CSN CONSEJO DE SEGURIDAD NUCLEAR

TRANSPORT OF RADIOACTIVE MATERIAL

PRACTICAL DOCUMENTATION FOR PROFESSIONALS

This document is for your information only and therefore has no legal value. Its purpose is to provide guidance for anybody who needs to learn more about this particular subject. You must be advised, however, that the information furnished here is subject to change and that the data given here in no case constitute any legal tie or obligation whatsoever for the Spanish Nuclear Safety Council. (Revision 20. February 2026)

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1 Transport: Requirements

The transport of radioactive material in Spain is regulated by a series of international regulations based on the *IAEA Regulations for the Safe Transport of Radioactive Material.*

Throughout these regulations, transport safety is based fundamentally on packaging safety; operational control during shipment is secondary. Since the regulations take this point of view, they focus on packaging design requirements and the standards that must be met by the consignor of the goods, which is the party that prepares the package (packaging plus content) for transport.

The regulations set requirements pursuing these basic objectives are:

- Containment of the radioactive materials inside the packaging.
- Control of external radiation outside the packages.
- Prevention of criticality when fissile materials are transported.
- Avoidance of damage due to the heat emitted by certain types of packages.

Packaging requirements are more demanding for higher-risk contents. In addition, the higher the risk of the contents, the stricter the transport conditions that must be upheld are.

Based on these premises, packages are classified into several types:

- Excepted
- Industrial
- Type A
- Type B
- Type C

The figure describes these package types according to the transport conditions each type must withstand, which are “routine”, “normal” (minor incidents) or “accident”.

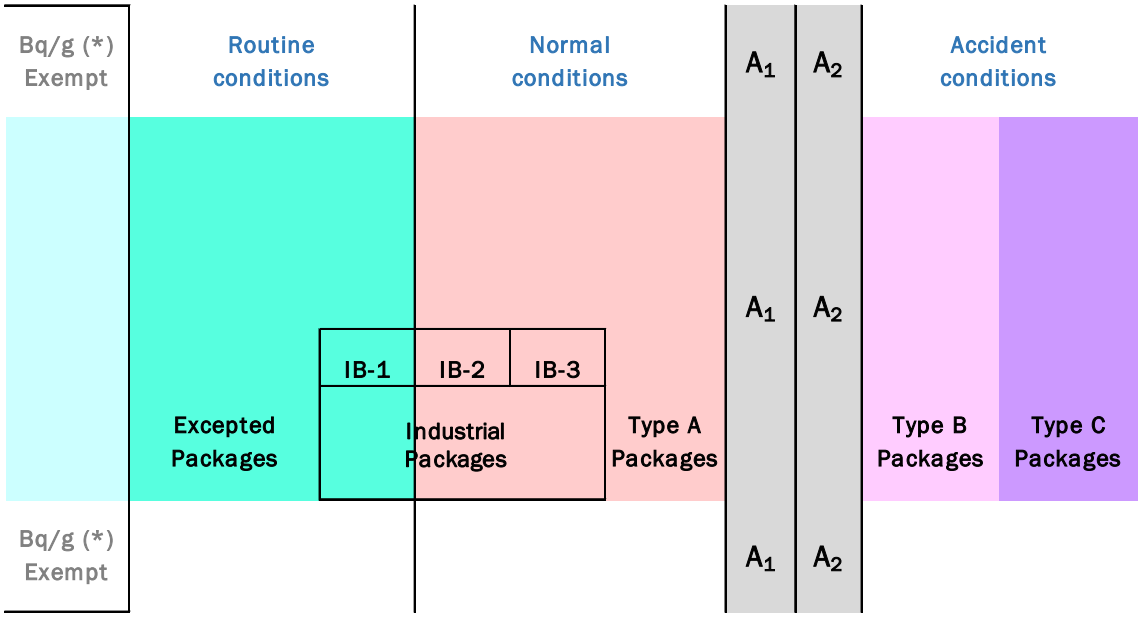
As can be seen, when the radioactive material has a certain activity level (a parameter directly related with risk), the package must be capable of withstanding a severe accident (as shown by the violet areas of the table: type B and C packages). These activity values are set individually for each radionuclide and are identified as A_1, if the radioactive material is encapsulated in a special form, or A_2 if it is not.

These A1/A2 values are important because they are used throughout the regulation for material characterisation, for activity limits in Type A, Excepted and Industrial packages, etc., taking into account the composition of the material (single isotope or mixture of isotopes) or even if only the irradiation conditions are known,

The CSN has developed a tool to calculate A_1/A_2 and exemption values (the set is called base values) in all possible cases, which is available at the following link. This tool makes it

possible to work with the current basic values (in force) included in Revision 1 of SSR-6, Safe Transport of Radioactive Material Regulations (ed. 2018), but also with the values proposed in Revision 2 (recently published), for comparison purposes in the latter case. This tool should be used for guidance only and does not constitute a validated programme that can be used to ensure compliance with the requirements, which remain those contained in the transport regulations.

Type of packages for transport of radioactive materials



(*) Value depends on the radionuclide

In the salmon-coloured area we have the package types designed to withstand normal transport conditions (A, industrial 2 and industrial 3), which comprise minor incidents. And lastly, in the green area fall the packages that contain very low-risk materials and thus have been designed to withstand only routine transport conditions. These constitute what are called “excepted packages” and “industrial packages 1”.

The area in blue indicates that if the radioactive material is below a certain activity level, it can be transported like any conventional material.

Most transport (around 90 %) involves excepted or type A packages; these packages have low-risk contents, and therefore they are not designed to withstand serious accidents. Nevertheless, transport accident statistics show that these packages have often withstood conditions more demanding than they were designed for.

In addition, specific requirements are defined for packages containing fissile material and packages containing over 0.1 kilograms of uranium hexafluoride (UF_6). Depending on the

