DOF: 04/09/2017 DOF = Official Journal of the Federation

PROJECT Official Mexican Standard PROY-NOM-009-NUCL-2017, Determination and application of the transport index for radioactive materials and of the safety index with respect to the criticality for the transport of fissile material.

PROYECTO MEXICANA OFFICIAL MEXICANA PROY-NOM-009-NUCL-2017, DETERMINATION AND IMPLEMENTATION OF THE TRANSPORT INDEX FOR RADIOACTIVE MATERIALS AND THE SAFETY WITH RESPECT TO CRITICALITY FOR THE TRANSPORT OF SUBSTANCES FISIONABLES

Content

Introduction

When the transport or storage in transit of radioactive materials is carried out, the transport index is determined as an indicator to provide control over groups of packages in order to minimize the risks of ionizing radiation.

In the particular case of packages containing fissile material, the safety index is calculated with respect to criticality as a measure to avoid nuclear criticality during the transport or storage in transit of such substances.

1. Purpose and scope

1.1 Objective

Establish methods for determining the transport index and safety index with respect to criticality, as well as the safety requirements to be met for the transport and storage in transit of radioactive material, with respect to the indexes already mentioned.

1.2 Field of application

The present draft Official Mexican Standard is applicable to transport units, packages, overpacks, containers and tanks, in which radioactive material is to be transported, as well as materials of Low Specific Activity-I and Objects Contaminated in the Surface -I without packaging, including storage in transit.

2. References

For the correct application of this Draft Official Mexican Standard, it is necessary to consult the following Mexican Official Norms or those that substitute them:

2.1 NOM-008-SCFI-2002, General system of units of measurement.

3. Definitions

For the purposes of this Draft Official Mexican Standard, the following terms and definitions shall apply:

3.1 Storage in transit

The storage that is made during the transfer of radioactive material due to the logistics of the same.

3.2 Security index with respect to criticality

The dimensionless number assigned to a package, overpack or cargo container containing fissile material, to control the accumulation of packages, overpacks or cargo containers containing such substances.

3.3 Transport index

The dimensionless number assigned to a package, overfill, tank or cargo container, or to a non-packaged surface-active material (BAE-I) or low contaminated surface (OCS-I) material to control exposure to ionizing radiation .

3.4 Materials of low specific activity (BAE)

Radioactive materials that by their nature have a limited specific activity, or those to which limits of the estimated average specific activity are applied.

3.5 Surface contaminated object (SCO)

Any solid object that is not itself radioactive but has radioactive materials distributed on its surface.

4. Nomenclature and abbreviations

BAE-I materials of low specific activity-I.

ISC safety index with respect to criticality.

IT transport index.

OCS-I contaminated objects on the surface-1.

5. Method for determining the transport index

5.1 The IT of a package, overfill, tank, container or BAE-1 or OCS-I unpacked shall be the figure deducted in accordance with the following procedure:

5.1.1 Using a suitable and calibrated detector for the type of ionizing radiation, the maximum radiation level in the units of the detector used shall be measured at a distance of 1 m from the outer surfaces of the package, overfill, tank, container or BAE-I or OCS-I without packaging, and its equivalent in millisievert per hour (mSv / h) is determined. If the field of ionizing radiation is composed of more than one type of ionizing radiation, the IT must be calculated on the basis of the sum of the maximum levels of the different types of ionizing radiation.

5.1.2 The value determined in the previous paragraph is multiplied by 100 and the number obtained will be IT.

5.1.3 For the transport of uranium and thorium minerals and concentrates, where radiation levels are not taken directly, maximum values shall be taken at any point within 1 m of the external surface of the cargo. following:

a) 0.4 mSv / h for minerals and physical concentrates of uranium and thorium.

b) 0.3 mSv / h for thorium chemical concentrates.

c) 0.02 mSv / h for chemical concentrates of uranium other than uranium hexafluoride.

5.1.4 For unpacked tanks, containers and BAE-I and OCS-I, the value determined in 5.1.1 to 5.1.3 is multiplied by the appropriate factor in Table 1.

Table 1

Multiplying factors for large loads

Dimensiones de la cargaa	Factor de multiplicación
dimensión de la carga ≤ 1 m²	1
1 m² < dimensión de la carga ≤ 5 m²	2
5 m² < dimensión de la carga ≤ 20 m²	3
20 m² < dimensión de la carga	10
a Se mide el área de la mayor sección transversal de la carga.	

5.1.5 The figure obtained in accordance with 5.1.1 to 5.1.4 for transport safety purposes is rounded up to the first decimal point, except values of 0.05 or less, which are considered as zero.

5.1.6 The IT of an overpack, container or transport unit must be obtained either by adding the IT of all the packages contained therein, or by directly measuring the total radiation level, except in the case of non-rigid overruns, for the which IT will be obtained only by adding the IT of all the packages.

