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NUCLEAR SAFETY AND RADIATION PROTECTION ACT (CAP N142 LAWS OF THE FEDERATION OF NIGERIA)

NIGERIAN TRANSPORTATION OF RADIOACTIVE MATERIAL REGULATIONS, 2023

ARRANGEMENT OF REGULATIONS

Regulation :

S. I. No. 2 of 2026

NUCLEAR SAFETY AND RADIATION PROTECTION ACT (Cap N142 LAWS OF THE FEDERATION OF NIGFERIA)

NIGERIAN TRANSPORTATION OF RADIOACTIVE MATERIAL REGULATIONS, 2023

In exercise of the powers conferred on it by section 47 of the Nuclear Safety and Radiation Protection Act, CAP N142 Laws of the Federation of Nigeria, 2004 and of all other powers enabling it in that behalf, the Nigerian Nuclear Regulatory Authority, with the approval of the President, makes the following Regulations —

[23*rd day of November*, 2023] Commencement.

PART I — GENERAL PROVISIONS

1. These Regulations shall provide for the protection of people, property and environment from the harmful effects of ionizing radiation during the transportation of radioactive material within Nigeria, which is achieved by the — Objective

(*a*) containment of the radioactive contents ;

(*b*) control of external dose rate ;

(*c*) prevention of criticality ; and

(*d*) prevention of damage caused by heat.

2.—(1) These Regulations shall apply to transport of radioactive material by all modes on land, water or in the air within Nigeria including transport which is incidental to the use of the radioactive material. Scope

(2) These Regulations do not specify controls such as routing or physical protection that may be instituted for reasons other than radiological safety.

(3) Any controls referred to sub-regulation (3) of this regulation shall take into account radiological and non-radiological hazards, and shall not detract from the standards of safety that these Regulations are intended to provide.

3. The under listed provisions shall not be affected by these Regulations — Exclusion

(*a*) where radioactive material is an integral part of the means of transport ;

(*b*) where the radioactive material is moved within an establishment that is subject to appropriate safety regulations and where the movement does not involve public roads or railways ;

(*c*) where the radioactive material is implanted or incorporated into a person or live animal for diagnosis and treatment ;

(*d*) where the radioactive material is in or on a person who is to be transported for medical treatment because the person has been subjected to accidental or deliberate intake of radioactive material or to contamination ;

(*e*) where the radioactive material is in consumer products which have received regulatory approval following their sale to the end user ;

(*f*) natural materials and ores containing naturally occurring radionuclide that either are in their natural state, or have been processed only for the purposes other than for extraction of radionuclide, and that are not intended to be processed for use of these radionuclide, where the activity concentration of the material does not exceed 10 times the activity limits and material restriction as specified in Table 1 of the First Schedule to these Regulations ; and

(*g*) non-radioactive solid objects with radioactive substances on the surfaces not in excess of 0.4 Bq/cm^2 for beta, gamma or low toxicity alpha emitters and 0.04 Bq/cm^2 for other alpha emitters.

Application

4. These Regulations shall apply in addition to the Nigeria Basic Ionizing Radiation Regulations (NIBIRR) and other applicable Regulations.

Part II — Relation to other Regulations and Resolution of Conflicting Provisions, Graded Approach, Management System, Compliance Assurance and Non-compliance

Relation to other regulations and resolution of conflicting provisions

5.—(1) The provisions of these Regulations are an addition to other applicable national laws and regulations and nothing in these Regulations shall relieve a licensee from complying with other applicable laws and regulations.

(2) A licensee who identifies an apparent or actual conflict between the provisions of these Regulations and any other law or regulations, shall notify the authority in order to resolve the conflicting provisions.

(3) Nothing in these Regulations shall restrict any actions that may be necessary for the safety and security of radioactive material.

(4) A licensee shall comply with any additional requirement imposed by the authority, by any regulation, order or terms and conditions of a licence, in addition to these Regulations, where necessary for the safety and security of radioactive material.

Graded approach

6. The requirements of these Regulations shall be accomplished by —

(*a*) applying a graded approach to contents limits for packages and conveyances and performance standards applied to package designs, depending upon the hazard of the radioactive contents ;

(*b*) imposing conditions on the design and operation of packages and on the maintenance of packaging, including consideration of the nature of the radioactive contents ;

(*c*) requiring administrative controls, including, where appropriate, approval by the Authority ; and

(*d*) making arrangements for planning and preparing emergency response to protect people, property and the environment.

Management system

7.—(1) A management system for all activities within the scope of these Regulations based on international, national or other standards acceptable to the authority shall be established, implemented and complied with.

(2) Certification that the design specification is fully implemented shall be provided to the authority.

(3) The manufacturer, consignor or user shall be prepared to —

(*a*) provide facilities for inspection during manufacture and use ; and

(*b*) demonstrate compliance with these Regulations to the Authority.

(4) Where the Authority's approval is required, such approval shall take into account and be contingent upon the adequacy of the management system.

Compliance assurance

8. The Authority shall assure compliance with these Regulations by arranging for periodic assessments of the radiation doses to people due to the transport of radioactive material, and ensuring that the system of protection and safety complies with NiBiRR.

Non-compliance

9. Where there is non-compliance with any dose rate or contamination limits in these Regulations —

(*a*) the consignor, consignee, carrier and any organisation involved in transport who is affected shall be informed of the non compliance by the —

(*i*) carrier, if the non-compliance is identified during transport, or

(*ii*) consignee, if the non-compliance is identified at receipt ;

(*b*) the consignor, carrier or consignee shall —

(*i*) take immediate steps to mitigate the consequences of the non-compliance,

(*ii*) investigate the non-compliance, its causes, circumstances and consequences,

(*iii*) take appropriate action to remedy the causes and circumstances that led to the non-compliance and to prevent a recurrence of the causes and circumstances similar to those that led to the non-compliance, and

(*iv*) communicate to the authority on the causes of the non-compliance and the corrective or preventive actions taken or to be taken ; and

(c) the consignor and the authority shall be informed —

(*i*) as soon as practicable, or

(*ii*) immediately where an emergency exposure situation has developed or is developing.

PART III — LICENCE TO TRANSPORT RADIOACTIVE MATERIAL

Application for licence

10.—(1) An application by a person, facility and organisation for licence to transport radioactive material shall contain —

(*a*) the date, time and location of any scheduled stop or trans-shipment in Nigeria ;

(*b*) the number of packages to be transported ;

(*c*) the types of conveyance to be used during transit ;

(*d*) the transport arrangements between the consignor and consignee ;

(*e*) the United Nations number for the radioactive material ;

(*f*) the identification number of the emergency response assistance plan approved under chapter 2.7 Class 7 of the United Nations recommendations on the Transport of Dangerous Goods ;

(*g*) the number of the certificate or approval applicable to the package where the radioactive material is required to be transported in a package of a certified design or in a package that has been approved as Type B(U)-96, Type C-96 or H(U)-96 by a foreign competent Authority in accordance with the applicable process specified in regulation 11 of these Regulations ;

(*h*) name of the vessel and its flag state, where a vessel is to be used as a conveyance during transit, and for a special vessel to be used as a conveyance during transit, a document issued by the competent Authority of the vessel's flag state approving a radiation protection programme shall be provided ; and

(*i*) where a vessel is to be used as a conveyance during transit, the name of the vessel and its flag state, and for a special vessel to be used as a conveyance during transit, a document issued by the competent Authority of the vessel's flag state approving a radiation protection programme ; and

(*j*) the International Maritime Dangerous Goods (IMDG) Code for the transport of radioactive material shall be applied along with these Regulations where the radioactive material is to be transported by sea.

(2) Where the radioactive material referred to in sub-regulation (1) of this regulation is to be transported by air, the International Air Transport Association (IATA) and International Civil Aviation Organization (ICAO) Dangerous Goods Regulations shall apply.

Licence to package or transport under special arrangement

11.—(1) Where it is impracticable to comply with the requirement of these Regulations in respect of the transportation of any consignment, such consignment may be transported under special arrangement.

(2) The transportation of any consignment under special arrangement shall apply where the Authority is satisfied that conformity with the other provisions of these Regulations is impracticable and the requisite standards of safety established by these Regulations have been demonstrated through means alternative to the other provisions of these Regulations.

(3) The Authority shall approve special arrangement transport operations for a single consignment or a planned series of multiple consignments where the overall level of safety in transport shall be at least equivalent to that which would be provided if all the applicable requirements in these Regulations are met.

(4) For consignments of this type, multilateral approval shall be required.

Licensing

12. Any licence issued under these Regulations shall be —

(*a*) valid for a period as the Authority may specify ; and

(*b*) renewable by the Authority if the licensee complies with the licence's terms and conditions.

Terms and conditions for licensing

13.—(1) Any authorisation issued shall carry terms and conditions, which shall be observed by the licensee and include —

(a) the designated ports of entry or exit of radioactive material ;

(b) requirement for the notification of the Authority of shipment and receipt of radioactive materials ;

(c) management systems and compliance assurance ;

(d) safety and security responsibilities ;

(e) radiation protection programme ; and

(f) emergency preparedness and response programme,

(2) Transportation of radioactive material shall be within 6am to 6pm local time.

(3) The Licence shall not relieve the consignor from compliance with any requirement of the government of any country through or into which the package is transported.

(4) Any other terms and conditions as may be imposed by the Authority.

Terms and conditions for licensing

14.—(1) A consignor, carrier and consignee of radioactive material within Nigeria shall have a valid licence from the Authority and notify the Authority in advance but not later than 14 working days prior to the delivery, transport and receipt of any such materials.

(2) Carriers of radioactive materials within Nigeria shall obtain security clearance from the Department of State Security Service.

(3) The vehicle for shipment by road shall be dedicated for transportation of radioactive materials and all relevant particulars of the vehicle shall be submitted to the Authority.

(4) Proposals from applicants for transportation of radioactive material shall be supplied in writing to the Authority as may be required under NiBiRR.

(5) A person who intends to dispatch radioactive materials shall carry out the packaging of the radioactive materials in compliance with regulation 22 of these Regulations.

(6) Consignors, consignees and carriers shall establish a procedure for routine communication with the Authority.

(7) An applicant shall pay the appropriate fees prescribed by the Authority.

PART IV — CERTIFICATION AND DECERTIFICATION OF PACKAGE DESIGN

Certification of package design

15.—(1) The Authority shall ensure that the following information is included in the application for certification of a package design, a design for special form radioactive material, a design for low dispersible radioactive or fissile material —

(*a*) detailed description of the radioactive material or a capsule particular reference shall be made to both physical and chemical states ;

(*b*) a detailed statement of the design of any capsule to be used ;

(*c*) a statement of the tests carried out and the results, or evidence based on the calculative methods to show that the radioactive material is capable of meeting the performance standards, or other evidence that the special form radioactive material, or low dispersible radioactive or fissile materials meet the applicable requirement of this regulation ;

(*d*) evidence that the design meets the requirements for packages containing uranium hexafluoride in Table VIII of the First Schedule to these

Regulations and regulation 22 (1) of these Regulations and a specification of the applicable management system as required in regulation 7 of these Regulations ;

(*e*) evidence that the design for a Type B(U) and Type B(M) packages, meets the requirements of regulations 20(4)(b), (ii, & iii), 22 (1) and 7 of these Regulations ;

(*f*) evidence that the design for a Type C package, meets the requirements specified in regulations 10(2), 20(4)(b)(ii & iii), 22(1), and 7 of these Regulations ;

(g) the identification number of any approval issued by a foreign competent Authority in accordance with the applicable process specified in these Regulations ;

(*h*) in respect of a package design, the recommended inspection and servicing program ;

(*i*) the instructions for packaging, transport, receiving, maintenance and unpackaging ; and

(*j*) any other information that is necessary to determine if the application for certification meets the requirements of these Regulations.

(2) The Authority shall accredit qualified independent assessors of package designs.

(3) An applicant shall give the Authority an opportunity to observe any test that the applicant conducts to demonstrate compliance of a package design, a design for special form radioactive material, design for low dispersible radioactive or fissile material in accordance with the provisions of these Regulations, including notice of the date and time of the test.

(4) Where it is not required that the Authority issue a certificate of approval, of package designs, the consignor shall, on request, make available for inspection by the Authority, documentary evidence of the compliance of the package design with all the applicable requirements.

(5) For package designs under transitional arrangements, provisions of para.819 – 823 of SSR-6 shall apply.

Recertification of package design

16.—(1) The Authority may recertify a design certified under regulation 11 of these Regulations, if its technical specifications have not changed and the Authority or designated officer receives an application from the certificate holder not later than 60 days after the expiry date of the certificate.

(2) A statement confirming that the drawings and procedures previously submitted have not changed or where they have changed, a copy of the revised drawings, procedures and a statement confirming that the changes are without

technical significance and do not affect the safety of the design shall be submitted.

(3) The application for recertification shall include —

(*a*) a statement which confirms that each package is maintained in compliance with the drawings and procedures previously submitted ;

(*b*) a statement which confirms that the instructions previously submitted in respect of a package design, have not changed ;

(*c*) the model number and drawings of any capsule containing radioactive material unless previously submitted ;

(*d*) a list of the serial numbers of packages manufactured and maintained in accordance with the certified package design in respect of a certified package design other than one referred to in regulation 11(4) of these Regulations ;

(*e*) a list of the serial numbers of all packages currently in use or intended to be used in Nigeria in respect of a certified package design that was certified after approval by a foreign competent Authority ;

(*f*) a list of the known users of the latest certified package design ;

(*g*) a summary of the maintenance performed and any operational or maintenance problems encountered with the package, including the date, nature of the maintenance or problem and any action taken ;

(*h*) in respect of a design originating in a foreign country, a copy of each package design approval document or low dispersible radioactive material approval document issued by the foreign competent Authority since the last certification ;

(*i*) a copy of the documents submitted to the foreign competent Authority in order to obtain a package design approval document referred to in regulations 7 and 11 of these Regulation at the request of the Authority ; and

(*j*) any other information the Authority may deem necessary to determine if the application meets the applicable requirements of these Regulations.

Refusal to certify

17. The Authority shall notify a person who has applied for the certification of a package design, a design for special form radioactive material or a design for low dispersible radioactive or fissile material of a proposed decision not to certify the design, and the basis for the proposed decision, at least 30 days before refusing to certify it.

Decertification of package design

18. The Authority shall notify a person to whom a certificate for a package design, a design for special form radioactive material or a design for low dispersible radioactive, or fissile material is issued and, in the case of a certificate for a package design, any registered user of a package of that design, of a proposed decision to decertify the design, and the basis for the proposed decision, at least 30 days before decertifying it.

Dissemination of authorisation

19.—(1) The Authority shall make available copies of authorisations for transport of radioactive material to law enforcement agents and other relevant government agencies for their information and other necessary actions.

(2) An applicant shall pay the appropriate fees prescribed by the Authority for copies of authorisation for transport of radioactive material.

Part V — Classification of Radioactive Material

Classification of radioactive material

20.—(1) The exempt limits for individual radionuclides that shall be contained in a package is provided in Table 1 of the First Schedule to these Regulations.

(2) For materials containing mixtures of radionuclides, the activity concentration for exempt consignment may be derived from the expression specified in the Third Schedule to these Regulations.

