

RADIOACTIVE WASTE AND DISCHARGES FROM UNSEALED SOURCES

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APPENDIX DEFINITIONS

This Guide is valid as of 1 February 2017 until further notice.

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Authorization

The Radiation Act stipulates that the party running a radiation practice is responsible for the safety of the operations. The responsible party is obliged to ensure that the level of safety specified in the ST Guides is attained and maintained.

Under section 70, paragraph 2, of the Radiation Act (592/1991), STUK – Radiation and Nuclear Safety Authority (Finland) issues general instructions, known as Radiation Safety Guides (ST Guides), concerning the use of radiation and operations involving radiation.

Translation. In the event of any differences in interpretation of this guide, the Finnish and Swedish versions shall take precedence over this translation.

1 General

This guide presents radiation safety requirements and activity limits concerning the treatment of radioactive waste originating from the use of unsealed sources, which must be observed when discharging small quantities of radioactive substances into air or the sewer system, and when delivering waste to a waste incineration plant, landfill or to be processed as hazardous waste (later in this guide treatment or management in general).

Waste is not deemed radioactive waste when it is disposed of or delivered for treatment in accordance with the activity limits and procedures specified in items 3.1–3.3 of this guide.

This guide concerns neither natural radioactive substances nor radioactive waste generated as a result of the use of nuclear energy or the utilisation of natural resources.

This guide does not concern the decommissioning of sealed sources.

The definitions concerning this guide are provided in Appendix.

More detailed instructions about the decommissioning of sealed sources are given in Guide ST 5.1.

2 The treatment of radioactive waste is subject to a plan

The party running a radiation practice (hereinafter referred to as the “responsible party”) must take into account radioactive waste management and procedures concerning the restriction of discharges as early as when planning its operations.

The responsible party must prepare a written plan for the management of radioactive waste, describing the radioactive waste and discharges generated in its operations and the procedures pertaining to their treatment. The plan must be kept up-to-date.

The procedure by which radioactive waste is rendered harmless is selected on the basis of the waste’s quality, activity and on the properties

of the radionuclides in the waste, such as their half-life and type of radiation. The starting point is the effective prevention of the dispersion of radioactive substances into the environment and waste ending up in the wrong hands.

Furthermore, the waste management must observe the provisions of environmental, water and air protection legislation and waste legislation, as well as legislation governing the transport of dangerous goods.

3 The Radiation and Nuclear Safety Authority lays down activity limits for discharges

If low discharges into air, the sewer system or otherwise into the environment of radioactive substances originating from the use of unsealed sources cannot be prevented, the responsible party must particularly ensure that the volumes of the substances discharged are kept as low as is practically possible, and below the activity limits laid down by the Radiation and Nuclear Safety Authority (STUK). The responsible party may also propose other means of disposal for STUK’s approval, provided that the responsible party is able to prove that the effective dose caused to a representative person by the operations is less than 10 μSv a year.

The effective dose for a representative person engaged in the treatment of radioactive waste may not exceed 10 μSv per year. This condition is deemed to have been met when the activity limits presented in STUK decision 4/3020/2014 are observed in the management of radioactive waste. The activity limits given in items 3.1–3.3 will accord with the aforementioned decision.

The dose constraint of 10 μSv per year mentioned above is applied separately to discharges of gaseous and liquid radioactive substances and to waste delivered for treatment.

In individual cases, STUK may, at the request of the responsible party or on its own initiative, set activity limits that deviate from the aforementioned decision.

STUK may issue special regulations concerning, for example, the measurement

of discharges, monitoring of environmental radioactivity and the external dose rate, intervals between the performance of monitoring measurements, as well as reporting to STUK for the assessment of radiation doses for members of the public and a representative person.

STUK's authorisation to lay down activity limits for low volumes of radioactive substances discharged into air, the sewer system or otherwise into the environment is provided in section 23 of the Radiation Decree (1512/1991). The activity limits are given in STUK's decision 4/3020/2014.

The responsible party's obligation to ensure that the volumes of discharged substances remain below the activity limits laid down by STUK, and as low as is practically possible, is provided in section 23 of the Radiation Decree (1512/1991).

The requirement concerning the responsible party's obligation to perform monitoring measurements of discharges is set out in Guide ST 1.6.

3.1 Discharges into the sewer network

The activity limits for radioactive substances discharged into the sewer network are as follows:

- The activity discharged into the sewer system from one place of use of radiation at one time may be at most equal to the exemption value for each radionuclide, but no larger than 100 MBq.
- The activity discharged into the sewer system from one place of use of radiation over one month may be at most 10 times the exemption value set for each radionuclide. However, the activity discharged into the sewer system over the course of one year must not exceed 100 GBq.

If the responsible party discharges several different radionuclides into the sewer system, the total activity must meet the following condition in terms of single discharges

$$\sum_k \frac{A_k}{A_{E,k}} \leq 1 \quad (1)$$

and the following condition for monthly discharges

$$\sum_k \frac{A_k}{A_{E,k}} \leq 10 \quad (2)$$

In the formulae, A_k stands for the activity of radionuclide k and $A_{E,k}$ for the exemption value of said radionuclide k .

Whenever a radioactive substance has been discharged into the sewer system, the basin and drain must be flushed with plenty of water.

The activity limits given above do not apply to the secretions of patients who have received a radioactive substance in medical radiation treatment.

The exemption values for radioactive substances are presented in STUK's decision 5/3020/2013.

3.2 Delivering waste for treatment

A responsible party may deliver waste for treatment on the conditions given below. Such waste can be treated as waste or hazardous waste pursuant to the Waste Act.

- The activity contained in a single waste package may be at most equal to the exemption value for each radionuclide, but no larger than 100 MBq.
- The activity of waste delivered for treatment from one place of use of radiation over the course of one month may be at most 10 times the exemption value set for each radionuclide. However, the activity of waste delivered for treatment over the course of one year must not exceed 100 GBq.

