and air as a result of operations, in GBq per calendar year

radionuclide	discharge into water GBq/year	discharge into air GBq/year
Pb-210	10	10
Po-210	10	10
Rn-222	-	10000
Ra-223	1000	-
Ra-224	1000	-
Ra-226	10	10

Ra-228	100	1
Ac-227	100	10
Th-227	1000	-
Th-228	1000	1
Th-230	100	1
Th-232	100	1
Th-234	10000	-
Pa-231	10000	0,1
U-234	1000	10
U-235	1000	10
U-238	1000	10

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- [1] [≤](#) See also the definition by the ICRU (1998b), in a separate category.
- [2] [≤](#) International Commission on Radiological Protection, 1990 Recommendations of the ICRP. Publication 60, Annals of the ICRP 21. No. 1-3 (Pergamon Press, Oxford).
- [3] [≤](#) International Commission on Radiological Protection, Conversion Coefficients for use in radiological protection against external radiation. Publication 74, Annals of the ICRP 26 No. 3-4 (Pergamon Press, Oxford).
- [4] [≤](#) International Commission on Radiological Protection, Publication 68 (Annals of the ICRP Vol. 24 No. 4) Dose coefficients for Intakes of Radionuclides by Workers (Pergamon Press, Oxford).
- [5] [≤](#) International Commission on Radiological Protection, Publication 67, (Annals of the ICRP Vol. 23 No. 3/4) Age-dependent Doses to Members of the Public from Intake of Radionuclides: Part 2 (Pergamon Press, Oxford).
- [6] [≤](#) International Commission on Radiological Protection, Conversion Coefficients for use in radiological protection against external radiation. Publication 74, Annals of the ICRP 26 No. 3-4 (Pergamon Press, Oxford).
- [7] [≤](#) Conversion coefficients for use in radiological protection against ionising radiation, ICRU report 57. International Commission on Radiation Units and Measurements (Bethesda, Maryland).