(3) For unknown radionuclides or mixtures the more restrictive values of activity concentration for exempt material or activity limits for exempt consignments specified in Table II of the First Schedule to these Regulations shall be used.

(4) Radioactive material or items to be transported shall be classified, using A_1 or A_2 values —

(*a*) material , instruments or articles not exceeding the limits for an excepted package activity limits are specified in Table III of the First Schedule to these Regulations, in addition, the radiation level at 10 cm from any point on the external surface of any unpackaged instrument or article shall not be greater than 0.1 mSv/h ;

(*b*) Low Specific Activity (LSA) material which shall be in one of thethree groups classified as LSA-I, LSA-II or LSA-III—

(*i*) in LSA-I, the following parameters shall apply —

(A) uranium and thorium ores and concentrates of such ores, and other ores containing naturally occurring radionuclides which are intended to be processed for the use of these radionuclides,

(B) solid unirradiated natural uranium or depleted uranium or natural thorium or their solid or liquid compounds or mixtures,

(C) radioactive material for which the A_2 value is unlimited, or

(D) other radioactive material in which the activity is distributed throughout and the estimated average specific activity does not exceed 30 times the values for exempt activity concentration specified in regulation 6 of these Regulations,

(*ii*) LSA-II, the following parameters shall apply —

(A) water with tritium concentration up to 0.8 TBq/L, or

(B) other material in which the activity is distributed throughout and the estimated average specific activity does not exceed 10^{-4} A_2/g for solids and gases, and 10^{-5} A_2/g for liquids,

(*iii*) LSA-III and which occurs in solids such as consolidated wastes, activated materials, excluding powders, in which the —

(A) radioactive material is distributed throughout a solid or a collection of solid objects, or which is essentially uniformly distributed in a solid compact binding agent such as concrete, bitumen, ceramic or any other applicable agent, and

(B) estimated average specific activity of the solid excluding any shielding material, does not exceed 2 x 10^{-3} A_2/g,

(c) surface contaminated objects (SCO) which shall be in I —

(*i*) SCO-I: A solid object in which the —

(A) non-fixed contamination on the accessible surface averaged over 300cm^2 or the area of the surface is less than 300cm^2 does not exceed 4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 0.4 Bq/cm^2 for all other alpha emitters,

(B) fixed contamination on the accessible surface averaged over 300cm^2 (or the area of the surface if less than 300cm2) does not exceed 4x10^4Bq/cm^2 for beta and gamma emitters andlow toxicity alpha emitters, or 4x10^3Bq/cm^2 for all other alpha emitters, and

(C) non-contamination and the fixed contamination on the inaccessible surface averaged over 300 cm^2 or the area of the surface if less than 300 cm^2 does not exceed 4x10^4Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 4x10^3 Bq/cm^2 for all other alpha emitters,

(*ii*) SCO-II which occurs in a solid object on which either the fixed or non-fixed contamination in the surface exceeds the applicable limits specified for SCO-I in sub regulation (c) paragraph (i) of this regulation and which the —

(A) non-fixed contamination on the accessible surface averaged

over 300cm^2 (or the area of the surface if less than 300cm^2) does not exceed 400 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 40 Bq/cm^2 for all other alpha emitters,

(B) fixed contamination on the accessible surface, averaged over 300cm^2 (or the area of the surface if less than 300cm^2 does not exceed 8 x10^5 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 8x10^4 Bq/cm^2 for all other alpha emitters, and

(C) non-fixed contamination and the fixed contamination on the inaccessible surface averaged over 300 cm2 or the area of the surface if less than 300cm2 does not exceed 8 x10^5 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 8x10^4 Bq/cm^2 for all other alpha emitters, and

(*iii*) SCO-III which occurs in a large solid object, because of its size, cannot be transported in a type of package described in these Regulations and for which —

(A) all openings are sealed to prevent release of radioactive material during conditions defined in in regulation 21 of these Regulations,

(B) the inside of the object is as dry as practicable,

(C) the non-fixed contamination on the external surfaces does not exceed the limits specified in regulation 38 of these Regulations, and

(D) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm2 does not exceed 8 × 10^5 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 8 × 10^4 Bq/cm^2 for all other alpha emitters ;

(*d*) Type A package quantity where the activity of the material does not exceed the A_1 or A_2 values in Table I or II of these Regulations or the A_1 or A_2 values as derived for material containing a mixture of known radionuclides ;

(*e*) Type B package quantity where the activity of the material exceeds the limits for a Type A package but not any limit specified in the competent Authority certificate for the Type B(U) or Type B(M) package in which it is to be transported ; and

(*f*) the complete and proper shipping names to be used for the transport of radioactive material are provided in Table VIII of these Regulations.

PART VI — UNPACKED SHIPMENT AND EXCLUSIVE USE, PACKAGING AND PACKAGES

Unpacked shipment and exclusive use

21.—(1) Radioactive materials such as LSA material and SCO in groups LSA-I, SCO-I and SCO-III may be transported unpackaged under the following conditions —

(*a*) unpackaged material other than ores containing naturally occurring radionuclides shall be transported in such a manner that under routine conditions of transport there shall be no escape of the radioactive contents from the conveyance or loss of shielding ;

(*b*) each conveyance shall be under exclusive use, except when transporting SCO-I on which the contamination on the accessible and the inaccessible surfaces is not greater than 10 times the applicable level specified for SCOs ;

(*c*) for SCO-I where it is suspected that non-fixed contamination exists on inaccessible surfaces in excess of the values in regulation 20(4)(c) of these Regulations, measures shall be taken to ensure that the radioactive material is not released into the conveyance ;

(*d*) unpackaged fissile material shall meet the requirement of regulation 20(4)(e) of these Regulations ; and

(e) for SCO-III —

(*i*) transport shall be under exclusive use by road, rail, inland waterway or sea,

(*ii*) stacking shall not be permitted,

(*iii*) all activities associated with the shipment, including radiation protection, emergency response and any special precautions or special administrative or operational controls that are to be employed during transport shall be described in a transport plan and the transport plan shall demonstrate that the overall level of safety in transport is at least equivalent to that which would be provided if the requirements of regulations 2 and 12 (b) of these Regulations had been met,

(*iv*) the object and any shielding are secured to the conveyance in accordance with regulation 21 (1)(a) of this regulation, and

(*v*) the shipment shall be subject to multilateral approval.

(2) All LSA material and SCO, except as otherwise specified in this regulation shall be packaged in accordance with the requirements of Table V of the First Schedule to these Regulations.

Packaging and packages

22.—(1) Radioactive material or items which require packaging for transport shall be packaged in any of the following packages in order of increasing risk which are designed, manufactured, tested, documented, used, maintained, and inspected in accordance with the requirements of regulation 7 and 11 of these Regulations —

(*a*) excepted package ;

(*b*) industrial package (IP-1, IP-2 or IP-3) ;

(*c*) type A package ;

(*d*) type B(M) package ;

(*e*) type B(U) package ;

(*f*) type C package ; and

(*g*) packaging Containing Fissile Materials.

(2) Industrial packages such as IP-1, IP-2 or IP-3 may be used for the transport of low specific activity material or surface contaminated objects as specified in Table IV of the First Schedule to these Regulations provided that the dose rate level at 3 m from the unshielded material or object does not exceed 10 mSv/h.

(3) Radioactive material or items may be transported in packages which provide more protection than required for the material.

(4) Empty packages, which previously contained radioactive material, may be shipped as excepted packages where —

(*a*) they are in a well maintained condition and securely closed ;

(*b*) the outer surface of any uranium or thorium in its structure is covered with an inactive sheath made of metal or some other substantial material ;

(*c*) the level of internal non-fixed contamination does not exceed one hundred times the levels specified in Table 1 of the First Schedule to these Regulations ;

(*d*) any labels required for its previous use are no longer visible ;

(*e*) packages of foreign origin in transit in Nigeria are inspected by the Authority ; and

(*f*) all other requirements for excepted packages in these Regulations are met.

Part VII — Mixed Content, Maximum Dose Rate, Transport Index (TI) and Criticality Safety Index (CSI)

Mixed content

23. A package shall not contain any other items except such articles and documents as are necessary for the use of the radioactive material.

Maximum dose rate

24.—(1) A dose rate limit shall apply to the following items and materials to be packaged for transport, where the —

(*a*) dose rate at 10 cm from any point on the external surface of any unpackaged instrument or article which has an activity levels below the limits for an excepted package, shall not be greater than 0.1 mSv/h ; and

(*b*) quantity of LSA material or SCO in a single industrial package such as Type IP-1, IP-2 or IP-3 shall be restricted to the extent that the external radiation level at 3m from the unshielded material or object does not exceed 10 mSv/h.

(2) A dose rate limits shall apply to packages or overpacks where —

(*a*) the dose rate limit for excepted packages is 5 μSv/h at the surface of an excepted package ;

(*b*) the dose rate for all other packages and overpacks, except for consignments under exclusive use, shall not exceed 2 mSv/h at any point on any external surface of the package or overpack and, in addition, shall not exceed 0.1 mSv/h at 1m from the external surfaces of the package or overpack ;

(*c*) a consignment to be transported by road or rail under exclusive use, the dose rate on the external surface of any package or overpack shall not exceed 10 mSv/h and may exceed 2 mSv/h when specific vehicle and shipment condition are met as specified in Table VII of the First Schedule to these Regulations ; and

(*d*) the dose rate for exclusive use, shipments by air or vessel, on the external surface of any package or overpack greater than 2 mSv/h may be allowed under special arrangement conditions which are stated in regulation 11 of these Regulations.

(3) Dose rate for conveyances are limited where —

(*a*) loading of freight containers and the accumulation of packages and over packs aboard a single conveyance shall be such that the dose rate under routine conditions of transport shall not exceed 2 mSv/h at any point on, and 0.1 mSv/h at 2m from the external surface of the conveyance ; and

(*b*) further control over radiation exposure during transport is provided with limits on the transport index as specified in regulation 25 of these Regulations.

Transport index

25.—(1) A Transport Index (TI) based on radiation levels, shall be assigned to a package, overpack, freight container or to unpackaged LSA-1 or SCO-1 to provide control over radiation exposure during the transportation

of —

(*a*) uranium and thorium ores and their concentrates, the maximum dose rate at any point 1m from the external surface of the load may be taken as —

(*i*) 0.4 mSv/h for ores and physical concentrates of uranium and thorium,

(*ii*) 0.3 mSv/h for chemical concentrates of thorium, and

(*iii*) 0.02 mSv/h for chemical concentrates of uranium, other than uranium hexafluoride ;

(*b*) tanks, freight containers and unpacked LSA-1 and SCO-1, the value determined in paragraph (a) of this sub-regulation shall be multiplied by the appropriate factor from Table VI of the First schedule to these Regulations ; and

(*c*) the value obtained in paragraphs (a) and (b) of this sub-regulation shall be rounded up to the first decimal place such as 1.16 becomes 1.2, except that a value of 0.05 or less may be considered as zero.

(2) The TI for each overpack, freight container or conveyance shall be determined as either the sum of the TIs of all the packages contained, or by direct measurement of dose rate, except in the case of non-rigid overpacks for which the TI shall be determined as the sum of the TIs of all the packages.

(3) Any package or overpack with a TI greater than 10 shall be transported under exclusive use.

(4) The TI limits for freight containers and conveyances not under exclusive use are provided in Table IX of the First Schedule to these Regulations.

(5) There is no limit on the sum of TIs for consignments of LSA-1 material.

(6) Where a consignment is transported under exclusive use, there is no limit on the sum of the TIs abroad a single conveyance.

Criticality safety index (CSI)

26.—(1) The CSI for each overpack or freight container shall be determined as the sum of the CSIs of all the packages contained, and the same procedure shall be followed to determine the total sum of the CSIs in a consignment or aboard a conveyance.

(2) The CSI packages containing fissile material in any form shall not exceed 10 where the —

(*a*) smallest external dimension of the package is not less than 10 cm ; or

(*b*) CSI of the package is calculated using the formula —

CSI = 50 × 5 × {[mass of uranium-235 in package (g)]/Z+ [mass of other fissile nuclides1 in package (g)]/280} where the values of Z are taken from Table XI of the First Schedule to these Regulations.

(3) The CSI packages containing fissile material in any form shall not exceed 10 where the —

(*a*) smallest external dimension of the package is not less than 30 cm ;

(*b*) package, after being subjected to the tests specified in paragraphs 719–724 of SSR-6 —

(*i*) retains its fissile material contents,

(*ii*) preserves the minimum overall outside dimensions of the package to at least 30 cm, or

(*iii*) prevents the entry of a 10 cm cube ; and

(*c*) CSI of the package is calculated using the following formula —

CSI= 50 × 2 × {[mass of uranium-235 in package (g)]/Z + [mass of other fissile nuclides1 in package (g)] / 280} where the values of Z are taken from Table XI of First schedule to these Regulations.

(4) The CSI packages or overpack containing fissile material in any form shall not exceed 50 where the —

(*a*) smallest external dimension of the package is not less than 10 cm ;

(*b*) package, after being subjected to the tests specified in paragraphs 719–724 of SSR-6 —

(*i*) retains its fissile material contents,

(*ii*) preserves the minimum overall outside dimensions of the package to at least 10 cm, and

(*iii*) prevents the entry of a 10 cm cube ;

(*c*) CSI of the package is be calculated using the following formula —

CSI = 50 × 2 × {[mass of uranium-235 in package (g)]/450 + [mass of other fissile nuclides1 in package (g)]/280} ;

(*d*) The maximum mass of fissile nuclides in any package does not exceed 15g ; and

(*e*) total mass of beryllium, hydrogenous material enriched in deuterium, graphite and other allotropic forms of carbon in an individual package is not greater than the mass of fissile nuclides in the package except where their total concentration does not exceed 1g in any 1000g of material and Beryllium incorporated in copper alloys up to 4% by weight of the alloy does not need

to be considered.

PART VIII — MARKING, LABELING AND PLACARDING

Marking

27.—(1) Where an unpackaged LSA-1 or SCO-1 material is contained in receptacles or packaging material and shipped under conditions specified in regulation 20 of these Regulations, the outer surface of these receptacles or wrapping materials shall bear the marks "RADIOACTIVE LSA-1" or RADIOACTIVE SCO-1".

(2) A package shall be legibly and durably marked on the outside of the packaging with an identification of either the consignor or consignee, or both.

(3) A package of gross mass exceeding 50 kg shall have its permissible gross mass legibly and durably marked on the outside of the packaging.

(4) A package shall be legibly and durably marked on the outside of the packaging with the appropriate United Nations number as stated in Table VIII of the First Schedule to these Regulations preceded by the letters "UN" and for each package other than excepted packages the proper shipping name as identified in Table VIII of the First Schedule to these Regulations shall also be included with these marks.

(5) Industrial package shall be legibly and durably marked on the outside of the packaging with "TYPE IP-1" "TYPE IP-2" or TYPE IP-3" as appropriate.

(6) Type A package shall be legibly and durably marked on the outside of the packaging with "TYPE A".

(7) Any package which conforms to an approved Type B(U) and Type B(M) design shall be legibly and durably marked on the outside of the packaging with —

(*a*) the identification mark allocated by the Authority to the design of the package ;

(*b*) a serial number to uniquely identify a packaging which conforms to the design ; and

(*c*) "TYPE B(U)", "TYPE B(M)", or "TYPE C", in the case of a Type B(U), Type B(M) or Type C package design.