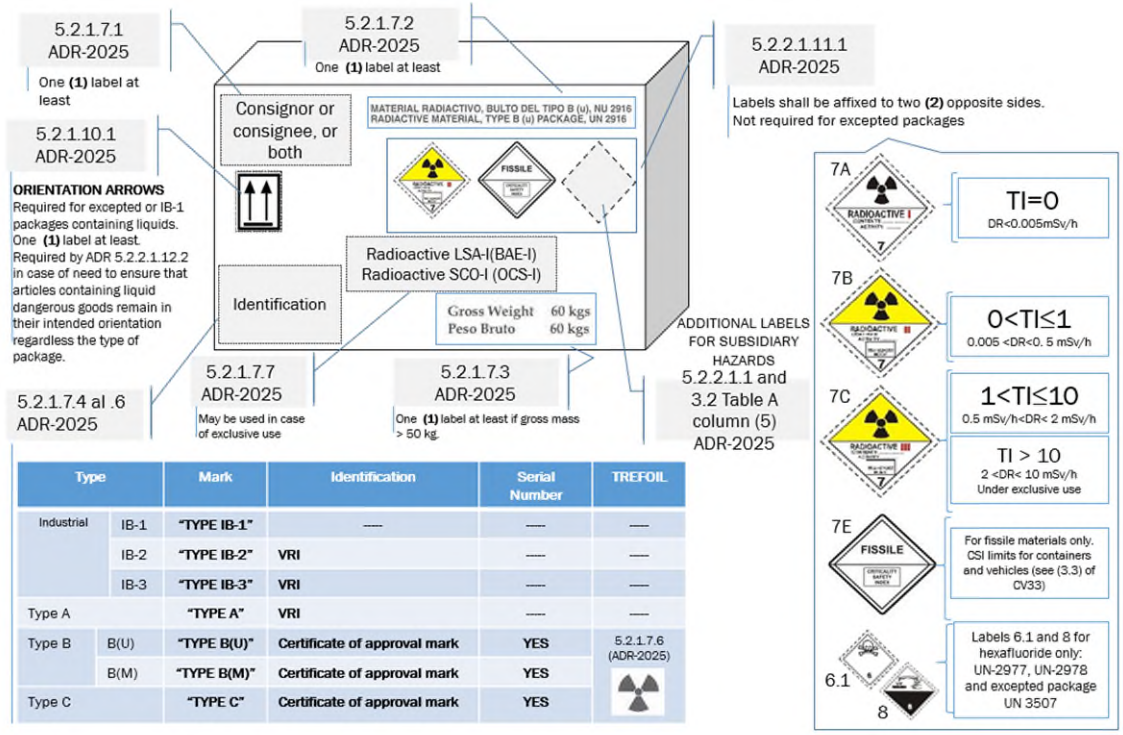
characteristics of the material, packages containing fissile material are also classified as industrial packages, type A, B or C packages or packages with UF_6.

The CSN has published a document that briefly states the requirements that the different package types must meet. This document is called: SDB-06.1 (updated 2022), El transporte de los materiales radiactivos (only in Spanish version).

1.1 Package and vehicle labelling, marking and placarding

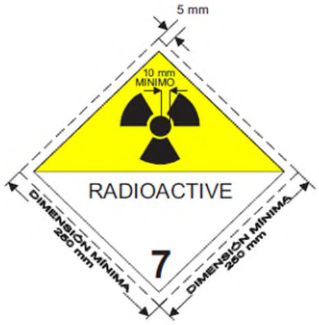
There are requirements for the **marking and labelling of packages and placarding of vehicles carrying packages.** You can find information about these requirements in issue 34 of Seguridad nuclear, the quarterly magazine formerly published by the CSN (only in Spanish version). The current name of this magazine is *Alfa.*

Summary chart for labelling and marking of packages



Type		Mark	Identification	Serial Number	TREFOIL
Industrial	IB-1	"TYPE IB-1"	----	----	----
	IB-2	"TYPE IB-2"	VRI	----	----
	IB-3	"TYPE IB-3"	VRI	----	----
Type A		"TYPE A"	VRI	----	----
Type B	B(U)	"TYPE B(U)"	Certificate of approval mark	YES	5.2.1.7.6 (ADR-2025)
	B(M)	"TYPE B(M)"	Certificate of approval mark	YES	
Type C		"TYPE C"	Certificate of approval mark	YES	

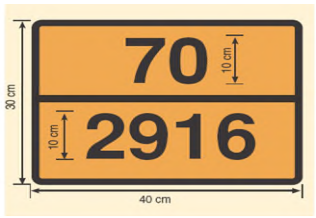
Placarding and marking of vehicles



Placard No.7D

Label

- Placard Model No.7D. (5.3.1.1.3)
- Not required for vehicles carrying excepted packages. (5.3.1.1.3)
- Enlarged label may be displayed instead of placard No. 7D to serve both purposes. (5.3.1.1.3), in case of both Class 7 labels and placards would be required be affixed to vehicles, containers, MEGCs, tank-containers or portable tanks.
- Placards shall be affixed to both sides and at the rear of the vehicle. (5.3.1.5.2)
- "RADIOACTIVE" or alternatively the UN number for the consignment. (5.3.1.7.2)
- Dimensions may be reduced from 250X250 mm to 100X100 mm. (5.3.1.7.4)



- Two orange coloured plates marking transport units carrying dangerous goods.
- Affixed one at the front and the other at the rear of the trasnport unit.
- The orange coloured plates shall bear the hazard identification number for radioactive materials (70) and the UN number (****) when required to be carried under exclusive use.
- Dimensions may be reduced.

ADR 2023: 5.3.2.1.1. 5.3.2.1.4. 5.3.2.1.5. 5.3.2.1.6. 5.3.2.2.1

1.2 Emergency Instructions

There are requirements set for the documents that must accompany materials in a transport, which include **written emergency instructions** that the carrier must provide before departure. In addition, the consignor must attach to the transport documents supplementary information with specific instructions, appropriate to the nature of the consignment, to be followed in case of an emergency. The CSN has published a safety guide about these instructions: Safety Guide GSG-06.03 (only Spanish version). The IAEA has also published another safety guide, Safety Guide SSG-65 IAEA , which provides information on the planning and preparation of emergency response measures to transport accidents involving radioactive materials.

1.3 Approvals and Notifications

Regulations establish a system of approvals for packages design, shipment authorisation and shipment notification, which may or may not be necessary, depending on the risk of the contents of the packages being shipped (i.e., depending on the package type) (see Appendix I).

1.4 Carriers Register

Companies that transport nuclear substances and radioactive materials are subject to a declaration procedure enabling them to register with the **Directorate-General for Energy Planning and Coordination** of the Ministry of Ecological Transition (Regulation on Nuclear and Radioactive Facilities and other activities related to expose to ionizing radiation –RINR-, article 110) (**Spanish version**). The **Carriers Register** can be consulted on the website.

1.5 Radiation Protection

Because the transport of radioactive material entails a risk of exposure to ionising radiations, the Regulation on Health Protection against risks derived from exposure to Ionising Radiations applies in full to this activity.

The transport regulations require to companies engaging in activities related to the transport of radioactive material that involves exposure to ionising radiations to have a **Radiation Protection Programme (RPP),** which must be kept available to the competent authority. For good guidance on how to prepare a RPP, consult the CSN Safety Guide GSG-06.02 (only in Spanish version and currently under revision).The IAEA has published the guide Specific Safety Guide SSG-86.

1.6 Quality Assurance

The transport regulations require companies engaging in activities related to the transport of radioactive material (like consignors, carriers and package manufacturers and designers) to have a **Management System**, that must be kept available to the competent authority and must include a **Quality assurance programme** that applies to this activity. The CSN has published a safety guide on this subject: Safety Guide GSG-06.01 (only in Spanish version) and the IAEA has published the safety guide TS-G-1.4.

