Decree of the Nuclear Regulatory Authority of the Slovak Republic No. 57/2006 Coll. as amended by Decree No. 105/2016 Coll. laying down details of the requirements for the transportation of radioactive materials (consolidated version)

The Nuclear Regulatory Authority of the Slovak Republic (herein referred to as the "Authority") Pursuant to Section 15 (4) and (14) of the Act No. 541/2004 Coll. on the peaceful use of nuclear energy (the Atomic Act) and on the amendment and supplementation to certain Acts (herein referred to as the "Act") lays down as follows

Section 1

Object

(1) This Decree shall govern
   a) procedures and methods for road, rail, water and air transportation of radioactive materials,
   b) details of the safety documentation required for the issue of authorisation for the transportation of radioactive materials pursuant to Annex 2 (A) of the Act,
   c) requirements for the provision of physical protection for the transportation of radioactive materials,
   d) scope and content of the documentation required for the issue of decisions for the approval of package design of the means of transport.

(2) With regard to activity limits and material restrictions, this Decree shall relate to the following types of transportation equipment and their radioactive content (herein referred to as "package")
   a) normal package,
   b) type 1 industrial package (hereinafter "IP-1"),
   c) type 2 industrial package (hereinafter "IP-2"),
   d) type 3 industrial package (hereinafter "IP-3"),
   e) type A package,
   f) type B(U) package,
   g) type B(M) package,
   h) type C package.

(3) The provisions of the Decree governing the procedures and methods for the transportation of radioactive materials shall also relate to the transportation of institutional radioactive waste from the point of processing and treatment or from the point of storage following processing and treatment to the point of disposal.

Section 2
Definitions

For the purposes of this decree,
   a) transport equipment shall mean packaging or transport facilities for the transportation of unpackaged radioactive material,
   b) packaging shall mean a set of components intended for the complete enclosure of the radioactive content, which may comprise one or more receptacles, absorption materials,

spacers, screening and service equipment for filling, emptying, ventilating or adjusting the pressure, equipment for cooling, absorbing mechanical shocks, handling and fastening and thermal screening; a packaging may be a chest, drum or similar receptacle, and also a freight container or tank,

c) freight container shall mean equipment facilitating the transportation of packaged or unpackaged radioactive material using one or more methods without transhipment, which shall be suitable for permanent closure, strong and adequately resistant to repeated usage and be fitted with equipment for handling it, in particular for transhipment between means of transport and from one type of transportation to another type of transportation; a small freight container shall mean a container with overall external dimensions of no more than 1.5 m or with an internal volume of no more than 3.0 m^3, other freight containers shall be large freight containers,
d) Low dispersible radioactive material shall mean either a solid radioactive material or a solid radioactive material in a sealed capsule that has limited dispersibility and is not in powder form.
e) highly dispersible radioactive material is a radioactive substance or radioactive waste in powder or other similar form that facilitates its easy dispersion; highly dispersible radioactive materials are those that fail defined tests pursuant to Annex 1, part I(2);
f) a transport control center is a facility with non-stop operation during transport that enables the constant monitoring of the consignment and coordination of all activities to prevent and manage incidents during transport related to a breach of the physical protection of transported radioactive material.

Section 3
Liability for transportation

(1) Authorisation holder for transport shall be liable for all the safety aspects of the transport. Arrangements for the transportation of radioactive waste or spent nuclear fuel must clearly and unambiguously specify liability for radioactive waste or spent nuclear fuel among the originator, shipper, recipient or any other natural or corporate person participating in transport.

(2) Authorisation holders for the transportation of radioactive materials shall
   a) inform the Authority
      1. of each planned transportation of nuclear materials, including the type and quantity, at least six weeks prior to the planned time of transportation,
      2. of the exact time of transportation at least five working days in advance,
      3. of all defects or damage to a package or empty packaging, of all escapes of radioactive material from a package or packages or of radioactive material handed over to the shipper for transportation (hereinafter "consignment") and also of any attempt to disrupt transportation or steal radioactive material from a consignment immediately,
   b) send the Authority a written report, assessing the transportation undertaken within 14 days of completion.

(3) Authorisation holders for the transportation radioactive materials shall ensure that the requirements pursuant to Annex 1 are fulfilled.

Section 4
Safety documentation

(1) Safety documentation pursuant to Annex 2 (A) (e) of the Act shall include
   a) radiation protection programme, as laid down by special legislation,[1])
   b) transport plan, including emergency transport plan,[2])
   c) transportation quality management system documentation,
   d) a plan for the provision of physical protection.

(2) Transport rules shall include in particular
   a) properties of the package and technical parameters of the means of transport,
   b) selection of transport route and substitute transport route,
   c) method of travel of the means of transport along a selected transport route,
   d) functions and obligations of the people accompanying a consignment and distribution of their responsibilities for the entire transportation,
   e) method of communication between people undertaking transport, representatives of the carrier and physical protection of the consignment or other people accompanying a consignment,
   f) procedure for the hand-over and acceptance of a consignment,
   g) information on the bodies monitoring the provision and progress of transportation.

(3) Transportation quality management system documentation shall comprise of documentation pursuant to special legislation[3]) and shall be supplemented by measures to implement
   a) supervision and operation of a package during transportation, loading and unloading,
   b) assessment of transportation and application of the results,
   c) maintenance of documentation,
   d) staff training and exercises.

(4) The plan for the provision of physical protection contains information on effective measures for the prevention of theft of radioactive material or disruption of transportation aimed at causing an intentional leak of the transported radioactive material into the environment. The scope of information on effective measures is provided in a graduated manner according to the radioactive material category pursuant to Section 6 (3). It primarily contains

   a) the type and amount of radioactive materials designated for transport;

   b) the transport route and alternate transport routes;

   c) reconnaissance of individual routes and related technical, modal, and organisational arrangements during transport;

   d) assessment of local conditions along transport routes from the perspective of physical protection;

   e) a summary of properties and characteristics of an insider or external adversary who could attempt unauthorised activity with radioactive materials during transport or sabotage, the number of adversaries, their weaponry, training, means of transport and motivation, drawn up based on information that has been secured and evaluated;

   f) classification of radioactive materials into individual categories, pursuant to Annex 2 Part IX, and on the critical amount of nuclear materials;

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1)Act No. 355/2007 Coll. on the protection, promotion, and development of public health and on amendments to certain acts as amended.

2) Section 19 of Nuclear Regulatory Authority of the Slovak Republic Decree No. 55/2006 Coll. laying down details in emergency planning for the event of an incident or an accident

3) Decree of the Nuclear Regulatory Authority of the Slovak Republic No. 431/2011 Coll. on a quality management system, as amended by Decree No. 104/2016 Coll.

g) a description of measures to ensure the physical protection of transported radioactive material, depending on its category;

h) a description of the organisation of physical protection during transport, including definition of responsibilities;

i) a description of modal measures adopted during transport;

j) the manner in which individuals and vehicles shall be granted and provided access to the transported consignment;

k) a definition of the roles and functions of armed guards, armed escorts, or guards and escorts, their responsibilities, location, and number;

l) the destination and manner in which physical protection will be handed over between individual units providing physical protection of the consignment;

m) definition of all activities and checks performed in connection with ensuring the consignment's physical protection, these being primarily pyrotechnic checks and checks of the integrity of locks and seals;

n) a description of the manner of communication between individual units participating in the transport;

o) a description of the transport control centre's activity and facilities;

p) contingency plan as a set of activities, procedures, and measures focused on addressing possible incidents during transport related to a breach of the physical protection of transported radioactive material due to unauthorised activity or sabotage; the contingency plan contains

1. a preliminary assessment of risks resulting from unauthorised activities or sabotage;

2. an analysis of possible unauthorised activities or sabotage during transport of radioactive material and an assessment of their consequences;

3. a description of possible events during transport related to a breach of the physical protection of transported radioactive material;

4. a description of procedures and reactions of individual physical protection units to an incident that occurs during transport;

5. definition of communication between individual response units and their mutual coordination;

6. a description of equipment, weaponry, and gear of individual response units;

7. specification of participants, periodicity, and a description of activities that are part of regular exercises pursuant to the contingency plan;

8. a description of notification of relevant authorities during an incident during transport related to a breach of the physical protection of transported radioactive material;

(5) If physical protection during the transport of radioactive materials is provided by the police, the physical protection plan does not mention information pursuant to Paragraph 4 (e), (g) to (i), (k) and (p); prior to the commencement of transport of radioactive materials, the police shall declare in writing to the Authority and the authorisation holder that the police are ready to provide physical protection during the transport of radioactive materials.

(6) If transportation is to be undertaken under conditions which do not comply with the requirements given in Annex 2 (herein referred to as "transportation under special conditions"), the carrier shall supplement the safety documentation with a programme for transportation under special conditions. The programme for transportation under special conditions shall include measures to ensure that the level of safety during such transportation and transit storage shall be at least the same as that achieved when observing all the provisions of the decree.

Section 5
Transportation conditions

(1) The following checks shall be carried out prior to the first transportation of a package:

a) if the design pressure of the set of components in the packaging intended to prevent the escape of radioactive material during transportation (hereinafter "containment system") exceeds 35 kPa, it shall be demonstrated that the containment system for each package corresponds to the approved design requirements with regard to the ability of the system to maintain integrity when subjected to that pressure,
b) for each type B(U), B(M) and C package and for each packaging containing nuclear material other than unirradiated natural or depleted uranium or natural or depleted uranium irradiated exclusively in thermal reactors (herein referred to as "fissile material"), it shall be demonstrated that the effectiveness of the screening and containment system and, if necessary, also the characteristics of heat transfer and the effectiveness of the system to ensure subcriticality comply with the transport equipment approved by the package design,
c) for packages containing fissile material, with properly positioned neutron absorbers as a component of the package, tests shall be used to demonstrate their presence and correct positioning.

(2) Prior to each package transportation, the following conditions shall be fulfilled:

a) lifting attachments which do not meet the requirements of this decree shall be removed or otherwise disabled with respect to lifting the package,
b) for type B(U), B(M) and C packages and for packages containing fissile material, all the requirements shown in the type approval document for the transport equipment and in the relevant provisions of this decree shall be satisfied of this decree,
c) type B(U), B(M) and C packages shall not be dispatched until steady conditions are achieved which are sufficiently close to conditions corresponding to the requirements for temperature and pressure during transportation,
d) for type B(U), B(M) and C packages, checks or appropriate tests shall be used to demonstrate that all the seals, valves and other apertures in the containment system, through which the radioactive content might escape, are properly closed using a method complying with the transportat equipment approved by the package design.

(3) The requirements for non-fixed contamination and dose rate shall be as follows:

a) non-fixed contamination on the external surface of a package (determined as the mean value of contamination from any surface measuring 300 cm^2 at any point on the surface of the package) shall be kept at as low as reasonably achievable, while taking account of technical,

economic and social factors and, under normal transportation conditions, the limit value laid down in special legislation shall not be exceeded[4])

b) the level of non-fixed contamination on the internal and external surfaces of packaging used by a single carrier for two or more packages in order to simplify handling during storage or transportation (herein referred to as "external packaging") of the freight container or means of transport, the limit values mentioned in sub-paragraph a) shall not be exceeded,

c) if external packaging, a freight container or means of transport is used by a single carrier, who ensures that all the initial, intermediate and final loading and unloading is carried out in accordance with the instructions (herein referred to as "exclusive use conditions"), the level of non-fixed contamination on the external surface of the packaging, freight container or means of transport may exceptionally exceed the limit values mentioned in sub-paragraph a),

d) under normal transportation conditions, the dose rate shall not exceed a value of 2 mSv/h^{-1} at any point on the external surface of the package or the external packaging,

e) under exclusive used conditions, the dose rate shall not exceed a value of 10 mSv/h^{-1} at any point on the external surface of the package or the external packaging,

f) under normal transportation conditions and also under exclusive use conditions, the dose rate shall not exceed a value of 2 mSv/h^{-1} at any point on the surface of the means of transport and, at a distance of 2 m away from the surface of the means of transport, a value of 0.1 mSv/h^{-1}.

(4) Radioactive material with low specific activity (herein referred to as "LSA radioactive material") shall be material belonging to one of the following three groups:

a) LSA-I radioactive material shall be
   1. solid unirradiated natural or depleted uranium or natural thorium or solid or liquid compounds or mixtures of it, or
   2. radioactive waste containing radionuclides for which the A_2 value pursuant to Annex 3 is unlimited, or
   3. radioactive waste in which the activity is dispersed throughout the entire volume and the estimated mean specific activity does not exceed 30-times the limit specific activity determined pursuant to Annex 3,

b) LSA-II radioactive material shall be
   1. water with a tritium concentration of up to 0.8 TBq/l^{-1}, or
   2. other radioactive material in which the activity is dispersed throughout the entire volume and the estimated mean specific activity does not exceed 10^{-4} $A_2.g^{-1}$ for solids and gases and 10^{-5} $A_2.g^{-1}$ for liquids,

c) LSA-III radioactive material shall be solids except for powders in which
   1. the radioactive material is dispersed throughout the entire volume of solid substance or solid objects or is uniformly dispersed in a compact binding substance (for example, concrete, bitumen, ceramics, etc.), and
   2. the radioactive material is relatively insoluble or is bound in a relatively insoluble substance so that, even if the packaging is breached, the loss of radioactive material

4) Decree of the Government of the Slovak Republic No. 345/2006 Coll. on basic safety requirements for protecting the health of workers and the population from ionising radiation.

Decree of the Ministry of Health of the Slovak Republic No. 545/2007 Coll. stipulating details of requirements for ensuring radiation protection during activities leading to irradiation and activities important from the perspective of radiation protection.

from one package by leaching in water over seven days does not exceed a value of 0.1 A_2, and

3. the estimated mean specific activity of a solid substance without screening material does not exceed 2×10^{-3} $A_2.g^{-1}$.

(5) The requirements for the transportation of LSA radioactive materials in industrial packages or in unwrapped packages shall be as follows:

a) the quantity of LSA radioactive material in one IP-1, IP-2, IP-3 or in objects of sets of objects shall be limited so that the dose rate at a distance of 3 m away from screened material or from unscreened objects does not exceed 10 $mSv.h^{-1}$,

b) radioactive materials assigned to the LSA-I group of radioactive materials may be transported unwrapped under the following conditions:

1. unwrapped radioactive material except for ores containing only naturally occurring radionuclides shall be transported so that, during transportation, there is no escape from the means of transport or loss of screening,
2. transportation shall be carried out under exclusive use conditions,

c) LSA radioactive materials except for the radioactive materials mentioned in sub-paragraph b) shall be packaged using the method given in Annex 2 Table 1,

d) the total activity of LSA radioactive material in an industrial package or in an unwrapped package, a single storage area on an inland waterway vessel or other means of transport shall not exceed the limit values given in Annex 2 Table 2.

(6) The transport index and the criticality safety index for a package, external packaging, freight container and for LSA-I unpackaged radioactive material shall be determined using the method given in Annex 2 Part II.