(8) In addition, a package which conforms to a Type B(U), Type B(M) or Type C package design shall have the outside of the outermost receptacle which is resistant to the effects of fire and water, plainly marked by embossing, stamping or other means resistant to the effects of fire and water with the trefoil symbol.

(9) Where a mark on the package made in accordance with the requirements of sub-regulation (1) – (7) of this regulation that does not relate to the UN number and proper shipping name assigned to the consignment shall be removed or covered.

Labeling

28.—(1). Labeling shall be required in accordance with the assigned category for packages and overpacks.

(2). Packages and overpacks shall be assigned to either category I WHITE, II- YELLOW or III –YELLOW in accordance with the conditions specified in Table VII of the First schedule to these Regulations and with the requirements —

(*a*) for a package or overpack, both the transport index and the surface dose rate conditions shall be taken into account to determine the appropriate category ;

(*b*) where the transport index satisfies the condition for one category but the surface dose rate satisfies the condition for a different category, the package or overpack shall be assigned to the higher category and for this purpose, category I-WHITE shall be regarded as the lowest category ; and

(*c*) the TI and CSI shall be determined following the procedures specified in regulations 25 and 26 of these Regulations.

Classification of labeling

29.—(1) Apart from excepted packages, all other packages, overpacks and freight containers shall bear labels which conform to the models in figures 2, 3, 4 and 5 of the Second Schedule to these Regulations.

(2) labels shall be affixed to two opposite sides of the outside of a package or overpack, or on the outside of all four sides of a freight containers or tank.

(3) A label which does not relate to the contents of a package shall be removed or covered.

(4) Enlarged label shall be used on large freight containers and tanks, in accordance with dimensions specified in figure 5 of the First Schedule to these Regulations, to display information of —

(*a*) Content —

(*i*) except for LSA-I material, the names of the radionuclides as taken from Table I of First Schedule to these Regulations , using the symbols prescribed in it and for mixtures of radionuclides, the most restrictive nuclides shall be listed to the extent the space on the line permits,

(*ii*) the group of LSA or SCO shall be shown following the names of the radionuclides, and the terms “LSA-II”, LSA-III”, “SCO-I”, “SCO-

II" and "SCO-III" shall be used for this purpose, and

(*iii*) for LSA-I material, use the term "LSA-1, without the name of the radionuclide ;

(*b*) the maximum activity of the radioactive contents during transport expressed in units of becquerels (Bq) with the appropriate SI prefix provided in Annex II to these Regulations ; and

(*c*) overpack and freight containers and the "contents" entries on the label shall bear the information required in sub-regulation (a) and (b) of this regulation, totaled together for the entire contents of the overpack or freight container except for labels on overpacks or freight containers containing mixed loads of packages containing different radionuclides.

(5) TI and CSI as described in regulations 25 and 26 are not required for category I-WHITE.

Placarding

30.—(1) Consignments consisting solely of excepted packages do not require placarding.

(2) Where other packages are involved, the following requirements for placarding shall apply —

(*a*) large freight containers carrying packages or other excepted packages, and tanks shall bear four placards which conform with the model given figure 5 of Second Schedule to these Regulations ;

(*b*) the placards shall be affixed in a vertical orientation to each side wall and each end wall of the large freight container or tank ; and

(*c*) any placard which does not relate to the contents shall be removed instead of using both labels and placards and it is permitted as an alternative to use large labels, as shown in figures 2, 3 and 4 of Second Schedule to these Regulations, where appropriate, with dimensions of the minimum size shown in figure 5 of Second Schedule to these Regulations.

(3) Where the consignment in the freight container or tank is an unpackaged LSA-I, SCO-I or SCO-III or where an exclusive use consignment in a freight container is packaged radioactive material with a single United Nations number, the appropriate United Nations number for the consignment as stipulated in Table VIII of First Schedule to these Regulations shall be used and be displayed, in black digits not less than 65 mm high, either —

(*a*) in the lower half of the placard shown in figure 5 of the Second Schedule to these Regulations, preceded by the letters "UN" and against the white background ; or

(*b*) on the placard shown in figure 6 of the Second Schedule to these Regulations.

(4) Where the alternative given in sub-regulation 3(b) of this regulation is used, the subsidiary placard shall be affixed immediately adjacent to the main placard, on all four sides of the freight container or tank.

(5) Rail and road vehicles carrying packages, overpacks or freight containers labeled with any of the labels shown in Figures 2, 3, 4 and 5 of the Second Schedule to these Regulations, or carrying consignments under exclusive use, shall display the placard shown in Figure 5 of the Second Schedule to these Regulations on each of the two external lateral walls —

(*a*) in the case of a rail vehicle; and

(*b*) the external rear wall in the case of a road vehicle.

(6) In the case of a vehicle without sided walls, the placards may be affixed directly on the cargo-carrying unit provided that they are readily visible and in the case of physically large tanks or freight containers, the placards on the tanks or freight containers shall suffice.

(7) In the case of vehicles which have insufficient area to allow the fixing of large placards, the dimensions of the placard as prescribed in figure 6 of the Second Schedule to these Regulations may be reduced to 100 mm.

(8) Any placard which do not relate to the content shall be removed.

(9) Where the consignment in or on the vehicle is unpackaged LSA-I material, SCO-I or SCO-III or where an exclusive use consignment is packaged radioactive material with a United Nations number, the appropriate number in Table VIII of the First schedule to these Regulations shall be displayed, in black digits not less than 65 mm high, either —

(*a*) in the lower half of the placard shown in figure 5 of the Second Schedule to these Regulations, preceded by the letters "UN" and against the white background ; or

(*b*) on the placard shown in figure 6 of the Second Schedule to these Regulations

(10) Where the alternative given in sub-regulation 9(b) of this regulation is used, the subsidiary placard shall be affixed immediately adjacent to the main placard, either on the two external lateral walls in the case of a rail vehicle or the two external lateral walls and the external rear wall in the case of a road vehicle.

PART IX — LOADING AND SEGREGATION, AND CONTROL OF RADIATION UNDER EXCLUSIVE USE

Loading and segregation

31.—(1) The following conditions shall apply to loading and segregation of all consignment —

(*a*) consignment shall be segregated from other dangerous goods during transport in compliance with its applicable dangerous goods transport regulations ; and

(*b*) radioactive material shall be segregated from undeveloped photographic film so that the radiation exposure of film due to the transport of radioactive material is limited to 0.1 mSv per consignment of such film.

(2) For consignment to be transported, not under exclusive use, the following conditions shall apply —

(*a*) the consignment shall not include any package or overpack with a transport index greater than 10 ; and

(*b*) loading of freight containers and the accumulation of packages, overpacks and freight containers aboard a single conveyance shall be so limited that the total sum of the transport indexes aboard a single conveyance shall be such that the radiation level under routine conditions of transport shall not exceed 2 mSv/h at any point on, and 0.1 mSv/h at 2m from, the external surface of the conveyance.

Control of radiation under exclusive use

32.—(1) Where a consignment is to be transported under exclusive use, there is no limit on the sum of TIs but the dose rate shall be controlled —

(*a*) for road and rail consignments under exclusive use, the dose rate shall not exceed 10 mSv/h at any point on the external surface of any package or overpack, and may exceed 2 mSv/h where —

(*i*) the vehicle is equipped with an enclosure which, during routine conditions of transport, prevents the access of unauthorised people to the interior of the enclosure,

(*ii*) provisions are made to secure the package or overpack so that its position within the vehicle remains fixed during routine conditions of transport, and

(*iii*) there is no loading or unloading during shipment ;

(*b*) at 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle,

on the upper surface of the load, and on the lower external surface of the vehicle ; and

(*c*) 0.1 mSv/h at any point 2m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point 2m from the vertical planes projected from the outer edges of the vehicle.

(2) The conditions for exclusive use under air shipment and shipment by vessel are subject to special arrangement conditions and provisions stated in regulation 11 of these Regulations.

PART X — TRANSPORT DOCUMENT, STORAGE AND DISPATCH, AND CARRIAGE

Transport document

33. Transport documentation, to accompany the consignment, shall include —

(a) particulars of consignment, which includes —

(*i*) the proper shipping name, as specified in Table VIII of First Schedule to these Regulations,

(*ii*) the United Nations Class number "7",

(*iii*) the United Nations number assigned to the material as specified in Table VIII of First schedule to these Regulations, preceded by the letters "UN",

(*iv*) the name or symbol of each radionuclide or, for mixtures of radionuclides, an appropriate general description or a list of the most restrictive nuclides,

(*v*) a description of the physical and chemical form of the material, or a notation that the material is special form radioactive material and a generic chemical description is acceptable for chemical form,

(*vi*) the maximum activity of the radioactive contents during transport expressed in units of becquerels (Bq) with an appropriate SI Unitas stipulated in Annex II to these Regulations,

(*vii*) the category of the package, such as I-WHITE, II-YELLOW, III-YELLOW,

(*viii*) TIs for categories II-YELLOW and III-YELLOW,

(*ix*) the identification mark for each Authority approved certificate for special form radioactive material, package design or shipment applicable to the consignments,

(*x*) a detailed statement of the content of each package within the overpack or freight container as specified in this regulation for

consignments or packages in an overpack or freight container,

(*xi*) appropriate transport documents shall be made available where packages are to be removed from the overpack or freight container at a point of intermediate unloading and where the consignment is required to be shipped under exclusive use, the statement "EXCLUSIVE USE SHIPMENT" shall be indicated, and

(*xii*) for LSA-II, LSA-III, SCO-I, and SCO-III, the total activity of the consignment as a multiple of A_2 ;

(*b*) Consignor's declaration, which —

(*i*) accurately describes the classification, packages, marking and labeling are in all respects in proper condition for transport by any mode according to the applicable Authority's and international Regulations,

(*ii*) shall be signed and dated by the consignor and facsimile signatures are acceptable where applicable laws or regulations recognize the legal validity of facsimile signatures, and

(*iii*) shall be made on the same transport document which contains the particulars of consignment listed in this regulation ; and

(*c*) Information for carriers, which —

(*i*) is a statement written in English regarding actions required to be taken by the carrier and shall include —

(A) supplementary requirements for loading, stowage, carriage, handling and unloading of the package, overpack or freight container including any special stowage provisions for the safe dissipation of heat, or a statement that such requirements are not necessary,

(B) restrictions on the mode of transport or conveyance and any necessary routing instructions, and

(C) emergency arrangements appropriate to the consignment, and

(*ii*) the consignor shall make all the relevant Authority's authorizations available to the carrier before loading and unloading.

Storage and dispatch

34.—(1) Consignment of radioactive material shall be stored and dispatched by segregating other dangerous goods, people and undeveloped photographic films and plates during storage in transit.

(2) The provision of sub-regulation (1) of this regulation shall apply where the average surface heat flux does not exceed 15 W/m2 and that the immediate surrounding cargo is not in sacks or bags.

(3) A package or overpack shall be stored among packaged general cargo without any special stowage provisions except where specified otherwise by the Authority in an applicable approval certificate.

(4) A provision in the Authority's approval certificates and relevant pre use and pre-shipment requirements shall be observed.

Carriage

35.—(1) Category II-YELLOW package, III-YELLOW package or overpacks shall not be carried in compartments occupied by passengers, except those exclusively reserved for couriers specially authorised to accompany such packages or overpacks.

(2) For transport by road, no person other than the driver, assistant, and the Radiation Protection Officer is permitted in vehicles carrying packages, overpacks or freight containers bearing category II-YELLOW or III-YELLOW labels.

PART XI - RADIATION PROTECTION PROGRAMME, RADIATION EXPOSURE MAGNITUDE AND CONTAMINATION AND DECONTAMINATION

Radiation protection programme

36.—(1) A consignor, carrier and consignee of radioactive source or nuclear material shall establish and implement a radiation protection programme and include the following as part of the programme —

(*a*) keep the effective dose, equivalent dose and committed dose to transport workers and the public as low as reasonably achievable, through the implementation of management control over practices, personnel qualification and training, control of occupational and public exposure to radiation and planning for emergency ;

(*b*) prevent people from receiving doses of radiation higher than the radiation dose limits prescribed in the regulations on ionizing radiation ; and

(*c*) train people referred to in the programme on the application of the programme.

(2) A consignor, carrier and consignee shall —

(*a*) keep a record of its radiation protection programme and of any information collected under the programme ; and

(*b*) maintain the record of information collected and the programme for the duration of two years after the date on which it is collected.

(3) The radiation protection programme for radiation protection control shall be related to —

(*a*) the magnitude and likelihood of radiation exposures expected during the transportation, and all programme documents shall be made available to the Authority ; and

(*b*) optimization principle in order that the magnitude of individual doses, the number of people exposed and the likelihood of exposure shall be kept as low as is reasonably achievable.

Radiation exposure magnitude

37. —(1) Occupational radiation exposure magnitude which arises from transport activities shall be assessed via —

(*a*) either workplace monitoring or individual monitoring when the effective dose is established to be below 6 mSv ; and

(*b*) both workplace monitoring and individual monitoring when the effective dose is established to be above 6 mSv.

(2) Records of workplace monitoring and individual monitoring conducted shall be kept.

Contamination and decontamination

38. For control of contamination and leaking packages, the following requirements shall be met —

(1) The non-fixed contamination on the external surfaces of any package shall be kept as low as practicable and, under routine conditions of transport, shall not exceed the following limits —

(*a*) 4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters ; and

(*b*) 0.4 Bq/cm^2 for all other alpha emitters, these limits are applicable when averaged over any area of 300 cm^2 of any part of the surface.

(2) The level of non-fixed contamination on the external and internal surfaces of overpacks, freight containers and conveyances shall not exceed the limits specified in sub-regulation (1) of this regulation and requirement does not apply to the internal surfaces of freight containers being used as packagings, either loaded or empty.

(3) Where it is evident that a package is damaged or leaking, or where it is suspected that the package may have leaked or been damaged, access to the package shall be restricted and a qualified person shall, as soon as possible, assess the extent of contamination and the resultant dose rate of the package, the scope of the assessment shall include the package, the conveyance, the adjacent loading and unloading areas and, where necessary, all other material carried in the conveyance.

(4) Additional steps for the protection of people, property and the environment, in accordance with provisions established by the relevant competent authority, shall be taken to overcome and minimize the consequences of such leakage or damage.

(5) Packages that are damaged or leaking radioactive contents in excess of allowable limits for normal conditions of transport may be removed to an

acceptable interim location under supervision, but shall not be forwarded until repaired or reconditioned and decontaminated.

(6) Conveyances and equipment used regularly for the transport of radioactive materials shall be periodically checked to determine the level of contamination, the frequency of such checks shall be related to the likelihood of contamination and the extent to which radioactive material is transported.

(7) Conveyances and equipment which have, in the course of transport of radioactive material, become contaminated above the previously stated contamination limits or which show a radiation level in excess of 5 μSv/h at the surface shall be decontaminated as soon as possible by a qualified person and shall not be reused unless the non-fixed contamination does not exceed the previously stated contamination limits.

(8) The radiation levels resulting from the fixed contamination on surfaces after decontamination shall be less that 5 μSv/h.

