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NRRC Technical Regulations

Safe Transport of Radioactive Materials

NRRC-R-15
2022

هيئة الرقابة النووية والإشعاعية
Nuclear and Radiological Regulatory Commission

Regulation
Safe Transport of Radioactive Materials

2022
NRRC-R-15

Preamble

In accordance with the provisions of the Law of Nuclear and Radiological Control issued by Royal Decree No. (M/82) dated 25/7/1439 AH, and NRRC's Statue issued by the Minsters' Cabinet Resolution No. (334) dated 25 /6/1439 AH, the NRRC prepared regulations that ensure control over radiological activities and practices as well as nuclear and radiological facilities.

This regulation has been prepared on the basis of International Atomic Energy Agency (IAEA) standards, international best practices and the experiences of similar international regulatory bodies, and in accordance with the Kingdom's international commitments. This Regulation has been presented in "the Public Consultation Platform" for the public review, comments, feedback.

This regulation has been approved by the NRRC's Board of Directors in resolution No. (R/5/2/2022), dated 01/12/2022.

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Chapter 1: Objective, Scope, and Definitions

Section 1: Objective

1. The objective of this regulation is to prescribe requirements that shall be fulfilled to ensure safety, security and to protect persons, property, and the environment from any harmful effects of radiation on the transport of radioactive materials or nuclear material.

Section 2: Scope

2. This regulation shall apply to transport of radioactive material or nuclear material by all modes on land, water or in the air, including transport which is incidental to the use of radioactive material or nuclear material.

3. Notwithstanding to the provision in Article 2 above, this regulation shall not apply to:

    a. Radioactive material that is an integral part of the means of transport.

    b. Radioactive material moved within an establishment that is subject to appropriate safety requirements in effect in that establishment and where the movement does not involve public roads or railways.

    c. Radioactive material implanted or incorporated into a person or live animal for diagnostic or therapeutic purposes.

d. Radioactive material in or on a patient who is to be transported for medical treatment due to accidental or intentional ingestion of radioactive material or contamination.

e. Radioactive material in consumer products that have received regulatory approval, following their sale to the end-user.

f. Natural material and ores containing naturally occurring radionuclides, which may have been processed, provided the activity concentration of the material does not exceed the values specified by the NRRC.

g. Non-radioactive solid objects with radioactive substances present on any surface in quantities, not in excess of the levels of contamination prescribed by the NRRC.

4. For radioactive material having subsidiary hazards, and for the transport of radioactive material with other dangerous goods, the relevant transport regulations for dangerous goods shall apply in addition to this regulation.

Section 3 Definitions

Aircraft

Cargo aircraft

Any aircraft, other than a passenger aircraft, that is carrying goods or property.

Passenger aircraft

An aircraft that carries any person other than a crew member, a carrier's employee in an official capacity, an authorized representative of an appropriate competent authority, or a person accompanying a consignment or other cargo.

Approval

Multilateral approval

An approval by the relevant competent authority both of the country of origin of the design or shipment and of each country through or to which the consignment is to be transported and includes any validation or endorsement of the original certificate by a competent authority of any country through or to which the consignment is transported;

Unilateral approval

An approval of a design that is required to be given by the competent authority of the country of origin of the design only.

Carrier

Any person, organization or government undertaking the carriage of radioactive material or nuclear material by any means of transport.

Certificate of approval

A document issued by the NRRC for the purpose of approval to the requirements made under this regulation.

Consignee

Any person, organization or government that is entitled to take delivery of a consignment.

Consignmen

Any package or packages, or load of radioactive material, presented by a consignor for transport.

Consignor

Any person, organization or government that prepares a consignment for transport.

Contamination

For this regulation, contamination is the presence of a radioactive substance on a surface in quantities in excess of values prescribed by the NRRC for beta and gamma emitters and low toxicity alpha emitters, or all other alpha emitters.

Non-fixed contamination

Contamination that can be removed from a surface during routine conditions of transport.

Fixed contamination

Contamination other than non-fixed contamination.

Conveyance

Conveyance shall refer to:

a. For transport by road or rail: any vehicle.

b. For transport by water: any vessel, or any hold, compartment, or defined deck area of a vessel.

c. For transport by air: any aircraft.

Criticality safety index (CSI)

A number that is used to provide control over the accumulation of packages, overpacks or freight containers containing fissile material.

Design

The description of special form radioactive material, low dispersible radioactive material, package, or packaging for the purpose of fully identifying the item, which may include specifications, engineering drawings, reports demonstrating compliance with regulatory requirements and other relevant documentation.