(7) Packages and external packaging shall be assigned to categories pursuant to Annex 2 Table 3. The following requirements shall also be fulfilled

a) when determining categories, consideration shall also be given to the transport index and also the dose rate on the surface; if the transport index meets the conditions of one category and the dose rate on the surface meets the conditions of another category, the package shall be assigned to the higher of these categories (for this purpose, category I - white shall be considered to be the lowest category),

b) if the transport index is higher than 10, the package or external packaging shall be transported under exclusive use conditions,

c) if the dose rate on the surface of the package or external packaging is higher than 2 $mSv.h^{-1}$, the package or external packaging shall be transported under exclusive use conditions,

d) a package transported under special conditions shall be assigned to category III - yellow,

e) external packaging containing packages being transported under special conditions shall be assigned to category III - yellow.

(8) Every package shall have, on the external surface of the packaging, the legibly and permanently marked data given in Annex 2 Part III.

(9) The carrier shall show, in the transport documents accompanying each package, the accompanying details for the package given in Annex 2 Part IV.

(10) Normal packages shall be transported using the method given in Annex 2 Part V.

(11) Apart from the radioactive and fissile properties of a package, during packaging, labelling, positioning of markings, storage and transportation, consideration shall be given to all the other hazardous properties of the content of the package, such as explosibility, combustibility,

flammability, chemical toxicity and corrodibility in order to meet the requirements of other special legislation[5]) for the transportation of hazardous material.

(12) During the transport of radioactive materials pursuant to § 2(e), technical and organisational measures must be adopted to eliminate or reduce risks ensuing from the nature of these materials and to ensure conditions for radiation protection[5a]) during transport in conditions of normal handling as well as under specified emergency conditions. These measures are part of documentation pursuant to Section 4 (1) and Section 7 (1).

(13) During transportation and transit storage, radioactive materials shall be kept separate and stored using the method given in Annex 2 Part VI.

(14) During transportation by rail and land units, transportation by water and transportation by air, the additional requirements given in Annex 2 Part VII shall apply.

5) For example Decree of the Ministry of Foreign Affairs No. 64/1987 Coll. on the European Agreement concerning the International Carriage of Dangerous Goods (ADR), the Regulations concerning the International Carriage of Dangerous Goods by Rail (RID), Annex I to the Uniform Rules for the International Convention concerning the Carriage of Goods by Rail (CIM), which forms Supplement B to the Convention concerning International Carriage by Rail (COTIF) of 9 May 1980 [Ministry of Foreign Affairs decree No. 8/1985 Coll. on the Convention concerning International Carriage by Rail (COTIF), as amended].

5a) Decree of the Government of the Slovak Republic No. 345/2006 Coll.
Act No. 355/2007 Coll. as amended.
Decree of the Ministry of Health of the Slovak Republic No. 545/2007 Coll.

Section 6
Physical protection during transportation

(1) In order to provide for physical protection during the transportation of radioactive materials, it shall be necessary to
   a) ensure the shortest possible total transportation time,
   b) limit the number and duration of interruptions to transportation,
   c) provide protection during transit storage using a method appropriate to the category of radioactive material,
   d) limit the regularity of transport plans,
   e) verify that people involved in transportation do not have criminal records pursuant to Section 2(a) of the Act,
   f) restrict information on transport to only the necessary number of individuals, and provide information on transport pursuant to special legislation[6]).

(2) Confidentiality of information relating to transport operations shall provide for
   a) the protection of information on transport rules and transport routes by restricting the marking of means of transport to just the special markings given in Annex 2,
   b) the use of non-public means of communication for sending reports on transportation; if such notification requires international agreements or there are other important reasons for it, only essential information shall be provided and encryption and appropriate means of communication shall be used.

(3) When selecting appropriate measures for the provision of physical protection during the transportation of radioactive materials, consideration shall be given to the properties of the radioactive materials being transported. For these purposes, radioactive materials shall be split into three categories using the method given in Annex 2 Part IX.

(4) Measures for the provision of physical protection during the transportation of radioactive materials in category III shall be as follows:
   a) radioactive materials shall be transported in separate means of transport assigned to normal transportation, for rail transport in a separate wagon in a normal train, while, during halts, access to the radioactive materials being transported shall be restricted,
   b) the shipper shall notify the recipient in advance of the planned consignment and specify the type of transport as road, rail, water or air, the estimated time of arrival of the consignment and the exact point of hand-over, if different from the destination,
   c) the recipient shall confirm to the shipper that he is ready to receive the consignment at the expected time; the shipper shall not dispatch the consignment until such confirmation has been received,
   d) where possible, locks and seals shall be used on means of transport,
   e) prior to the start of transportation, locks and seals on the package, the means of transport, a special section of them or on the freight container shall be checked for tampering,
   f) prior to loading and prior to departure, the means of transport shall be thoroughly inspected in order to ensure that there are no hidden devices which might disrupt transportation,

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6) Act No. 215/2004Coll. on the protection of confidential information and on amendments and supplementation to some acts as amended.
Decree of the Government of the Slovak Republic No. 216/2004 Coll. stipulating areas of classified information.
Section 28 (15) of the Act No. 541/2004 Coll. on the peaceful use of nuclear energy (the Atomic Act) and on amendments and supplementation to certain acts as amended.
Decree of the Ministry of the Interior of the Slovak Republic No. 533/2006 Coll. laying down the details of protection of the population from the effects of hazardous substances, as amended.

g) the recipient shall accept the consignment immediately it arrives, check that the packaging, locks and seals are intact and report acceptance of the package to the shipper; if the consignment does not arrive at the expected time, the delay shall be reported to the shipper,
h) for international transportation, the entity providing physical protection for the consignment on the territory of the Slovak Republic shall conclude an agreement with the entity providing physical protection in the state from which the consignment has come or to which the consignment is going; the agreement shall include the point at which these entities are to transfer responsibility for the physical protection of the consignment, the method for transferring responsibility and the conditions for cooperation in applying means of physical protection in attempts to recover radioactive material on the territory of the state in which a consignment has been stolen,
i) the carrier shall monitor transportation until the consignment is handed over to the recipient or to a carrier in a neighbouring state.

(5) In order to provide physical protection for the transportation of radioactive materials in category II, the following measures shall be implemented as well as the measures for category III:
a) radioactive materials shall be transported in separate means of transport (separate train) sealed and locked in special sections or in freight containers; packages heavier than 2 000 kg may also be transported in open vehicles if each package is locked or sealed,
b) the carrier shall ensure that the transport route is safe to use and avoids water sources, areas of natural catastrophes and social unrest and areas in which there will be large numbers of people at the time of transportation,
c) each consignment shall be accompanied by an armed escort or armed guard and a specialist technical escort,
d) the armed escort or armed guard shall be on constant watch; if packages, means of transport, vessels or railway facilities are locked and sealed, monitoring of the consignment may be replaced by frequent and periodic inspection of the seals and, if the means of transport are not in motion, also by constant watch over the entire consignment,
e) consignments of spent nuclear fuel shall be accompanied by an armed escort or armed guard,
f) it shall be verified that none of the people involved in transportation has a criminal record,
g) particularly dangerous points on the transport route shall be secured by guards,
h) the armed escort or armed guard shall have written authorisation to undertake these activities and written instructions with a detailed specification of the responsibilities,
i) the carrier shall ensure that the written instructions include the transport route, stopping points, destination and method of handing over the consignment, the method of identifying people authorised to accept the consignment and enter means of transport, the method for issuing reports on normal and extraordinary situations and the procedure to deal with events during transportation,
j) the organisation providing the armed escort or armed guard shall ensure that there are reliable communications between the means of transport and the shipper and recipient or their authorised representatives or between them and the dispatch centre.

(6) In order to provide physical protection during the transportation of radioactive materials in category I, the following measures shall be implemented as well as the measures for category II:
a) radioactive materials shall be accompanied by a specialist technical escort in constant communication with the competent bodies pursuant to the emergency transport plan,
b) the consignment shall be accompanied by an armed escort or an armed guard,

c) the transport control centre is staffed exclusively by individuals with a verified clean record pursuant to Paragraph 5 (f) while adhering to conditions pursuant to special legislation, [6]) and is equipped with

1. a communication link working non-stop on two different principles ensuring protection of classified information[6]) between individual units participating in transport, and

2. equipment for tracking the current and continuous movement of the consignment,

d) in order to prevent the occurrence of and to deal with events during the transport of radioactive materials related to a breach of physical protection measures, the carrier shall ask the Police Force to provide a police response group,

e) continuous and redundant security communication working on two different principles shall be ensured between the sender, the carrier, the recipient, the transport control centre, the armed guard or armed escort accompanying the consignment, the police, relevant authorities regulating the transport of radioactive materials, and other subjects performing activities related to the transport of radioactive materials;

f) reconnaissance of the transport route and alternate routes shall be performed.

(7) In order to provide physical protection during the transportation of radioactive materials in category I, depending on the type of transport, the following measures shall be implemented as well as the measures listed in Paragraph 6:

a) road transport:

1. transportation shall make use of trucks fitted with immobilising equipment and shall be specially constructed so as to resist attack until a response unit arrives,
2. every consignment shall use a special-purpose vehicle; in a vehicle carrying a consignment, the driver shall be accompanied by another person as an armed escort or armed vehicle guard,
3. the consignment shall be accompanied by at least two escort vehicles carrying one or more members of the armed guard,
4. the armed guard shall maintain a constant watch and check the seals and locks at each halt,
5. if the transportation cannot be completed in one day, arrangements shall be made in advance for an overnight stop at an approved location; during such overnight stops, the vehicle shall be parked in a locked and guarded building or facility,
6. apart from the communications needed to meet the requirements stipulated in Paragraph 6 (a), (c), (d), two-way radio communications shall be established between each vehicle carrying a consignment and the escort vehicles,
7. an alternate transport route shall be planned in advance so that the decision to change the transport route can be made in a brief notification,

b) rail transport:

1. transportation shall make use of a special freight train,
2. the consignment shall be accompanied by at least five members of an armed escort or armed guard, who shall remain in the car closest to the car carrying the consignment, constantly watch over the car carrying the consignment, check the locks and seals when the train stops and, at planned stopping places, make contact by two-way radio or telephone communications,

c) waterway transport:

1. the consignment shall be accompanied by at least three members of an armed escort or armed guard,
2. the consignment shall be carried in a safe section of the vessel or in a freight container, which shall be locked and sealed; during transportation, the armed escort or armed guard shall regularly check the locks and seals,

d) air transport:
   1. the consignment shall only be transported on a cargo aircraft, in a closed and sealed transport container,
   2. the consignment shall be accompanied by at least two members of an armed escort or armed guard.

Section 7
Approval of package design

(1) Applications for the approval of package design pursuant to Section 15 (4) of the Act shall be accompanied by a package project, containing
   a) carrier identification data pursuant to Section 6 (1),
   b) clear identification of the transport equipment,
   c) detailed description of the proposed radioactive content with special attention to its physical and chemical form and the nature of the radiation,
   d) detailed design data, including complete technical drawings, a list of materials and production processes used,
   e) reports on tests and their results, the results of calculations or other evidence that the type of transport equipment meets the corresponding requirements given in Annex 1,
   f) draft operating instructions and instructions for the use and maintenance of the transport equipment,
   g) measures required to provide for the dispersion of heat from the package for the method of transportation in question and the types of transportation equipment or freight container, if the radioactive material being transported develops heat,
   h) quality assurance programme.

(2) If type B(U), B(M) and C packaging are to be used, an application pursuant to paragraph 1 shall also be accompanied by:
   a) specification of the constructional material for the pressure vessel in the packaging,
   b) method of sampling and tests to be performed, if the package is designed for a maximum operating pressure exceeding an overpressure of 100 kPa,
   c) safety analysis for each proposal relating to the characteristics of the fuel, if the radioactive content is spent nuclear fuel,
   d) reproducible illustration of the package no larger than 21 cm x 30 cm,
   e) design of low dispersible radioactive material, if it is to be transported in the packaging.

(3) If a type B(M) packaging is to be used, an application pursuant to paragraph 1 shall also be accompanied by the following, as well as the data pursuant to paragraphs 1 and 2:
   a) list of the specific requirements for a type B(U) package, as given in Annex 1 Part VII(6) and Part VIII(4), (5) and (8) to (15), which the package does not meet,
   b) list of proposed additional operating controls to be carried out during transportation which this Decree does not stipulate, but which are needed to ensure the safety of the package or to compensate for the shortcomings mentioned in sub-paragraph a),
   c) declaration relating to any limitations on the type of transportation and special procedures for loading, transportation, unloading and handling,
   d) data on temperature, solar radiation and other external conditions expected during transportation and taken into account when producing the package design.

(4) A project for low dispersible radioactive material shall include
   a) detailed description of the radioactive material with special attention to its physical and chemical form and the nature of the radiation,
   b) detailed description of the design of the package, if used,

c) reports on tests and their results, the results of calculations or other evidence that the design meets the requirements given in Annex 1,
d) quality assurance programme,
e) description of activities to be carried out prior to the transportation of these materials.

(5) The quality assurance programme shall comprise a quality plan for classified equipment and quality requirements for selected installations produced pursuant to special legislation[3]).

(6) If a package design or a design for low dispersible radioactive material cannot be shown to have satisfied the corresponding requirements given in Annex 1, the application shall be accompanied by a programme for transportation under special conditions pursuant to Section 4 (6), showing the measures to ensure the provision of at least such a level of safety during transportation and transit storage as would be achieved by observing all the requirements given in Annex 1.

Section 7a
Transitional provisions concerning the amendment effective as of 1 March 2016

Documents in proceedings commenced prior to 1 March 2016 are subject to document requirements pursuant to existing legislation. Transport of radioactive materials approved prior to 1 March 2016 shall take place pursuant to requirements stipulated in existing legislation.

Section 8

This Decree has been adopted in accordance with a legally binding act of the European Union in the area of technical standards and technical regulations.[7])

Section 9
Entry into force

This decree shall enter into force on 1 March 2006.

Marta Žiaková, m. p.

7) Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services (Special edition in Slovak: Chapter 13 Volume 20) as amended.

Annex 1
to Decree No. 57 /2006 Coll.

Requirements for radioactive material, packagings and packages

Part I: Requirements for radioactive materials

1. LSA-III radioactive material shall be a solid substance of such a nature that, if the entire content of the package is subjected to the test laid down in Annex 4 Part II, the activity in water does not exceed 0.1 A_2.

    a) Low dispersible radioactive material shall be such that the total amount of this radioactive material in a package shall meet the following requirements: (a) The dose rate at 3 m from the unshielded radioactive material does not exceed 10 mSv/h.
    b) if subjected to the tests laid down in Annex 4 Part IV (25) and (26), escapes into air in gaseous and aerosol form to an aerodynamic equivalent diameter of 100 m shall not exceed 100 A_2; a separate sample may be used for each test,
    c) if subjected to the test laid down in Annex 4 Part II, the activity in water shall not exceed 100 A_2; when performing this test, consideration shall be given to the harmful effects of the tests laid down in sub-paragraph b).

Part II: General requirements for all the packagings and packages

1. Packages shall be designed so that they can be
    a) easily and safely transported in view of their weight, volume and form,
    b) during transportation, properly secured in means of transport.