2 Transport: Regulations

2.1 Legislation applicable to transport

Regulations on radioactive material transport are just part of the body of general regulations applied to all dangerous goods. Radioactive material is a dangerous good, and it is identified as class 7 out of a total of nine classes. Each mode of transport (road, rail, air and sea) has its own regulations.

All transport regulations base the requirements applicable to radioactive material on the IAEA's *Regulations for the Safe Transport of Radioactive Material,* SSR-6. The latest edition of the regulations was published in 2025 and it can be consulted in SSR-6 (Rev.2) Edition 2025. The requirements incorporated in the international regulations for the different modes of transport (ADR, RID, IMDG Code and ICAO technical instructions), which are currently

applicable in Spain, are given in Revision 1 of SSR-6. The provisions of Revision 2 are not expected to be included in the regulations applicable in Spain until 2029.

There is also a very handy manual explaining the regulations (Advisory material), which goes by the title of SSG-26 (Rev.1) (English version).

The latest edition of the regulations applicable to transport by road **(ADR)** was published in Spain in Boletín Oficial del Estado, issue 3, on 3rd January 2025. For easier application of the ADR, you may consult the table of equivalences between sections of the current ADR and the paragraphs of the 2018 edition of the IAEA's SSR-6. The changes made between the 2023 and 2025 editions of the ADR that concern the requirements specifically applicable to the transport of radioactive material are also identified.

In addition, in the Alfa Magazine of the Nuclear Safety Council, no. 46 of May 2021, has been published the following article Nuevos requisitos en 2021 en el transporte de material radiactivo, which reports on changes in regulatory requirements and discusses their purpose, necessity and the implications of their implementation. There are no relevant changes added to the current edition of the modal regulations.

2.2 Guide for the application of the regulatory requirements on the transport of radioactive material, G.S-06.05

The CSN has published a guide, Guía de Seguridad 6.5 (only Spanish version), to make it easier for users (such as consignors, carriers, consignees and radioactive packaging designers and manufacturers) to check the ADR requirements that apply to the transport of radioactive material by road. The guide helps to classify consignments of radioactive material according to their United Nations number (UN number) and provides a summary schedule with detailed requirements applicable to each UN number. This guide has recently been revised to update the transport regulations requirements following the publication of RD 1217/2024 (new RINR) and ADR 2025. It has been published on the CSN website, pending its editing to include direct access to the paragraphs of the ADR where these requirements are defined.

For the classification of shipments under a UN number, the CSN has prepared a document, intended initially for training purposes, which describes the classification process system.

2.3 CSN Instruction IS-34

The *Boletín Oficial del Estado* of 4 February 2012 contains the CSN Instruction IS-34 (IS-34 English unofficial version) establishing mandatory criteria on actions to take in connection with:

- Measurements of vehicle contamination levels.
- Unloading, haulage and movements of radioactive material during delivery to radioactive facilities.
- Actions to take and reports to submit to the CSN in the event of non-conformities.
- Availability of staff and means of help in emergencies.

- Surveillance of vehicles and their load during loading, unloading and delivery of radioactive packages.

Within this instruction, it should be pointed out that registered companies transporting radioactive material by road, and having their registered address in Spain, must guarantee the availability of personnel and means to provide assistance to the authorities in the event of any incident during transport. The contact information (name and telephone number) of the responsibles must be notified to the CSN Emergency Room (SALEM) and kept permanently updated. Initial notification or existing changes can be made by e-mail to the following address: salem@csn.es including the following description in the subject line: **IS-34.** ***RTR Carrier Incident Contact(s) - [registered carrier number], [name of the carrier company]***

2.4 CSN Instruction IS-35 on Design Modifications of Packages for Transport

The *Boletín Oficial del Estado* of 4 January 2014 contains the CSN Instruction IS-35 (IS-35 English unofficial version) establishing the mandatory procedure to follow when the design of a package for the transport of radioactive material with a certificate of approval of Spanish origin is modified or when a package's shipper makes physical or operational modifications to the packaging used.

2.5 CSN Instruction IS-38 on training

The *Boletín Oficial del Estado* of 6 July 2015 contains the CSN Instruction IS-38 (IS-38 English unofficial version), which defines the minimum content and frequency of the initial and periodical training of workers involved in the transport of radioactive material of consignors, carriers and consignees.

2.6 CSN Instruction IS-39 on packaging manufacture

The *Boletín Oficial del Estado* of 6 July 2015 contains the CSN Instruction IS-39 (IS-39 English unofficial version) (currently in the process of being published), regarding control and monitoring of the manufacturing of packagings for the transport of radioactive material that are fabricated in Spain. This Instruction also stablishes the content of the documentation that justify the compliance with the requirements of transport regulations for a package design no requiring approval.

2.7 CSN Instruction IS-42 on criteria on notification to the Nuclear Safety Council of events in the transport of radioactive material

The *Boletín Oficial del Estado* of 22 September 2016 contains the CSN Instruction IS-42, (IS-42 English unofficial version) establishing the criteria for notifying the CSN the events in the transport of radioactive material. This instruction stablishes the types of events must be notified, the notification time and who must notify. Also indicates that notifications must be carried out in CSN´s Emergency Room (SALEM) by e-mail to the following address: salem@csn.es and it is included in Appendix I the minimum information to provide.

IS-42 (article 3.6) states that the carrier, the shipper/unloader or the consignee, who has notified an event in the transport of radioactive material, must submit a detailed report to the CSN within a maximum period of 30 days from the notification, including an analysis of

the causes of the event and the corrective or preventive measures adopted or to be adopted. It is also indicated that the CSN will have at the disposal of the users a report model to submit such information. In the following link you can find the model report following an event in the transport of radioactive material (PDF and Word Spanish version).

2.8 CSN Instruction IS-46 on security during transport of nuclear material and radioactive sources

The *Boletín Oficial del Estado* of 10 June 2024 contains the CSN Instruction IS-46, establishing the security requirements for nuclear material and radioactive sources during their transport, with the aim of protecting them against theft, robbery or any other unlawful taking, as well as to prevent acts of sabotage or other malicious acts which, if successful, could have unacceptable radiological consequences for people, society or the environment.

Explanatory note: with regard to transport, the **classification of radioactive sources** must be carried out according to tables II and III of Annex II of Royal Decree 1308/2011, as stated in IS-46 (see section five) and not according to the practice in which the source is used (which is included in Table I of the same annex).

2.9 Procedure to apply for an authorisation

Package design approval and transport authorisations are regulated by the Regulation on *Nuclear and Radioactive Facilities* (article 109). Applications must be submitted to the **Directorate-General for Energy Planning and Coordination** of the Ministry of Ecological Transition (Paseo de la Castellana, 160, Madrid). If the application is submitted on paper and not by electronic means, it is advisable to submit two copies; one of which will be sent to the CSN for examination, so it can issue the required safety report. The CSN has recently published revision 1 of a safety guide, Guía de Seguridad 6.4 (Spanish version), to facilitate the preparation of the supporting documents to include in the application for an authorisation.