Dose Rate

Dose rate shall mean the ambient dose equivalent or the directional dose equivalent, as appropriate, per unit time, measured at the point of interest.

Exclusive use

Exclusive use shall mean the sole use, by a single consignor of a conveyance or of a large freight container in respect of which all initial, intermediate, and final loading and unloading and shipment are carried out in accordance with the directions of the consignor or consignee, where so required by this regulation.

Fissile material

Material containing any of fissile nuclides, but does not include unirradiated natural uranium, depleted uranium, and natural or depleted uranium that has been irradiated in thermal reactors only.

Freight container

An article of transport equipment that is of a permanent character and is 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 and/or readily handled, and having fittings for these purposes. The term freight container does not include the vehicle.

International Maritime Dangerous Goods (IMDG) Code

International code for the maritime transport of dangerous goods in packaged form, to enhance and harmonize the safe carriage of dangerous goods and to prevent pollution to the environment. The Code sets out in detail the requirements applicable to each individual substance, material, or article, covering matters such as packing, container traffic and stowage, with reference to the segregation of incompatible substances.

Intermediate bulk container, (IBC)

A portable packaging that:

a. Has a capacity of not more than 3 m^3;

b. Is designed for mechanical handling; and

c. Is resistant to the stresses produced in handling and transport, as determined by tests.

Low dispersible radioactive material

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 material (LSA)

Radioactive material or nuclear material, that by its nature has a limited specific activity, or radioactive material or nuclear material for which limits of estimated average specific activity apply. External shielding materials surrounding the LSA material shall not be considered in determining the estimated average specific activity.

Overpack

An enclosure used by a single consignor to contain one or more packages and to form one unit for convenience of handling and stowage during transport.

Package

The complete product of the packing operation, consisting of the packaging and its contents prepared for transport. The types of packages covered by this regulation that are subject to activity limits and material restrictions as prescribed by the NRRC.

Packaging

One or more receptacles and any other components or materials necessary for the receptacles to perform the containment and other safety functions.

Radioactive contents

The radioactive material together with any contaminated or activated solids, liquids, and gases within the packaging.

Shipment

Specific movement of a consignment from origin to destination.

Special arrangement

Those provisions, approved by the NRRC, under which consignments that do not satisfy all the applicable requirements of this regulation may be transported.

Special form radioactive material

An indispersible solid radioactive material or a sealed capsule containing radioactive material.

Special use vessel

A vessel which by virtue of its design, or by reason of its being chartered, is dedicated to the purpose of carrying radioactive material or nuclear material.

Surface contaminated object (SCO)

A solid object that is not itself radioactive, but which has radioactive material distributed on its surface and SCO shall be in one of two groups prescribed by the NRRC.

Tank

A portable tank (including a tank container), a road tank vehicle, a rail tank wagon or a receptacle that contains solids, liquids, or gases, having a capacity of not less than 450 L when used for the transport of gases.

Through or into

Through or into the countries in which a consignment is transported by all modes on land, water, or in the air, including when there are no scheduled stops within the territorial of the Kingdom.

Transport index (TI)

Transport index (TI) assigned to a package, overpack or freight container, or to unpackaged LSA or SCO mean a number that is used to provide control over radiation exposure.

Vehicle

Vehicle shall mean a road vehicle (including an articulated vehicle, i.e., a tractor and semi-trailer combination), railroad car or railway wagon. Each trailer shall be considered as a separate vehicle.

Vessel

Any seagoing vessel or inland waterway craft used for carrying cargo.

Chapter 2: General Provisions

Section 4: Authorization Requirements

5. Any person intended to transport radioactive material or nuclear material within and through or into the Kingdom shall obtain a valid authorization as prescribed by the NRRC.

6. Any consignor responsible for preparing shipments containing radioactive material or nuclear material shall possess valid authorization from NRRC.

7. Any consignee responsible for accepting the shipments containing radioactive material or nuclear material shall possess valid authorization from NRRC.

8. The person having a valid authorization to transport radioactive material or nuclear material shall notify each intended transportation as prescribed by the NRRC.

9. Any person intending to transit radioactive material or nuclear material in the Kingdom shall posses' valid authorization from the NRRC.

Section 5: Requirements for Safety and Security

10. The authorized person shall ensure the assessment of exposure arising from transport activities are as prescribed in Regulation on Radiation Safety (NRRC-R-01).

11. Measures should be taken to ensure that radioactive material is kept secure in transport to prevent theft or damage and to ensure that control of the material is not relinquished inappropriately.