2. Lifting attachments on a package shall be designed so as not to fail when used as intended and so that, if damaged, they do not affect the ability of the package to meet the other requirements of this Decree. The design shall take account of the relevant safety factors relating to lifting by a tug.

3. Clamping equipment and any other attachments on the external surface of a package which might be used for lifting shall be designed so as to support its weight pursuant to the requirements given in paragraph 2 or shall be removed or otherwise disabled during transportation.

4. If practicable, packaging shall be designed and produced so that the external surfaces do not have any projecting parts and can easily be decontaminated.

5. If practicable, the external surface of a package shall be designed so that water does not fall on it and is not retained on it.

6. Any equipment attached to a package during transportation which does not form part of the package shall not affect its safety.

7. The package shall be capable of withstanding the effects of any acceleration, vibration or vibration resonance which might occur under conditions which are likely during normal transportation without reducing the effectiveness of the sealing equipment in different areas of

the package and without affecting the integrity of the package as a whole. In particular, nuts, bolts, pins and other securing equipment shall be designed so that they do not spontaneously loosen or become lost, even after multiple usage.

8. Materials in packaging, any parts or structures and the radioactive content of a package shall be physically and chemically compatible. Account shall be taken of changes in their properties under the effect of radiation.

9. Valves through which radioactive content might escape shall be secured against unauthorised use.

10. The design of a package shall also take account of the external temperatures and pressures which might occur under normal transportation conditions.

11. A consignment shall be designed with a view to further hazardous properties of radioactive material.
12. A consignment containing highly dispersible radioactive material must be designed to ensure the greatest possible degree of radiation measures.

Part III: Additional requirements for packages transported by air

1. The temperature of accessible surfaces of packages transported by air shall not exceed 50 °C at an external temperature of 38 °C. Solar radiation shall not be taken into account.

2. Packages intended for air transportation shall be designed so that, at an external temperature in a range from -40 °C to +55 °C, there is no damage to the integrity of their packaging.

3. Packages transported by air containing radioactive materials shall have containment systems capable of withstanding a reduction in external pressure to 5 kPa without any escapes.

Part IV: Requirements for normal packages

The design of a normal package shall take account of the requirements given in Part II and, if the package is to be transported by air, also the requirements given in Part III.

Part V: Requirements for industrial packages

1. Type 1 industrial packages (IP-1) shall be designed so as to meet the requirements given in Part II and Part VII(2) and also, if they are to be transported by air, the requirements given in Part III.

2. In order for a package to be able to be qualified as a type 2 industrial package (IP-2), it shall be designed so as to meet the requirements for IP-1 given in paragraph 1 and, if subjected to the tests laid down in Annex 4 Part IV(10) and (11), it shall prevent
    a) the loss or dispersion of radioactive content,
    b) a loss in integrity of the screening which might give rise in an increase in the dose rate at any point on the external surface of the package by more than 20%.

3. In order for a package to be able to be qualified as a type 3 (IP-3), it shall be designed so as to meet the requirements for IP-1 given in paragraph 1 and the requirements given in Part VII(3) to (15).

4. Non-flammable solid LSA-II or LSA-III radioactive material may be transported by air in IP-1, IP-2 or IP-3 packages if the total content of activity in an individual package does not exceed 3 000 A_2.

Part VI: Requirements for packages containing uranium hexafluoride

1. Uranium hexafluoride shall be packaged and transported in accordance with the requirements in a technical standard.[8])

2. Each package containing 0.1 kg of uranium hexafluoride or more shall be designed so as to withstand
   a) the structural test laid down in Annex 4 Part IV(6) without escapes and without the unacceptable stresses specified in a technical standard[8]),
   b) the test laid down in Annex 4 Part IV(10) without losses or dispersion of uranium hexafluoride,
   c) the test laid down in Annex 4 Part IV(16) without rupture of the containment system.

3. A package containing 0.1 kg of uranium hexafluoride or more shall not have pressure relief equipment.

Part VII: Requirements for type A packages

1. Type A packages may contain radioactive material, the total activity of which does not exceed value A_2. The following relation shall apply for a mixture of radionuclides in a type A package:

$$\sum_j \frac{C(j)}{A2(j)} 1$$

where

C(j) is the activity of the j-th radionuclide,
A_2(j) is the value A_2 for the j-th radionuclide.

2. A type A package shall be designed so as to meet the requirements given in paragraphs 3 to 16, the requirements given in Part II and, if transported by air, also the requirements given in Part III.

3. The minimum external dimension of the package shall not be less than 10 cm.

4. The external form of the package shall allow for the attachment of a seal which cannot easily be broken and the unbroken state of which serves as proof that the package has not been opened.

8) ISO 7195 Packaging of uranium hexafluoride for transport.

5. Any clamping equipment on a package shall be designed so that forces acting on such equipment under normal and emergency transportation conditions do not give rise to changes in the package which are not in accordance with this Decree.

6. Packages shall be designed so that the individual components of the packaging can withstand temperatures in a range from -40 °C to +70 °C. Special attention shall be paid to low liquid freezing points and the possibilities for impairment of the materials in the packaging in the temperature range in question.

7. The design of a package and the production processes shall be in accordance with Slovak standards or other requirements approved by the Authority.

8. The design of a package shall include a containment system which can be safely sealed using a closing mechanism and cannot be opened by accident or as a result of the pressure which might occur in the package.

9. If the containment system forms a special unit in the package, it shall be able to be safely sealed with a closing mechanism which is independent of any other part of the packaging.

10. The design of any part of the containment system shall take account of the radiolytic decomposition of liquids and other unstable materials and the formation of gases through chemical reaction and radiolysis.

11. The containment system shall retain its radioactive content with a reduction of external pressure to 60 kPa.

12. All valves except for safety valves shall be fitted with seals preventing any escapes through the valves.

13. Radiation screening enclosing this part of the package, which shall be specified as a component of the containment system, shall be designed so as to prevent the undesirable release of this part from the screening. If the radiation screening and the component of the containment system enclosed by it form a special unit, this screening shall be able to be safely sealed using a mechanism which is independent of any other part of the structure of the packaging.

14. The package shall be designed so that, during the tests laid down in Annex 4 Part IV(7) to (12), there is no
    a) loss or dispersion of radioactive content,
    b) loss of screening integrity which might give rise to an increase in dose rate on any part of the external surface of the package by more than 20%.

15. A package containing liquid radioactive material shall be fitted with equipment to deal with changes in the volume of content in relation to temperature changes, dynamic phenomena and dynamics during filling.

16. As well as the preceding provisions, a type A package containing liquid radioactive material shall
    a) meet the requirements given in paragraph 14, if the package is subjected to the tests laid down in Annex 4 Part IV(13),

b) be fitted with one of the following pieces of equipment:
   1. suitable absorption material, capable of absorbing double the volume of the liquid content, such absorption material being positioned so as to be in contact with the liquid, if it escapes,
   2. a containment system comprising primary internal and secondary external containment sections, designed so as to ensure retention of the liquid content in the secondary external section, if the primary internal section leaks.

Part VIII: Requirements for type B(U) packages

1. Type B(U) packages shall be designed so as to meet the requirements given in paragraphs 2 to 16, the requirements given in Part II, Part VII(3) to (15) except for paragraph 14(a) and, if transported by air, also the requirements given in paragraph 17 and in Part III.

2. Packages shall be designed so as, under normal transportation conditions (tests laid down in Annex 4 Part IV(7) to (12)), to meet the requirements of this Decree for the packaging and screening, even if the package is subjected, unsupervised for one week, to the adverse action of heat developed by its radioactive content in an internal environment with the temperature given in paragraph 4 and the solar radiation given in paragraph 5. Special consideration shall also be given to the effects of heat which might
   a) change the layout, geometric shape or physical state of the radioactive content or, if the radioactive material is sealed in sheet metal packaging or in a vessel (e.g. fuel cells in casing), give rise to deformation or melting of the sheet metal packaging, vessel or radioactive material,
   b) reduce the effectiveness of the packaging through non-uniform expansion, cracking or melting of the screening material,
   c) accelerate corrosion in combination with humidity.

3. Packages shall be designed so that the temperature of their accessible surfaces does not exceed 50 °C at the external temperature given in paragraph 4, except for transportation under exclusive use conditions.

4. External temperature shall mean a temperature of 38 °C.

5. Solar radiation conditions shall mean the conditions given in Table 1.

Table 1: Solar radiation

Shape and position of surface	Solar radiation in W/m^2 for 12 hours a day
Flat surface shipped horizontal - base - other surfaces	 0 800
Flat surface not shipped horizontal - all surfaces	 200 a)
Curved surface	400 a)

a) Alternatively, a sine function may be used with adjusted absorption coefficient, ignoring the possible effect of reflection from surrounding objects.

6. Packages which have thermal protection meeting the requirements of the heat test laid down in Annex 4 Part IV(16) shall be designed so that the protection remains effective when the package is subjected to the test laid down in Annex 4 Part IV(7) to (12) and (15)(a) and (b) or (b) and (c), depending on which is more appropriate. Such protection on the external part of the package shall not be disrupted by etching, cutting, shearing, abrasion or rough handling.

7. Packages shall be designed so that, during the tests laid down
   a) in Annex 4 Part IV(7) to (12), the loss of radioactive content does not exceed 10^{-6} $A^{2} \cdot h^{-1}$,
   b) in Annex 4 Part IV(14), (15)(b), paragraphs 16, 17 and 18 and during the tests laid down
      1. in Annex 4 Part IV(15)(c) for packages weighing a maximum of 500 kg, a total density determined on the basis of the external dimensions not exceeding 1000 $kg.m^{-3}$ and a radioactive content exceeding 1 000 A_2,
      2. in Annex 4 Part IV(15)(a) for all other packages, the following requirements are met:
         2a) the package screening shall remain in a state whereby the dose rate at a distance of 1 m away from the surface of the package does not exceed 10 $mSv.h^{-1}$ with the maximum radioactive content for which the package is designed,
         2b) the total loss of radioactive content from the package over one week shall not exceed a value of 10 A_2 for ^{85}Kr and a value of A_2 for all other radionuclides.

8. If a package contains a mixture of different radionuclides, paragraph 7 shall involve the use of the provisions of Annex 3(3) to (5) except for ^{85}Kr, for which it shall be possible to use an effective value of A_2(i) equal to 10 A_2. Paragraph 7(a) shall take account of the limit values for external contamination given in Section 5(3)(a) of this Decree.

9. A package with a radioactive content with activity higher than 10^5 A_2 shall be designed so that, during the water immersion test laid down in Annex 4 Part IV(18), the containment system is not breached.

10. Observance of the permitted values for the escape of activity shall not be limited to the use of filters and mechanical cooling systems.

11. Packages shall not include safety pressure systems in the containment systems which might, under the conditions given in Annex 4 Part IV(7) to (12) and (14) to (17), allow the escape of radioactive material into the environment.

12. Packages shall be designed so that the level of stress in the containment system at maximum normal operating pressure and during the tests laid down in Annex 4 Part IV(7) to (12) and (14) to (17) does not exceed a value which might adversely affect the package so that it fails to satisfy the relevant provision of this decree.

13. Maximum normal operating pressure in a package shall not exceed 700 kPa.

14. Apart from the requirements for packages transported by air (Part III(1)), the maximum temperature on any part of easily accessible surfaces of the package during transportation shall not exceed 85°C at the external temperature given in paragraph 4 and without being exposed to solar radiation. The package shall be transported under exclusive use conditions if the maximum temperature exceeds 50°C. In order to protect people involved in transportation, use may be made of barriers or walls, which shall not be subjected to any tests.

15. Packages containing low dispersible radioactive material shall be designed so that no internal parts of the packaging adversely affect the characteristics of the low dispersible radioactive material.

16. Packages shall be designed for an ambient temperature in a range from -40 °C to +38 °C.

17. Type B(U) packages may be transported by air if the total content of activity in the package does not exceed
    a) a value approved by the Authority or a competent body in another state in a certificate for low dispersible radioactive material,
    b) 3 000 A_2 for other radioactive materials.

Part IX: Requirements for type B(M) packages

18. Type B(M) packages shall meet the requirements for type B(U) packages given in Part VIII(1). The Authority may lay down requirements other than those given in Part VII(6) and Part VIII(4), (5) and (8) to (15) for type B(M) transportation packages in the Slovak Republic or by agreement with the competent bodies in the appropriate states for international transportation between the Slovak Republic and the states in question. The requirements for type B(U) packages given in Part VIII(8) to (15) shall however be satisfied as far as is practicable.

19. The Authority may permit the periodic venting of type B(M) packages during transportation.

Part X: Requirements for type C packages

1. Type C packages shall be designed so as to meet the requirements given in paragraphs 2 to 4, the requirements given in Part II, Part VII(2) to (14) except for (13)(a) and the requirements given in Part VIII(2) to (5) and (9) to (15).

2. Packages shall satisfy the provisions of Part VIII(7)(b) and (11) after being placed in an atmosphere with thermal conductivity of 0.33 $W.m^{-1}.K^{-1}$ and a temperature of 38 °C in a steady state. Before starting tests, the package shall be at maximum normal operating pressure, all the thermal insulation on the package shall be undisturbed and the ambient temperature shall be 38 °C.

3. Packages shall be designed so that, at maximum normal operating pressure and during the tests laid down
    a) in Annex 4 Part IV(7) to (12), the loss of radioactive content does not exceed 10^{-6} A_2 per hour,

b) in Annex 4 Part IV(22), the following requirements are met:
   1. the package shielding shall remain in a state whereby the dose rate at a distance of 1 m away from the surface of the package does not exceed 10 $mSv.h^{-1}$ with the maximum radioactive content for which the package is designed,
   2. the total loss of radioactive content from the package over one week shall not exceed a value of 10 A_2 for ^{85}Kr and a value of A_2 for all other radionuclides.

4. If a package contains a mixture of different radionuclides, paragraph 3 shall involve the use of the provisions of Annex 3(3) to (5) except for ^{85}Kr, for which it is possible to use an effective value of $A_2(i)$ equal to 10 A_2. Paragraph 3(a) shall take account of the limit values for external contamination given in Section 5(3)(a) of this Decree.

5. Packages shall be designed so that, during the water immersion test laid down in Annex 4 Part IV(18), the containment system is not breached.

Part XI: Requirements for packages containing fissile material

1. Fissile material shall be transported so that,
   a) under normal and emergency transportation conditions, subcriticality is maintained; the following eventualities shall be given particular consideration:
      1. penetration of water out of or into the package,
      2. loss of effectiveness of built-in neutron absorbers or moderators,
      3. change in layout of the fissile material in the package or as a result of escape out of the package,
      4. reduction in the spacing in packages or between packages,
      5. immersion of the package in water or covering with snow,
      6. changes in temperature,
   b) the requirements
      1. of Part VII(3) for fissile materials contained in packages,
      2. of this Decree relating to the properties of the material,
      3. given in paragraphs 2 to 11

      are met.

