

Pursuant to Article 26-e, paragraph 1, item 17 of the Law on Ionising Radiation Protection and Radiation Safety (Official Gazette of the Republic of Macedonia No. 48/02 and 135/07), the Director of the Radiation Safety Directorate hereby adopts a

**RULEBOOK
ON THE MANNER OF TRANSPORTING RADIOACTIVE AND NUCLEAR
MATERIAL**

Article 1

This Rulebook shall prescribe the manner of transporting radioactive and nuclear material.

Article 2

Certain terms used in this Rulebook shall have the following meaning:

1. "Transport of radioactive and nuclear material" shall be the transport of radioactive and nuclear material;
2. "A1" shall be the value of the activity of a special form of radioactive material and it shall be used to determine activity limits;
3. "A2" shall be the value of the activity of radioactive material other than a special form of radioactive material and it shall be used to determine activity limits;
4. "Packing" shall be a set of one or more boxes and other components or materials necessary for the boxes to retain their radioactive content and to provide other safety functions;
5. "Package" shall be the final product of the packaging procedure consisting of the packaging and its content ready for transport;
6. "Additional package" shall be a closed wrapping containing one or more packages and representing a whole whose purpose is to facilitate handling and loading for transport;
7. "Bulk container" shall be part of the transport equipment intended to facilitate the transport of packaged or unpackaged goods in types of transport which do not include reloading, which is continuously sealed, hard and sufficiently solid for reuse and accompanied by devices that facilitate handling, in particular in transfer from one means or type of transport to another. A small bulk container shall be a container with external dimensions smaller than or equal to 1,5m or an internal volume smaller than or equal to 3m³. Any other bulk container shall be considered a large bulk container;
8. "Intermediate bulk container" shall be a movable packaging with a capacity smaller than or equal to 3m³, designed for mechanical handling, resistant to physical impact caused by handling and transport and designed in accordance with the construction recommendations of the United Nations concerning the transport of dangerous goods;
9. "Consignment" shall be a package, packages or a load of radioactive material intended for transport;
10. "Unfixed contamination" shall be contamination that may be removed from the surface in normal transport conditions;
11. "Fixed contamination" shall be any contamination other than unfixed contamination;

12. "Design" shall be the description of a special form of radioactive material, low-dispersing radioactive material, package or packaging enabling its full identification (e.g. specifications, engineers' drafts, reports etc.);
13. "Fissile material" shall be material containing fissile nuclides (uranium-233, uranium-235, plutonium-239, plutonium-241), with the exception of natural or depleted non-irradiated uranium and natural or depleted uranium irradiated solely in thermal reactors;
14. "Low-dispersion radioactive material" shall be solid radioactive material or solid radioactive material in a sealed capsule with limited dispersion and in a non-powdered form;
15. "Low specific activity or LSA material" shall be radioactive material that by its nature has limited specific activity or radioactive material to which the limits of the assessed intermediate specific activity apply, without taking into consideration the external protective materials of this material, which is subdivided into:
 1. LSA-I material:
 - ores and ore concentrates of uranium and thorium, as well as other ores containing natural radionuclides intended to be processed in order to use the radionuclides;
 - natural and depleted uranium, natural thorium and their components or mixtures, non-irradiated and in solid or liquid form;
 - radioactive material whose A_2 value is unlimited, with the exception of non-exempt fissile material; or
 - other radioactive material whose activity is thoroughly distributed and whose assessed intermediate specific activity does not exceed by 30 times the activity concentration values established in Appendix 1, which is a constituent part of this Rulebook, with the exception of non-exempt fissile material.
 2. LSA-II material:
 - water with tritium concentration up to 0,8 TBq/l or
 - other material whose activity is thoroughly distributed and whose assessed intermediate specific activity does not exceed $10^{-4} \cdot A_2 / \text{g}$ for solid bodies and gases and $10^{-5} \cdot A_2 / \text{g}$ for liquids.
 3. LSA-III material:

Solid bodies (e.g. solid waste, materials subject to activation), with the exception of powdered materials in which:

 - the radioactive material is thoroughly distributed in the solid body or group of solid bodies or it is thoroughly distributed in the solid compactly bound material (e.g. concrete, bitumen, ceramics, etc.);
 - the radioactive material is relatively insoluble or internally contained in a relatively insoluble matrix, in a manner that even in case of packing loss, the leakage per package that has been in water for 7 days does not exceed $0,1 \cdot A_2$; and
 - the assessed intermediate specific activity of the solid body, with the exception of the protected material, does not exceed $2 \cdot 10^{-3} \cdot A_2 / \text{g}$;
16. "Low toxicity alpha emitters" shall be natural uranium, depleted uranium, natural thorium, uranium-235 or uranium-238, thorium-232, thorium-228 and

- thorium-230 contained in ores or physical and chemical concentrates, or alpha emitters with a half-life shorter than 10 days;
17. "Radioactive content" shall be radioactive material along with each contaminated solid body or each solid body subjected to an activation process, any liquids and gases in the packing;
 18. "Special form of radioactive material" shall be non-dispersing solid radioactive material or radioactive material sealed in a capsule;
 19. "Surface contaminated object or SCO" shall be a solid object which is not radioactive in itself, but whose surface is contaminated with radioactive material; it is subdivided into:
 1. SCO-I: Solid object whose:
 - unfixed contamination of the accessible surface mediated over 300 cm^2 (or along the surface area, if it is smaller than 300cm^2) does not exceed the value of 4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters or $0,4\text{ Bq/cm}^2$ for all other alpha emitters;
 - fixed contamination of the accessible surface mediated over 300 cm^2 (or along the surface area, if it is smaller than 300cm^2) does not exceed the value of $4\cdot 10^4\text{ Bq/cm}^2$ for beta and gamma emitters and low toxicity alpha emitters or $4\cdot 10^3\text{ Bq/cm}^2$ for all other alpha emitters; and
 - unfixed and fixed contamination of the inaccessible surface mediated over 300 cm^2 (or along the surface area, if it is smaller than 300cm^2) do not exceed the value of $4\cdot 10^4\text{ Bq/cm}^2$ for beta and gamma emitters and low toxicity alpha emitters or $4\cdot 10^3\text{ Bq/cm}^2$ for all other alpha emitters.
 2. SCO-II: Solid object whose fixed or unfixed surface contamination does not exceed the limits established for SCO-I and whose:
 - unfixed contamination of the accessible surface mediated over 300 cm^2 (or along the surface area, if it is smaller than 300 cm^2) does not exceed the value of 400 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters or 40 Bq/cm^2 for all other alpha emitters;
 - fixed contamination of the accessible surface mediated over 300 cm^2 (or along the surface area, if it is smaller than 300cm^2) does not exceed the value of $8\cdot 10^5\text{ Bq/cm}^2$ for beta and gamma emitters and low toxicity alpha emitters or $8\cdot 10^4\text{ Bq/cm}^2$ for all other alpha emitters; and
 - unfixed and fixed contamination of the inaccessible surface mediated over 300 cm^2 (or along the surface area, if it is smaller than 300cm^2) do not exceed the value of $8\cdot 10^5\text{ Bq/cm}^2$ for beta and gamma emitters and low toxicity alpha emitters or $8\cdot 10^4\text{ Bq/cm}^2$ for all other alpha emitters;
 20. "Transport index (TI) of the package, additional package or bulk container or of the unpackaged LSA-I material or SCO-I" shall be a number used for providing control over the exposure to ionising radiation;
 21. "Critical safety index of the package, additional package or bulk container containing fissile material or CSI" shall be a number used to provide control over the accumulation of packages, additional packages or bulk container containing fissile material;

22. "Non-irradiated uranium" shall be uranium containing less than $2 \cdot 10^3$ Bq of plutonium per gram of uranium-235, less than $9 \cdot 10^6$ Bq of fissile products per gram of uranium-235 and less than $5 \cdot 10^{-3}$ g of uranium-236 per gram of uranium-235;
23. "Natural uranium" shall be uranium that is chemically separable and that contains the same isotopic ratio as found in nature (approximately 99,28% uranium-238 and 0,72% uranium-235 by weight);
24. "Depleted uranium" shall be uranium with a lower content of uranium-235 by weight than natural uranium; and
25. "Enriched uranium" shall be uranium with a uranium-235 content greater than 0,72%.