12. The authorized person transporting radioactive material or nuclear material within the Kingdom shall:

    a. Ensure that the radiation exposure from the transport of such materials is kept as low as practicable so that no person involved in such transport shall be likely to receive a radiation dose in excess of the appropriate dose limits specified in the Regulation on Radiation Safety (NRRC-R-01);

    b. Ensure that the security of radioactive materials or nuclear material during transport is in line with the requirement made under Regulation for Security of Radioactive Materials (NRRC-R-17) or Regulation on Nuclear Security (NRRC-R-11) respectively.

    c. Ensure that all transport and storage personnel receive such instructions as necessary concerning the safety and security involved in the transport and the relevant precautions to be observed.

13. The authorized person shall adopt a structured and systematic approach including the interfaces between transport and other activities in ensuring for the safety and security.

14. The authorized person shall establish a Radiation Protection Program and, where applicable a Transport Security Plan that shall be made available, on request, for inspection by the NRRC.

15. The authorized person shall ensure records for individual monitoring or workplace monitoring are kept and available for inspection by the NRRC.

Section 6: Emergency Preparedness

16. The authorized person shall establish arrangements for emergency preparedness and response for the transportation of radioactive materials or nuclear material

17. The arrangements for preparedness and response shall be based on the graded approach and take into consideration the hazards identified and their 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 an emergency.

18. In the event of an accident during the transport of radioactive materials or nuclear material, a detailed incident report shall be issued with a statement of the measures and actions taken or planned as specified by the NRRC from the date of the accident.

Section 7: Management System

19. The authorized person shall establish and implement management system for all activities within the scope of this regulation in accordance with other relevant NRRC regulations.

Section 8: Non-compliance

20. In the event of non-compliance with the NRRC's prescribed dose rate or contamination, the following actions shall be taken.

a. The authorized person and any person involved during transport who may be affected, shall be informed of the non-compliance by:

   (i) The carrier if the non-compliance is identified during transport; or

   (ii) The consignee if the non-compliance is identified at receipt.

b. The authorized person shall:

   (i) Take immediate steps to mitigate the consequences of the non-compliance;

   (ii) Investigate the non-compliance and 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;

   (iv) Communicate to the NRRC the causes of the non-compliance and the corrective or preventive actions taken or to be taken.

c. The communication of the non-compliance to the consignor and the NRRC, respectively, shall be made as soon as practicable and shall be immediate whenever an emergency exposure situation has developed or is developing.

Section 9: Training

21. The authorized person shall ensure that any person engaged in the transport of radioactive material or nuclear material shall receive appropriate training commensurate with their responsibilities.

22. The employer shall keep records of all training undertaken, and it shall be made available to the employee and to the NRRC.

23. The training shall be provided or verified by the employer upon employment and shall be periodically supplemented with retraining as deemed appropriate by the NRRC.

Chapter 3: Activity Limits and Classification

Section 10: General Provisions

24. Radioactive material or nuclear material in transport shall be assigned as prescribed by the NRRC.

Section 11: Determination of Basic Radionuclide Values

25. The authorized person shall determine basic radionuclides value in preparing the transport packages that are designated based on activity values assigned to each radionuclide as prescribed by the NRRC.

26. The authorized person shall obtain prior approval from the NRRC for activity values of radionuclides that are not prescribed by the NRRC before shipment of such material.

Section 12: Classification of Packages

27. The authorized person shall classify packages for transport as prescribed by the NRRC.

28. The authorized person shall conform to the requirements for each package as prescribed by the NRRC.

Chapter 4: Requirements and Controls for Transport

Section 13: Requirements Before the First Shipment

29. Before a packaging is first used to transport radioactive material, the authorized person shall confirm that a packaging has been manufactured in conformity with the design specifications that comply to the requirements prescribed by the NRRC and the applicable certificate of approval.

Section 14: Requirements Before Each Shipment

30. Before each shipment of any package, the authorized person shall ensure that all the requirements specified by the NRRC and in the applicable certificates of approval have been fulfilled.

31. The authorized person shall ensure before each shipment of any package, that the package contains neither:

    a. Radionuclides different from those specified for the package design; nor

    b. Contents in a form, or physical or chemical state, different from those approved for the package design.

Section 15: Transport of Other Goods

32. A package shall not contain any item other than those that are necessary for the use of the radioactive material or nuclear material and the interaction between these items and the package, under the conditions of transport applicable to the design, shall not reduce the safety of the package.

33. Freight containers, IBCs, tanks, and other packaging and overpacks used for the transport of radioactive material or nuclear material shall not be used for the storage or transport of other goods unless decontaminated to the level approved by the NRRC.