Transport companies shall be registered in the same entity. The documents needed to apply for registration are listed in article 110 of the Regulation on Nuclear and Radioactive Facilities.

3 Summary of regulatory requirements to bear in mind when transporting radioactive material in Spain

3.1 Common requirements for all modes of transport: road, air, sea and rail

Some requirements are common to all kinds of transport, whether by road, rail, air or sea. The requirements given below apply to all modes of transport of radioactive material, and the requirements specific to each mode are given after these.

Radiation protection

Radioactive material produces ionising radiations. Therefore, activities related to the handling of radioactive material (such as the transport of radioactive material) must adhere to standards that are designed to protect workers and the public from the risks of ionising radiations. In Spain, these standards are set in the Regulation on health protection against the dangers arising from exposure to ionising radiation (English unofficial version). This royal decree is based on Directive 96/29/EURATOM of the Council of the European Union laying

down basic safety standards for the protection of the health of workers and the public from the risks arising from ionising radiations.

Nuclear risk insurance

According to legislation, the operator of the facility of origin or destination (as applicable) of radioactive material transported through Spanish territory must engage civil liability insurance covering nuclear damage caused by accidents during transport of nuclear substances or for damage caused in the transport of radioactive materials other than nuclear substances. The carrier may be held liable, in substitution of such operators provided that such substitution is authorized by the competent authority and the agreement of the operator of the facility of origin or destination is obtained.

From January 1, 2022, Law 12/2011, of May 27, on civil liability for nuclear damage or damage caused by radioactive materials, has entered into effect. This Law has been amended by Law 11/2023 (article 42).

Title I establish the civil liability for nuclear damage. According to Article 2: "*Title I of this law applies to nuclear damage as defined in Article 3.1.h) occurring in the territory of; or in the maritime zone established under international law belonging to; or, except in the case of those States which are not party to the Paris Convention and which do not meet the requirements set forth in subparagraphs b), c) and d) of this Article, on board a ship or aircraft registered by...*"

"Title II of the present law applies to damage produced during the storage, handling, transformation, use in any form or ***transport*** *of radioactive materials other than nuclear substances throughout the national territory."*

Since the entry into force of Law 12/2011, the coverages for the transportation of nuclear substances and radioactive materials not considered nuclear substances are as follows:

a) NUCLEAR SUBSTANCE (1)

1200 million €, with the possibility of a reduction to a limit of not less than 80 million € under the express authorization of the Ministry for Ecological Transition and the Demographic Challenge.

In the particular case of entries and exits from Spanish nuclear facilities, if uranium oxide powder with a maximum enrichment in U-235 of 5% by weight or non-irradiated fuel assemblies with this maximum enrichment is transported, the reduction up to **100 million €** has already been authorized by the Ministry.

b) NON-NUCLEAR SUBSTANCE (2)

It is noted that, as of November 9, 2023, because of the amendment by Law 11/2023 of Article 16 of Law 12/2011, the existence of a limit on the amount of liability of operators of

radioactive facilities for damage caused in accidents involving radioactive materials other than nuclear substances, has been eliminated.

The minimum amount of the nuclear risk coverage is that stipulated in the annex of Law 12/2011, which is reproduced in the table below.

Amount of the mandatory minimum guarantee for civil liability coverage for accidents caused by radioactive materials other than nuclear substances.

Natural uranium hexafluoride UF_6					
Activity (TBq)	< 0,4	≥ 0,4 y < 10		≥ 10 y < 100	≥ 100
Minimum guarantee (€)	300.000	600.000		1.200.000	2.400.000
Natural uranium concentrate U_3O_8					
Activity (TBq)	< 0,4	≥ 0,4 y < 10		≥ 10 y < 100	≥ 100
Minimum guarantee (€)	150.000	300.000		600.000	1.200.000
Other radioactive materials					
Activity (TBq)	< 0,1	≥ 0,1 y < 10	≥ 10 y < 100	≥ 100 y < 1000	≥ 1000
Minimum guarantee (€)	Exento	150.000	300.000	600.000	1.200.000

(1) **"Nuclear substances"**, according to the definitions of Law 12/2011, it means: *nuclear fuels, excluding natural uranium and depleted uranium, and radioactive products or radioactive waste*. Being:

> **"Nuclear fuels"**: *fissionable materials, including uranium in the form of metal, alloy or chemical compound (including natural uranium) and plutonium in the form of metal, alloy or chemical compound*.
>
> **"Radioactive products or radioactive waste":** *radioactive materials produced or rendered radioactive by exposure to radiation resulting from operations for the production or use of nuclear fuels, excluding nuclear fuels and radioisotopes which, having reached the last stage of manufacture, are outside a nuclear installation and may be used for industrial, commercial, agricultural, medical, scientific or educational purposes.*

(2) **"Non-nuclear substances".** For the purposes of risk coverage, all those radioactive materials that do not fall within the definition of "nuclear substance" will be considered.

The mentioned requirements also affect any transit through the Spanish territory, within the scope of application defined by Law 12/2011.

Title I relating to nuclear substances may be affected by the planned publication in the Boletín Oficial del Estado (BOE) of certain NEA decisions (when these are published in the BOE).

Physical protection (Security)

Royal Decree 1308/2011 (Boletín Oficial del Estado, 07/10/2011) on physical protection of facilities and nuclear materials and sources of radiation, establishes certain physical protection measures for the transport of nuclear material (categories I, II and III) and major sources of radiation (categories 1, 2 and 3).

The royal decree lays down a procedure of approvals of physical protection for the transport of nuclear material in categories I, II and III and notifications of transport of sources of radiation in categories 1 and 2 (according to the categories defined in the royal decree). In addition, entities transporting nuclear materials and sources of radiation in the stated categories are required to be registered with the **Directorate-General for Energy Planning and Coordination** of the Ministry of Ecological Transition.

For the transport of more than 500 kg of natural uranium not in the form of ore or mineral waste, notification must be reported at least ten days prior to the scheduled date of transport.

The mentioned requirements also affect any transit through the Spanish territory, within the scope of application defined by **Royal Decree 1308/2011.**

Physical security requirements for the transport of nuclear material and radioactive sources are developed in **CSN Instruction IS-46**, as described above.

Entities that carry out transports requiring physical protection measures must be registered in a registry attached to the **Directorate-General for Energy Planning and Coordination** of the Ministry of Ecological Transition, apart from the one required by Article 110 of the Regulation on Nuclear and Radioactive Facilities.

Shipments of radioactive waste and spent nuclear fuel

The authorisation procedure applied in the shipments of these materials is that defined in Royal Decree 243/2009 (Boletín Oficial del Estado, 02/04/2009) regulating the supervision and control of shipments of radioactive waste and spent nuclear fuel between member states or from or to locations outside the European Union, which transposes into the Spanish regulations the Directive 2006/117/EURATOM of the Council of the European Union of 20 November 2006.