Article 3

The provisions of this Rulebook shall apply to the transport of radioactive material when the total activity exceeds the activity limits of a special form of radioactive material and of radioactive material other than a special form of radioactive material, as given in Appendix 1 of this Rulebook.

Article 4

The provisions of this Rulebook shall not apply to the transport of:

- radioactive material which is a constituent part of transport vehicles;
- radioactive material transported within a legal entity performing an activity with sources of ionising radiation without using public roads or railroads;
- radioactive material which is implanted or incorporated in a human being or a live animal for diagnostic or therapeutic purposes;
- radioactive material in general use objects;
- natural material and ores containing natural radionuclides which are in their natural state or processed for purposes other than radionuclide extraction and which are not to be processed in order to use these radionuclides, thereby providing that the activity of the material does not exceed 10 times larger values from those given in Appendix 1 of this Rulebook; and
- non-radioactive solid objects with radioactive substances present on any surface in amounts not exceeding 0,4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters or 0,4 Bq/cm² for all other alpha emitters.

Article 5

During transport, the radioactive and nuclear material shall be placed at as great a distance as possible from any persons involved in the transport, depending on the type of vehicle intended for transport and taking into consideration the principle of optimisation of ionising radiation exposure.

Article 6

The following packages shall be used for the transport of radioactive material:

- Exempt package;
- Industrial Type 1 package (Type IP-1);
- Industrial Type 2 package (Type IP-2);
- Industrial Type 3 package (Type IP-3);
- Type A package;
- Type B(U) package;

- Type B(M) package; and
- Type C package.

The packages referred to in paragraph 1 of this Article shall have UN numbers depending on the activity level of the radionuclides contained in the packages, the fissile or non-fissile characteristics of radionuclides, the type of package, the nature or form of the package content, etc.

The UN numbers referred to in paragraph 2 of this Article shall be given in Appendix 2, which is a constituent part of this Rulebook.

Article 7

During transport, the package shall not contain other parts than those which are necessary for using the radioactive material being transported, in a manner that the mutual action of those parts and the package does not jeopardise the safety of the package.

Article 8

Packaging, including intermediate bulk containers and tanks used for transport of radioactive material, shall not be used for storage or transport of other goods unless decontamination is performed below the level of 0,4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters and 0,04 Bq/cm² for all other alpha emitters.

Article 9

Consignments with radioactive content shall be separated from other dangerous substances during transport.

Article 10

The unfixed contamination of the external surface of each package shall be at lowest possible level and in normal transport conditions it shall not exceed the following limits:

- 4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters; and
- 0,4 Bq/cm² for all other alpha emitters.

The limits referred to in paragraph 1 of this Article shall apply to the activity concentration distributed over each area of 300 cm² of each part of the package surface.

Article 11

The unfixed contamination level of the internal and external surface of the packages, bulk containers, tanks, intermediate bulk containers and transport vehicles shall not exceed the limits established in Article 10 of this Rulebook.

Article 12

If the package is or is considered to be damaged and/or leaking, access thereto shall be restricted and an assessment shall be made, as soon as possible, of the degree of contamination and the level of radiation resulting from the damage or leakage of the package.

In the assessment referred to in paragraph 1 of this Article, the package, the transport vehicle, the adjusted loading and unloading sites and, if necessary, any other materials being transported in the transport vehicle shall be taken into consideration.

Article 13

Damaged packages letting through radioactive content above the limits prescribed in normal transport conditions may be removed at supervised locations, but transport shall not be resumed until they are sanitised and decontaminated.

Article 14

The transport vehicle and equipment used during the transport of radioactive material shall be regularly checked in order to determine the level of contamination, depending on the probability of contamination and the scope of the transport of radioactive material.

Article 15

Each transport vehicle, equipment or parts thereof that are contaminated above the limits established in Article 10 of this Rulebook and whose dose rate resulting from the fixed contamination of the surface exceeds 5 $\mu\text{Sv/h}$ shall be decontaminated and shall not be used as long as the unfixed contamination exceeds the limits established in Article 10 of this Rulebook and until the dose rate resulting from the fixed contamination is below 5 $\mu\text{Sv/h}$ on the surface after decontamination.