Section 16: Other Dangerous Properties of Contents

34. Consignments shall be segregated from other dangerous goods during transport as prescribed by the NRRC.

35. In addition to the radioactive and fissile properties of the transported content, any other dangerous properties of the contents of the package, such as explosiveness, flammability, pyrophoricity, chemical toxicity and corrosiveness, shall be considered in the packing, labeling, marking, placarding, storage, and transport during transport.

Section 17: Requirements and Controls for Contamination and Leaking Packages

36. The authorized person shall ensure that the non-fixed contamination on the external and internal surfaces of any package shall be kept as low as practicable and shall not exceed the limits prescribed by the NRRC under routine transports conditions.

Section 18: Limits on Transport Index for Packages and Overpacks

37. The authorized person shall determine TI for a package, overpack or freight container, or for unpackaged types LSA or SCO, as prescribed by the NRRC.

38. Except under the condition of exclusive use, the authorized person and/or carrier shall ensure that the total number of packages, tanks, freight containers or overpacks aboard a single conveyance is limited such that the total sum of the TI aboard the conveyance does not exceed the respective values prescribed by the NRRC.

39. The CSI for each overpack or freight container shall be determined as the sum of the CSIs of all the packages contained.

40. The same procedure shall be followed for determining the total sum of the CSIs in a consignment or aboard a conveyance.

41. Except for consignments under exclusive use, the TI and CSI of any package or overpack shall not exceed the limit prescribed by the NRRC.

42. For a package, overpack or freight container, the TI, and the surface dose rate conditions shall be considered in determining package category as prescribed by the NRRC.

Section 19: Marking, Labelling and Placarding

43. Each package and overpack shall be legibly and durably marked, labelled, and placarded on the outside of the packaging, the serial number to identify each package which conforms to that design and other information prescribed by the NRRC that are made under this regulation.

44. Each package, overpack and freight container containing fissile material, other than excepted fissile material, shall bear the CSI labels.

45. Any label that does not relate to the contents shall be removed or covered.

46. The authorized person shall ensure the carrier of radioactive material in a vehicle is placarded in accordance with this regulation while the material is transported.

47. The labels and placards required by this regulation shall conform to the appropriate designs and colors as prescribed by the NRRC.

48. All statements on the labels, placards and markings shall be in Arabic, or in any other language as prescribed by the NRRC.

Section 20: NRRC Identification Marks

49. Each approval certificate issued by the NRRC shall be assigned an identification mark and the mark shall satisfy all the requirements prescribed by the NRRC.

Section 21: Transport Documents

50. The authorized person shall include in the transport documents with each consignment the identification of the consignor and consignee, and the complete information as prescribed by the NRRC.

51. The authorized person shall include in the transport documents a declaration certifying that the contents of the consignment are described by the proper shipping name, are properly classified, packaged, marked, and labelled in accordance with this regulation, and are in proper condition for transport.

52. When radioactive material or nuclear material, other than when carried in tanks, is packed, or loaded into any freight container or vehicle that will be transported by sea, the authorized person shall ensure availability of the container/vehicle packing certificate specifying the container/vehicle identification number(s) and certifying that the operation has been carried out in accordance with the applicable conditions dangerous goods as prescribed by the NRRC.

53. The authorized person shall provide in the transport documents a statement regarding actions, if any, that are required to be taken by the carrier in the languages deemed necessary by the carrier or the authorities concerned at the minimum with the following information:

    a. Supplementary requirements during transport including any special provisions or a statement that no such requirements are necessary;

b. Restrictions on the mode of transport or conveyance and any necessary routing instructions;

c. Emergency arrangements appropriate to the consignment.

Chapter 5: Transport and Storage in Transit

Section 22: Segregation During Transport and Storage in Transit

54. Packages, overpacks and freight containers containing radioactive material and unpackaged radioactive material shall be segregated during transport and during storage in transit:

    a. From workers in regularly occupied working areas by distances calculated using a dose constrains for annual occupational exposure dose;

    b. From members of the public in areas where the public has regular access by distances calculated using a dose limit for public;

    c. From other dangerous goods.

55. The storage shall comply to safety and security requirements as well as the relevant regulations.

Section 23: Stowage During Transport and Storage in Transit

56. The consignments shall be securely stowed in appropriate environment taking into consideration the physical and chemical properties.

57. The loading of freight containers and accumulation of packages, overpacks and freight containers shall be conducted as prescribed by the NRRC.