2. If the chemical or physical form, isotopic composition, weight or concentration, moderation ratio or density or geometric arrangement are not known, an assessment pursuant to paragraphs 6 to 11 shall be carried out, assuming that every unknown parameter has a value which gives rise to maximum neutron multiplication in accordance with the known conditions and parameters of such an assessment.

3. For spent nuclear fuel, an assessment pursuant to paragraphs 6 to 11 shall be based either on the isotopic composition demonstrably giving rise to maximum neutron multiplication during irradiation or on a conservative estimate of neutron multiplication for assessment of the package. Prior to transportation, a measurement shall be made to confirm that the estimate of the isotopic composition is conservative.

4. After performing the tests laid down in Annex 4 Part IV(7) to (12) it shall be demonstrated that it is not possible to insert a cube with edges measuring 10 cm into the packaging.

5. Packages shall be designed for ambient temperatures in a range from -40 °C to +38 °C, unless the Authority stipulates otherwise in a type approval document for the transport equipment.

6. For an individual package, it shall be assumed that water may penetrate into all free spaces in the package or may escape from them, including spaces inside the containment system. However, if the design involves the use of special facilities preventing such penetration of water into certain free spaces or escape from them, despite human error, then such an assumption shall not be made. Special facilities shall be:
   a) for packages containing only uranium hexafluoride
      1. valves which, after the package tests laid down in paragraph 11(b), are not in physical contact with any other component of the packaging except for the original point of attachment and which also remain sealed following the testing laid down in Annex 4 Part IV(16),
      2. a high degree of quality control during manufacture, maintenance and repair of the packaging,
      3. tests demonstrating that the package is closed prior to each dispatch,
   b) for other packages
      1. multiple, highly effective protections against water, each of which shall remain watertight following the tests laid down in paragraph 11(b),
      2. a high degree of quality control during manufacture, maintenance and repair of the packaging assembly,
      3. tests demonstrating that the package is closed prior to each dispatch.

7. During assessment, it shall be assumed that the containment system may be surrounded by a layer of water at least 20 cm deep acting as a reflector or a deeper reflector which may be formed by the surrounding material of the packaging. But if it can be shown that, following the tests laid down in Paragraph 11 (b), the containment system remains undisturbed inside the packaging, it may be assumed in Paragraph 8 (c) that the reflector around the containment system is formed by a layer of water at least 20 cm deep.

8. The package shall be subcritical on the assumptions given in paragraphs 6 and 7 and in such a package state as results in maximum neutron multiplication
   a) under normal transportation conditions (with no accidents),
   b) during the testing laid down in paragraph 10(b),
   c) during the testing laid down in paragraph 11(b).

9. Packages transported by air shall be covered by the following requirements:
   a) the package shall be subcritical during the testing laid down in Annex 4 Part IV(22) if it is surrounded by a layer of water at least 20 cm deep, acting as a reflector, and if the water does not penetrate inside the package,
   b) the contribution of the special facilities mentioned in paragraph 6 shall not be taken into consideration unless the penetration of water into free spaces or escape from such spaces following the testing laid down in Annex 4 Part IV(24) and subsequently in Annex 4 Part IV(22) is excluded.

10. When assessing groups of packages under normal transportation conditions, the number "N" (number of packages) is determined so that packages numbering five times "N" are subcritical for an arrangement and conditions which give rise to the maximum neutron multiplication, assuming that

a) there is free space between packages and the packages are arranged so that they are surrounded by a layer of water at least 20 cm deep on all sides, acting as a reflector,
b) the state of the packages is as assessed or demonstrated following the tests laid down in Annex 4 Part IV(7) to (12).

11. When assessing groups of packages under emergency transportation conditions, the number "N" (number of packages) is determined so that packages numbering two times "N" are subcritical for an arrangement and conditions which give rise to the maximum neutron multiplication, assuming that
    a) there is hydrogen moderation between packages and the packages are arranged so that they are surrounded by a layer of water at least 20 cm deep on all sides, acting as a reflector,
    b) the tests laid down in Annex 4 Part IV(7) to (12) are carried out, after which those of the following tests which impose the maximum restrictions are carried out:
        1. the tests laid down in Annex 4 Part IV(15)(b) and either in Annex 4 Part IV(15)(c) for packages weighing a maximum of 500 kg and with a total density determined on the basis of the external dimensions, not exceeding 1 000 kg/m^3, or in Annex 4 Part IV(15)(a) for all other packages, following which the tests laid down in Annex 4 Part IV(16) and in Annex 4 Part IV(19) to (21),
        2. the test laid down in Annex 4 Part IV(17),
    c) if any part of the fissile material escapes from the containment system following the tests laid down in sub-paragraph b), the fissile material escapes from every package in a consignment and all such fissile material can be arranged in such a configuration and with such moderation as to bring about the maximum neutron multiplication, if it is surrounded by a layer of water at least 20 cm deep, acting as a reflector.

12. Fissile material may be transported as a normal package, which is not covered by the provisions of paragraphs 2 to 11, if it meets one of the following conditions:
    a) one consignment may transport a quantity of fissile material, for which the following applies:

$$\frac{F1}{X} + \frac{F2}{Y} < 1$$

where F1 is the mass of ^{235}U [g],
F2 is the mass of other fissile materials [g],
X and Y are the mass limits given in Table 2,

Table 2

Type of fissile material	Mass of fissile material in a mixture with substances with a mean hydrogen density lower than or equal to water [g]	Mass of fissile material in a mixture with substances with a mean hydrogen density greater than water [g]
^{235}U (X)	400	290
Other fissile materials (Y)	250	180

and also, one of the following assumptions applies:
1. each individual package contains no more than 15 g of fissile material; for unpackaged material, this limit shall relate to the total consignment placed in the means of transport,
2. the fissile material is a homogeneous aqueous solution or a mixture where the ratio of fissile nuclides to hydrogen is less than 5% by weight,

3. in any 10-litre volume of material, there is no more than 5 g of fissile material, (beryllium and deuterium shall not be present in a quantity exceeding 0.1% by mass o fissile material),

b) the fissile material is uranium enriched ^{235}U to a maximum of 1% by mass with a total content of Pu and ^{233}U not exceeding 1% by mass of ^{235}U, distributed completely homogeneously in the whole material and if the ^{235}U is in the form of a metal, oxide or carbide, it shall not be arranged in the shape of a grid,

c) the fissile material comprises liquid solutions of uranyl nitrate with uranium enriched ^{235}U to a maximum of 2% by mass with a total content of Pu and ^{233}U not exceeding 0.002% by mass of uranium and with a ratio of nitrogen atoms to uranium (N/U) of at least 2,

d) less than 1 kg of Pu is transported in each package; of this quantity, the content of ^{239}Pu and ^{241}Pu or combinations of them shall form a maximum of 20% by mass.

Annex 2
to decree No. 57 /2006 Coll.

REQUIREMENTS FOR TRANSPORTATION

Part I: LSA radioactive materials

Table 1: Packaging of LSA radioactive materials

Type of LSA	Type of industrial package	
	Exclusive use	Other
LSA-I Solid Liquid	 IP-1 IP-1	 IP-1 IP-2
LSA-II Solid Liquid	 IP-2 IP-2	 IP-2 IP-3
LSA-III	IP-2	IP-3

Table 2: Limits for total activity of LSA radioactive materials

Type of LSA	Limits of activity for means of transport other then inland waterways	Limits of activity for vessels on inland waterway routes
LSA-I	unlimited	unlimited
LSA-II, LSA-III, non-flammable solids	unlimited	100 x A_2
LSA-II, LSA-III, liquids, solids and flammable substances	100 x A_2	10 x A_2

Part II: Determination of transport index and criticality safety index

a) The transport index (TI) for packages, external packaging, freight containers and for unpackaged LSA-I radioactive material shall be a number deduced on the basis of the following procedure:
   1. the maximum dose rate shall be determined in millisieverts per hour [mSv/h] at a distance of 1 m away from the external surface of the package, external packaging, freight container or unpackaged LSA-I radioactive material and multiplied 100,
   2. for tanks, freight containers and unpackaged LSA-I radioactive material, the value obtained in the preceding step shall be multiplied by the following factors:

Size of cargo [a)]	Multiplication factor
up to 1 m^2	1
from 1 m^2 to 5 m^2	2
from 5 m^2 to 20 m^2	3
over 20 m^2	10

a) Size determined as maximum area of cargo cross-section.

b) The transport index for each external packaging, freight container or means of transport shall be determined either as the sum of the package TIs placed in them or by direct measurement of the dose rate except for the case of non-consolidated external packaging, when the TI shall be determined as the sum of the TIs for the individual packages.

c) The criticality safety index (CSI) for packages containing fissile material shall be obtained by dividing the number 50 by the smaller of the two values for N derived in Annex 1 Part XI(10) and (11) (i.e. CSI = 50/N). The value for CSI may be equal to zero, if an unlimited set of packages is subcritical (i.e. N is close to infinite in both cases).

d) The criticality safety index for each consignment shall be determined as the sum of the CSIs for all the packages forming a consignment.

e) Except for consignments in exclusive use form
   1. the transport index for any individual package or external packaging shall not be greater than 10,
   2. the criticality safety index for any individual package or external packaging shall not be greater than 50.

Table 3: Assignment of packages and external packaging to categories Conditions		
Transport index (TI)	Maximum dose rate at any point on the external surface of the package or external packaging	Category
0	No more than 0.005 $mSv.h^{-1}$	I - white
Over 0, but no more than 1	Over 0.005 mSv/h, but no more than 0.5 $mSv.h^{-1}$	II - yellow
Over 1, but no more than 10	Over 0.5 mSv/h, but no more than 2 $mSv.h^{-1}$	III - yellow
Over 10	Over 2 mSvh, but no more than 10 $mSv.h^{-1}$	III - yellow

Part III: Labelling and position of labels and signs

1. For every package, the external surface of the packaging assembly shall be legibly and indelibly marked with
   a) carrier's identification data,
   b) number from the United Nations Organisation list (see Table 6), preceded by the designator "UN" and the appropriate load marking,
   c) data on the permitted gross weight, if it exceeds 50 kg.

2. Each package of a type corresponding to
   a) type 1 industrial packages, type 2 industrial packages or type 3 industrial packages shall be legibly and indelibly marked on the external surface of the packaging assembly with the inscription "TYPE IP-1", "TYPE IP-2" or "TYPE IP-3",
   b) type A packages shall be legibly and indelibly marked on the external surface of the packaging assembly with the inscription "TYPE A",

c) type 2 industrial packages, type 3 industrial packages or type A packages shall be legibly and indelibly marked on the external surface of the packaging assembly with the international vehicle registration identification code (VRI Code) for the country of origin of the package design and the name of the manufacturer or other packaging assembly marking specified by the Authority or a competent body in the country of origin of the package design.

3. Each package corresponding to a package design for approved type of transportation equipment B(U), B(M), C or transportation equipment UF6 shall be legibly and indelibly marked on the external surface of the packaging assembly with
   a) an identification marking assigned to the package design in question by the Authority or other competent body,
   b) a serial number unambiguously identifying each packaging assembly corresponding to a given package design,
   c) the inscription "TYPE B(U)" or "TYPE B(M)" for a package design for transportation equipment of type B(U) or type B(M),
   d) the inscription "TYPE C" for a package design for transportation equipment of type C.

4. Each package corresponding to a package design for transportation equipment of type B(U), B(M) or C shall have, on a point on the external surface which is resistant to the effects of fire and water, the symbol shown in Fig. 1 clearly marked in paint, embossed or using another method resisting the effects of water and fire.

5. If LSA-I radioactive material is being transported in a package in exclusive use form, the package shall be marked with the inscription "RADIOACTIVE NMA-I" ("RADIOACTIVE LSA-I").

6. Each package, external packaging, tank and freight container shall have a label corresponding to the samples in Figs. 2, 3 or 4 except for large freight containers or tanks, for which the alternative provisions of paragraph 11 may be used, depending on the category. Each package, external packaging and freight container containing fissile material shall be marked with a label corresponding to the sample in Fig. 5.

7. The labels shall be attached to two opposite external sides of a package or external packaging or to all four external sides of a freight container or tank. Labels according to Fig. 5 shall be attached in the immediate vicinity of labels according to Fig. 2, 3 and 4 and shall not overlap.

8. Each label shall contain the following information:
   a) radioactive content:
      1. name of the radionuclide being transported from Annex 3 Table 1 (symbol given in the table) except for LSA-I radioactive material; the LSA group shall be given after the name of the radionuclide, using for this purpose the terms "LSA-II" or "LSA-III",
      2. names of the most restricting radionuclides (in view of the line length) supplemented by the LSA group, if a mixture of radionuclides is being transported,
      3. the designator "LSA-I" instead of the name of the radionuclide, if LSA-I radioactive material is being transported,
   b) maximum activity of the radioactive content during transportation expressed in Bq units with the corresponding SI prefix (see Table 7); if fissile material is being transported, the weight in grams or multiples of them may be used instead of activity,

c) if external packaging or freight containers are being used, the "content" and "activity" spaces shall contain the information required in sub-paragraphs a) and b) summarised for the entire contents of the external packaging or freight container; the labels on external packaging or freight containers containing packages with different radionuclides may include the inscription: "See freight documents",
d) transport index (the transport index shall not be given for category I - white).

9. Each label corresponding to the sample in Fig. 5 shall be marked with the value for the criticality safety index given in the package design or in the transportation programme for special conditions forming the basis for the type approval of the means of transport.

10. The criticality safety index for the needs of paragraph 9 shall be determined for external packaging or freight containers as the sum of the CSIs for the fissile content of the individual packages in such packaging.

11. Large freight containers containing packages and tanks shall be marked with four signs corresponding to the sample in Fig. 6. The signs shall be positioned vertically on each sidewall and on the front and back walls of the freight container or tank. Signs which do not correspond to the content shall be removed. Instead of the simultaneous use of labels and signs, it shall be possible to use the larger signs shown in Figs. 2, 3, 4 and 5 in dimensions the minimum size of which is given in Fig. 6.

12. If the consignment in a freight container or tank is unpackaged LSA-I radioactive material or if a consignment being transported in exclusive use form in a freight container is packaged radioactive material with a single UN code number, the appropriate UN code for the consignment shall be marked with black figures at least 65 mm high
    a) in the bottom half of the sign given in Fig. 6 on a white background with the letters "UN" in front of the number or
    b) on the sign given in Fig. 7; this supplementary sign shall be positioned close to the main sign on all four sides of the freight container or tank.