PART XII — EMERGENCY PREPARDNESS AND RESPONSE AND TRAINING

Emergency preparedness and response

39.—(1) In the event of a nuclear or radiological emergency during the transport of radioactive material, provisions as established by National Nuclear and Radiological Emergency Plan or international organisations shall be observed to protect people, property and the environment.

(2) Consignors and carriers shall establish, in advance, arrangements for preparedness and response in accordance with the national and international requirements and in a consistent and coordinated manner with the national and international emergency management system.

(3) Arrangements for preparedness and response shall be based on the graded approach and shall take into consideration the identified hazards and the potential consequences, including the formation of other dangerous substances that may result from the reaction between the contents of a consignment and the environment in the event of a nuclear or radiological emergency.

Training

40.—(1) Workers shall receive appropriate training on radiation protection, including the precautions to be observed in order to restrict occupational exposure and the exposure of other people who may be affected by their actions.

(2) Persons engaged in the transport of radioactive material listed in this sub-regulation shall receive training on the contents of these Regulations which shall commensurate with their responsibilities —

(*a*) classify radioactive material ;

(*b*) pack radioactive material ;

(*c*) mark and label radioactive material ;

(*d*) prepare transport documents for radioactive material ;

(*e*) offer or accept radioactive material for transport ;

(*f*) carry or handle radioactive material during transport ;

(*g*) mark, placard load or unload packages of radioactive material into or from transport vehicles ;

(*h*) engage in bulk packagings or freight containers ; and

(*i*) are otherwise directly involved in the transport of radioactive material as determined by the Authority.

(3) The training for a person shall include —

(*a*) training designed to provide familiarity with the general provisions of these Regulations which shall include description of the categories of radioactive material's labeling, marking, placarding, packaging, segregation requirements, the purpose and content of the radioactive material transport document, and the available emergency response documents ;

(*b*) detailed training concerning specific radioactive material transport requirements that are applicable to the function that a person performs; and

(*c*) safety training commensurate with the risk of exposure in the event of a release and the functions performed includes the —

(*i*) methods and procedures for accident avoidance, such as proper use of package handling equipment and appropriate methods of stowage of radioactive material,

(*ii*) available emergency response information and how to use it,

(*iii*) general hazards presented by the various categories of radioactive material and how to prevent exposure to those hazards, including, if appropriate, the use of personal protective clothing and equipment, and

(*iv*) procedures to be immediately followed in the event of an unintentional release of radioactive material, including any emergency response procedures for which the person is responsible and personal protection procedures to be followed.

(4) Records of all safety training undertaken shall be kept by the employer and made available to the employee if requested.

(5) The training requirement in sub-regulation (2) and (3) of this regulation

shall be provided or verified upon employment in a position involving radioactive material transport and shall be periodically supplemented with retraining as deemed appropriate by the Authority.

PART XIII — OFFENCES, PENALTIES AND APPEAL

Offences and penalties

41.—(1) A person who contravenes any of the provisions of these Regulations commits an offence and is liable on conviction to the penalties stipulated under the Act and any other extant laws.

(2) Notwithstanding the provisions of sub-regulation (1) of this regulation, the Authority may impose penalties such as administrative fine, suspension, revocation of authorisation, sealing of facility or any combination of these.

Appeal

42. A person or body corporate may appeal to the Board of the Authority against any decision made by the Authority pursuant to these Regulations.

PART XIV — MISCELLANOUS PROVISION

Miscellaneous

43. —(1) The relevant transport regulation for dangerous goods shall apply in addition to these Regulations for radioactive material having subsidiary risks and for transport of radioactive material with other dangerous goods.

(2) Customs operations involving the inspection of the radioactive contents of a package shall be carried out in a place where adequate means of controlling radiation exposure are provided and in the presence of qualified person.

(3) Any package opened on custom's instructions shall, be restored to its original condition before being forwarded to the consignee.

(4) Where a consignment is undeliverable, the consignment shall be placed in a safe location and the Authority shall be informed as soon as possible and a request made for instructions on further action.

Interpretation

44. In these Regulations —

"A_1 and A_2" means —

(*i*) A_1 is the activity value of special form of radioactive material which is listed in Table I and is used to determine the activity limits for the requirements of these Regulations,

(*ii*) A_2 is the activity value of radioactive material, other than special form radioactive material, which is listed in Table I and is used to determine the activity limits for the requirements of these Regulations ;

"approval" (Multilateral or Unilateral) ;

"multilateral approval" means approval by the relevant competent

Authority of the country of origin of the design or shipment, as applicable, and also, where the consignment is to be transported through or into any other country, approval by the competent Authority of that country ;

"unilateral approval" means an approval of a design which is required to be given by the competent Authority of the country of origin of the design ;

"the Authority" means the Nigerian Nuclear Regulatory Authority established under Section 1 of the Act ;

"the Act" means the Nuclear Safety and Radiation Protection Act, CAP 142 LFN, 2004 ;

"aircraft" (cargo or passenger) ;

"cargo aircraft" means any aircraft, other than a passenger aircraft, that carries goods or property ;

"passenger aircraft" means an aircraft that carries any person other than a crew member, a carrier's employee in an official capacity, an authorised representative of an appropriate national Authority, or a person accompanying a consignment or other cargo ;

"authorisation" means a permission granted in a document by the Authority to a legal person who has submitted an application to transport radioactive material and the authorisation may take the form of a license, registration, permit or an exemption ;

"carrier" means any person, organisation or government which undertakes the carriage of radioactive material by any means of transport and includes carriers for hire or reward and carriers on own account ;

"competent Authority" means any national or international regulatory body or Authority designated or recognized as such for any purpose in connection with these Regulations ;

"compliance assurance" means a systematic programme of measures applied by the Authority to ensure that the provisions of these Regulations are met in practice ;

"confinement system" means the assembly of fissile material and packaging components specified by the designer and agreed to by the Authority as intended to preserve criticality safety ;

"containment system" means the assembly of components of the packaging specified by the designer as intended to retain the radioactive material during transport ;

"consignee" means any person, organisation or government which receives a consignment ;

"consignment" means any package or load of radioactive material, presented by a consignor for transport ;

"consignor" means any person, organisation or government which prepares a consignment for transport, and is named as consignor in the transport documents ;

"contamination" means the presence of a radioactive substance on a surface in quantities in excess of 0.4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, 0.04 Bq/cm^2 for all other alpha emitters which occurs in one of the following groups —

(*i*) non-fixed contamination means contamination which is removable from a surface during routine conditions of transport, or

(*ii*) fixed contamination means contamination other than non-fixed contamination ;

"conveyance" means —

(*i*) transport by road or rail,by any vehicle,

(*ii*) transport by water by any vessel, or any hold, compartment, or defined deck area of a vessel, and

(*iii*) transport by air by any aircraft ;

"criticality safety index" means Criticality Safety Index (CSI) assigned to a package, overpack or freight container containing fissile material means a number that is used to provide control over the accumulation of packages, overpacks or freight containers containing fissile material ;

"defined deck area" means the area, of the weather deck of a vessel, or of a vehicle deck of a roll-on orroll-off ship, or a ferry, which is allocated for the stowage of radioactive material ;

"design" means the description of fissile material excepted under para. 417(f) of SSR 6, special form radioactive material, low dispersible radioactive material, package or packaging that enables such an item to be fully identified, the description may include specifications, engineering drawings, reports demonstrating compliance with regulatory requirements, and other relevant documentation ;

"dose rate" means the ambient dose equivalent or the directional dose equivalent, as appropriate, per unit time, measured at the point of interest ;

"effective dose" has the meaning assigned to that term by regulation 1 of NiBIRR ;

"equivalent dose" has the meaning assigned to that term by regulation 1 of NiBIRR ;

"excluded" means beyond the scope of these Regulations ;

"exclusive use" means the sole use, by a single consignor, of a conveyance or of a large freight container, in respect of which all initial, intermediate, final loading and unloading and shipment are carried out in accordance with the directions of the consignor or consignee, where required by these Regulations ;

"fissile nuclides" means uranium-233, uranium-235, plutonium-239 and Plutonium 241 ;

"fissile material" means a material containing any of the fissile nuclides excluded from the definition of fissile material —

(*i*) natural uranium or depleted uranium that is unirradiated ;

(*ii*) natural uranium or depleted uranium that has been irradiated in thermal reactors ;

(*iii*) material with fissile nuclides less than a total of 0.25g ;

(*iv*) any combination of (i), (ii) or (iii),these exclusions are valid if there is no other material with fissile nuclides in the package or in the consignment if shipped unpackaged ;

"freight container" (small, large) means an article of transport equipment that is of a permanent character and strong enough to be suitable for repeated use, specially designed to facilitate the transport of goods by one or other modes of transport without intermediate reloading, designed to be secured or readily handled, and with fittings for these purpose, it excludes the vehicle —

" small freight container" means a freight container that has an internal volume of not more than 3 m^3 ;

" large freight container" means a freight container that has an internal volume of more than 3 m^3 ;

"IAEA" means International Atomic Energy Agency ;

"intermediate bulk container (IBC)" means a portable packaging that —

(*i*) has a capacity of not more than 3 m^3,

(*ii*) is designed for mechanical handling, and

(*iii*) is resistant to the stresses produced during handling and transport, as determined by performance tests ;

"licence" means an authorisation granted by the Authority on the basis of a safety assessment and accompanied by specific requirements and conditions to be complied with by the licensee ;

"licensee" means the holder of a current license granted by the Authority for transport of radioactive material who has recognised rights and duties

for the practice or source, particularly in relation to radiation protection, safety, security and emergency response ;

"low dispersible radioactive material" means either a solid radioactive material or a solid radioactive material in a sealed capsule, that has limited dispersibility and is not in powder form ;

"low specific activity (LSA) material" means radioactive material which by its nature has a limited specific activity, or radioactive material for which limits of estimated average specific activity apply and external shielding materials surrounding the LSA material shall not be considered in determining the estimated average activity ;

"low toxicity alpha emitter" means natural uranium, depleted uranium, natural thorium, uranium-235 or uranium-238, thorium-232, thorium-228 and thorium-230 when contained in ores or physical and chemical concentrates, or alpha emitters with a half-life of less than 10 days ;

"management system" means element system used to establish policies and objectives and enable the objectives and scope of these Regulations to be achieved in an efficient and effective manner ;

"maximum normal operating pressure" means the maximum pressure above atmospheric pressure at mean sea-level that may develop in the containment system in a period of one year under the conditions of temperature and solar radiation corresponding to environmental conditions in the absence of venting, external cooling by an ancillary system, or operational controls during transport ;

"NiBIRR" means Nigeria Basic Ionizing Radiation Regulations ;

"overpack" means an enclosure used by a single consignor to contain one or more packages and to form one unit for convenience of handling, stowage and carriage during transport ;

"package" means the complete product of packing operation consisting of packaging and its contents prepared for transport', the types of packages covered by these Regulations, which are subject to the activity limits and material restrictions shown in regulation 20 of these Regulations and meet the following corresponding requirements —

(*i*) Excepted package,

(*ii*) Industrial package Type 1 (Type IP-1),

(*iii*) Industrial package Type 2 (Type IP-2),

(*iv*) Industrial package Type 3 (Type IP-3),

(*v*) Type A package,

(*vi*) Type B(U) package,

(*vii*) Type B(M) package, and

(*viii*) Type C package,

packages containing fissile material or uranium hexafluoride are subject to additional requirements ;

"packaging" means one or more receptacles and any other components or materials necessary for the receptacles to perform the containment and other safety functions ;

"radiation protection programme" means systematic arrangements which are aimed at providing adequate consideration of radiation protection measures ;

"radioactive contents" means the radioactive material with any contaminated or activated solids, liquids and gases within the packaging;

"radioactive material" means any material containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values specified in Table 1 of the First Schedule to these Regulations ;

"shipment" means the specific movement of a consignment from origin to destination ;

"special arrangement" means the provisions, approved by the competent Authority, under which consignments which do not satisfy all the applicable requirements of these Regulations may be transported ;

"special form radioactive material" means either an indispersible solid radioactive material or a sealed capsule containing radioactive material ;

"specific activity of a radionuclide" means the activity per unit mass of the nuclide ;

"specific activity of a material" means the activity per unit mass or volume of the material in which the radionuclides are essentially uniformly distributed ;

"SSR-6" means the IAEA Safety Standard Series on Regulations for the Safe Transport of Radioactive Material ;

"surface contaminated object (SCO)" means a solid object which is not radioactive but which has radioactive material distributed on its surfaces ;

"tank" means a portable tank including a tank container, a road tank vehicle, a rail tank wagon or a receptacle that contains solids, liquids, or gases, with a capacity of not less than 450 L when used for the transport of gases ;

"through or into" means through or into the countries in which a

consignment is transported but specifically excludes countries over which a consignment is carried by air where there are no scheduled stops in the countries ;

"transport" comprises all operations and conditions associated with and involved in the movement of radioactive material, and includes the design, loading, manufacture, maintenance and repair of packaging, and the preparation, consigning, loading, carriage including in-transit storage, unloading and receipt at final destination of loads of radioactive material and packages ;

"transport index (TI)" assigned to a package, over pack or freight container, or to unpackaged LSA-I, SCO-I or SCO-III means a number which is used to provide control over radiation exposure ;

"unirradiated thorium" means thorium containing not more than 10^{-7} g of uranium-233 per gram of thorium-232 ;

"unirradiated uranium" means uranium containing not more than 2×10^3 Bq of plutonium per gram of uranium-235, not more than 9×10^6 Bq of fission products per gram of uranium-235 and not more than 5×10^{-3} g of uranium-236 per gram of uranium-235 ;

"natural uranium" means chemically separated uranium containing the naturally occurring distribution of uranium isotopes (approximately 99.28% uranium-238, and 0.72% uranium-235 by mass) a small mass percentage of uranium-234 is present ;

"depleted uranium" means uranium containing a lesser mass percentage of uranium-235 than in natural uranium ;

"enriched uranium" means uranium containing a greater mass percentage of uranium-235 than 0.72% and a very small mass percentage of uranium-234 is present ;

"vehicle" means a road vehicle including an articulated vehicle, that is, a tractor and semi-trailer combination or railroad car or railway wagon and a trailer shall be considered as a separate vehicle ; and

"vessel" means any seagoing vessel or inland waterway craft used for carrying cargo.