3.2 Road

In addition to the common requirements that apply to all modes of transport, the transport of radioactive materials by road in Spain must meet the following requirements:

Transport of dangerous goods

The European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) is applicable. This agreement states the requirements for transporting all classes of dangerous goods by road, including class 7, which is radioactive material.

Royal Decree 97/2014 (Boletín Oficial del Estado, 27/02/2014) regulating operations to transport dangerous goods by road in Spanish territory states that the ADR applies to the transport of dangerous goods by road in Spain. It includes additional provisions on certain

points, such as standards for drivers, traffic rules and basic rules of action in the event of breakdown or accident, plus provisions on the control of the manufacture of packaging.

Safety advisers

Any company whose activity involves the transport of dangerous goods by road or packaging, loading, filling or unloading operations related to the transport of dangerous goods by road must designate one or more safety advisers for the transport of dangerous goods. These advisers are entrusted with helping to prevent the risks for persons, property or the environment that are inherent to these activities (ADR, section 1.8.3.). Royal Decree 97/2014 (Boletín Oficial del Estado, 27/02/2014), chapter V, establishes the requirements of safety advisers for the transport of dangerous goods by road.

Carrier register

Carriers of radioactive materials in non-excepted packages must declare their activity by registering in the Register of Carriers of Radioactive Materials at the **Directorate-General for Energy Planning and Coordination**, at the Ministry of Ecological Transition, under article 110 of the Regulation on Nuclear and Radioactive Facilities (Spanish version). In addition, entities transporting nuclear materials or sources of radiation by road in the categories I, II or III, are required to be registered (see previous section on physical protection-security)

Provisions on traffic restrictions for the transport of dangerous goods

Each year the Directorate-General of Traffic publishes its restrictions on the times, dates and itineraries that may be used by vehicles transporting goods in general and dangerous goods in particular. This information may be found at the DGT's web page: Dirección General de Tráfico.

3.3 Air

In addition to the common requirements that apply to all modes of transport, the transport of radioactive material by air in Spain must meet the following requirements:

Transport of dangerous goods

The Technical Instructions for the Safe Transport of Dangerous Goods by Air released by the International Civil Aviation Organization (ICAO) are applicable. These instructions state the requirements for transporting by air all classes of dangerous goods, including class 7, which is radioactive material.

3.4 Sea

In addition to the common requirements that apply to all modes of transport, the transport of radioactive material by sea in Spain must meet the following requirements:

Transport of dangerous goods

The International Maritime Dangerous Goods Code (IMDG Code) of the **International Maritime Organization, IMO,** states the requirements for transporting by sea all classes of dangerous goods, including class 7, which is radioactive material.

The notices that must be delivered to the authority regulating the arrival and departure in Spanish ports of ships carrying dangerous goods are regulated in the Real Decreto 145/1989, de 20 de enero, por el que se aprueba el Reglamento Nacional de Admisión, Manipulación y Almacenamiento de Mercancías Peligrosas en los Puertos.

Explanatory note: It should be pointed out that Royal Decree 145/1989 does not adequately include certain radiological limitations established in Royal Decree 1029/2022, of 20th December, approving the Regulation on health protection against the risks deriving from exposure to ionising radiations, the latter being mandatory.

The Dirección General de la Marina Mercante (Directorate General of Merchant Shipping) is reviewing the existing service instruction on the control of the transport of radioactive material by sea, which will clarify the requirements for entry into port and for loading and unloading of the material, to include recommendations for the authorization of radioactive material loading on ROPAX (ferry) type ships.

This instruction will allow UN numbers corresponding to exempted packages, as well as UN numbers transporting special form sources, to be exempt from the requirements for measuring contamination on the ship. It will also establish the requirements for the transport of other radioactive material on such ferries.

3.5 Rail

In addition to the common requirements that apply to all modes of transport, the transport of radioactive material by rail in Spain must meet the following requirements:

Transport of dangerous goods

Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID) states the requirements for transporting by rail all classes of dangerous goods, including class 7, which is radioactive material.

Royal Decree 412/2001 (Boletín Oficial del Estado, 08/05/2001) regulating various aspects related with the transport of dangerous goods by rail states that the RID is applicable to the transport of dangerous goods by rail in Spain. It includes additional provisions on certain points, such as traffic rules and basic rules of action in the event of breakdown or accident.

Safety advisers

Any company whose activity involves the transport of dangerous goods by rail or packaging, loading, filling or unloading operations related with the transport of dangerous goods by rail must designate one or more safety advisers for the transport of dangerous goods. These advisers are entrusted with helping to prevent the risks for persons, property or the environment that are inherent to these activities (RID, section 1.8.3.). Royal Decree 1566/1999, published in the Boletín Oficial del Estado on 20/10/1999, establishes the requirements of safety advisors for the transport of dangerous goods by road, rail or inland waterways.

4 Clarification of regulatory requirements

4.1 Instructions in writing according to ADR and emergency arrangements

In the event of any incident or accident happening during the transport of dangerous goods, the carrier has to know the risks of the material being carried and the emergency measures that he must take.

For this purpose, the rules and regulations on the transport of dangerous goods (including radioactive material, class 7) state that during transport the carrier must hold written instructions to help him know what to do.

In the transport by road, the regulations include a form, "**Instructions in writing according to ADR",** which the carrier must provide to the crew of the vehicle before the shipment departs, telling them what the driver (and/or crew) must do in the event of an accident or emergency involving dangerous goods. In addition to these common actions for all classes of dangerous goods, instructions are given on the hazard characteristics and generic actions for each class. In the case of class 7 (radioactive materials), intake and external radiation are generic risks, and limiting exposure time is a generic action (ADR, section 5.4.3.).

For class 7, it is furthermore established that the consignor must add to the transport documents a statement regarding any actions the carrier has to take for the specific radioactive material that is presented for shipment. One of these documents to be furnished by the shipper is referred to as **"emergency arrangements appropriate to the consignment"** (ADR, 5.4.1.2.5.2.c). To facilitate the preparation of these arrangements, the CSN has published a safety guide: Guía de Seguridad 6.3 GS-06.03 (only in Spanish version).

Therefore, if there is an emergency, the vehicle crew will know about and be furnished with the measures of action anticipated for radioactive materials and the specific measures for the radioactive material they are carrying in that particular shipment.

4.2 Transport under Exclusive Use

Knowing the meaning of the phrase **"exclusive use",** when it is required by the regulations and what requirements it entails are issues that may not appear so obvious after you read the regulations concerning the carriage of dangerous goods. In fact, there is a certain amount of confusion over how to interpret the term.

Here is some information that may help you get a clearer picture.