13. Markings in English in brackets may be used for international transportation.

Part IV: Accompanying details of a consignment

1. Carriers shall include the following information in the transport documents accompanying each consignment (if appropriate) in the following order:
    a) appropriate transport name according to Table 6,
    b) UN class number "7",
    c) UN code number assigned to the material in question according to Table 6, preceded by the designator "UN",
    d) name or symbol for each radionuclide or mixture of radionuclides according to the general description or a list of the most restricting radionuclides,
    e) description of the physical or chemical form of the material; the chemical formula may be used as a description of the chemical form,
    f) maximum activity of the radioactive content during transportation expressed in Bq units with the appropriate SI prefix; if fissile material is being transported, data on the activity may be replaced by the mass of fissile material expressed in grams or multiples of grams,

g) package category, i.e. I - WHITE, II - YELLOW, III - YELLOW,
h) transport index (only for categories II - YELLOW and III - YELLOW),
i) criticality safety index for packages containing fissile material,
j) identification designator for each document approved by a competent body (type certificate for transportation equipment or transportation authorisation) depending on the nature of the consignment,
k) detailed data on the content of each package and, if necessary, also on each external packaging or each freight container in a consignment, if the packages are being transported in external packaging or in a freight container; if the package is to be taken out of the external packaging or freight container during transportation, the appropriate transport documentation shall be attached,
l) marking "EXCLUSIVE USE PACKAGE", if it is required that the consignment be transported in exclusive use form,
m) total activity in the consignment in A_2 vessels (see Annex 3 Table 1) for LSA-II and LSA-III radioactive material.

2. Carriers shall include in the transport documents a declaration with the following text or text with a similar meaning: "We hereby declare that the contents of this consignment are fully and precisely described in the transport name, are assigned to a group, packaged, labelled and fitted with labels and are in all respects in a suitable state for transportation" (insert type of transportation) "in accordance with the operative legislation of the Slovak Republic and the international rules." (If international transportation is involved.)

3. If the declaration is a condition for transportation under the terms of a specific international agreement, the carrier need not issue such a declaration for that part of the transportation to which the agreement applies.

4. The declaration shall be dated and shall be signed by the carrier.

5. The declaration shall be attached to the document specifying the details of the consignment, as set out in paragraph 1.

6. The carrier shall include in the transport documents a statement on any activities to be carried out by the shipping agent. The statement shall be in the language or languages required by the shipping agent or the bodies involved and shall include at least the following data:
   a) additional operational requirements for loading, storage, transportation, handling and unloading packages, external packaging, freight containers or tanks, including special conditions for storage with regard to the requirements for the safe dispersion of heat or a statement to the effect that such requirements are not needed,
   b) restrictions as regards type of transportation or means of transport and any necessary route instructions,
   c) emergency measures relating to a given consignment, unless they already form part of the emergency transport plan.

7. Labelling in English in brackets may be used for international transportation.

Part V: Requirements for transportation of normal packages

1. The dose rate on the external surface of a normal package shall not exceed 5 mSv/h.

2. Radioactive material enclosed in an installation or in a product or a part of it satisfying the values given in columns 2 and 3 of Table 4 may be transported as a normal package if
   a) the dose rate at a distance of 10 cm away from any point on the external surface of an unpackaged installation or product does not exceed 0.1 $mSv.h^{-1}$,
   b) the installation or product is marked with the inscription "RADIOACTIVE",
   c) it is fully sealed by a component which is not radioactive; the actual installation or product shall not be regarded as being that component.

3. Other radioactive material, as shown in paragraph 2 and satisfying the values given in column 4 of Table 4, may be transported as a normal package if
   a) the package does not release its radioactive content under normal transportation conditions,
   b) the package is marked on the internal surface with the inscription "RADIOACTIVE" so that this warning is visible when opening the package.

4. Products containing just unirradiated natural or depleted uranium or unirradiated natural thorium may be transported as a normal package if the external surface of such nuclear materials is sealed in a package made from metal or another strong material.

5. Normal packages shall be covered by the provisions of Annex 1 Part IV and, if the package contains fissile material, also the provisions of Annex 1 Part VII(3) and Part XI(12).

Table 4: Limits of activity for normal packages

Physical form of content	Installations or products		Materials
	Limit per item	Limit per package	Limit per package
1	2	3	4
Solids	10^{-2} A_2	A_2	10^{-3} A_2
Liquids	10^{-3} A_2	10^{-1} A_2	10^{-4} A_2
Gases: tritium	2×10^{-2} A_2	2×10^{-1} A_2	2×10^{-2} A_2
other	10^{-3} A_2	10^{-2} A_2	10^{-3} A_2

Part VI: Separation and storage of loads during transportation and transit storage

1. Packages, external packaging, freight containers and tanks shall be separated during transportation from
a. places used by operating staff and members of the public,
b. undeveloped photographic film,
c. other hazardous material.

2. Category II - yellow or III - yellow packages or external packaging containing such packages shall not be transported in areas used by passengers except for areas intended for staff authorised to accompany such packages or external packaging.

3. Consignments shall be stored safely.

4. Except for transportation under special conditions, packages may be combined with another type of radioactive material, including fissile material and different types of packages with different transport indexes.

5. Loading freight containers and consolidating packages, external packaging and freight containers shall be governed by the following principles:

a. except for transportation in exclusive use form the total number of packages, external packaging and freight containers in a single means of transport shall be restricted so that the total sum of transport indexes does not exceed the values given in Table 5; consignments of LSA-I radioactive materials shall not be subject to any restrictions on the total sum of transport indexes,
b. when a consignment is transported in exclusive use form, the overall transport index for individual means of transport shall not be subject to any restriction,
c. the overall criticality safety index for freight containers or for individual means of transport shall not exceed the values given in Table 5.

6. Any package or external packaging with a transport index higher than 10 or any consignment with a criticality safety index higher than 50 shall only be transported in exclusive use form.

7. The number of packages, external packaging and freight containers containing fissile material stored during transit in any storage area shall be limited so that the total sum of criticality safety indexes in any group of such packages, external packaging or freight containers does not exceed a value of 50. Such individual groups of packages, external packaging and freight containers shall be separated from one another by at least 6 m.

8. If the total sum of criticality safety indexes for packages in an individual means of transport or freight container exceeds a value of 50 (see Table 5), the packages shall be stored at a distance of at least 6 m away from other groups of packages, external packaging or freight containers containing fissile material or other means of transport transporting radioactive material.

Table 5: Limits for transport indexes a criticality safety indexes for freight containers and means of transport

Type of freight container or means of transport	Limits on total sum in individual freight containers or means of transport		
	transport indexes (TI)	criticality safety indexes (CSI)	
		exclusive use	other
Small freight container	50	–	50
Large freight container	50	100	50
Vehicle	50	100	50
Aircraft: - passenger transport - cargo transport	 50 200	 – 100	 50 50
Inland waterways	50	100	50

Part VII: Additional requirements for different types of transportation

1. Rail and road vehicles transporting packages, external packaging or freight containers marked with any of the labels shown in Figs. 2, 3, 4 or 5 or transporting consignments in exclusive use form shall be fitted with signs as shown in Fig. 6, as follows:
   a) on the external side of both side walls of a vehicle,
   b) on the external side of both side walls and on the external rear wall of a road vehicle,
   c) if the vehicle does not have side walls, the signs may be positioned directly on the chassis carrying the load, providing they are easily visible there,
   d) for the transportation of large-volume freight containers, signs positioned on the containers shall be sufficient,
   e) if the vehicle does not have a sufficiently large area for the positioning of signs as shown in Fig. 6, their size may be reduced to 100 mm,
   f) signs not corresponding to the content shall be removed.

2. If the consignment on a vehicle or in a vehicle is unpackaged LSA-I radioactive material or if a consignment being transported in exclusive use form is packaged radioactive material with a single UN code number, the UN code number shall be (see Table 6) marked with black figures at least 65 mm high
   a) either on a white background in the bottom half of a sign as shown in Fig. 6,
   b) or on a sign as shown in Fig. 7; this supplementary sign shall be positioned close to the main sign on both side walls of a rail wagon or on both side walls and on the rear wall of a road vehicle.

3. If consignments are being transported in road or rail transportation in exclusive use form, the dose rate shall not exceed a value of
   a) 10 $mSv.h^{-1}$ at any point on the package or external packaging; a value of 2 $mSv.h^{-1}$ may be exceeded if
      1. the vehicle is fitted with a lock which, under normal transportation conditions, does not allow unauthorised people access to the interior of the vehicle,
      2. the package or external packaging is secured so that its position inside the vehicle does not change during transportation,
      3. there are no loading or unloading operations during transportation,

b) 2 $mSv.h^{-1}$ at any point on the external surface of the vehicle, including the upper and lower surface or at any point in vertical planes represented by points on the external edges of the vehicle, on the upper surface of the load and on the lower external surface of an open vehicle,
c) 0.1 $mSv.h^{-1}$ at any point at a distance of 2 m away from vertical planes represented by the external side walls of the vehicle or at a distance of 2 m away from vertical planes represented by the external edges of an open vehicle.

4. A road vehicle transporting packages, external packaging or freight containers assigned to category II - yellow or III - yellow, apart from the driver, may only carry assistants and physical protection staff.

5. Packages and external packaging with a dose rate on the surface higher than 2 $mSv.h^{-1}$ shall not be transported by water vessel except for transportation under special conditions.

6. The transportation of consignments shall not be covered by the requirements given in Part VI(5) if they are being transported by a special-purpose vessel, the design or lease conditions of which mean that it is intended for the transportation of radioactive material and if the following conditions are satisfied:
   a) transportation is covered by a programme for radiation protection approved by a competent state body in the country where the vessel is registered,
   b) the storage conditions for the consignment are firmly specified for the entire journey and apply also to consignments which may be transhipped during the journey at an intermediate landing point,
   c) loading and handling a consignment and unloading take place under the supervision of a person qualified in the matter of transportation of radioactive material.

7. Type B(M) packages and consignments being transported in exclusive use form shall not be transported in passenger aircraft.

8. The following shall not be transported by air:
   a) type B(M) ventilated packages,
   b) packages requiring external cooling using a cooling system,
   c) packages subject to operational monitoring during transportation,
   d) packages containing liquid pyrophoric materials,
   e) packages and external packaging with a dose rate on the surface of higher than 2 mSv/h except for transportation under special conditions.

9. If the customs status of a package requires that its contents be verified, this shall be carried out at a place which meets the conditions for working in an environment of ionising radiation and in the presence of a qualified employee of the shipping agent. Each package which is opened on the instructions of the customs authorities shall be returned to its original state before onward transportation to the consignee.

10. If a package cannot be delivered or handed over, the carrier shall ensure that it is stored in a safe place and shall inform the shipping agent and the Authority without undue delay.

Part VIII: List of UN numbers, shipping names, descriptions and additional risks for the most frequently transported radioactive materials

Table 6

UN number	Proper shipping name	Additional risks
2910	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - LIMITED QUANTITY OF MATERIAL	
2911	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - INSTRUMENTS or ARTICLES	
2909	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - ARTICLES MANUFACTURED FROM NATURAL URANIUM or DEPLETED URANIUM or NATURAL THORIUM	
2912 a)	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-I)b)	
3321 a)	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II)	
3322 a)	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III)	
2915 a)	RADIOACTIVE MATERIAL, TYPE A PACKAGE	
2916 a)	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE	
2917 a)	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE	
3323 a)	RADIOACTIVE MATERIAL, TYPE C PACKAGE	
2919 a)	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT	
2978 a)	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE	corrosive (UN Class 8)
3324	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE	
3325	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE	
3327	RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE	
3328	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE	
3329	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE	
3330	RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE	
3331	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE	
2977	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE	corrosive (UN Class 8)

a) Used for non-fissile form of material.
b) Labelling in English may be used for international transport.

Table 7: SI prefixes

Factor with respect to basic unit	Prefix	Symbol
10^{18}	exa-	E
10^{15}	peta-	P
10^{12}	tera-	T
10^{9}	giga-	G
10^{6}	mega-	M
10^{3}	kilo-	k
10^{2}	hector-	h
10^{1}	deca-	da
10^{-1}	deci-	d
10^{-2}	centi-	c
10^{-3}	milli-	m
10^{-6}	micro-	µ
10^{-9}	nano-	n
10^{-12}	pico-	p
10^{-15}	femto-	f
10^{-18}	atto-	a

Part IX: Categorisation of radioactive material for the purposes of physical protection

Table 8

Material	Type	Category		
		I	II	III
1. Plutonium [a)]	unirradiated [b)]	2 kg and over	less than 2 kg, but over 500 g	500 g or less, but more than 15 g
2. Uranium-235	unirradiated [b)] - uranium enriched to 20% ^{235}U or over - uranium enriched to 10% ^{235}U or over, but not less than 20% uranium enriched to more than natural, but less than 10% ^{235}U	5 kg and over	less than 5 kg , but more than 1 kg 10 kg or over	1 kg or less, but more than 15 g less than 10 kg, but more than 1 kg 10 kg or over
3. Uranium-233	unirradiated [b)]	2 kg and over	less than 2 kg, but more than 500 g	500 g or less, but more than 15 g
4. Spent fuel			depleted or natural uranium or thorium, slightly enriched fuel (less than 10% fissile content)	

5. Radioactive waste		Assigned to category I, II or III as other nuclear materials. For assignment to categories, consideration shall be given in particular to the activity of the radioactive waste, the quantity, possibilities for unauthorised activities with radioactive waste and other properties which might threaten the natural environment or human health and life

a) Plutonium except for plutonium with an isotopic plutonium concentration of - 238 exceeding 80%.
b) Material unirradiated in a reactor or material irradiated in a reactor, but with a dose rate <= 1 Gy/h.

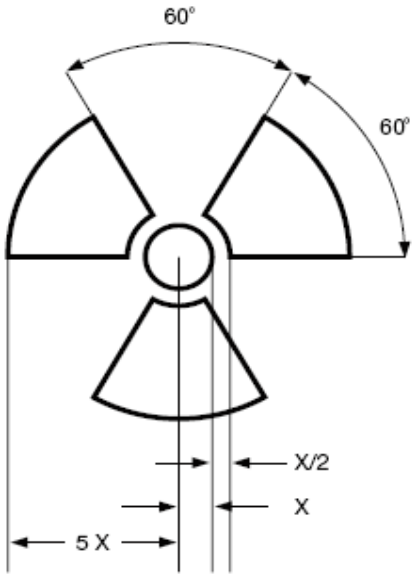

Fig. 1 Basic trefoil symbol with dimensions derived from the diameter of the central circle. The minimum permissible size of X shall be 4 mm.

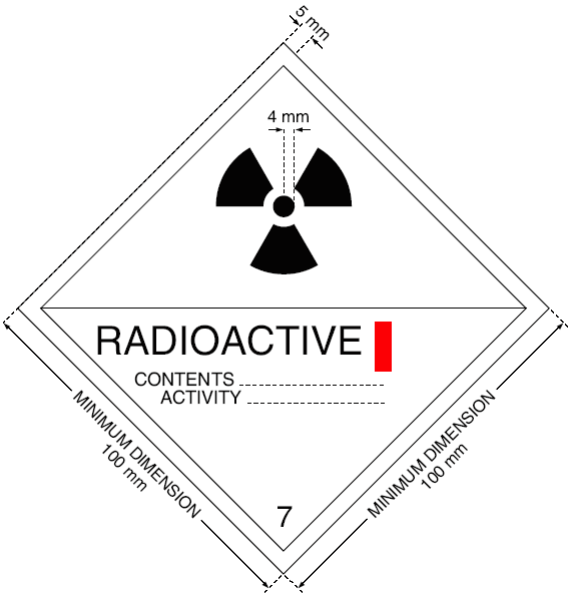

Fig. 2 Label for category I – white.
The background colour of the label shall be white, the colour of the trefoil and inscription shall be black, the Roman numeral denoting the category shall be red.