Citation

45. These Regulations may be cited as the Nigerian Transportation of Radioactive Material Regulations, 2023.

FIRST SCHEDULE

Regulation 15(d), 20(1&3), 21 (2),22 (2 &4c),25(1b & 4),26(2b & 3c), 27(4), 28(2), 29(4), 30(3&9) & 33(a)

TABLE 1 : BASIC RADIONUCLIDE VALUES

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Actinium (39)				
Ac-225 (a)	8×10^{-1}	6×10^{-3}	1×10^{1}	1×10^{4}
Ac-227 (a)	9×10^{-1}	9×10^{-5}	1×10^{-1}	1×10^{3}
Ac-228	6×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Silver (47)				
Ag-105	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Ag-108m (a)	7×10^{-1}	7×10^{-1}	1×10^{1} (b)	1×10^{6} (b)
Ag-110m (a)	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{6}
Ag-111	2×10^{0}	6×10^{-1}	1×10^{3}	1×10^{6}
Aluminum (13)				
Al-26	1×10^{-1}	1×10^{-1}	1×10^{1}	1×10^{5}
Americium (95)				
Am-241	1×10^{1}	1×10^{-3}	1×10^{0}	1×10^{4}
Am-242m (a)	1×10^{1}	1×10^{-3}	1×10^{0} (b)	1×10^{4} (b)
Am-243 (a)	5×10^{0}	1×10^{-3}	1×10^{0} (b)	1×10^{3} (b)
Argon (18)				
Ar-37	4×10^{1}	4×10^{1}	1×10^{6}	1×10^{8}
Ar-39	4×10^{1}	2×10^{1}	1×10^{7}	1×10^{4}
Ar-41	3×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{9}
Arsenic (33)				
As-72	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
As-73	4×10^{1}	4×10^{1}	1×10^{3}	1×10^{7}
As-74	1×10^{0}	9×10^{-1}	1×10^{1}	1×10^{6}
As-76	3×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{5}
As-77	2×10^{1}	7×10^{-1}	1×10^{3}	1×10^{6}
Astatine (85)				
At-211 (a)	2×10^{1}	5×10^{-1}	1×10^{3}	1×10^{7}
Gold (79)				
Au-193	7×10^{0}	2×10^{0}	1×10^{2}	1×10^{7}
Au-194	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Au-195	1×10^{1}	6×10^{0}	1×10^{2}	1×10^{7}

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Au-198	1×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Au-199	1×10^{1}	6×10^{-1}	1×10^{2}	1×10^{6}
Barium (56)				
Ba-131 (a)	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Ba-133	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Ba-133m	2×10^{1}	6×10^{-1}	1×10^{2}	1×10^{6}
Ba-135m	2×10^{1}	6×10^{-1}	1×10^{2}	1×10^{6}
Ba-140 (a)	5×10^{-1}	3×10^{-1}	1×10^{1} (b)	1×10^{5} (b)
Beryllium (4)				
Be-7	2×10^{1}	2×10^{1}	1×10^{3}	1×10^{7}
Be-10	4 x 101	6×10^{-1}	1×10^{4}	1×10^{6}
Bismuth (83)				
Bi-205	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Bi-206	3×10^{-1}	3×10^{-1}	1 x 101	1×10^{5}
Bi-207	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Bi-210	1×10^{0}	6×10^{-1}	1×10^{3}	1×10^{6}
Bi-210m (a)	6×10^{-1}	2×10^{-2}	1×10^{1}	1×10^{5}
Bi-212 (a)	7×10^{-1}	6×10^{-1}	1×10^{1} (b)	1×10^{5} (b)
Berkelium (97)				
Bk-247	8×10^{0}	8×10^{-4}	1×10^{0}	1×10^{4}
Bk-249 (a)	4×10^{1}	3×10^{-1}	1×10^{3}	1×10^{6}
Bromine (35)				
Br-76	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
Br-77	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Br-82	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{6}
Carbon (6)				
C-11	1×10^{0}	6×10^{-1}	1×10^{1}	1×10^{6}
C-14	4×10^{1}	3×10^{0}	1×10^{4}	1×10^{7}
Calcium-20				
Ca-41	Unlimited	Unlimited	1 x 105	1×10^{7}
Ca-45	4×10^{1}	1×10^{0}	1×10^{4}	1×10^{7}
Ca-47 (a)	3×10^{0}	3×10^{-1}	1×10^{1}	1×10^{6}
Cadmium (48)				
Cd-109	3×10^{1}	2×10^{0}	1×10^{4}	1×10^{6}
Cd-113	4×10^{1}	5×10^{-1}	1×10^{3}	1×10^{6}
Cd-115 (a)	3×10^{0}	4×10^{-1}	1×10^{2}	1×10^{6}
Cd-115m	5×10^{-1}	5×10^{-1}	1×10^{3}	1×10^{6}

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Cerium (58)				
Ce-139	7×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Ce-141	2×10^{1}	6×10^{-1}	1×10^{2}	1×10^{7}
Ce-143	9×10^{-1}	6×10^{-1}	1×10^{2}	1×10^{6}
Ce-144 (a)	2×10^{-1}	2×10^{-1}	1×10^{2} (b)	1×10^{5} (b)
Californium (98)				
Cf-248	4×10^{1}	6×10^{-3}	1×10^{1}	1×10^{4}
Cf-249	3×10^{0}	8×10^{-4}	1×10^{0}	1×10^{3}
Cf-250	2×10^{1}	2×10^{-3}	1×10^{1}	1×10^{4}
Cf-251	7×10^{0}	7×10^{-4}	1×10^{0}	1×10^{3}
Cf-252	5×10^{-2}	3×10^{-3}	1×10^{1}	1×10^{4}
Cf-253 (a)	4×10^{1}	4×10^{-2}	1×10^{2}	1×10^{5}
Cf-254	1×10^{-3}	1×10^{-3}	1×10^{0}	1×10^{3}
Chlorine (17)				
Cl-36	1×10^{1}	6×10^{-1}	1×10^{4}	1×10^{6}
Cl-38	2×10^{-1}	2×10^{-1}	1×10^{1}	1×10^{5}
Curium (96)				
Cm-240	4×10^{1}	2×10^{-1}	1×10^{2}	1×10^{5}
Cm-241	2×10^{0}	1×10^{0}	1×10^{2}	1×10^{6}
Cm-242	4×10^{1}	1×10^{-2}	1×10^{2}	1×10^{5}
Cm-243	9×10^{0}	1×10^{-3}	1×10^{0}	1×10^{4}
Cm-244	2×10^{1}	2×10^{-3}	1×10^{1}	1×10^{4}
Cm-245	9×10^{0}	9×10^{-4}	1×10^{0}	1×10^{3}
Cm-246	9×10^{0}	9×10^{-4}	1×10^{0}	1×10^{3}
Cm-247 (a)	3×10^{0}	1×10^{-3}	1×10^{0}	1×10^{4}
Cm-248	2×10^{-2}	3×10^{-4}	1×10^{0}	1×10^{3}
Cobalt (27)				
Co-55	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Co-56	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Co-57	1×10^{1}	1×10^{1}	1×10^{2}	1×10^{6}
Co-58	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Co-58m	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{7}
Co-60	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
Chromium (24)				
Cr-51	3×10^{1}	3×10^{1}	1×10^{3}	1×10^{7}
Caesium (55)				
Cs-129	4×10^{0}	4×10^{0}	1×10^{2}	1×10^{5}

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Cs-131	3×10^{1}	3×10^{1}	1×10^{3}	1×10^{6}
Cs-132	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{5}
Cs-134	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{4}
Cs-134m	4×10^{1}	6×10^{-1}	1×10^{3}	1×10^{5}
Cs-135	4×10^{1}	1×10^{0}	1×10^{4}	1×10^{7}
Cs-136	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{5}
Cs-137 (a)	2×10^{0}	6×10^{-1}	1×10^{1}(b)	1×10^{4}(b)
Copper (29)				
Cu-64	6×10^{0}	1×10^{0}	1×10^{2}	1×10^{6}
Cu-67	1×10^{1}	7×10^{-1}	1×10^{2}	1×10^{6}
Dysprosium (66)				
Dy-159	2×10^{1}	2×10^{1}	1×10^{3}	1×10^{7}
Dy-165	9×10^{-1}	6×10^{-1}	1×10^{3}	1×10^{6}
Dy-166	9×10^{-1}	3×10^{-1}	1×10^{3}	1×10^{6}
Erbium (68)				
Er-169	4×10^{1}	1×10^{0}	1×10^{4}	1×10^{7}
Er-171	8×10^{-1}	5×10^{-1}	1×10^{2}	1×10^{6}
Europium (63)				
Eu-147	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Eu-148	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Eu-149	2×10^{1}	2×10^{1}	1×10^{2}	1×10^{7}
Eu-150 (short-lived)	2×10^{0}	7×10^{-1}	1×10^{3}	1×10^{6}
Eu-150 (long-lived)	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Eu-152	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Eu-152m	8×10^{-1}	8×10^{-1}	1×10^{2}	1×10^{6}
Eu-154	9×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Eu-155	2×10^{1}	3×10^{0}	1×10^{2}	1×10^{7}
Eu-156	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Fluorine (9)				
F-18	1×10^{0}	6×10^{-1}	1×10^{1}	1×10^{6}
Iron (26)				
Fe-52	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{6}
Fe-55	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{6}
Fe-59	9×10^{-1}	9×10^{-1}	1×10^{1}	1×10^{6}
Fe-60 (a)	4×10^{1}	2×10^{-1}	1×10^{2}	1×10^{5}
Gallium (31)				
Ga-67	7×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Ga-68	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{5}
Ga-72	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
Gadolinium (64)				
Gd-146 (a)	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Gd-148	2×10^{1}	2×10^{-3}	1×10^{1}	1×10^{4}
Gd-153	1×10^{1}	9×10^{0}	1×10^{2}	1×10^{7}
Gd-159	2×10^{0}	6×10^{-1}	1×10^{3}	1×10^{6}
Germanium (32)				
Ge-68 (a)	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{5}
Ge-69	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Ge-71	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{8}
Ge-77	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Hafnium (72)				
Hf-172 (a)	6×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Hf-175	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Hf-181	2×10^{0}	5×10^{-1}	1×10^{1}	1×10^{6}
Hf-182	Unlimited	Unlimited	1×10^{2}	1×10^{6}
Mercury (80)				
Hg-194 (a)	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Hg-195m (a)	3×10^{0}	7×10^{-1}	1×10^{2}	1×10^{6}
Hg-197	2×10^{1}	1×10^{1}	1×10^{2}	1×10^{7}
Hg-197m	1×10^{1}	4×10^{-1}	1×10^{2}	1×10^{6}
Hg-203	5×10^{0}	1×10^{0}	1×10^{2}	1×10^{5}
Holmium (67)				
Ho-166	4×10^{-1}	4×10^{-1}	1×10^{3}	1×10^{5}
Ho-166m	6×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Iodine (53)				
I-123	6×10^{0}	3×10^{0}	1×10^{2}	1×10^{7}
I-124	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
I-125	2×10^{1}	3×10^{0}	1×10^{3}	1×10^{6}
I-126	2×10^{0}	1×10^{0}	1×10^{2}	1×10^{6}
I-129	Unlimited	Unlimited	1×10^{2}	1×10^{5}
I-131	3×10^{0}	7×10^{-1}	1×10^{2}	1×10^{6}
I-132	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
I-133	7×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
I-134	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
I-135 (a)	6×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Indium (49)				
In-111	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
In-113m	4×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
In-114m (a)	1×10^{1}	5×10^{-1}	1×10^{2}	1×10^{6}
In-115m	7×10^{0}	1×10^{0}	1×10^{2}	1×10^{6}
Iridium (77)				
Ir-189 (a)	1×10^{1}	1×10^{1}	1×10^{2}	1×10^{7}
Ir-190	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Ir-192	1×10^{0}	6×10^{-1}	1×10^{1}	1×10^{4}
Ir-193m	4×10^{1}	4×10^{0}	1×10^{4}	1×10^{7}
Ir-194	3×10^{-1}	3×10^{-1}	1×10^{2}	1 x 105
Potassium (19)				
K-40	9×10^{-1}	9×10^{-1}	1×10^{2}	1×10^{6}
K-42	2×10^{-1}	2×10^{-1}	1×10^{2}	1×10^{6}
K-43	7×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Krypton (36)				
Kr-79	4×10^{0}	4×10^{0}	1×10^{3}	1×10^{5}
Kr-81	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{7}
Kr-85	1×10^{1}	1×10^{1}	1×10^{5}	1×10^{4}
Kr-85m	8×10^{0}	3×10^{0}	1×10^{3}	1×10^{10}
Kr-87	2×10^{-1}	2×10^{-1}	1×10^{2}	1×10^{9}
Lanthanum (57)				
La-137	3×10^{1}	6×10^{0}	1×10^{3}	1×10^{7}
La-140	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
Lutetium (71)				
Lu-172	6×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Lu-173	8×10^{0}	8×10^{0}	1×10^{2}	1×10^{7}
Lu-174	9×10^{0}	9×10^{0}	1×10^{2}	1×10^{7}
Lu-174m	2×10^{1}	1×10^{1}	1×10^{2}	1×10^{7}
Lu-177	3×10^{1}	7×10^{-1}	1×10^{3}	1×10^{7}
Magnesium (12)				
Mg-28 (a)	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Manganese (25)				
Mn-52	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Mn-53	Unlimited	Unlimited	1×10^{4}	1×10^{9}
Mn-54	3×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Mn-56	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Molybdenum(42)				
Mo-93	4×10^{-1}	2×10^{-1}	1×10^{3}	1×10^{8}
Mo-99 (a)	1×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Nitrogen (7)				
N-13	9×10^{-1}	6×10^{-1}	1×10^{2}	1×10^{9}
Sodium (11)				
Na-22	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Na-24	2×10^{-1}	2×10^{-1}	1×10^{1}	1×10^{5}
Niobium (41)				
Nb-93m	4×10^{-1}	3×10^{-1}	1×10^{4}	1×10^{7}
Nb-94	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Nb-95	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Nb-97	9×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Neodymium (60)				
Nd-147	6×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Nd-149	6×10^{-1}	5×10^{-1}	1×10^{2}	1×10^{6}
Nickel (28)				
Ni-57	6×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Ni-59	Unlimited	Unlimited	1×10^{4}	1×10^{8}
Ni-63	4×10^{-1}	3×10^{-1}	1×10^{5}	1×10^{8}
Ni-65	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{6}
Neptunium (93)				
Np-235	4×10^{-1}	4×10^{-1}	1×10^{3}	1×10^{7}
Np-236 (short-lived)	2×10^{-1}	2×10^{-1}	1×10^{3}	1×10^{7}
Np-236 (long-lived)	9×10^{0}	2×10^{-2}	1×10^{2}	1×10^{5}
Np-237	2×10^{-1}	2×10^{-3}	1×10^{0} (b)	1×10^{3} (b)
Np-239	7×10^{-0}	4×10^{-1}	1×10^{2}	1×10^{7}
Osmium (76)				
Os-185	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Os-191	1×10^{1}	2×10^{0}	1×10^{2}	1×10^{7}
Os-191m	4×10^{1}	3×10^{1}	1×10^{3}	1×10^{7}
Os-193	2×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Os-194 (a)	3×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{5}
Phosphorus (15)				
P-32	5×10^{-1}	5×10^{-1}	1×10^{3}	1×10^{5}
P-33	4×10^{1}	1×10^{0}	1×10^{5}	1×10^{8}
Protactinium (91)				