According to the ADR, exclusive use is mandatory in the following cases:

- Unpackaged materials in groups LSA-I, SCO-I and SCO-III (see paragraph 4.1.9.2.4).
- Liquid LSA-I materials in Industrial packages type-1 (see paragraph 4.1.9.2.5. and table).
- Gaseous and/or liquid LSA-II materials in Industrial packages type-2 (see paragraph 4.1.9.2.5. and table).
- LSA-III materials in Industrial packages type-2 (see paragraph 4.1.9.2.5. and table).

- Package or overpack with an individual transport index (TI) of more than 10 or a criticality safety index (CSI) of more than 50 (see paragraphs 4.1.9.1.10 and 7.5.11.CV33 (3.4)).
- Package or overpack with a radiation level of more than 2 mSv/h in contact with the outer surface (see paragraph 4.1.9.1.11)
- Loaded vehicle or large container with a total TI sum that exceeds the values in Table D, paragraph 7.5.11.CV33 (3.3) a).
- Loaded vehicle or large container with a total CSI sum that exceeds the values in Table E, paragraph 7.5.11.CV33 (3.3) d).

- Type-B(U), type-B(M) or type-C package with a temperature of more than 50 °C on the accessible surfaces and an ambient temperature of 38 °C in the absence of solar radiation (see paragraph 6.4.8.3).
- Up to 45 g of fissile nuclides on a conveyance, either packaged or unpackaged, in accordance with the provisions of paragraph 2.2.7.3.5 e) and the paragraph 4.1.9.2.4 d).
- Packages containing fissile material classified and non-fissile or fissile-excepted under paragraph 2.2.7.2.3.5 a) i) or iii) of ADR Edition 2011 and 2013, paragraph 417 a) i) or iii) of the 2009 Edition of Regulations for the Safe Transport of Radioactive Material of IAEA.
- When required by the competent authority within the conditions of approval of the package or transport.

Transport that includes any of the above circumstances must abide by the ADR's definition for the mode of exclusive use, which is: *the sole use, by a single consignor, of a vehicle or of a large 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 ADR.*

Therefore, these conditions entail an additional requirement for each consignment or shipment under exclusive use.

Furthermore, it must be clearly understood that regular transports by a single consignor and all operations performed according to the consignor or consignee (for example, the transport of soil density and moisture gauges or gammagraphy equipment to construction sites) without any of the circumstances identified above (the circumstances requiring exclusive use) must not be classified as exclusive use, and therefore they are not obligated to meet the additional requirements set for exclusive use in the ADR.

Only for the cases required by the ADR (listed above) a shipment must be classified as exclusive use and so mentioned on the transport document. If the exclusive-use information is placed on the transport documents of a shipment for which exclusive use is not required, it means that whoever included the additional information has called for a higher degree of attention or exclusiveness than the shipment in question requires, and that constitutes misreporting.

4.3 Compliance Documentation for packages no requiring design approval

For the case of types of packages requiring a design approval according to the regulations on transport of dangerous goods (type B, type C and uranium hexafluoride and fissile material packages) the competent authority issues a certificate of approval.

For the case of packages no requiring a design approval (excepted, industrial and type A) the regulations do not require to issue a certificate, but requires the consignor has available for the competent authority documentary evidence which justifies the package design complies the applicable provisions (hereinafter "compliance documentation"). This requirement is contained in the four international regulations on the transport of dangerous goods that apply in Spain: road (ADR), rail (RID), air (ICAO Technical Instructions) and sea (IMDG Code).

Therefore, any entity that assumes the responsibilities assigned to the consignor by transport regulations and consigns an excepted, industrial, or type A must be willing to submit to the CSN, where be required, the compliance documentation of these packages.

In that sense, it is very important to note that **anyone who acts as consignor and stating as such in the transport documents is responsible for the use of appropriate packaging and for a proper loading and preparation of the package** according to the compliance documentation of the package, which should be available for inspection by the CSN.

Since in the above regulations the content of the compliance documentation of non-approval packages is not specified, the CSN has published the Instruction IS-39, which stablishes in its fifth article the contents that a compliance documentation should have (**currently in the process of being published**):

- Basic administrative information (name of package design, designer, type of package, operational restrictions and transport mode restrictions, edition of the regulations used as a reference to demonstrate compliance).
- Specifications of acceptable contents.
- Specifications of packaging defining its design, including drawings.
- Package performance characteristics. This section shall describe the main design principles and performance characteristics of the package design to meet the different safety requirements of the regulations, e.g. containment, heat removal, and shielding).
- List of the standards provisions on transport of dangerous goods applicable to the package design.
- Requirements for operation of the package.
- Requirements for package maintenance and periodic verification.
- Management system, including the quality assurance program.
- Basic illustration of the package.

- Technical analyses demonstrating the fulfilment of the standards requirements, as appropriate: structural analysis, thermal analysis, containment design analysis and external dose rate analysis.

It is recommended for the Spanish consignors of radioactive packages not subject to design approval to follow the CSN Safety Guide GS-06.06 (only in Spanish version), for the preparation of the compliance documentation of those packages, in accordance with the structure required by the Instruction IS-39 (English unofficial version).

At the same time in the CSN GS-06.06 it is recommended the use of *Technical Guide on Package Design Safety Reports for the transport of radioactive material* issued by the European Association of Competent Authorities for the Safe Transport of Radioactive Material (EACA). The current revision (rev.3) of this guide is from December 2014 and already takes into account the regulatory changes in the IAEA's SSR-6 Regulation in its 2012 edition. The English version of the EACA technical guide may be found in: European PDSR Guide Issue 3, Dic 2014, and the Spanish version in: Guía Europea ESDB revisión 3, Dic 2014.

The EACA technical guide applies to all type of packages, not only to those no subjected to an approval, but for the case of package designs requiring approval the CSN has just published the safety guide 6.4.: Safety Guide GS-06.04 *to facilitate the application of regulations requirements on transport of radioactive material (Updated to ADR 2015).* This guide already gives recommendations on the content of the Package Design Safety Report for approval packages.

The IAEA issued in 2022 the Safety Guide SSG-66 'Format and Content of the Package Design Safety Report for the Transport of Radioactive Material', also based on the document produced by the EACA.

5 List of Transport Packages Approved in Spain

The table in Appendix II lists the packages for the transport of radioactive material that have valid certificates of design approval in Spain. This includes packages approved in Spain as the design's country of origin and packages whose certificate of approval at origin has been validated by Spain. The table gives you access to a summary sheet on each package and the package's certificate from its country of origin (plus the package's certificate of Spanish validation, if the case).

6 Denials and Delays in radioactive material transport

Sometimes there are delays or denials of shipments of radioactive material. Often they happen without good reason, but always they pose an extra problem. These situations, known internationally as "denials and delays" or "D&D", happen fundamentally in air and sea transport, although they are known to happen in transport overland by road as well.

Since 2005 work has been under way on the development of an international IAEA-backed programme to try and solve the denial problem, and various initiatives have been launched,

such as the issuance of sea and air transport training and information documents, the creation of a standing IAEA committee to draw up.