6. Method for determining the safety index with respect to criticality

6.1 In order to calculate the ISC of packages containing fissile material, the procedure described below shall apply:

6.1.1 The number N of packages shall be determined first and shall comply with the following:

6.1.1.1 A number of packages equal to 5N, with the arrangement and conditions allowing the maximum multiplication of neutrons, shall be subcritical when:

6.1.1.1.1 There is nothing between the packages and the package is surrounded on all sides by a water reflection of at least 20 cm.

6.1.1.1.2 The condition of the packages is the condition evaluated or demonstrated once subjected to the tests to demonstrate the ability to withstand the routine transport conditions specified in the Official Mexican Standard on tests for packages containing radioactive material.

6.1.1.2 A number of packages equal to 2N, with the arrangement and conditions allowing the maximum multiplication of neutrons, shall be subcritical when:

6.1.1.2.1 There is a hydrogenated moderation between the packages and the package with a water reflection of at least 20 cm on all sides.

6.1.1.2.2 The packages have undergone the tests to demonstrate the ability to withstand routine transport conditions, followed by the tests established in the Official Standard

Mexicana on tests for packages containing radioactive material that are more stringent among the following:

(a) The mechanical test for fall II established to demonstrate the ability to withstand accident conditions during transport and either the fall III test specified for packages with a mass not exceeding 500 kg and a density total not exceeding 1000 kg / m³ according to their external dimensions, or the test established for fall I for all other packages, followed by the thermal test for the accident conditions and, finally, for the tests specified for the infiltration of water into packages containing fissile material, or

b) The water immersion test established for the accident conditions.

6.1.1.2.3 Any part of the fissile material shall escape the containment system after the tests specified in 6.1.1.2.2, in which case it shall be assumed that fissile material is removed from each package of the ordered set and that the total of the fissile material will be ordered in the configuration and moderation leading to maximum neutron multiplication with a full and direct water reflection of at least 20 cm.

6.1.2 The ISC of packages containing fissile material shall be obtained by dividing the number 50 by the lesser of the two N values set in accordance with the procedures specified in 6.1.1.1 and 6.1.1.2:

$$ISC = 50 / N$$

6.1.3 The ISC of an overpack, container, shipment or on board a transport unit shall be obtained by adding the ISCs of all the packages it contains.

7. Requirements

7.1 Any package or overpack that has an IT greater than 10, or any shipment with an ISC greater than 50, must be transported only in the exclusive use mode.

7.2 The IT for any package or overpack should not be greater than 10, and the ISC of any package or overpack should not exceed 50, except for consignments transported in the exclusive use mode.

7.3 Except in the exclusive use mode, and for BAE-I shipments, the total number of packages, overpacks, tanks and containers in a transport unit should be limited, so that the total sum of IT on board of the transport unit does not exceed the values given in Table 2.

Table 2

Transport index limits for containers and transport units not in the transport mode exclusive use

Tipo de contenedor o unidad de transporte	Límite de la suma de IT en un contenedor o a bordo de una unidad de transporte
Contenedor-pequeño	50
Contenedor-grande	50
Vehículo	50
Embarcación de navegación interior	50
Embarcación de navegación marítimaa Bodega, compartimiento o zona delimitada de lacubierta: Bultos, sobreenvases, contenedores pequeños.	50
Contenedores grandes.	200b
Total en embarcaciones: Bultos, sobreenvases, contenedores pequeños.	200b
Contenedores grandes.	Sin límiteb

a Los bultos o sobreenvases que se acarreen dentro o sobre un vehículo en la modalidad de uso exclusivo, pueden transportarse en embarcación, siempre que no se descarguen del vehículo en ningún momento mientras se encuentren a bordo de la embarcación.

b La remesa debe manipularse y estibarse de modo que la suma de los IT en cualquiera de los grupos no exceda de 50, y de modo que cada grupo se manipule y estibe de forma tal que los grupos estén separados entre sí por una distancia mínima de 6 m.