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Pa-230 (a)	2×10^{0}	7×10^{-2}	1×10^{1}	1×10^{6}
Pa-231	4×10^{0}	4×10^{-4}	1×10^{0}	1×10^{3}
Pa-233	5×10^{0}	7×10^{-1}	1×10^{2}	1×10^{7}
Lead (82)				
Pb-201	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Pb-202	4×10^{1}	2×10^{1}	1×10^{3}	1×10^{6}
Pb-203	4×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Pb-205	Unlimited	Unlimited	1×10^{4}	1×10^{7}
Pb-210 (a)	1×10^{0}	5×10^{-2}	1×10^{1}(b)	1×10^{4} (b)
Pb-212 (a)	7 x 10-1	2×10^{-1}	1×10^{1}(b)	1×10^{5} (b)
Palladium (46)				
Pd-103 (a)	4×10^{1}	4×10^{1}	1×10^{3}	1×10^{8}
Pd-107	Unlimited	Unlimited	1×10^{5}	1×10^{8}
Pd-109	2×10^{0}	5×10^{-1}	1×10^{3}	1×10^{6}
Promethium (61)				
Pm143	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Pm-144	7×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Pm-145	3×10^{1}	1×10^{1}	1×10^{3}	1×10^{7}
Pm-147	4×10^{1}	2×10^{0}	1×10^{4}	1×10^{7}
Pm-148m (a)	8×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Pm-149	2×10^{0}	6×10^{-1}	1×10^{3}	1×10^{6}
Pm-151	2×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Polonium (84)				
Po-210	4×10^{1}	2×10^{-2}	1×10^{1}	1×10^{4}
Praseodymium (59)				
Pr-142	4×10^{-1}	4×10^{-1}	1×10^{2}	1×10^{5}
Pr-143	3×10^{0}	6×10^{-1}	1×10^{4}	1×10^{6}
Platinum (78)				
Pt-188 (a)	1×10^{0}	8×10^{1}	1×10^{1}	1×10^{6}
Pt-191	4×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Pt-193	4×10^{1}	4×10^{-1}	1×10^{4}	1×10^{7}
Pt-193m	4×10^{1}	5×10^{-1}	1×10^{3}	1×10^{7}
Pt-195m	1×10^{1}	5×10^{1}	1×10^{2}	1×10^{6}
Pt-197	2×10^{1}	6×10^{-1}	1×10^{3}	1×10^{6}
Pt-197m	1×10^{1}	6×10^{-1}	1×10^{2}	1×10^{6}
Plutonium (94)				
Pu-236	3×10^{1}	3×10^{-3}	1×10^{1}	1×10^{4}

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Pu-237	2×10^{1}	2×10^{1}	1×10^{3}	1×10^{7}
Pu-238	1×10^{1}	1×10^{-3}	1×10^{0}	1×10^{4}
Pu-239	1×10^{1}	1×10^{-3}	1×10^{0}	1×10^{4}
Pu-240	1×10^{1}	1×10^{-3}	1×10^{0}	1×10^{3}
Pu-241 (a)	4×10^{1}	6×10^{-2}	1×10^{2}	1×10^{5}
Pu-242	1×10^{1}	1×10^{-3}	1×10^{0}	1×10^{4}
Pu-244 (a)	4×10^{1}	1×10^{-3}	1×10^{0}	1×10^{4}
Radium (88)				
Ra-223 (a)	4×10^{-1}	7×10^{-3}	1×10^{2} (b)	1×10^{5} (b)
Ra-224(a)	4×10^{-1}	2×10^{-2}	1×10^{1}(b)	1×10^{5} (b)
Ra-225 (a)	2×10^{-1}	4×10^{-3}	1×10^{2}	1×10^{5}
Ra-226 (a)	2×10^{-1}	3×10^{-3}	1×10^{1}(b)	1×10^{4} (b)
Ra-228 (a)	6×10^{-1}	2×10^{-2}	1×10^{1}(b)	1×10^{5} (b)
Rubidium (37)				
Rb-81	2×10^{0}	8×10^{-1}	1×10^{1}	1×10^{6}
Rb-83 (a)	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Rb-84	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Rb-86	5×10^{-1}	5×10^{-1}	1×10^{2}	1×10^{5}
Rb-87	Unlimited	Unlimited	1×10^{4}	1×10^{7}
Rb(nat)	Unlimited	Unlimited	1×10^{4}	1×10^{7}
Rhenium (75)				
Re-184	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Re-184m	3×10^{0}	1×10^{0}	1×10^{2}	1×10^{6}
Re-186	2×10^{0}	6×10^{-1}	1×10^{3}	1×10^{6}
Re-187	Unlimited	Unlimited	1×10^{6}	1×10^{9}
Re-188	4×10^{-1}	4×10^{-1}	1×10^{2}	1×10^{5}
Re-189 (a)	3×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Re(nat)	Unlimited	Unlimited	1×10^{6}	1×10^{9}
Rhodium (45)				
Rh-99	2×10^{0}	2×10^{0}	1×10^{1}	1×10^{6}
Rh-101	4×10^{0}	3×10^{0}	1×10^{2}	1×10^{7}
Rh-102	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Rh-102m	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Rh-103m	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{8}
Rh-105	1×10^{1}	8×10^{-1}	1×10^{2}	1×10^{7}
Radon (86)				
Rn-222 (a)	3×10^{-1}	4×10^{-3}	1×10^{1} (b)	1×10^{8} (b)

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Ruthenium (44)				
Ru-97	5×10^{0}	5×10^{0}	1×10^{2}	1×10^{7}
Ru-103 (a)	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Ru-105	1×10^{0}	6×10^{-1}	1×10^{1}	1×10^{6}
Ru-106 (a)	2×10^{-1}	2×10^{-1}	1×10^{2} (b)	1×10^{5} (b)
Sulphur (16)				
S-35	4×10^{1}	3×10^{0}	1×10^{5}	1×10^{8}
Antimony (51)				
Sb-122	4×10^{-1}	4×10^{-1}	1×10^{2}	1×10^{4}
Sb-124	6×10^{-1}	6×10^{-1}	1×10^{1}	1×10^{6}
Sb-125	2×10^{0}	1×10^{0}	1×10^{2}	1×10^{6}
Sb-126	4×10^{-1}	4×10^{-1}	1×10^{6}	1×10^{5}
Scandium (21)				
Sc-44	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{5}
Sc-46	5×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Sc-47	1×10^{1}	7×10^{-1}	1×10^{2}	1×10^{6}
Sc-48	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Selenium (34)				
Se-75	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Se-79	4×10^{1}	2×10^{0}	1×10^{4}	1×10^{7}
Silicon (14)				
Si-31	6×10^{-1}	6×10^{-1}	1×10^{3}	1×10^{6}
Si-32	4×10^{1}	5×10^{-1}	1×10^{3}	1×10^{6}
Samarium (62)				
Sm-145	1×10^{1}	1×10^{1}	1×10^{2}	1×10^{7}
Sm-147	Unlimited	Unlimited	1×10^{1}	1×10^{0}
Sm-151	4×10^{1}	1×10^{1}	1×10^{4}	1×10^{8}
Sm-153	9×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Tin (50)				
Sn-113 (a)	4×10^{0}	2×10^{0}	1×10^{3}	1×10^{7}
Sn-117m	7×10^{0}	4×10^{-1}	1×10^{2}	1×10^{6}
Sn-119m	4×10^{1}	3×10^{1}	1×10^{3}	1×10^{7}
Sn-121m (a)	4×10^{1}	9×10^{-1}	1×10^{3}	1×10^{7}
Sn-123	8×10^{-1}	6×10^{-1}	1×10^{3}	1×10^{6}
Sn-125	4×10^{-1}	4×10^{-1}	1×10^{2}	1×10^{5}
Sn-126 (a)	6×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
Strontium (38)				
Sr-82 (a)	2×10^{-1}	2×10^{-1}	1×10^{1}	1×10^{5}

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Sr-83	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Sr-85	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Sr-85m	5×10^{0}	5×10^{0}	1×10^{2}	1×10^{7}
Sr-87m	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Sr-89	6×10^{-1}	6×10^{-1}	1×10^{3}	1×10^{6}
Sr-90 (a)	3×10^{-1}	3×10^{-1}	1×10^{2} (b)	1×10^{4} (b)
Sr-91 (a)	3×10^{-1}	3×10^{-1}	1×10^{1}	1×10^{5}
Sr-92 (a)	1×10^{0}	3×10^{-1}	1×10^{1}	1×10^{6}
Tritium (1)				
T (H-3)	4×10^{1}	4×10^{1}	1×10^{6}	1×10^{9}
Tantalum (73)				
Ta-178 (long-lived)	1×10^{0}	8×10^{-1}	1×10^{1}	1×10^{6}
Ta-179	3×10^{1}	3×10^{1}	1×10^{3}	1×10^{7}
Ta-182	9×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{4}
Terbium (65)				
Tb-149	8×10^{-1}	8×10^{-1}	1×10^{1}	1×10^{6}
Tb-157	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{7}
Tb-158	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Tb-160	1×10^{0}	6×10^{-1}	1×10^{1}	1×10^{6}
Tb-161	3×10^{1}	7×10^{-1}	1×10^{3}	1×10^{6}
Technetium (43)				
Tc-95m (a)	2×10^{0}	2×10^{0}	1×10^{1}	1×10^{6}
Tc-96	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{6}
Tc-96m (a)	4×10^{-1}	4×10^{-1}	1×10^{3}	1×10^{7}
Tc-97	Unlimited	Unlimited	1×10^{3}	1×10^{8}
Tc-97m	4×10^{1}	1×10^{0}	1×10^{3}	1×10^{7}
Tc-98	8×10^{-1}	7×10^{-1}	1×10^{1}	1×10^{6}
Tc-99	4×10^{1}	9×10^{-1}	1×10^{4}	1×10^{7}
Tc-99m	1×10^{1}	4×10^{0}	1×10^{2}	1×10^{7}
Tellurium (52)				
Te-121	2×10^{0}	2×10^{0}	1×10^{1}	1×10^{6}
Te-121m	5×10^{0}	3×10^{0}	1×10^{2}	1×10^{5}
Te-123m	8×10^{0}	1×10^{0}	1×10^{2}	1×10^{7}
Te-125m	2×10^{1}	9×10^{-1}	1×10^{3}	1×10^{7}
Te-127	2×10^{1}	7×10^{-1}	1×10^{3}	1×10^{6}
Te-127m (a)	2×10^{1}	5×10^{-1}	1×10^{3}	1×10^{7}
Te-129	7×10^{-1}	6×10^{-1}	1×10^{2}	1×10^{6}

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
Te-129m (a)	8×10^{-1}	4×10^{-1}	1×10^{3}	1×10^{6}
Te-131m (a)	7×10^{-1}	5×10^{-1}	1×10^{1}	1×10^{6}
Te-132 (a)	5×10^{-1}	4×10^{-1}	1×10^{2}	1×10^{7}
Thorium (90)				
Th-227	1×10^{1}	5×10^{-3}	1×10^{1}	1×10^{4}
Th-228 (a)	5×10^{-1}	1×10^{-3}	1×10^{0} (b)	1×10^{4} (b)
Th-229	5×10^{0}	5×10^{-4}	1×10^{0} (b)	1×10^{3} (b)
Th-230	1×10^{1}	1×10^{-3}	1×10^{0}	1×10^{4}
Th-231	4×10^{1}	2×10^{-2}	1×10^{3}	1×10^{7}
Th-232	Unlimited	Unlimited	1×10^{1}	1×10^{4}
Th-234 (a)	3×10^{-1}	3×10^{-1}	1×10^{3} (b)	1×10^{5} (b)
Th (nat)	Unlimited	Unlimited	1×10^{0} (b)	1×10^{3} (b)
Titanium (22)				
Ti-44 (a)	5×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
Thallium (81)				
Tl-200	9×10^{-1}	9×10^{-1}	1×10^{1}	1×10^{6}
Tl-201	1×10^{1}	4×10^{0}	1×10^{2}	1×10^{6}
Tl-202	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Tl-204	1×10^{1}	7×10^{-1}	1×10^{4}	1×10^{4}
Thulium (69)				
Tm-167	7×10^{0}	8×10^{-1}	1×10^{2}	1×10^{6}
Tm-170	3×10^{0}	6×10^{-1}	1×10^{3}	1×10^{6}
Tm-171	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{8}
Uranium (92)				
U-230 (fast lung absorption)(a)(d)	4×10^{1}	1×10^{-1}	1×10^{1}(b)	1×10^{5} (b)
U-230 (medium lung absorption) (a)(e)	4×10^{1}	4×10^{-3}	1×10^{1}	1×10^{4}
U-230 (slow lung absorption)(a)(f)	3×10^{1}	3×10^{-3}	1×10^{1}	1×10^{4}
U-232 (fast lung absorption)(d)	4×10^{1}	1×10^{-2}	1×10^{0} (b)	1×10^{3} (b)
U-232 (medium lung absorption)(e)	4×10^{1}	7×10^{-3}	1×10^{1}	1×10^{4}

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
U-232 (slow lung absorption)(f)	1×10^{1}	1×10^{-3}	1×10^{1}	1×10^{4}
U-233 (fast lung absorption)(d)	4×10^{1}	9×10^{-2}	1×10^{1}	1×10^{4}
U-233 (medium lung absorption)(e)	4×10^{1}	2×10^{-2}	1×10^{2}	1×10^{5}
U-233 (slow lung absorption)(f)	4×10^{1}	6×10^{-3}	1×10^{1}	1×10^{5}
U-234 (fast lung absorption)(d)	4×10^{1}	9×10^{-2}	1×10^{1}	1×10^{4}
U-234 (medium lung absorption)(e)	4×10^{1}	2×10^{-2}	1×10^{2}	1×10^{5}
U-234 (slow lung absorption)(f)	4×10^{1}	6×10^{-3}	1×10^{1}	1×10^{5}
U-235 (all lung absorption types) (a),(d),(e),(f)	Unlimited	Unlimited	1×10^{1}(b)	$1 \times {}^{104}$ (b)
U-236 (fast lung absorption)(d)	Unlimited	Unlimited	1×10^{1}	1×10^{4}
U-236 (medium lung absorption)(e)	4×10^{1}	2×10^{-2}	1×10^{2}	1×10^{5}
U-236 (slow lung absorption)(f)	4×10^{1}	6×10^{-3}	1×10^{1}	1×10^{4}
U-238 (all lung absorption types) (d),(e),(f)	Unlimited	Unlimited	1×10^{1}(b)	1×10^{4} (b)
U (nat)	Unlimited	Unlimited	1×10^{0} (b)	1×10^{3}(b)
U (enriched to 20 or less)(g)	Unlimited	Unlimited	1×10^{0}	1×10^{3}
U (dep)	Unlimited	Unlimited	1×10^{0}	1×10^{3}
Vanadium (23)				
V-48	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{5}
V-49	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{7}
Tungsten (74)				
W-178 (a)	9×10^{0}	5×10^{0}	1×10^{1}	1×10^{6}
W-181	3×10^{1}	3×10^{1}	1×10^{3}	1×10^{7}
W-185	4×10^{1}	8×10^{-1}	1×10^{4}	1×10^{7}