Transport is an essential activity in the development of certain applications of radioactive material in the medical and industrial sectors. Therefore, to reject these transports, not based on safety reasons or in non-compliances of transport of dangerous goods regulations, could have a significant impact on these sectors.

Each phase of the shipment is important for the radioactive material can be transferred to or from industrial facilities or medical centers authorized for using it. Although the role of the consignor of the material is critical because this entity must prepare each shipment complying the regulations requirements, an adequate intervention of carriers is also fundamental for a successful shipment, as well as other intermedium facilities such as airports, air cargo terminals, ports, customs, etc.

Requirements for the transport by land, sea and air of dangerous goods, including explosives, gases, flammable liquids, toxic, infectious materials and radioactive, are collected in regulations that are accepted worldwide. Those international regulations are fully implemented in Spain and are aimed at minimizing the risk during transport setting requirements. Many of those requirements are common to all dangerous goods and other are specific taking into account the particular characteristics of each class. Therefore, **the radioactive material should be considered as a dangerous good else, having its specific risks, and then it should not be considered more dangerous than others when transported in compliance with all regulations requirements.**

Therefore, situations that hinder the development of transport of radioactive material, as rejections or undue delay, shall be avoided, since they can have a significant impact on industry and medical sectors.

The Nuclear Safety Council, through its Area of transport of radioactive material, is available to any transport operator, airport, port or authority with competences on the transport of dangerous goods, to provide information or clarifications that they may need as well as publications edited by the CSN in this area, which may be useful in the training of workers involved in the transport of radioactive material.

The IAEA has a list of contacts with rejection focal points, the purpose of which is to report existing rejections and to establish ways to achieve a satisfactory and timely resolution.

7 Other Topics of Interest

7.1 INES scale for the transport of radioactive material. IAEA Manual on the International Nuclear and Radiological Event Scale – INES Manual

In 2008 the International Atomic Energy Agency (IAEA) published the revised edition of *INES: The International Nuclear and Radiological Event Scale User's Manual.* The objective of the INES is to make the safety significance of a given event understandable to different stakeholders, owners, the public and the media.

INES was introduced in 1992 exclusively for events in nuclear facilities. The big new feature of the revised 2008 edition is that it includes the technical criteria for classifying any event related with radioactive facilities and the transport of radioactive material.

After the publication of the *INES Manual* in 1992, the CSN approved the application of the INES in Spain, and ever since it has been used regularly for events in nuclear facilities. In November 2009 the CSN Plenary Session passed a motion to extend the INES to events in radioactive facilities and in transport, in application of the 2008 edition of the manual.

The scale classifies events into seven levels. The higher levels (4-7) are termed "accidents", the lower levels (1-3) are termed "incidents", and events having no impact on safety are classified below the scale (or level 0) and are termed "events without safety significance". There is an informative brochure published by the CSN: INES Escala Internacional de Sucesos Nucleares y Radiológicos (only in Spanish version), which gives the basic information about the manual's application.

If you prefer to download the full manual in English, you can get it from the IAEA's website: http://www-pub.iaea.org/MTCD/Publications/PDF/INES2013web.pdf.

So now, when any event occurs that affects the activities of nuclear facilities, radioactive facilities or transport, the CSN conducts an analysis of the event's classification under the INES criteria. If the analysis shows that the magnitude of the event ranks on the scale, the event is assigned one of the classification levels between 1 and 7, and it is reported publicly via a range of mechanisms (web page statement and/or press release). The reporting mechanism varies depending on the gravity of the event, in accordance with the internal procedures approved at the CSN.

7.2 Analysis of doses in Radiopharmaceutical Transport

Worker dose analysis

In the document Dosis 2011 Sevilla (only in Spanish version) is presented an analysis of the doses received by transport workers in Spain from 2003 to 2010, particularly in the carriage of radiopharmaceuticals by road. This paper was presented at the Second Joint Conference of the Spanish Society of Medical Physics and the Spanish Radiation Protection Society, which was held in Seville from 10 to 13 May 2011.

General public dose analysis

The CSN carried out a study in 2022 aimed at estimating the doses received by the public as a result of the radioactive material transport activities carried out in Spain.

A monograph on this subject is scheduled for publication in 2026. However, the CSN magazine Alfa nº 58, June 2024 (only in Spanish version), includes an article summarising the analysis carried out, the results of which show that the doses received by the public due to the transport of radioactive materials currently carried out in Spain are well below the current annual dose limit of 1 mSv.

In view of the results, this assessment is considered to be exploratory (Article 84.g).12 of Regulation on Health Protection against risks derived from exposure to Ionising Radiations), and does not need to be repeated periodically unless the flows and characteristics of the transports used in the assessment undergo a significant change.

7.3 Status of revision of the transport regulations

As of the date of publication of this document, there are a number of proposed amendments to the regulations referenced in this document. Listed below are the regulations that are currently in some stage of the revision process, together with a general summary of the requirements that may be affected:

Instruction IS-39, which includes the procedures for the control and monitoring of the manufacturing of packagings for the transport of radioactive materials (manufactured in Spain), as well as the content of the documentation justifying compliance with the transport regulations for packages whose design does not require approval.

Internal and external review of the draft revision 1 of this instruction has been completed. It is expected to be published during the first quarter of 2026.

The proposed changes are related to the manufacture of the packagings used as transport packages. Paragraph 5 will be amended with regards to the content of the supporting documentation for packages not subject to approval, taking into account the recommendations of the IAEA Guideline SSG-66. These latest changes are minor and a transition period of two years has been provided for their implementation.

Law 12/2011 on civil liability for nuclear damage or damage caused by radioactive materials.

Although this Law is not intended to be revised, the fifth additional provision of Royal Decree 1217/2024, which approves the Regulation on nuclear and radioactive facilities and other activities related to exposure to ionizing radiation, specifies that those decisions adopted by the Steering Committee of the Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD) referred to in that provision, and including exclusions from the application of the Paris Convention that could affect the transport of such substances, and therefore the scope of Law 12/2011, shall be incorporated into Spanish law.

Royal Decree 1308/2011 on physical protection of facilities and nuclear materials and sources of radiation.

The review of this royal decree has been initiated.

CSN Safety Guide 6.2, regarding the content of the Radiological Protection Program of transport of radioactive materials.

The revision of this Safety Guide has been initiated in order to adapt it to the regulations in force, referring to the Regulation on health protection against the risks derived from exposure

to ionising radiation, included in Royal Decree 1029/2022, of 20th December. Furthermore, the IAEA reference guide SSG-86 Radiation Protection Programmes for the Transport of Radioactive Material will be taken into account in its revision.

IAEA document SSR-6, Regulations for the Safe Transport of Radioactive Material.

The document was approved in revision 2 by the IAEA in December 2025. Its provisions are not expected to be transposed into national legislation until 2029.