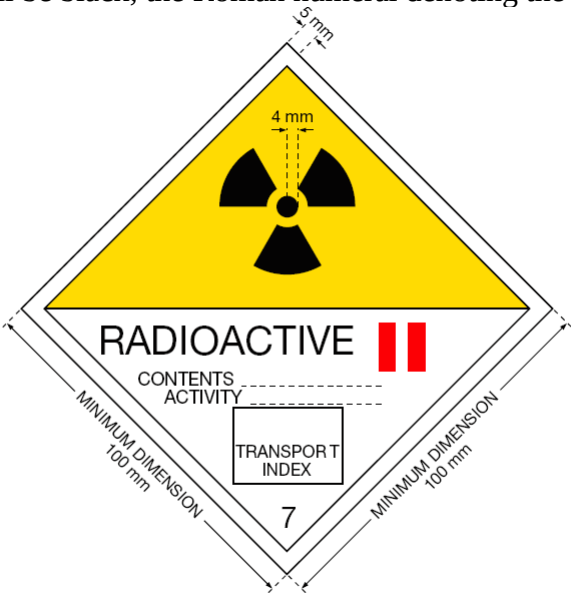

Fig. 3 Label for category II – yellow.
The background colour of the top half of the label shall be yellow, the bottom half white, the colour of the trefoil and inscription shall be black, the Roman numeral denoting the category shall be red.

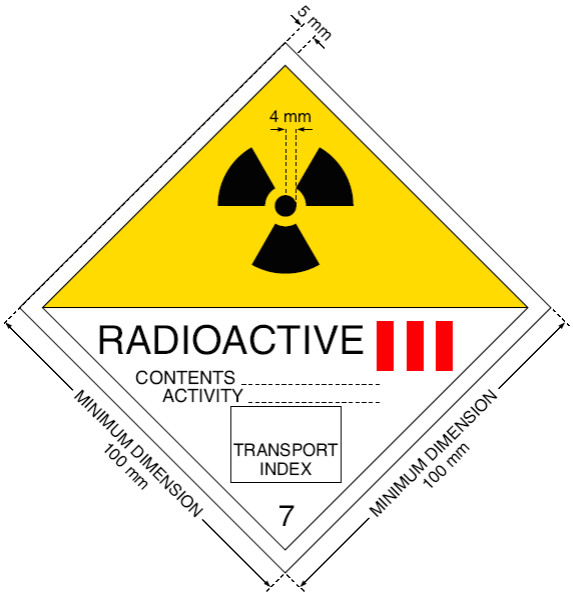

Fig. 4 Label for category III – yellow.
The background colour of the top half of the label shall be yellow, the bottom half white, the colour of the trefoil and inscription shall be black, the Roman numeral denoting the category shall be red.

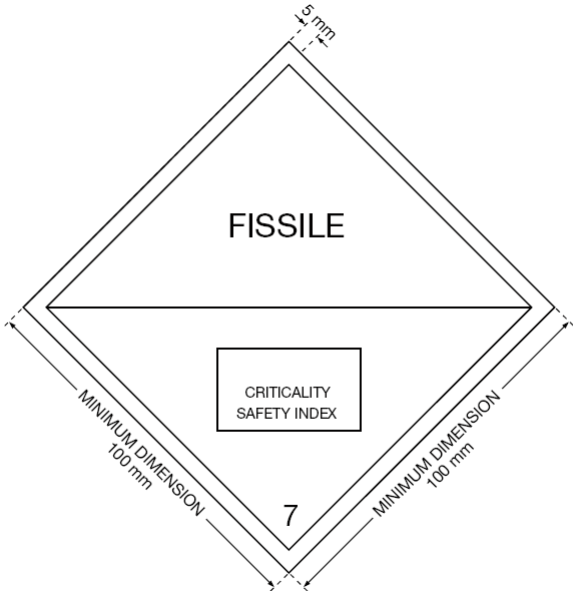

Fig. 5 Label for criticality safety index (CSI).
The background colour of the label shall be white, text colour black.

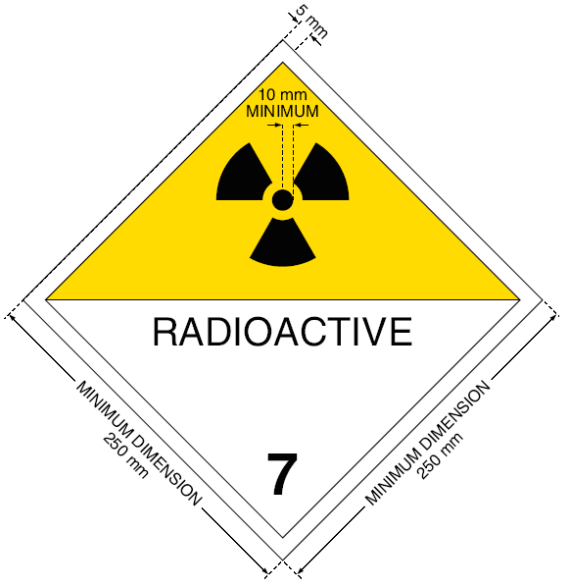

Fig. 6 Sign

The minimum dimensions shall be set; if the dimensions are greater, the relative proportions shall be retained. The numeral "7" shall not be smaller than 25 mm. The background colour of the top half of the sign shall be yellow, bottom half white, colour of the trefoil and transcriptions black. The use of the inscription "Radioactive" in the bottom half of the sign shall not be compulsory, which means that this sign can be used to show the appropriate UN code number for a consignment.

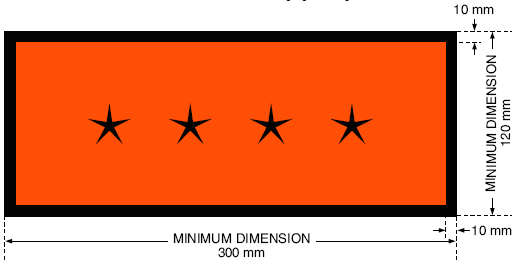

Fig. 7 Sign for separate display of UN code number

The background colour of the sign shall be orange, the border and UN number black. The symbol **** shows the position for the appropriate UN number for radioactive material.

Annex 3
to the Decree No. 57 /2006 Coll.

BASIC DATA ON RADIONUCLIDES

1. Table 1 gives the following data on the different radionuclides:
   a) values for A_2 in [TBq],
   b) limit specific activity in [Bq/g].
2. In order to determine the A_2 value of a radionuclide which is not shown in Table 1, the simple radioactive decay series shall be considered to be an individual radionuclide if the radionuclides are contained in it in the quantity in which they occur naturally and if no daughter radionuclide has a half-life longer than 10 days or longer than the half-life of the parent radionuclide in the decay series. If any daughter radionuclide in the decay series has a half-life longer than 10 days or longer than the half-life of the parent radionuclide, the parent and daughter radionuclides shall be considered to be a mixture of different radionuclides.
3. The values according to paragraph 1 for mixtures of radionuclides with known characteristics and activity shall be calculated as follows:

$$X_m = \frac{1}{\sum_i \frac{f(i)}{x(i)}}$$

where

f(i) is the proportion of activity of the i-th radionuclide in the mixture,
x(i) is the value of A_2 or the limit specific activity for the i-th radionuclide,
X_m is the value of A_2 or the limit specific activity deduced for the mixture.

4. If the id0entity of all the radionuclides is known, but the individual activity of some of the radionuclides is not known, the radionuclides may be classified into groups so that, for calculations according to the formula given in paragraph 3, it is possible to use the minimum values for the radionuclides in each group. The groups may be formed on the basis of total alpha activity and total beta and gamma activity, if known, using the minimum values for alpha and gamma emitters.
5. For individual radionuclides or mixtures of radionuclides the relevant data for which are not known, the values given in Table 2 shall be used.

Table 1: Basic data on radionuclides

Radionuclide (atomic number)	A_2	Limit specific activity
	[TBq]	[Bq/g]
1	2	3
Actinium (89)		
Ac-225 (a)	6×10^{-3}	1×10^{1}
Ac-227 (a)	9×10^{-5}	1×10^{-1}
Ac-228	5×10^{-1}	1×10^{1}
Silver (47)		
Ag-105	2×10^{0}	1×10^{2}
Ag-108m (a)	7×10^{-1}	1×10^{1} (b)
Ag-110m (a)	4×10^{-1}	1×10^{1}
Aluminium (13)		
Al-26	1×10^{-1}	1×10^{1}
Americium (95)		
Am-241	1×10^{-3}	1×10^{0}
Am-242 m (a)	1×10^{-3}	1×10^{0} (b)
Am–243 (a)	1×10^{-3}	1×10^{0} (b)
Argon (18)		
Ar-37	4×10^{1}	1×10^{6}
Ar-39	2×10^{1}	1×10^{7}
Ar-41	3×10^{-1}	1×10^{2}

Arsenic (33)		
As-72	3×10^{-1}	1×10^{1}
As-74	9×10^{-1}	1×10^{1}
1	2	3
As-76	3×10^{-1}	1×10^{2}
As-77	7×10^{-1}	1×10^{3}
Astatine (85)		
At-211 (a)	5×10^{-1}	1×10^{3}
Gold (79)		
Au-193	2×10^{0}	1×10^{2}
Au-194	1×10^{0}	1×10^{1}
Au-195	6×10^{0}	1×10^{2}
Au-198	6×10^{-1}	1×10^{2}
Au-199	6×10^{-1}	1×10^{2}
Barium (56)		
Ba-131 (a)	2×10^{0}	1×10^{2}
Ba-133	3×10^{0}	1×10^{2}
Ba-133m	6×10^{-1}	1×10^{2}
Ba-140 (a)	3×10^{-1}	1×10^{1} (b)
Beryllium (4)		
Be-7	2×10^{1}	1×10^{3}
Be-10	6×10^{-1}	1×10^{4}
Bismuth (83)		
Bi-205	7×10^{-1}	1×10^{1}
Bi-206	3×10^{-1}	1×10^{1}
Bi-207	7×10^{-1}	1×10^{1}
Bi-210	6×10^{-1}	1×10^{3}
Bi-201m (a)	2×10^{-2}	1×10^{1}
Bi- 212 (a)	6×10^{-1}	1×10^{1} (b)
Berkelium (97)		
Bk-247	8×10^{-4}	1×10^{0}
Bk-249 (a)	3×10^{-1}	1×10^{3}
Bromine (35)		
Br-76	4×10^{-1}	1×10^{1}
Br-77	3×10^{0}	1×10^{2}
Br-82	4×10^{-1}	1×10^{1}
Carbon (6)		
C-11	6×10^{-1}	1×10^{1}
C-14	3×10^{0}	1×10^{4}
Calcium (20)		
Ca-41	unlimited	1×10^{5}
Ca-45	1×10^{0}	1×10^{4}
Ca-47 (a)	3×10^{-1}	1×10^{1}
Cadmium (48)		
Cd-109	2×10^{0}	1×10^{4}
Cd-113m	5×10^{-1}	1×10^{3}
Cd-115 (a)	4×10^{-1}	1×10^{2}

As-73	4×10^{1}	1×10^{3}

Cd-115m	5×10^{-1}	1×10^{3}
Cerium (58)		
Ce-139	2×10^{0}	1×10^{2}
Ce-141	6×10^{-1}	1×10^{2}
1	2	3
Ce-143	6×10^{-1}	1×10^{2}
Ce-144 (a)	2×10^{-1}	1×10^{2} (b)
Californium (98)		
Cf-248	6×10^{-3}	1×10^{1}
Cf-249	8×10^{-4}	1×10^{0}
Cf-250	2×10^{-3}	1×10^{1}
Cf-251	7×10^{-4}	1×10^{0}
Cf-252	3×10^{-3}	1×10^{1}
Cf-253 (a)	4×10^{-2}	1×10^{2}
Cf-254	1×10^{-3}	1×10^{0}
Chlorine (17)		
Cl-36	6×10^{-1}	1×10^{4}
Cl-38	2×10^{-1}	1×10^{1}
Curium (96)		
Cm-240	2×10^{-2}	1×10^{2}
Cm-241	1×10^{0}	1×10^{2}
Cm-242	1×10^{-2}	1×10^{2}
Cm-243	1×10^{-3}	1×10^{0}
Cm-244	2×10^{-3}	1×10^{1}
Cm-245	9×10^{-4}	1×10^{0}
Cm-246	9×10^{-4}	1×10^{0}
Cm-247 (a)	1×10^{-3}	1×10^{0}
Cm-248	3×10^{-4}	1×10^{0}
Cobalt (27)		
Co-55	5×10^{-1}	1×10^{1}
Co-56	3×10^{-1}	1×10^{1}
Co-57	1×10^{1}	1×10^{2}
Co-58	1×10^{0}	1×10^{1}
Co-58m	4×10^{1}	1×10^{4}
Co-60	4×10^{-1}	1×10^{1}
Chromium (24)		
Cr-51	3×10^{1}	1×10^{3}
Caesium (55)		
Cs-129	4×10^{0}	1×10^{2}
Cs-131	3×10^{1}	1×10^{3}
Cs-132	1×10^{0}	1×10^{1}
Cs-134	7×10^{-1}	1×10^{1}
Cs-134m	6×10^{-1}	1×10^{3}
Cs-135	1×10^{0}	1×10^{4}
Cs-136	5×10^{-1}	1×10^{1}