Article 16

The dose rate at any point on the external surface of an exempt package shall not exceed the value of 5 $\mu\text{Sv/h}$.

Article 17

In a single package of types IP-1, IP-2, IP-3 or an object or a set of objects, the amount of LSA material or SCO shall be restricted in a manner that the external dose rate at a distance of 3m from the unprotected material, object or set of objects does not exceed the value of 10mSv/h.

Article 18

For each package, additional package, bulk container or unpackaged LSA-I material or SCO-I, the transport index (TI) of the package, additional package, bulk container or unpackaged LSA-I material or SCO-I shall be calculated.

The manner of calculation of the transport index (TI) referred to in paragraph 1 of this Article shall be given in Appendix 3, which is a constituent part of this Rulebook.

Article 19

The transport index of each package or additional package shall not exceed the value of 10.

Article 20

The maximum dose rate at any point on the external surface of the package or additional package intended for transport or storage shall not exceed 2mSv/h.

Article 21

The packages and additional packages are subsumed into the categories I-WHITE, II-YELLOW or III-YELLOW.

The classification criteria for the categories referred to in paragraph 1 of this Article shall be given in Appendix 4, which is a constituent part of this Rulebook.

Article 22

Each package shall be clearly and permanently marked on its external part with the identification of either the consignor or the consignee, or of both the consignor and the consignee.

Article 23

Each package and additional package shall be clearly and permanently marked on its external part with a UN mark, the additional package being clearly and permanently marked with the word “ADDITIONAL PACKAGE”.

Article 24

On the external part of the packing of each package with a total mass greater than 50 kg, the package total mass shall also be indicated.

Article 25

Each package corresponding to an IP-1, IP-2 or IP-3 design shall be clearly and permanently marked on the external part of the packing with the wording “Type IP-1”, “Type IP-2” or “Type IP-3” appropriately.

Each package corresponding to the Type A package shall be clearly and permanently marked on the external part of the packing with the wording “Type A”.

Each package of types IP-2, IP-3 or Type A shall be clearly and permanently marked on the external part of the packing with the international registration code of the transport vehicle (VRI code).

Each package corresponding to a design of Type B(U), Type B(M) or Type C shall be clearly and permanently marked on the external part of the packing with the wording “Type B(U)“, “Type B(M)“ or “Type C“ appropriately, as well as with the marking symbol given in Appendix 5, which is a constituent part of this Rulebook.

Article 26

Each package, additional package and bulk container shall be marked with the labels given in Appendix 6, which is a constituent part of this Rulebook.

All labels not referring to the content of the package, additional package and bulk container shall be removed or covered.

The labels referred to in paragraph 1 of this Article shall be placed on two opposite sides of the external part of the package or the additional package, or on the external part of all four sides of the bulk container or tank, and they shall contain the following information, as appropriate: radionuclides, LSA material, SCO, maximum activity, mass of fissile material, transport index and critical safety index.

Article 27

Large bulk containers transporting packages other than exempt packages and tanks shall be marked on all four side areas of the container or tank with the sign given in Appendix 7, which is a constituent part of this Rulebook, placed in a vertical position.

All marking signs not indicating the content shall be removed.

Instead of the simultaneous usage of labels and the marking sign, the labels referred to in Article 26 of this Rulebook may be used, but with dimensions smaller than the minimum dimensions established in paragraph 1 of this Article.

Article 28

When the consignment in the bulk container or tank is unpackaged LSA-I or SCO-I, or when the consignment is packed radioactive material with a unique UN

number, the corresponding UN number of the consignment shall be marked with black signs not smaller than 65 mm at the height of the lower half of the sign referred to in Article 27 of this Rulebook on a white background, or on a sign for separate display of the UN number given in Appendix 8, which is a constituent part of this Rulebook, and it shall be placed next to the principal sign referred to in Article 27 of this Rulebook, on all four sides of the bulk container or tank.

Article 29

The transport of:

- packages of type C containing radioactive material with an activity greater than $3000 \cdot A_1$ or $3000 \cdot A_2$ depending on the consignment, or 1000 TBq, taking the lower value;
- packages of type B(U) containing radioactive material with an activity greater than $3000 \cdot A_1$ or $3000 \cdot A_2$ depending on the consignment, or 1000 TBq, taking the lower value; and
- packages of type B(M),

shall be declared before commencing transport.