Work is currently underway to incorporate it into the UNECE document on recommendations for the transport of dangerous goods, through the issuance of an IAEA report: INF. 10 (IAEA with the list of changes since the 2018 edition of the IAEA - Regulations for the Transport of Radioactive Material (SSR-6)), with the transition period currently under discussion. The document UN-SCETDG-67-INF10e.pdf, entitled *Table of Changes from the 2018 Edition to the 2025 Edition of the IAEA Regulations for the Safe Transport of Radioactive Material (SSR-6)*, has been submitted to the committee.

One of the changes in this revision is the addition of new radionuclides and changes of some of the existing radionuclide basic values, including A_1 and A_2 values. This will affect the classification of radioactive material and the criteria for selecting the type of package to be used. A comparison of the values quoted can be viewed through the basic value calculation application.

7.4 Publication: Transportation of radioactive waste and irradiated nuclear fuel

In response to a recommendation of the CSN's Advisory Committee for Information and Participation, it has been published the document Transport of radioactive waste and irradiated nuclear fuel (only in Spanish version). It identifies the regulatory framework applicable to the transport of radioactive material and the main requirements for the safe performance of the activity, highlighting the particularities of the transport of very low, low and medium level radioactive material, as well as irradiated fuel and high-level waste. It also provides information on the radiological risks involved in the transport of radioactive material, specifying the doses that may be received by members of the public and workers during transport operations, as well as the incidents that may occur during the activity.

7.5 Publication: Analysis of events occurring in the transport of radioactive materials in Spain from 2000 to 2020

During the development of the phases comprising the transport, different types of incidents or events may occur, which, after being reported to the Nuclear Safety Council (CSN), are recorded in its Transport Management database.

In this document, once the transport of radioactive material in Spain has been characterised and the legal framework to which it is subject identified, analyses in detail the 100 events occurring in this area in the period between 2000 and 2020.

The analysis, which is approached taking into account the most relevant characteristics of the transports, identifies the most noteworthy type events and considers the severity of the events according to the IAEA INES Scale, as well as their consequences.

The analysis also reports on the lessons learned and actions derived for a series of noteworthy events in the period and, finally, evaluates the trends of the events and compares the conclusions reached in the national framework with respect to the international context.

The publication can also be found in English version at this link. An article summarising this publication has also been published in number 53 of the March 2023 issue of Alpha Magazine on Nuclear Safety and Radiation Protection (only in Spanish).

8 Appendices

8.1 Appendix I: Approval and Notification procedures in the transport of radioactive material

Package Type	Package Approval	Shipment Approval	Prior Notification of Shipment
Excepted	No	No	No
Industrial	No	No	No
Type A	No	No	No
Type B(U)	Yes (unilateral) If LDM is included (1), multilateral	No	If A > preset value(4)
Type B(M)	Yes (multilateral)	If A > pre-set value (4)	Yes
Type C	Yes (unilateral)	No	If A > pre-set value(4)
Fissile	Yes (multilateral)	If $\sum$ CSI > 50(2)	Depending on package type(5)
Uranium Hexafluoride(3) UF_6 (≥ 0.1 kg)	Yes (unilateral)	No	Depending on package type(3)

(1) LDM: Material classified as low dispersion radioactive material. Its design is subject to multilateral approval.
(2) If the criticality safety index (CSI) is greater than 50 in a single container or in a single vehicle.
(3) If this is fissile material due to the enrichment of uranium, the requirements for fissile packages must also be met.
(4) If Activity > 3,000 A_1 or 3,000 A_2, as applicable, or 1,000 TBq, with the lowest of these values being the reference.
(5) Fissile packages are moreover classified as Industrial packages, type-A packages, type-B (U) packages or type-B(M) packages. As such, they may require shipment approval.

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8.2 Appendix II: Table. List of Approved Packages in Spain

List of Approved Certified Packages Accepted in Spain					
Package Identification		Country of Origin Certificate	Spanish Approval	Spanish Certification Expiration Date	Package Contents
3516C	SHEET	GB/3516C/AF (Rev.3)	E/164/AF (Rev.3)	30/09/2030	Fresh enriched uranium oxide
3525	SHEET	S/2010/AF (Rev.3)	E/093/AF (Rev.4)	31/12/2028	Fresh uranium fuel elements (VVER)
ANF-18	SHEET	D/4343/IF-96 (Rev.7)	E/109/IF-96 (Rev.7)	28/02/2027	Fresh uranium fuel elements (PWR)
EMBRACE	SHEET	S/50/IF (Rev. 15)	E/102/IF (Rev. 9)	31/12/2028	Fresh uranium fuel elements (BWR)
ENRESA B-02A	SHEET	E/105/B(U)-96 (Rev.2)		31/03/2027	Solid radioactive sources of Am, Am/Be and Cm
ENSA/DPT	SHEET	E/077/B(U)F-96 (Rev.6)		31/12/2029	Irradiated uranium fuel elements (PWR)
ENUN-24P	SHEET	E/155/B(U)F-96 (Rev.1)		30/11/2028	Irradiated uranium fuel elements (PWR)
ENUN-32P	SHEET	E/141/B(M)F-96 (Rev.3)		31/03/2027	Irradiated uranium fuel elements (PWR)
ENUN-52B	SHEET	E/147/B(M)-F-96 (Rev. 2)		31/12/2029	Irradiated uranium fuel elements (BWR)

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List of Approved Certified Packages Accepted in Spain

Package Identification		Country of Origin Certificate	Spanish Approval	Spanish Certification Expiration Date	Package Contents
FCC-3	SHEET	F/347/IF-96 (Gx)	E/173/IF-96 (Rev.0)	30/04/2028	Fresh enriched or reprocessed uranium fuel rods (PWR)
FCC-4	SHEET	F/348/IF-96 (Gv)	E/174/IF-96 (Rev.0)	31/12/2027	Fresh enriched or reprocessed uranium fuel rods (PWR and EPR)
HI-STAR 100	SHEET	E/120/ B(U)F-96 (Rev.4)		31/03/2030	Irradiated uranium fuel elements (PWR) and high-level radioactive wastes
HI-STAR 150	SHEET	E/166/B(U)F-96 (Rev.2)		30/11/2026	Irradiated uranium fuel elements (BWR)
NPC	SHEET	USA/9294/AF-96 (Rev.12)	E/108/AF-96 (Rev.5)	30/11/2030	Enriched uranium in different forms
RAJ-II	SHEET	USA/9309/B(U)F-96 (Rev.9)	E/125/B(U)F-96 (Rev.6)	31/01/2029	Fresh uranium fuel elements (BWR)
TNF-XI	SHEET	F/381/AF-96 (En)	E/165/AF-96 (Rev. 2)	31/12/2026	Fresh enriched uranium oxide
TRAVELLER	SHEET	USA/9297/AF-96 (Rev.11)	E/119/AF-96 (Rev.10)	31/03/2030	A fresh uranium fuel element (PWR) or fuel rods