Cs-137 (a)	6×10^{-1}	1×10^{1} (b)
Copper (29)		
Cu-64	1×10^{0}	1×10^{2}
Cu-67	7×10^{-1}	1×10^{2}
Dysprosium (66)		
Dy-159	2×10^{1}	1×10^{3}
Dy-165	6×10^{-1}	1×10^{3}
1	2	3
Dy-166 (a)	3×10^{-1}	1×10^{3}
Erbium (68)		
Er-169	1×10^{0}	1×10^{4}
Er-171	5×10^{-1}	1×10^{2}
Europium (63)		
Eu-147	2×10^{0}	1×10^{2}
Eu-148	5×10^{-1}	1×10^{1}
Eu-149	2×10^{1}	1×10^{2}
Eu-150 (short-term)	7×10^{-1}	1×10^{3}
Eu-150 (long-term)	7×10^{-1}	1×10^{1}
Eu-152	1×10^{0}	1×10^{1}
Eu-152m	8×10^{-1}	$1x\ 10^{2}$
Eu-154	6×10^{-1}	1×10^{1}
E-155	3×10^{0}	1×10^{2}
Eu-156	7×10^{-1}	1×10^{1}
Fluorine (9)		
F-18	6×10^{-1}	1×10^{1}
Iron (26)		
Fe-52 (a)	3×10^{-1}	1×10^{1}
Fe-55	4×10^{1}	1×10^{4}
Fe-59	9×10^{-1}	1×10^{1}
Fe-60 (a)	2×10^{-1}	1×10^{2}
Gallium (31)		
Ga-67	3×10^{0}	1×10^{2}
Ga-68	5×10^{-1}	1×10^{1}
Ga-72	4×10^{-1}	1×10^{1}
Gadolinium (64)		
Gd-146 (a)	5×10^{-1}	1×10^{1}
Gd-148	2×10^{-3}	1×10^{1}
Gd-153	9×10^{0}	1×10^{2}
Gd-159	6×10^{-1}	1×10^{3}
Germanium (32)		
Ge-68 (a)	5×10^{-1}	1×10^{1}
Ge-71	4×10^{1}	1×10^{4}
Ge-77	3×10^{-1}	1×10^{1}
Hafnium (72)		
Hf-172 (a)	6×10^{-1}	1×10^{1}
Hf-175	3×10^{0}	1×10^{2}
Hf-181	5×10^{-1}	1×10^{1}
Hf-182	unlimited	1×10^{2}
Mercury (80)		
Hg-194 (a)	1×10^{0}	1×10^{1}
Hg-195m (a)	7×10^{-1}	1×10^{2}
Hg-197	1×10^{1}	1×10^{2}
Hg-197m	4×10^{-1}	1×10^{2}
Hg-203	1×10^{0}	1×10^{2}
1	2	3
Holmium (67)		
Ho-166	4×10^{-1}	1×10^{3}
Ho-166m	5×10^{-1}	1×10^{1}
Iodine (53)		
I-123	3×10^{0}	1×10^{2}
I-124	1×10^{0}	1×10^{1}
I-125	3×10^{0}	1×10^{3}
I-126	1×10^{0}	1×10^{2}
I-129	unlimited	1×10^{2}
I-131	7×10^{-1}	1×10^{2}
I-132	4×10^{-1}	1×10^{1}
I-133	6×10^{-1}	1×10^{1}
I-134	3×10^{-1}	1×10^{1}
I-135 (a)	6×10^{-1}	1×10^{1}
Indium (49)		
In-111	3×10^{0}	1×10^{2}
In-113m	2×10^{0}	1×10^{2}
In-114m (a)	5×10^{-1}	1×10^{2}
In-115m	1×10^{0}	1×10^{2}
Iridium (77)		
Ir-189 (a)	1×10^{1}	1×10^{2}
Ir-190	7×10^{-1}	1×10^{1}
Ir-192	6×10^{-1}	1×10^{1}
Ir-19	3×10^{-1}	1×10^{2}
Potassium (19)		
K-40	9×10^{-1}	1×10^{2}
K-42	2×10^{-1}	1×10^{2}
K-43	6×10^{-1}	1×10^{1}
Krypton (36)		
Kr-79	$2x10^{0}$	$1x10^{3}$
Kr-81	4×10^{1}	1×10^{4}
Kr-85	1×10^{1}	1×10^{5}
Kr-85m	3×10^{0}	1×10^{3}
Kr-87	2×10^{-1}	1×10^{2}
Lanthanum (57)		
La-137	6×10^{0}	1×10^{3}
La-140	4×10^{-1}	1×10^{1}
Lutetium (71)		

Lu-172	6×10^{-1}	1×10^{1}
Lu-173	8×10^{0}	1×10^{2}
Lu-174	9×10^{0}	1×10^{2}
Lu-174m	1×10^{1}	1×10^{2}
Lu-177	7×10^{-1}	1×10^{3}
Magnesium (12)		
Mg-28 (a)	3×10^{-1}	1×10^{1}
Manganese (25)		
Mn-52	3×10^{-1}	1×10^{1}
Mn-53	unlimited	1×10^{4}
1	2	3
Mn-54	1×10^{0}	1×10^{1}
Mn-56	3×10^{-1}	1×10^{1}
Molybdenum (42)		
Mo-93	2×10^{1}	1×10^{3}
Mo-99 (a)	6×10^{-1}	1×10^{2}
Nitrogen (7)		
N-13	6×10^{-1}	1×10^{2}
Sodium (11)		
Na-22	5×10^{-1}	1×10^{1}
Na-24	2×10^{-1}	1×10^{1}
Niobium (41)		
Nb-93m	3×10^{1}	1×10^{4}
Nb-94	7×10^{-1}	1×10^{1}
Nb-95	1×10^{0}	1×10^{1}
Nb-97	6×10^{-1}	1×10^{1}
Neodymium (60)		
Nd-147	6×10^{-1}	1×10^{2}
Nd-149	5×10^{-1}	1×10^{2}
Nickel (28)		
Ni-59	unlimited	1×10^{4}
Ni-63	3×10^{1}	1×10^{5}
Ni-65	4×10^{-1}	1×10^{1}
Neptunium (93)		
Np-235	4×10^{1}	1×10^{3}
Np-236 (short-term)	2×10^{0}	1×10^{3}
Np-236 (long-term)	2×10^{-2}	1×10^{2}
Np-237	2×10^{-3}	1×10^{0} (b)
Np-239	4×10^{-1}	1×10^{2}
Osmium (76)		
Os-185	1×10^{0}	1×10^{1}
Os-191	2×10^{0}	1×10^{2}
Os-191m	3×10^{1}	1×10^{3}
O-193	6×10^{-1}	1×10^{2}
Os-194 (a)	3×10^{-1}	1×10^{2}
Phosphorus (15)		

P-32	5×10^{-1}	1×10^{3}
P-33	1×10^{0}	1×10^{5}
Protactinium (91)		
Pa-230 (a)	7×10^{-2}	1×10^{1}
Pa-231	4×10^{-4}	1×10^{0}
Pa-233	7×10^{-1}	1×10^{2}
Lead (82)		
Pb-201	1×10^{0}	1×10^{1}
Pb-202	2×10^{1}	1×10^{3}
Pb-203	3×10^{0}	1×10^{2}
Pb-205	unlimited	1×10^{4}
Pb-210 (a)	5×10^{-2}	1×10^{1} (b)
1	2	3
Pb-212 (a)	2×10^{-1}	1×10^{1} (b)
Palladium (46)		
Pd-103 (a)	4×10^{1}	1×10^{3}
Pd-107	unlimited	1 x 105
Pd-109	5×10^{-1}	1×10^{3}
Promethium (61)		
Pm-143	3×10^{0}	1×10^{2}
Pm-144	7×10^{-1}	1×10^{1}
Pm-145	1×10^{1}	1×10^{3}
Pm-147	2×10^{0}	1×10^{4}
Pm-148m (a)	7×10^{-1}	1×10^{1}
Pm-149	6×10^{-1}	1×10^{3}
Pm-151	6×10^{-1}	1×10^{2}
Polonium (84)		
Po-210	2×10^{-2}	1×10^{1}
Praseodymium (59)		
Pr-142	4×10^{-1}	1×10^{2}
Pr-143	6×10^{-1}	1×10^{4}
Platinum (78)		
Pt-188 (a)	8×10^{-1}	1×10^{1}
Pt-191	3×10^{0}	1×10^{2}
Pt-193	4×10^{1}	1×10^{4}
Pt-193m	5×10^{-1}	1×10^{3}
Pt-195m	5×10^{-1}	1×10^{2}
Pt-197	6×10^{-1}	1×10^{3}
Pt-197m	6×10^{-1}	1×10^{2}
Plutonium (94)		
Pu-236	3×10^{-3}	1×10^{1}
Pu-237	2×10^{1}	1×10^{3}
Pu-238	1×10^{-3}	1×10^{0}
Pu-239	1×10^{-3}	1×10^{0}
Pu-240	1×10^{-3}	1×10^{0}
Pu-241 (a)	6×10^{-2}	1×10^{2}
Pu-242	1×10^{-3}	1×10^{0}

Pu-244 (a)	1×10^{-3}	1×10^{0}
Radium (88)		
Ra-223 (a)	7×10^{-3}	1×10^{2} (b)
Ra-224 (a)	2×10^{-2}	1×10^{1} (b)
Ra-225 (a)	4×10^{-3}	1×10^{2}
Ra-226 (a)	3×10^{-3}	1×10^{1} (b)
Ra-228 (a)	2×10^{-2}	1×10^{1} (b)
Rubidium (37)		
Rb-81	8×10^{-1}	1×10^{1}
Rb-83 (a)	2×10^{0}	1×10^{2}
Rb-84	1×10^{0}	1×10^{1}
Rb-86	5×10^{-1}	1×10^{2}
Rb-87	unlimited	1×10^{4}
1	2	3
Rb (natural)	unlimited	1×10^{4}
Rhenium (75)		
Re-184	1×10^{0}	1×10^{1}
Re-184m	1×10^{0}	1×10^{2}
Re-186	6×10^{-1}	1×10^{3}
Re-187	unlimited	1×10^{6}
Re-188	4×10^{-1}	1×10^{2}
Re-189 (a)	6×10^{-1}	1×10^{2}
Re (natural)	unlimited	1×10^{6}
Rhodium (45)		
Rh-99	2×10^{0}	1×10^{1}
Rh-101	3×10^{0}	1×10^{2}
Rh-102	5×10^{-1}	1×10^{1}
Rh-102m	2×10^{0}	1×10^{2}
Rh-103m	4×10^{1}	1×10^{4}
Rh-105	8×10^{-1}	1×10^{2}
Radon (86)		
Rn-222 (a)	4×10^{-3}	1×10^{1} (b)
Ruthenium (44)		
Ru-97	5×10^{0}	1×10^{2}
Ru-103 (a)	2×10^{0}	1×10^{2}
Ru-105	6×10^{-1}	1×10^{1}
Ru-106 (a)	2×10^{-1}	1×10^{2} (b)
Sulphur (16)		
S-35	3×10^{0}	1×10^{5}
Antimony (51)		
Sb-122	4×10^{-1}	1×10^{2}
Sb-124	6×10^{-1}	1×10^{1}
Sb-125	1×10^{0}	1×10^{2}
Sb-126	4×10^{-1}	$1x\ 10^{1}$
Scandium (21)		
Sc-44	5×10^{-1}	1×10^{1}
Sc-46	5×10^{-1}	$1 x10^{1}$

Sc-47	7 x 10-1	$1 x10^{2}$
Sc-48	3×10^{-1}	1×10^{1}
Selenium (34)		
Se-75	3×10^{0}	$1 x10^{2}$
Se-79	2×10^{0}	1×10^{4}
Silicon (14)		
Si-31	6×10^{-1}	1×10^{3}
Si-32	5×10^{-1}	1×10^{3}
Samarium (62)		
Sm-145	1×10^{1}	1×10^{2}
Sm-147	unlimited	1×10^{1}
Sm-151	1×10^{1}	1×10^{4}
Sm-153	6×10^{-1}	$1x\ 10^{2}$
Tin (50)		
1	2	3
Sn-113 (a)	2×10^{0}	1×10^{3}
Sn-117m	4×10^{-1}	1×10^{2}
Sn-119m	3×10^{1}	1×10^{3}
Sn-121m (a)	9×10^{-1}	1×10^{3}
Sn-123	6×10^{-1}	1×10^{3}
Sn-125	$4 x10^{-1}$	1×10^{2}
Sn-126 (a)	4×10^{-1}	1×10^{1}
Strontium (38)		
Sr-82 (a)	2×10^{-1}	1×10^{1}
Sr-85	2×10^{0}	1×10^{2}
Sr-85m	5×10^{0}	1×10^{2}
Sr-87m	3×10^{0}	1×10^{2}
Sr-89	6×10^{-1}	1×10^{3}
Sr-90 (a)	3×10^{-1}	1×10^{2} (b)
Sr-91 (a)	3×10^{-1}	1×10^{1}
Sr-92 (a)	3×10^{-1}	1×10^{1}
Tritium		
T (H-3)	4×10^{1}	1×10^{6}
Tantalum (73)		
Ta-178 (long-term)	8×10^{-1}	1×10^{1}
Ta-179	3×10^{1}	1×10^{3}
Ta-182	5×10^{-1}	1×10^{1}
Terbium (65)		
Tb-157	4×10^{1}	1×10^{4}
Tb-158	1×10^{0}	1×10^{1}
Tb-160	6×10^{-1}	1×10^{1}
Technetium (43)		
Tc-95m (a)	2×10^{0}	1×10^{1}
Tc-96	4×10^{-1}	1×10^{1}
Tc-96m (a)	4×10^{-1}	1×10^{3}
Tc-97	unlimited	1×10^{3}
Tc-97m	1×10^{0}	1×10^{3}

Tc-98	7×10^{-1}	1×10^{1}
Tc-99	9×10^{-1}	1×10^{4}
Tc-99m	4×10^{0}	1×10^{2}
Tellurium (52)		
Te-121	2×10^{0}	1×10^{1}
Te-121m	3×10^{0}	1×10^{2}
Te-123m	1×10^{0}	1×10^{2}
Te-125m	9×10^{-1}	1×10^{3}
Te-127	7×10^{-1}	1×10^{3}
Te-127m (a)	5×10^{-1}	1×10^{3}
Te-129	6×10^{-1}	1×10^{2}
Te-129m (a)	4×10^{-1}	1×10^{3}
Te-131m (a)	5×10^{-1}	1×10^{1}
Te-132 (a)	4×10^{-1}	1×10^{2}
Thorium (90)		
1	2	3
Th-227	5×10^{-3}	1×10^{1}
Th-228 (a)	1×10^{-3}	1×10^{0} (b)
Th-229	5×10^{-4}	1×10^{0} (b)
Th-230	1×10^{-3}	1×10^{0}
Th-231	2×10^{-2}	1×10^{3}
Th-232	unlimited	1×10^{1}
Th-234 (a)	3×10^{-1}	1×10^{3} (b)
Th (natural)	unlimited	1×10^{0} (b)
Titanium (22)		
Ti-44 (a)	4×10^{-1}	1×10^{1}
Thallium (81)		
Tl-200	9×10^{-1}	1×10^{1}
Tl-201	4×10^{0}	1×10^{2}
Tl-202	2×10^{0}	1×10^{2}
Tl-204	7×10^{-1}	1×10^{4}
Thulium (69)		
Tm-167	8×10^{-1}	1×10^{2}
Tm-170	6×10^{-1}	1×10^{3}
Tm-171	4×10^{1}	1×10^{4}
Uranium (92)		
U-230 (a), (c), (g)	1×10^{-1}	1×10^{1} (b)
U-230 (a), (d), (h)	4×10^{-3}	1×10^{1}
U-230 (a), (e), (i)	3×10^{-3}	1×10^{1}
U-232 (c), (g)	1×10^{-2}	1×10^{0} (b)
U-232 (d), (h)	7×10^{-3}	1×10^{1}
U-232 (e), (i)	1×10^{-3}	1×10^{1}
U-233 (c), (g)	9×10^{-2}	1×10^{1}
U-233 (d), (h)	2×10^{-2}	1×10^{2}
U-233 (e), (i)	6×10^{-3}	1×10^{1}
U-234 (c), (g)	9×10^{-2}	1×10^{1}
U-234 (d), (h)	2×10^{-2}	1×10^{2}