Article 30

Packages, additional packages and bulk containers containing radioactive materials and unpackaged radioactive materials during transport and storage shall be separated from:

- workers in the operation zone where they are at a distance calculated by using the dose limit of 5 mSv per year;
- individuals from the critical population group in areas accessible to the general public at distances calculated by using the dose limit of 1 mSv per year;
- an undeveloped photographic film at a distance calculated by using the criterion for radiation exposure of an undeveloped photographic film during the transport of radioactive material of 0,1 mSv per package for each film; and
- other dangerous goods, in accordance with the regulations on transport of dangerous goods.

Article 31

Consignments shall be safely placed during transport.

Article 32

If the intermediate surface heat flux does not exceed 15 W/m² and the load in the immediate vicinity is not in packs or bags, the package or the additional package may be transported and stored along with the other load.

Article 33

When loading bulk containers and accumulating packages, additional packages and bulk containers:

1. The sum of the transport indexes of the total number of packages, additional packages and bulk containers in the transport vehicle, except for consignments of LSA-I material, shall not exceed the limits established for the transport index of bulk containers and transport vehicles, given in Appendix 9, which is a constituent part of this Rulebook; and

2. The radiation level in normal transport conditions shall not exceed 2 mSv/h at any point on the external surface of the transport vehicle and 0,1 mSv/h at a distance of 2m from the external surface of the transport vehicle.

Article 34

Vehicles used for transport of packages, additional packages or bulk containers shall carry the label given in Appendix 6 of this Rulebook on each of:

- the two external sides in the case of a railroad vehicles; and
- the two external sides and the back side in the case of road vehicles.

The transport vehicle lacking external sides shall carry the labels attached directly to the load in a manner that their visibility is ensured.

For large tanks or bulk containers, the labels on the tanks or bulk containers shall be sufficient.

For vehicles lacking sufficient space for attaching large labels, label dimensions may be reduced up to 100 mm, in accordance with the dimensions given in Appendix 6 of this Rulebook.

Article 35

During the transport of packages, additional packages or bulk containers of categories II-YELLOW or III-YELLOW, only the driver and co-driver shall be present in the vehicle.

Article 36

An exempt package whose radioactive content activity does not exceed one tenth of the limits given in Appendix 10, which is a constituent part of this Rulebook, may be also transported through the postal network.

For international transport through the postal network, the consignment shall:

- be delivered by authorised consignors;
- be shipped by the closest route (plane);
- be clearly and permanently marked on the external part with the wording "RADIOACTIVE MATERIAL – AMOUNTS PERMITTED TO BE SENT BY MAIL";
- contain the name and address of the consignor on its external surface; and
- contain the name and address of the consignor and the content of the consignment on its internal packing.

Article 37

The design of the package intended for transport shall fulfil the following conditions:

1. The package shall have a mass, volume and shape ensuring easy and safe transport and it shall be properly secured in or on the transport vehicle during the transport;
2. Any accessory devices for lifting the package shall not fail during their usage;
3. The accessories and all other characteristics of the external package surface that might be used in lifting shall be able to carry the weight or shall be removed or disabled during transport;
4. The external layer of the package shall not accumulate and hold water;
5. Package accessories which are not parts thereof shall not jeopardise its safety during transport;

6. The package shall endure the effects of any acceleration, vibration or vibratory resonance that might occur in normal transport conditions;
7. Ambient temperatures and pressures that might occur in normal transport conditions shall be taken into account; and
8. Any hazardous characteristics of certain radioactive material shall be taken into account.

Article 38

The packing design shall fulfil the following requirements:

1. The external sides of the packing shall have no jutting parts and they shall enable the performance of decontamination;
2. Packing materials and each component or structure shall be physically and chemically compatible with each other and with the radioactive content, taking into consideration their behaviour during radiation; and
3. All valves letting through radioactive content shall be protected against damage and uncontrolled opening.

Article 39

This Rulebook shall enter into force on the eighth day from the date of its publication in the Official Gazette of the Republic of Macedonia.

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Skopje

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