Radionuclide (Atomic number)	*A_1 (TBq)*	*A_2 (TBq)*	*Activity concentration for exempt material (Bq/g)*	*Activity limit for an exempt consignment (Bq)*
W-187	2×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
W-188 (a)	4×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{5}
Xenon				
Xe-122 (a)	4×10^{-1}	4×10^{-1}	1×10^{2}	1×10^{9}
Xe-123	2×10^{0}	7×10^{-1}	1×10^{2}	1×10^{9}
Xe-127	4×10^{0}	2×10^{0}	1×10^{3}	1×10^{5}
Xe-131m	4×10^{1}	4×10^{1}	1×10^{4}	1×10^{4}
Xe-133	2×10^{1}	1×10^{1}	1×10^{3}	1×10^{4}
Xe-135	3×10^{0}	2×10^{0}	1×10^{3}	1×10^{10}
Yttrium (39)				
Y-87 (a)	1×10^{0}	1×10^{0}	1×10^{1}	1×10^{6}
Y-88	4×10^{-1}	4×10^{-1}	1×10^{1}	1×10^{6}
Y-90	3×10^{-1}	3×10^{-1}	1×10^{3}	1×10^{5}
Y-91	6×10^{-1}	6×10^{-1}	1×10^{3}	1×10^{6}
Y-91m	2×10^{0}	2×10^{0}	1×10^{2}	1×10^{6}
Y-92	2×10^{-1}	2×10^{-1}	1×10^{2}	1×10^{5}
Y-93	3×10^{-1}	3×10^{-1}	1×10^{2}	1×10^{5}
Ytterbium (79)				
Yb-169	4×10^{0}	1×10^{0}	1×10^{2}	1×10^{7}
Yb-175	3×10^{1}	9×10^{-1}	1×10^{3}	1×10^{7}
Zinc (30)				
Zn-65	2×10^{0}	2×10^{0}	1×10^{1}	1×10^{6}
Zn-69	3×10^{0}	6×10^{-1}	1×10^{4}	1×10^{6}
Zn-69m (a)	3×10^{0}	6×10^{-1}	1×10^{2}	1×10^{6}
Zirconium (40)				
Zr-88	3×10^{0}	3×10^{0}	1×10^{2}	1×10^{6}
Zr-93	Unlimited	Unlimited	1×10^{3} (b)	1×10^{7} (b)
Zr-95 (a)	2×10^{0}	8×10^{-1}	1×10^{1}	1×10^{6}
Zr-97 (a)	4×10^{-1}	4×10^{-1}	1×10^{1} (b)	1×10^{5} (b)

1. A_1 or A_2 values for the parent radionuclides include contributions from their progeny with half-lives less than 10 days, are listed —

(1)	Mg-28	Al-28 ;
(2)	Ca-47	Sc-47 ;
(3)	Ti-44	Sc-44 ;
(4)	Fe-52	Mn-52m ;
(5)	Fe-60	Co-60m ;

(6)	Zn-69m	Zn-69 ;
(7)	Ge-68	Ga-68 ;
(8)	Rb-83	Kr-83m ;
(9)	Sr-82	Rb-82 ;
(10)	Sr-90	Y-90 ;
(11)	Sr-91	Y-91m ;
(12)	Sr-92	Y-92 ;
(13)	Y-87	Sr-87m ;
(14)	Zr-95	Nb-95m ;
(15)	Zr-97	Nb-97m, Nb-97 ;
(16)	Mo-99	Tc-99m ;
(17)	Tc-95m	Tc-95 ;
(18)	Tc-96m	Tc-96 ;
(19)	Ru-103	Rh-103m ;
(20)	Ru-106	Rh-106 ;
(21)	Pd-103	Rh-103m;
(22)	Ag-108m	Ag-108 ;
(23)	Ag-110m	Ag-110 ;
(24)	Cd-115	In-115m ;
(25)	In-114m	In-114 ;
(26)	Sn-113	In-113m ;
(27)	Sn-121m	Sn-121 ;
(28)	Sn-126	Sb-126m ;
(29)	Te-127m	Te-127 ;
(30)	Te-129m	Te-129 ;
(31)	Te-131m	Te-131 ;
(32)	Te-132	I-132 ;
(33)	I-135	Xe-135m ;
(34)	Xe-122	I-122 ;
(35)	Cs-137	Ba-137m ;
(36)	Ba-131	Cs-131 ;
(37)	Ba-140	La-140 ;
(38)	Ce-144	Pr-144m, Pr-144 ;
(39)	Pm-148m	Pm-148 ;
(40)	Gd-146	Eu-146 ;
(41)	Dy-166	Ho-166 ;
(42)	Hf-172	Lu-172 ;
(43)	W-178	Ta-178 ;
(44)	W-188	Re-188 ;
(45)	Re-189	Os-189m ;
(46)	Os-194	Ir-194 ;
(47)	Ir-189	Os-189m ;

(48)	Pt-188	Ir-188 ;
(49)	Hg-194	Au-194 ;
(50)	Hg-195m	Hg-195 ;
(51)	Pb-210	Bi-210 ;
(52)	Pb-212	Bi-212, Tl-208, Po-212 ;
(53)	Bi-210m	Tl-206 ;
(54)	Bi-212	Tl-208, Po-212 ;
(55)	At-211	Po-211 ;
(56)	Rn-222	Po-218, Pb-214, At-218, Bi-214, Po-214 ;
(57)	Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Po-211, Tl-207 ;
(58)	Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212 ;
(59)	Ra-225	Ac-225, Fr-221, At-217, Bi-213, Tl-209, Po-213, Pb-209 ;
(60)	Ra-226	Rn-222, Po-218, Pb-214, At-218, Bi-214, Po-214 ;
(61)	Ra-228	Ac-228 ;
(62)	Ac-225	Fr-221, At-217, Bi-213, Tl-209, Po-213, Pb-209 ;
(63)	Ac-227	Fr-223 ;
(64)	Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212 ;
(65)	Th-234	Pa-234m, Pa-234 ;
(66)	Pa-230	Ac-226, Th-226, Fr-222, Ra-222, Rn- 218, Po-214 ;
(67)	U-230	Th-226, Ra-222, Rn-218, Po-214 ;
(68)	U-235	Th-231 ;
(69)	Pu-241	U-237 ;
(70)	Pu-244	U-240, Np-240m ;
(71)	Am-242m	Am-242, Np-238 ;
(72)	Am-243	Np-239 ;
(73)	Cm-247	Pu-243 ;
(74)	Bk-249	Am-245 ; and
(75)	Cf-253	Cm-249.

2. Parent nuclides and their progeny included in secular equilibrium are listed —

(1)	Sr-90	Y-90 ;

(2)	Zr-93	Nb-93m ;
(3)	Zr-97	Nb-97 ;
(4)	Ru-106	Rh-106 ;
(5)	Cs-137	Ba-137m ;
(6)	Ce-134	La-134 ;
(7)	Ce-144	Pr-144 ;
(8)	Ba-140	La-140 ;
(9)	Bi-212	TI-208 (0.36), Po-212 (0.64) ;
(10)	Pb-210	Bi-210, Po-210 ;
(11)	Pb-212	Bi-212, TI-208 (0.36), Po-212 (0.64) ;
(12)	Rn-220	Po-216 ;
(13)	Rn-222	Po-218, Pb-214, Bi-214, Po-212 ;
(14)	Ra-223	Rn-219, Po-215, Pb-211, Bi-211, TI-207 ;
(15)	Ra-224	Rn-220, Po-216, Pb-212, Bi-212, TI-208, (0.36), Po-212 (0.64) ;
(16)	Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210 ;
(17)	Ra-228	Ac-228 ;
(18)	Th-226	Ra-222, Rn-218, Po-214 ;
(19)	Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, TI-208 (0.36), Po-212 (0.64) ;
(20)	Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209;
(21)	Th-nat	Ra-228, Ac-228, Th-228, Ra-224. Rn-220, Po-216, Pb-212, Bi-212, TI-208 (0.36), Po-212 (0.64) ;
(22)	Th-234	Pa-234m ;
(23)	U-230	Th-226, Ra-222, Rn-218, Po-214 ;
(24)	U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, TI-208 (0.36), Po-212 (0.64) ;
(25)	U-235	Th-231 ;
(26)	U-238	Th-234, Pa-234m ;
(27)	U-nat	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214 ;
(28)	Po-214	Pb-210, Bi-210, Po-210 ;
(29)	U-240	Np-240m ;
(30)	Np-237	Pa-233 ;
(31)	Am-242m	Am-242 ; and

(32) Am-243 Np-239

3. The quantity may be determined from a measurement of the rate of decay or a measurement of the radiation level at a prescribed distance from the source.

4. These values apply to compounds or uranium that take the chemical form of UF6, UO2F2 and UO2 (NO3)2 in both normal and accident conditions of transport.

5. These values apply only to compounds of uranium that take the chemical form of UO3, UF4, Ucl4 and hexavalent compounds in both normal and accident conditions of transport.

6. These values apply to all compounds of uranium other than those specified in paragraphs 4 and 5.

7. These values apply to unirradiated uranium .

TABLE II — BASIC RADIONUCLIDE VALUES FOR UNKNOWN RADIONUCLIDES OR MIXTURES

Radioactive contents	A_1	A_2	*Activity concentration for exempt material*	*Activity limit for an exempt consignment*
	TBq	TBq	Bq/g	Bq
Only beta or gamma emitting nuclides are known to be present	0.1	0.02	1×10^{1}	1×10^{-4}
Only alpha emitting nuclides are known to be present	0.2	9×10^{-5}	1×10^{-1}	1×10^{4}
No relevant data are available	0.001	9×10^{-5}	1×10^{-1}	1×10^{3}

TABLE III — ACTIVITY LIMITS FOR EXCEPTED PACKAGES

Physical state of contents	*Instrument of article*		*Materials*
	Item limits	Package limits	Package limits
Solids: Special form Other forms	10^{-2} A_1 10^{-2} A_2	A_1 A_2	10^{-3} A_1 10^{-3} A_2
Liquids	10^{-3} A_2	10^{-1} A_2	$10^{-4}A_2$
Gases: Tritium Special form Other forms	2 x 10^{-2} A_2 10^{-3} A_1 10^{-3} A_2	2 x 10^{-1} A_2 10^{-2} A_1 10^{-2} A_2	2 x 10^{-2} A_2 10^{-3} A_1 10^{-3} A_2

TABLE IV — INDUSTRIAL PACKAGE REQUIREMENTS FOR LSA MATERIAL AND SCO

Radioactive Contents	*Industrial Package type*	*Materials*
	Exclusive use	*Not under exclusive use*
LSA - I Solid[a] Liquid	*Type IP-1* *Type IP-1*	*Type IP-1* *Type IP-2*
LSA-II Solid	*Type IP-2*	*Type IP-2*
Liquid and gas	*Type IP-2*	*Type IP-3*
LSA-III	*Type IP-2*	*Type IP-3*
SCO-I[a]	*Type IP-1*	*Type IP-1*
SCO-II	*Type IP-2*	*Type IP-2*
SCO-III		

[a] Under the conditions specified in Article 5, LSA-I material and SCO-I may be transported unpackaged.

TABLE V: CONVEYANCE ACTIVITY LIMITS FOR LSA MATERIAL AND SCO IN INDUSTRIAL PACKAGES OR UNPACKAGED

Nature of material	*Activity limit for conveyances other than by inland waterway*	*Activity limit for a hold or compartment of an inland water craft*
LSA-I	No limit	No limit
LSA-II and LSA-III non-combustible solids	No limit	100 A_2
LSA-II and LSA-III combustible solids, and all liquids and gases	100 A_2	100 A_2
SCO	100 A_2	100 A_2

TABLE VI: MULTIPLICATION FACTORS FOR LARGE DIMENSION LOADS

Size of load[a]	*Multiplication factor*
Size of load ?1m^2	1
1m^2 < size of load ≤ 5m^2	2
5m^2 < size of load ≤ 20m^2	3
20m^2 < size of load	10

[a] Largest cross-sectional area of the load being measured.

TABLE VII: CATEGORIES OF PACKAGES AND OVERPCAKSS

Transport index	*Conditions*	*Category*
	Maximum dose rate at any point on external surface	
0[a]	Not more than 0.005mSv/h	I-WHITE
More than 0 but not more than 1[a]	More than 0.005mSv/h but not more than 0.5mSv/h	II-YELLOW
More than 1 but not more than 10	More than 0.5mSv/h but not more than 2mSv/h	III-YELLOW
More than 10	More than 2mSv/h but not more than 10mSv/h	III-YELLOW[b]

(1) If the measured TI is not greater than 0.05, the value quoted may be zero in accordance with Article 10.

(2) Shall be transported under exclusive use.

TABLE VIII: EXCERPTS FROM LIST OF UNITED NATIONS NUMBERS, PROPER SHIPPING NAMES AND DESCRIPTIONS

Assignment of UN numbers	PROPER SHIPPING NAME and description
Excepted package	
UN 2908	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - EMPTY PACKAGING
UN 2909	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - ARTICLES MANUFACTURED FROM NATURAL URANIUM or DEPLETED URANIUM or NATURAL THORIUM
UN 2910	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - LIMITED QUANTITY OF MATERIAL
UN 2911	RADIOACTIVE MATERIAL, EXCEPTED PACKAGE - INSTRUMENTS or ARTICLES
UN 3507	URANIUM HEXAFLUORIDE, RADIOACTIVE MATERIAL, EXCEPTED PACKAGE, less than 0.1 kg per package, non-fissile or fissile-excepted
Low specific activity material	
UN 2912	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY ? (LSA-I), non-fissile or fissile-excepted
UN 3321	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY? (LSA-II), non-fissile or fissile-excepted
UN 3322	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), non-fissile or fissile-excepted

UN 3324	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-II), FISSILE
UN 3325	RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY (LSA-III), FISSILE
Surface contaminated objects	
UN 2913	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I ,SCO-II or SCO-III), non-fissile or fissile-excepted
UN 3326	RADIOACTIVE MATERIAL, SURFACE CONTAMINATED OBJECTS (SCO-I, SCO-II or SCO-III), FISSILE
Type A package	
UN 2915	RADIOACTIVE MATERIAL, TYPE A PACKAGE, non-special form, non-fissile or fissile-excepted
UN 3327	RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE, non-special form
UN 3332	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, non-fissile or fissile-excepted
UN 3333	RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, FISSILE
Type B(U) package	
UN 2916	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, nonfissile or fissile-excepted
UN 3328	RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE, FISSILE
Type B(M) package	
UN 2917	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, nonfissile or fissile-excepted
UN 3329	RADIOACTIVE MATERIAL, TYPE B(M) PACKAGE, FISSILE

Type C package	
UN 3323	RADIOACTIVE MATERIAL, TYPE C PACKAGE, non-fissile or fissile-excepted
UN 3330	RADIOACTIVE MATERIAL, TYPE C PACKAGE, FISSILE
Special arrangement	
UN 2919	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, non-fissile or fissile-excepted
UN 3331	RADIOACTIVE MATERIAL, TRANSPORTED UNDER SPECIAL ARRANGEMENT, FISSILE
Uranium hexafluoride	
UN 2977	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, FISSILE
UN 2978	RADIOACTIVE MATERIAL, URANIUM HEXAFLUORIDE, non-fissile or fissile-excepted

(1) The *"PROPER SHIPPING NAME"* is found in the column *"PROPER SHIPPING NAME and description"* and is restricted to that part shown in CAPITAL LETTERS.

(2) In the cases of UN 2909, UN 2911, UN 2913 and UN 3326, where alternative proper shipping names are separated by the word "or" the relevant proper shipping name shall be used.