If the waste contains several different radionuclides, the total activity in the waste must meet condition (1), set out in item 3.1, for one waste package and condition (2), set out in item 3.1, for waste that is delivered for disposal within one month.

When delivering radioactive waste to landfill, the waste's suitability for the purpose must be ensured prior to the delivery. In terms of its radioactivity, waste is suitable for landfill as long as the aforementioned activity limits are not exceeded.

The packing and labelling of waste delivered for treatment must take into account the

requirements of waste legislation. This means that any markings of radioactivity must be removed from the waste packages.

Clearance levels may be applied to the re-use, recycling and disposal of solid radioactive material as waste. Radioactive material means a solid material that contains a radioactive substance or has been contaminated by a radioactive substance.

Further information on the determination of waste's suitability for a landfill is available in the Government Decree on Landfills (331/2013) and the guide "Classification of waste as hazardous waste" published by the Ministry of the Environment (2016).

The Government Decree on Waste (179/2012) contains more detailed provisions on the packing and labelling of non-hazardous and hazardous waste.

The clearance levels for radioactive materials are provided in STUK's decision 4/3020/2013, and instructions on their application in Guide ST 1.5.

3.3 Discharges into air

When radioactive substances are discharged into outdoor air, the discharges must be limited in such a way that the effective dose caused to a representative person does not exceed 10 μSv a year.

If practices result in discharges into outdoor air, the responsible party must assess the effective dose caused to a representative person over the course of a year. The assessment must take into account both internal and external radiation exposure. The methods used in the calculation must be documented, suitable and proven reliable. The results of the assessment and specifications on the calculation methods used must be delivered to STUK before the practices begin or are significantly expanded with the introduction of new radionuclides, for example.

3.4 Delivery of radioactive waste to a recognised installation

Radioactive waste that cannot be disposed of with the methods mentioned in items 3.1 and 3.2 must be delivered to a recognised installation.

Radioactive waste that contain long-term radionuclides that cannot be rendered harmless

through ageing within a reasonable period of time (approximately 2 years) must be delivered to a recognised installation.

Radioactive waste with an activity high enough to necessitate delivery to a recognised installation must be kept separate from waste that can be discharged into the sewer network or delivered to waste management.

4 The treatment of radioactive waste is subject to instructions

The responsible party must prepare written instructions on the treatment of radioactive waste. The sorting of radioactive waste must be started in the laboratory already.

The amounts of radioactive substances discharged into the environment must be kept as low as practically possible. The ageing of waste containing short-term radionuclides (with a half-life of less than 100 days) and the filtering or recovery of exhaust air is always advisable.

In addition to radioactivity, the treatment of the waste must take into account the physical, chemical and biological properties of the waste, such as chemical toxicity and the risk of microbial infection.

When the radioactive waste is treated at the place of use of radiation, the waste package must be furnished with the following indications:

- a label warning about ionising radiation
- radionuclides and their activities
- the dates on which the activity was ascertained and by whom it was ascertained
- the chemical and physical form of the substance
- the origin of the waste package.

Regarding unsealed sources, the waste package must also indicate the total volume or activity concentration (e.g. activity per volume element).

Radioactive waste should not be stored in laboratories needlessly; rather, it should be moved to a special storage for radioactive waste.

Radioactive substances that are no longer needed constitute radioactive waste that should

not be stored in the place of use of radiation unnecessarily.

5 Radioactive waste is subject to up-to-date record keeping

A record must be kept of all radioactive waste in storage.

A record must also be kept of any radionuclides discharged into the sewer network or air and delivered to waste treatment and activity thereof.

Literature

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APPENDIX

DEFINITIONS

Unsealed source

Radiation sources that are not sealed sources.

Representative person

An individual in the population group most exposed to a certain radiation source whose dose is representative for individuals in this group.

Additional information: The formerly used term was “average member of the critical group”. The term “representative person” is defined in the ICRP Publication 101.

Effective dose

Sum of the equivalent doses H_T , multiplied by the tissue weighting factors w_T :

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

The unit of effective dose is the sievert (Sv).

Additional information: The effective dose is mainly used to assess stochastic harmful effects of radiation on human health. The term “equivalent dose” is defined in Guide ST 7.2.

Radioactive waste

Radioactive substances and equipment, goods and materials contaminated by radioactive substances for which there is no use and which must therefore be rendered harmless. A radioactive substance or a radiation appliance containing a radioactive substance for which an owner cannot be found is also deemed radioactive waste.

Radioactive material

Solid matter containing a radioactive substance or contaminated by a radioactive substance.

Rendering radioactive waste harmless

All measures necessary to treat, isolate, emplace or restrict the use of waste in such a way that it will not result in detrimental effects to health or the environment.

Recognised installation

An enterprise registered in Finland or other responsible party whose field of activity includes rendering radioactive waste harmless and has a safety licence for this operation.

Sealed source

A radioactive source wherein the radioactive substance is permanently enclosed inside a capsule or in a solid form; the purpose is to prevent the spreading of radioactive material under normal conditions of use.

Hazardous waste

Any waste with properties that render it flammable or explosive, infectious, or hazardous to human health or the environment in other ways, or with other corresponding properties.

Additional information: The term “hazardous waste” is defined in the Waste Act (646/2011).

Exemption value

A value, expressed as the activity or activity concentration of a radioactive substance, defining the threshold below which no safety licence or notification is required.

Clearance level

A value, expressed as the activity concentration of solid radioactive materials resulting as by-products from practices subject to the safety licence or notification obligation, below which the final disposal, recycling or reuse of a material is exempt from all regulatory control and requires no approval from STUK.