58. The sum of the CSIs in any group of packages, overpacks and freight containers containing fissile material stored in transit in any one storage area shall not exceed the values prescribed by the NRRC.

Section 24: Requirement for Other Inspections

59. Operations involving inspection other than those of the NRRC on the radioactive contents of a package shall be carried out only in a place where adequate means of controlling radiation exposure are provided and with prior notification to the NRRC.

60. Any package opened due to inspection in Article 59 shall, before being forwarded to the consignee, be restored to its original condition with prior authorization from the NRRC.

Chapter 6: Administrative Requirements

Section 25: Approval for Design of Special Form Radioactive Material and Low Dispersible Radioactive Material

61. The authorized person shall acquire unilateral approval for design of special form radioactive material.

62. The authorized person shall acquire both unilateral and multilateral approval for the design of low dispersible radioactive.

63. The authorized person shall submit application for approval of a design for special form radioactive material and low dispersible radioactive material as prescribed by the NRRC.

Section 26: Approval Requirements for all Packaging and Packages

64. The package shall be designed in relation to its mass, volume, and shape so that it may be transported easily, safely, and with the ability to be properly secured in or on the conveyance as required and approved by the NRRC.

65. The authorized person shall acquire unilateral or multilateral approval for each design type of package as prescribed by the NRRC.

Section 27: Approval of Certain Shipment

66. Shipment of certain type of package that is not conforming or exceeding technical criteria to the prescribed package requirements by the NRRC, or for transport of consignments by means of a special use vessel, shall require approval from the NRRC and when it involves international transboundary movement, multilateral approval shall be required for which the applicant shall submit the following information:

    a. The period for which the approval is sought;

    b. The actual radioactive contents of the package, the expected modes of transport, the type of conveyance and the probable or the proposed route; and

c. The details of how the special precautions, administrative or operational controls referred to in the package design approval certificates are to be put into effect.

Section 28: Approval for Special Arrangement

67. A consignment which does not satisfy all the applicable requirements of this regulation shall not be transported except under special arrangement.

68. The application for special arrangement approval shall be submitted with the justification on why the consignment cannot be shipped, transported, or made in accordance with this regulation and a statement of any special precautions or special administrative or operational controls which are to be employed during transport to compensate for the failure to meet this regulation.

69. The overall level of safety arrangement for special arrangement transport shall be at least equivalent to that which would be provided if all the applicable requirements in this regulation are met.

70. The approval for transportations with special arrangements shall be obtained from the NRRC and, in addition, for international consignment it shall be subject to relevant multilateral approval.

Section 29: Types of Approval Issued under the Regulation

71. For the purpose of this regulation, the following items shall require the approval of the NRRC:

a. The design of a special form radioactive material;

b. The design of low dispersible radioactive material;

c. The design of packages containing prescribed amount of uranium hexafluoride;

d. The design of a prescribed type of package;

e. The design of all packages containing fissile material unless excepted as specified by the NRRC;

f. Certain shipments;

g. Radiation protection programs for a special use vessel;

h. Special arrangements; and

i. The assignment of Activity values to individual radionuclides which are not prescribed by the NRRC.

j. Any prior approval issued by the competent authority of a foreign country.

Section 30: Types of Approval Certificate

72. There shall be five types of approval certificates which may be issued by the NRRC, namely:

a. The design of a special form radioactive material;

b. The design of a low dispersible radioactive material;

c. The design of all packages, other than excepted packages containing fissile material;

d. A certain shipment; and

e. A special arrangement.

73. For package designs where it does not require a certificate of approval by the NRRC, the authorized person shall, upon request, make available for inspection to the NRRC documentary evidence of the compliance of the package design with all the applicable requirements.

74. Certification that designs specification for packaging demonstrating compliance to this regulation shall be made available to the NRRC.

Section 31: Demonstration of Compliance

75. Demonstration of compliance with the performance standards shall be accomplished by any of the methods or by a combination of test thereof as prescribed by the NRRC.

Chapter 7: General Requirements

Section 32: Prohibition

76. Without prejudice to the requirements of this regulation, no person shall transport or cause to be transported any radioactive material or nuclear material, unless:

a. it is packed in a package whose design meets all the requirements prescribed by NRRC; and;

b. the consignment is accompanied with proper transport document, packed, marked, labelled, categorized and placarded in accordance with all the requirements as prescribed by NRRC.

77. Passengers or crew of transport shall not be permitted to carry any nuclear materials or radioactive materials on any conveyance, whether by hand or through checked-in or carry-on baggage.

78. No person shall transmit domestically any radioactive material or nuclear material by postal service or courier service.

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