7.4 The sum of ISCs in a container and on board a transport unit shall not exceed the values given in Table 3.

Table 3

Limits of safety index with respect to criticality for containers and units transport of fissile material

Tipo de contenedor o unidad detransporte	Límite aplicable a la suma de ISC en un contenedor o a bordo de una unidad de transporte	
	No en la modalidad de uso exclusivo	En la modalidad de uso exclusivo
Contenedor-pequeño	50	No se aplica
Contenedor-grande	50	100

Vehículo	50	100
Embarcación de navegación interior	50	100
Embarcación de navegación marítimaa Bodega, compartimiento o zonadelimitada de la cubierta: Bultos, sobreenvases, contenedorespequeños.	50	100
Contenedores grandes.	50	100
Total en embarcaciones: Bultos, sobreenvases, contenedorespequeños	200b	200c
Contenedores grandes.	Sin límiteb	Sin límitec

a Los bultos o sobreenvases que se acarreen dentro o sobre un vehículo en la modalidad de uso exclusivo, podrán transportarse en embarcación, siempre que no se descarguen del vehículo en ningún momento mientras se encuentren a bordo de la embarcación. En este caso se aplicarán los límites que figuran bajo el epígrafe "en la modalidad de uso exclusivo".

b La remesa deberá manipularse y estibarse de modo que la suma de los ISC en cualquiera de los grupos no exceda de 50, y de modo que cada grupo se manipule y estibe de forma tal que los grupos estén separados entre sí por una distancia mínima de 6 m.

c La remesa deberá manipularse y estibarse de modo que la suma de los ISC en cualquiera de los grupos no exceda de 100, y de modo que cada grupo se manipule y estibe de forma tal que los grupos estén separados entre sí por una distancia mínima de 6 m. El espacio que quede entre grupos podrá ser ocupado por otro tipo de carga atendiendo los requisitos para los mismos, como es el caso de otro tipo de materiales peligrosos.

7.5 When packages containing fissile material are to be transported through or within any other country, issuance shall require multilateral approval if the sum of the ISCs of the packages in a single transport container or in a transport unit exceeds 50 Exemption from this requirement shall be excluded from shipping by sea-going vessels if the sum of the ISC does not exceed 50 in any cellar, compartment or delimited area of the deck of a vessel and if the 6-m spacing between the groups is satisfied of packages or overpacks required in Table 3.

8. Records

8.1 Records relating to the determination of IT and ISC must be maintained and maintained for a period of five years. Such records shall include, as a minimum, the following:

8.1.1 IT and ISC calculation report, according to what is established in paragraphs 5 and 6. The report must include the calculation of IT and ISC for each package and for each group of packages. For the ISC, the methodology applied to calculate the N number of packages should be included.

8.1.2 In the case of IT, information on the instrument used to measure the maximum radiation level, including that relating to verification of its proper functioning, in accordance with NOM-012-NUCL-2016 or replace

8.1.3 Drawings or sketches specifying the separation distance between the different groups of packages on board the transport unit. It should be demonstrated that the distribution of the packages is such that it complies with what is established in Tables 2 and 3 of this Draft Official Mexican Standard.

9. Surveillance

This draft Official Mexican Standard is mandatory throughout the national territory, and it is the responsibility of the Energy Secretariat, through the National Nuclear Safety and Safeguards Commission, to monitor compliance.

10. Conformity assessment procedure

10.1 The assessment of the conformity of the present Draft Mexican Official Standard shall be made by the Energy Secretariat through the National Nuclear Safety and Safeguards Commission and / or by persons accredited and approved under the terms of the Federal Law on Metrology and Standardization and its Regulations.

10.2 The conformity assessment shall include the following:

10.2.1 Documentary review of the records generated in points 8.1.1 to 8.1.3.

10.2.2 Measurement of the maximum radiation levels to verify compliance with the provisions of 5.1.1.

10.2.3 Verification that the separation distance between the groups of packages is at least 6 m, as established in Tables 2 and 3 of this Draft Official Mexican Standard.

11. Compliance with international standards

This Draft Official Mexican Standard is not equivalent (NEQ) with any International Standard, as it does not exist at the time of its elaboration.

12. Bibliography

• Regulations for the Safe Transport of Radioactive Material, published in the Official Gazette of the Federation on April 10, 2017.

• Agreement establishing the International Maritime Dangerous Goods Code (IMDG Code), published in the Official Gazette of the Federation on May 20, 2016.

• International Atomic Energy Agency. "Regulation for the Safe Transport of Radioactive Materials", 2012 Edition. IAEA Safety Standards Series No. SSR-6, IAEA, Vienna (2013).

• International Atomic Energy Agency. "Explanatory Material for the Implementation of the IAEA Regulations for the Safe Transport of Radioactive Materials (2012 Edition)". IAEA Safety Standards Series No. SSG-26, IAEA, Vienna (2016).

• International Atomic Energy Agency. "Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material", 2012 Edition. IAEA Safety Standards Series No. SSG-33, IAEA, Vienna (2015).

TRANSITORY

Sole: The present Draft Mexican Official Standard once published in the Official Gazette of the Federation as a definitive rule will come into effect 60 calendar days from the immediate natural day following the day of its publication.

Mexico City, June 22, 2017.- The Chairman of the National Advisory Committee on Standardization of Nuclear Safety and Safeguards and Director General of the National Commission on Nuclear Safety and Safeguards, Juan Eibenschutz Hartman.