(3) The term *"fissile-excepted"* means to material excepted under para. 417 of SSR-6

TABLE IX: TI LIMITS FOR FREIGHT CONTAINERS AND CONVEYANCES NOT UNDER EXCLUSIVE USE

Type of freight container or conveyance	Limit on total sum of transport indexes in a freight container or aboard a conveyance
Freight container - Small	50
Freight container - Large	50
Vehicle	50
Aircraft	
Passenger	50
Cargo	200
Inland water-way vessel	50
Seagoing vessel[a]	
1. Hold, compartment or defined deck area	
Packages, overpacks, small freight containers	50
Large freight Containers	
2. Total vessel:	200
Packages, overpacks, small freight containers	
Large freight containers	No limit

TABLE X: CSI LIMITS FOR FREIGHT CONTAINERS AND CONVEYANCES CONTAINING FISSILE MATERIAL

The Limit on sum of CSIs in a freight container or abroad a conveyance

Type of freight container or conveyance	Not under exclusive use	Under exclusive use
Freight container:	50	Not applicable
Small freight container Large	50	100
freight container	50	100
Vehicle		
Aircraft:	50	Not applicable
Passenger	50	100
Cargo	50	100
Inland waterway craft		
Seagoing vessel a:		
(*i*) Hold, compartment or defined deck area :	50	100
Packages, overpacks, small freight containers	50	100
Large freight containers		
(*ii*) Total vessel:	200b	200c
Packages, overpacks, small freight containers	No limitb	No limitb
Large freight containers		

(1) Packages or overpacks carried in or on a vehicle that are in accordance with the provisions of regulation 14 of these Regulations may be transported by vessels if they are not removed from the vehicle at any time while on board the vessel and the entries under the heading *"under exclusive use"* apply.

(2) The consignment shall be handled and stowed in a way that the sum of CSIs in any group shall not exceed 50 and a group shall be handled and stowed maintaining a spacing of at least 6 m from other groups.

(3) The consignment shall be handled and stowed that the sum of CSIs in any group does not exceed 100 and that each group is handled and stowed maintaining a spacing of at least 6 m from other groups.

(4) The intervening space between groups may be occupied by other cargo in accordance with regulation 28 of these Regulations.

TABLE XI: VALUES OF Z FOR CALCULATION OF CSI IN ACCORDANCE WITH

Enrichment	Z
Uranium enriched up to 1.5%	2200
Uranium enriched up to 5%	850
Uranium enriched up to 10%	660
Uranium enriched up to 20%	580
Uranium enriched up to 100%	450

If a package contains uranium with varying enrichments of uranium-235, the value corresponding to the highest enrichment shall be used for Z.

ANNEX — I

CONVERSION FACTORS AND PREFIXES

1. This edition of the regulations uses the International System of Units (SI). The conversion factors for non-SI units are —

(1) Radiation units which includes —

(*a*) activity in becquerel (Bq) or curie (Ci)

$1\ Ci = 3.7 \times 10^{10}\ Bq$

$1\ Bq = 2.7 \times 10^{-11}\ Ci$

(*b*) dose equivalent in sievert (SV) or rem

$1\ rem = 1.0 \times 10^{-2}\ Sv$

$1\ Sv = 100\ rem$

(2) Pressure which includes —

Pressure in pascal (Pa) or (kgf/cm^2)

1 kgf/cm2 = 9.806 x 104 Pa

1 Pa = 1.020 x 10^{-5} kgf/cm^2

(3) Conductivity which includes —

(*a*) conductivity in siemens per metre (S/m) or (mho/cm)

10 imho/cm = I mS/m, and

(*b*) 1 mho/cm = 100S/m

1 S/m = 10^{-2} mho/cm.

ANNEX II — PREFIXES

The prefixes to be used with the SI units are —

Multiplying factor	Prefix	Symbol
1 000 000 000 000 000 000 = 10^{18}	exa	E
1 000 000 000 000 000 = 10^{15}	peta	P
1 000 000 000 000 = 10^{12}	tera	T
1 000 000 000 = 10^{9}	giga	G
1 000 000 = 10^{6}	mega	M
1 000 = 10^{3}	kilo	k
100 = 10^{2}	hecto	h
10 = 10^{1}	deca	da
0.1 = 10^{-1}	deci	d
0.01 = 10^{-2}	centi	c
0.001 = 10^{-3}	milli	m
0.000 001 = 10^{-6}	micro	i
0.000 000 001 = 10^{-9}	nano	n
0.000 000 000 001 = 10^{-12}	pico	p
0.000 000 000 000 001 = 10^{-15}	femto	f
0.000 000 000 000 000 001 = 10^{-18}	atto	a

SECOND SCHEDULE

Regulation 29(1), 30(2, a & b), (3), (5), (7) & (9b)

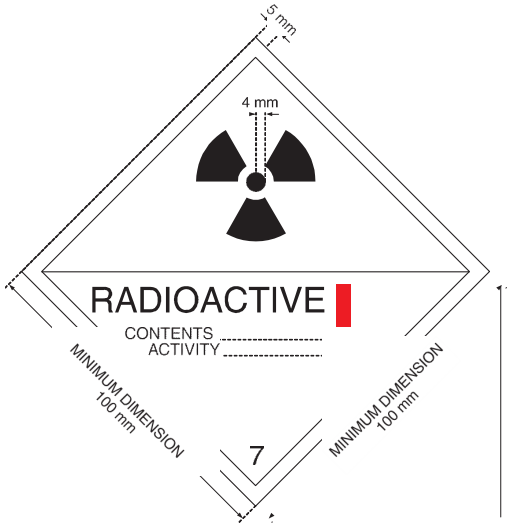

FIG. 1. Category I-WHITE label. The minimum width of the line inside the edge forming the diamond shall be 2 mm. The background colour of the label shall be white, the colour of the trefoil and the printing shall be black, and the colour of the category bar shall be red.

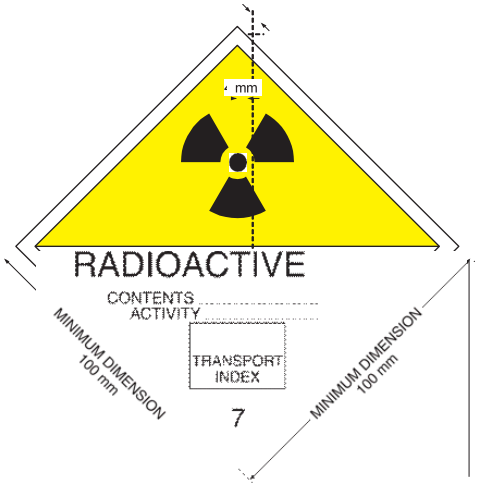

FIG. 2. Category II-YELLOW label. The minimum width of the line inside the edge forming the diamond shall be 2 mm. The background colour of the upper half of the label shall be yellow and the lower half white, the colour of the trefoil and the printing shall be black, and the colour of the category bars shall be red.

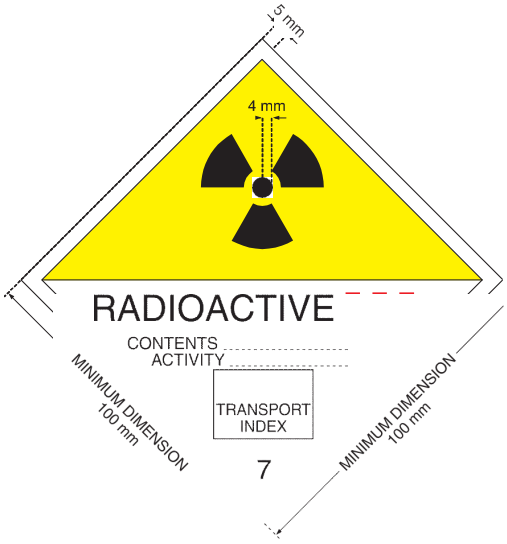

FIG. 3. Category III-YELLOW label. The minimum width of the line inside the edge forming the diamond shall be 2 mm. The background colour of the upper half of the label shall be yellow and the lower half white, the colour of the trefoil and the printing shall be black, and the colour of the category bars shall be red.

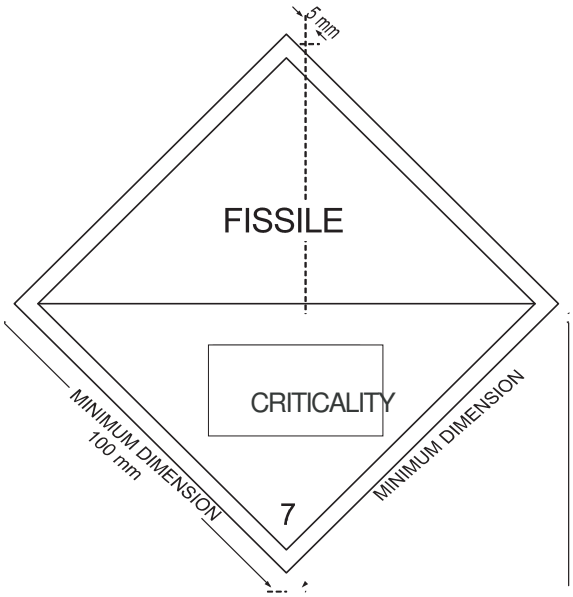

FIG. 4. CSI label. The minimum width of the line inside the edge forming the diamond shall be 2 mm. The background colour of the label shall be white; the colour of the printing shall be black.

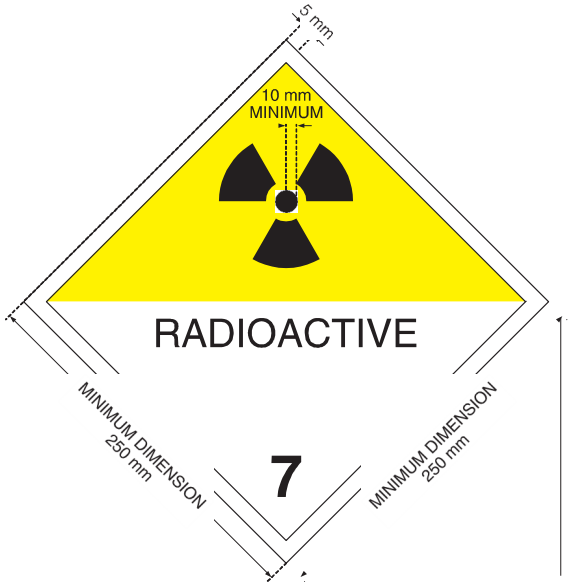

FIG. 5. Placard. Except as permitted by para. 571, minimum dimensions shall be as shown; when different dimensions are used, the relative proportions must be maintained. The number "7"shall not be less than 25 mm high. The background colour of the upper half of the placard shall be yellow and of the lower half white, the colour of the trefoil and the printing shall be black. The use of the word "RADIOACTIVE" in the bottom half is optional, to allow the alternative use of this placard to display the appropriate UN number for the consignment.

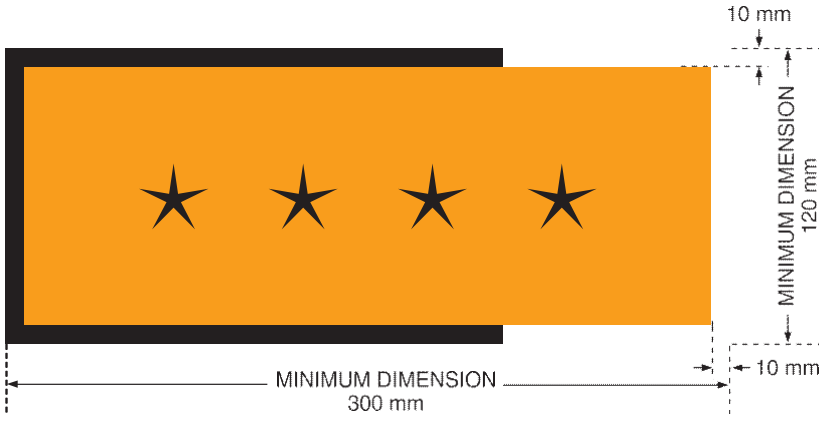

FIG. 6 Placard for separate display of UN number. The background colour of the placard shall be orange and the border and UN number shall be black. The symbol "****" denotes the space in which the appropriate UN number for radioactive material, as specified in Table 1, shall be displayed

ANNEX — I

CONVERSION FACTORS AND PREFIXES

This edition of the regulations uses the International System of Units (SI). The conversion factors for non-SI units are:

Radiation Units

Activity in becquerel (Bq) or curie (Ci)

1 Ci = 3.7×10^{10} Bq

1 Bq = 2.7×10^{-11} Ci

Dose equivalent in sievert (Sv) or rem

1 rem = 1.0×10^{-2} Sv

1 Sv = 100 rem

Pressure

Pressure in pascal (Pa) or (kgf/cm^2)

1 kgf/cm^2 = 9.806×10^4 Pa

1 Pa = 1.020×10^{-5} kgf/cm^2

Conductivity

Conductivity in siemens per metre (S/m) or (mho/cm)

10 imho/cm = I mS/m

OR

1 mho/cm = 100S/m

1 S/m = 10^{-2} mho/cm

ANNEX II —PREFIXES

The prefixes to be used with the SI units are:

Multiplying factor	Prefix	Symbol
1 000 000 000 000 000 000 = 10^{18}	exa	E
1 000 000 000 000 000 = 10^{15}	peta	P
1 000 000 000 000 = 10^{12}	tera	T
1 000 000 000 = 10^9	giga	G
1 000 000 = 10^6	mega	M
1 000 = 10^3	kilo	k
100 = 10^2	hecto	h
10 = 10^1	deca	da
0.1 = 10^{-1}	deci	d
0.01 = 10^{-2}	centi	c
0.001 = 10^{-3}	milli	m
0.000 001 = 10^{-6}	micro	i

$0.000\ 000\ 001 = 10^{-9}$	nano	n
$0.000\ 000\ 000\ 001 = 10^{-12}$	pico	p
$0.000\ 000\ 000\ 000\ 001 = 10^{-15}$	femto	f
$0.000\ 000\ 000\ 000\ 000\ 001 = 10^{-18}$	atto	a

THIRD SCHEDULE

Regulation 20(2)

1. The activity concentration for exempt consignment may be derived from the expression

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

where,

(*a*) *f(i)* is the fraction of activity or activity concentration of radionuclide in the mixture ;

(*b*) *X(i)* is the appropriate value of the activity/ exempt per consignment as appropriate for the radionuclide i ; and

(*c*) X_m is the derived value of the activity concentration for exempt material or the activity limit for an exempt consignment in the case of a mixture.

2. The basic activity limit for individual radionulcides, A_1 and A_2 that shall not be exceeded in a package is given in Table 1of the First schedule to these Regulations.

3. The activity and exempt limits for a mixture of radionuclides shall be derived using the following formula

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

where,

(*a*) *g(i)* is the fraction of activity or activity concentration of radionuclide in the mixture ;

(*b*) *A(i)* is the appropriate value of the activity limit per consignment, A_1 or A_2 for the radionuclide i ; and

(*c*) A_m is the derived value of the activity or activity concentration limit A_1 or A_2 for individual radionuclide per consignment in mixture.

4. For unknown radionuclides or mixtures the more restrictive values of activity concentration for exempt material or activity limits for exempt con-

signments specified in Table II of the First Schedule to these Regulations shall be used.

MADE at Abuja this 23rd day of November 2023

BOLA AHMED TINUBU, GCFR
President, Federal Republic of Nigeria