U-234 (e), (i)	6×10^{-3}	1×10^{1}
U-235 (a), (c), (d), (e), (J)	unlimited	1×10^{1} (b)
U-236 (c), (g)	unlimited	1×10^{1}
U-236 (d), (h)	2×10^{-2}	1×10^{2}
U-236 (e), (i)	6×10^{-3}	1×10^{1}
U-238 (c), (d), (e), (j)	unlimited	1×10^{1} (b)
U (natural)	unlimited	1×10^{0} (b)
U (enriched to 20% or less) (f)	unlimited	1×10^{0}
1	2	3
U (depleted)	unlimited	1×10^{0}
Vanadium (23)		
V-48	4×10^{-1}	1×10^{1}
V-49	4×10^{1}	1×10^{4}
Tungsten (74)		
W-178 (a)	5×10^{0}	1×10^{1}
W-181	3×10^{1}	1×10^{3}
W-185	8×10^{-1}	1×10^{4}
W-187	6×10^{-1}	1×10^{2}
W-188 (a)	3×10^{-1}	1×10^{2}
Xenon (54)		
Xe-122 (a)	4×10^{-1}	1×10^{2}
Xe-123	7×10^{-1}	1×10^{2}
Xe-127	2×10^{0}	1×10^{3}
Xe-131m	4×10^{1}	1×10^{4}
Xe-133	1×10^{1}	1×10^{3}
Xe-135	2×10^{0}	1×10^{3}
Yttrium (39)		
Y-87 (a)	1×10^{0}	1×10^{1}
Y-88	4×10^{-1}	1×10^{1}
Y-90	3×10^{-1}	1×10^{3}
Y-91	6×10^{-1}	1×10^{3}
Y-91m	2×10^{0}	1×10^{2}
Y-92	2×10^{-1}	1×10^{2}
Y-93	3×10^{-1}	1×10^{2}
Ytterbium (79)		
Yb-169	1×10^{0}	1×10^{2}
Yb-175	9×10^{-1}	1×10^{3}
Zinc (30)		
Zn-65	2×10^{0}	1×10^{1}
Zn-69	6×10^{-1}	1×10^{4}
Zn-69m (a)	6×10^{-1}	1×10^{2}
Zirconium (40)		
Zr-88	3×10^{0}	1×10^{2}
Zr-93	unlimited	1×10^{3} (b)

Zr-95 (a)	8×10^{-1}	1×10^{1}
Zr-97 (a)	4×10^{-1}	1×10^{1} (b)

(a) – value A_2 includes the contribution of daughter radionuclides with a half-life shorter than 10 days,

(b) – list of parent radionuclides and their disintegration products in permanent state of equilibrium:

Sr-90	Y-90,
Zr-93	Nb-93m,
Zr-97	Nb-97,
Ru-106	Rh-106,
Cs-137	Ba-137m,
Ce-134	La-134,
Ce-144	Pr-144,
Ba-140	La-140,
Bi-212	Tl-208 (0,36), Po-212 (0,64),
Pb-210	Bi-210, Po-210,
Pb-212	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,
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, Pb-209,
Th-natural	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- natural	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,

(c) – values apply only for uranium compounds which have the chemical form UF_6, UO_2F_2 and $UO_2(NO_3)_2$, under both normal and emergency transportation conditions,

(d) – values apply only for uranium compounds which have the chemical form UO_3, UF_4, UCl_4 and hexavalent compounds, under both normal and emergency transportation conditions,

(e) – values apply for all other uranium compounds not specified in (c) and (d),

(f) – values apply only for unirradiated uranium,

(g) – rapid absorption through the lungs,

(h) – moderately rapid absorption through the lungs,

(i) – slow absorption through the lungs,
(j) – all types of absorption through the lungs.

Table2: Basic data for unknown radionuclides or mixtures of radionuclides

Radioactive content	A_2 [TBq]	Limit specific activity [Bq/g]
Only beta and gamma radionuclides present	0.02	1×10^{1}
Only alpha radionuclides present	9×10^{-5}	1×10^{-1}
No important data known	9×10^{-5}	1×10^{-1}

Annex 4
to the Decree No. 57 /2006
Coll.

TEST PROCEDURES FOR RADIOACTIVE MATERIALS, PACKAGING AND PACKAGES

Part I: Fulfilment of requirements

Fulfilment of the requirements laid down in Annex 1 shall be demonstrated using any of the following methods or a combination of them:

a) performing tests with samples representing LSA-III radioactive material or low dispersible radioactive material or prototypes or with samples of packaging; the content of the samples or packaging for the tests shall emulate as closely as possible the anticipated radioactive content and the test sample or packaging shall be prepared as usually handed over for transportation,
b) reference to previous satisfactory results of tests of a similar nature,
c) performing tests with models appropriately emulating those properties of the test object which are decisive for the results of these tests; when using reduced models, the relevant test parameters shall be adjusted as appropriate, such as, for example, mandrel diameter or magnitude of pressure loading,
d) calculation or reasoned argument in cases when the reliability or conservative nature of the calculation methods and parameters are generally acceptable.

Part II: Tests on LSA radioactive materials

A sample of a solid material representing the total content of a package shall be immersed in water at ambient temperature for seven days. The volume of water used for testing shall be sufficient to form, at the end of the 7-day test, a free volume of unabsorbed and unreacted water of at least 10 % of the volume of the solid test sample. The water shall have an initial pH of 6 - 8 and a maximum conductivity of 1 mS/m at 20°C. The total activity of the free volume of water shall be measured after the end of the 7-day test.

Part III: Tests on low dispersible radioactive material

A sample containing or emulating low dispersible radioactive material shall be subjected to the extended thermal test laid down in Part IV(24) and the impact test laid down in Part IV(25). A different sample may be used for each of these tests. After each test, the sample shall be subjected to the extraction test laid down in Part 11. After each such test, it shall be demonstrated that the applicable requirements given in Annex 1 Part 1(2) have been met.

Part IV: Package tests

1. Prior to testing, each sample package (hereinafter “sample”) shall be inspected and records shall be made of all defects or damage, including
   a) deviations from the design,
   b) construction defects,
   c) corrosion or other damage,
   d) deformations.

2. The package containment system shall be clearly specified.
3. The external signs on the sample shall be clearly identified so that it is possible to refer simply and clearly to each part of it.

4. Following the tests laid down in paragraphs 6 to 26,
   a) defects and damage to the sample shall be identified and recorded,
   b) it shall be determined whether the integrity of the screening and containment system in the sample has been retained pursuant to the requirements in Annex 1,
   c) it shall be determined whether the requirements laid down in Annex 1 Part XI have been met for an individual package or for several packages containing fissile material.

5. The target for the drop tests laid down in paragraph 10, paragraph 13(a) and paragraphs 15, 23 and 25 shall be flat, shall have a horizontal surface such that any increase in its resistance to displacement or deformation following impact of the sample does not increase the damage to the sample.

6. Samples containing or emulating packaging designed for the transportation of at least 0.1 kg of uranium hexafluoride shall be tested hydraulically at an internal pressure of at least 1.4 MPa. Any other equivalent non-destructive tests may be used for repeat testing of packaging.

7. Samples shall be subjected to a free drop test, a pressure loading test and a penetration test. Each of these tests shall be preceded by a water spray test. One sample may be used for all the tests, providing the provisions of paragraph 8 are fulfilled.

8. The time interval between the end of the water spray test and the next test shall be such that the water is absorbed as much as possible and the external surface of the sample does not dry out. If sprays from four sides are used simultaneously, this interval shall last for two hours. If successive water sprays from each of four directions are used, the tests shall be performed without pause.

9. In the water spray test, the sample shall be sprayed with water for at least one hour so that the quantity of water corresponds to rain at an intensity of 5 cm per hour.

10. In the free fall test, the sample shall drop onto the target so that it is damaged as much as possible, in view of the test safety characteristics. The drop height measured from the lowest point on the sample to the upper surface of the target shall not be less than the distance shown in Table 1 for the package weight in question, except for
    a) samples which are rectangular in shape and made from fibrous cardboard or wood with a weight not exceeding 50 kg and which are subjected to free fall from a height of 0.3 m onto each corner of the sample,
    b) samples which are cylindrical in shape and made from corrugated cardboard with a weight not exceeding 100 kg and which are subjected to free fall from a height of 0.3 m onto each quarter edge of both ends of the basic cylinder.

Table 1: Drop height for testing packages under normal transportation conditions

Package weight [kg]	Drop height [m]
less than 5 000	1.2
5 000 or over, but less than 10 000	0.9
10 000 or over, but less than 15 000	0.6
over 15 000	0.3

11. Providing the shape of the packaging does not prevent stacking, the pressure loading test shall involve subjecting the sample for 24 hours to pressure loading equal to the greater value of
    a) five times the weight of the actual package or
    b) the equivalent of 13 kPa multiplied by the vertically projected cross-section of the package.

    The loading shall be uniformly distributed on two opposites sides of the sample, one of which shall be the base on which the package usually rests.

12. The penetration tests shall be performed as follows:
    a) the sample shall be placed on a flat horizontal surface, which shall not move greatly during the test,
    b) a bar with a diameter of 3.2 cm, a hemispherical end and a weight of 6 kg shall be dropped in a vertical direction onto the centre of weakest part of the sample so that, with sufficiently deep penetration, it impacts on the containment system; the bar shall not be substantially deformed during the test,
    c) the bar drop height measured from its lower end to the intended point of impact on the upper edge of the sample shall be 1 m.

13. In supplementary tests on type A packages containing liquids and gases, the sample or separate samples shall be subjected to each of these tests unless it can be demonstrated that one of the tests causes greater damage to the sample than the others. In this case, the sample shall be subjected to that test. The tests shall be performed as follows:
    a) the sample shall drop in free fall onto the target so that the containment of the sample suffers maximum damage; the drop height measured from the lowest part of the sample to the upper surface of the target shall be 9 m,
    b) the sample shall be subjected to the penetration test laid down in paragraph 12, except that the drop height shall be adjusted to 1.7 m.

14. In tests to demonstrate the ability to resist accident conditions during transportation, the sample shall be subjected to the cumulative effect of the tests laid down in paragraphs 15 and 16 in the order given. After these tests, the sample or a particular sample shall be subjected to the water immersion tests (tests) laid down in paragraph 17 and, if applicable, also the test laid down in paragraph 18.

15. The mechanical test shall comprise three different drop tests. Each sample shall be subjected to the appropriate drop pursuant to Annex 1 Part VIII(7) or Part XI(11). The order in which the sample is subjected to these drops shall be such that, after the end of the mechanical test, it suffers the maximum damage during the subsequent thermal test. The tests shall be performed as follows:
    a) drop I - the sample shall fall from a height of 9 m onto the target so that it suffers maximum damage; the drop height shall be measured from the lowest point on the sample to the upper surface of the target,
    b) drop II - the sample shall fall from a height of 1 m onto a mandrel firmly attached perpendicularly to the target so as to cause maximum damage to the sample; the drop height shall be measured from the anticipated point of impact on the sample to the upper surface of the mandrel; the mandrel shall be made

from mild steel of circular cross-section with a diameter of (15,0 ±0,5) cm and a length of 20 cm (if a longer mandrel would cause greater damage, a longer mandrel shall be used in order to cause the maximum damage), the upper end of the mandrel shall be flat and horizontal with rounded edges with a maximum radius of 6 mm,

c) drop III - the sample shall be positioned on the target so that a solid steel plate measuring 1 m x 1 m and weighing 500 kg falling from a height of 9 m in a horizontal direction causes maximum damage; the drop height shall be measured from the lower side of the plate to the upper edge of the sample.

16. In the thermal test, the sample stabilised at a constant external temperature of 38°C shall be exposed to the solar radiation conditions defined in Annex 1 Table 1 and also to the maximum design rate of internal development of heat released by the radioactive content of the package. Any of these parameters may have different values before testing and during it, if they are properly taken into account in assessing the reaction of the sample.

17. The thermal test shall be performed as follows:

a) the whole sample shall be left for 30 minutes in an environment with a heat flow at least equivalent to the flow caused by the flame from a mixture of a hydrocarbon fuel and air under ambient conditions which are sufficiently stable to achieve a mean flame emission coefficient of at least 0.9, a mean flame temperature of at least 800°C, the flame completely encompassing the entire sample with a coefficient of surface absorption of either 0.8 or a value which the package would have had, if exposed to the specified fire,

b) the sample shall then be left for a sufficiently long period of time for the temperatures to stabilise throughout the sample in an environment with an external temperature of 38°C and also exposed to the solar radiation defined in Annex 1 Table 1 and the maximum design rate of internal development of heat released by the radioactive content of the package; any of these parameters may have different values after the end of heating, if they are properly taken into account in assessing the reaction of the sample.

18. In the water immersion test, the sample shall be immersed beneath the surface of the water to a depth of at least 15 m for at least 8 hours in a position causing maximum damage to it. These conditions shall correspond to an external pressure of at least 150 kPa.

19. In the extended water immersion test for type B(U) and type B(M) packages containing more than 10^5 A_2 and type C packages, the sample shall be immersed in water for at least one hour to a depth of at least 200 m. These conditions shall correspond to an external pressure of at least 2 MPa.

20. The water penetration test for packages containing fissile material shall not be used for packages for which the penetration or discharge of water is assumed for the purposes of assessment of maximum reserve of reactivity pursuant to Annex 1 Part XI(6) to (11).

21. Before a sample is subjected to the test pursuant to paragraph 22, it shall be subjected to the test laid down in paragraph 15(b), the test laid down in paragraph 15(a) or (c), as shown in Annex 3 Part XI(11), and the tests laid down in paragraphs 16 and 17.

22. The sample shall be immersed beneath the surface of the water to a depth of at least 0.9 m for at least 8 hours in a position in which the maximum penetration of water is anticipated.

23. In tests for type C packages, the samples shall be subjected to the effects of each of these tests in the following order:

    a) tests laid down in Paragraph 15 (a), (c) and Paragraphs 24 and 25,
    b) tests laid down in Paragraph 26.

    Separate samples may be used for each of these tests.

24. In the test for perforation and splitting, the sample shall be exposed to the damaging effects of a solid test instrument made from mild steel. The orientation of the instrument to the surface of the sample shall be such that, at the conclusion of the sequence of tests laid down in Paragraph 23 (a), the sample suffers maximum damage. The test shall be performed as follows:
    a) if the sample represents a package weighing less than 250 kg, it shall be placed on the target and exposed to a test instrument weighing 250 kg falling from a height of 3 m above the anticipated point of drop; for this test, the test instrument used shall be a cylindrical bar with a diameter of 20 cm with an impact end forming a cone with a rectangular apex, a length of 30 cm and a diameter of 2.5 cm at the point,
    b) if the sample represents a package weighing 250 kg or more, the base of the test instrument shall be attached to the target and the sample shall fall onto the test instrument from a height of 3 m from the anticipated point of drop; for this test, use shall be made of the test instrument described in sub-paragraph a), the length of which shall be adjusted so as to cause maximum damage to the sample.
25. The extended thermal test shall be performed as laid down in paragraphs 16 and 17. The period of action of the thermal environment shall be extended to 60 minutes.

26. In the impact test, the sample shall impact onto the target at a velocity of at least 90 m/s in such a direction as to suffer maximum damage.