

What regulations apply to radioactive material transport?

The transport of radioactive material is a complex matter that falls under strict international and national regulations. Safety is paramount, both for the people working with it and for the environment. The regulations are extensive and detailed, with specific requirements for packaging, documentation, and safety measures. In this article, we answer the most important questions about the regulations and practical aspects of radioactive material transport, so you know exactly what you need to comply with.

What are the international regulations for radioactive material transport?

The international regulations for the transport of radioactive material are primarily determined by the International Atomic Energy Agency (IAEA). The IAEA has established the 'Regulations for the Safe Transport of Radioactive Material', also known as SSR-6. These form the basis for virtually all national and international transport rules.

In addition to the IAEA regulations, there are various modality-specific regulations:

- **ADR** – European Agreement concerning the International Carriage of Dangerous Goods by Road
- **RID** – Regulations concerning the International Carriage of Dangerous Goods by Rail
- **IMDG-Code** – International Maritime Dangerous Goods Code for sea transport
- **ICAO-TI** – Technical Instructions of the International Civil Aviation Organization for air transport

In the Netherlands, the Decree on the transport of fissile materials, ores, and radioactive substances (BVSER) is in force, based on the Nuclear Energy Act. For European transport, the ADR agreement applies, which is regularly updated to incorporate the latest IAEA recommendations.

What's important to know: the regulations are hierarchically structured, with the IAEA regulations forming the basis. National regulations may be stricter, but not less strict than the international standards. This ensures that radioactive material is transported according to comparable safety standards worldwide.

Which packaging categories are required for different radioactive materials?

The packaging requirements for radioactive materials are directly related to the risk posed by the material. The IAEA and derived regulations distinguish different types of packaging, each with specific safety requirements:

- **Exempted packages** – For materials with very low activity levels, such as certain measuring instruments. These packages must meet general design requirements but need less stringent testing.
- **Industrial packages (IP)** – Subdivided into IP-1, IP-2, and IP-3, for materials with low specific activity (LSA) or surface contaminated objects (SCO). The requirements become stricter from IP-1 to IP-3.
- **Type A packages** – For transport of radioactive substances with limited activity. These must be able to withstand normal transport conditions, including minor accidents.
- **Type B packages** – For materials with higher activity levels. Type B packages must be able to withstand both normal and accident conditions, including severe impact and fire.

- **Type C packages** – Specifically for air transport of large quantities of radioactive material. These must be able to withstand extreme accident scenarios.

The choice of a specific packaging type is determined by various factors:

- The A1/A2 value of the radioactive material (a measure of radiotoxicity)
- The physical form (solid, liquid, gas)
- The total activity of the content
- The radiation level at the surface of the package

For special materials such as fissile materials, additional requirements apply to prevent nuclear chain reactions.

How are radioactive transport packages tested and certified?

Transport packages for radioactive material undergo rigorous test procedures to ensure they maintain their protective function under various conditions. These tests simulate both normal transport conditions and accident scenarios.

For normal transport conditions, packages are subjected to:

- Water spray test (simulation of rain)
- Free drop onto an unyielding surface
- Stacking test (compression test)
- Penetration test with a steel bar

For accident conditions (Type B and C packages), there are additional, more severe tests:

- Drop test from 9 meters onto an unyielding surface
- Puncture test (drop onto a steel pin)
- Thermal test (exposure to 800°C for 30 minutes)
- Immersion test (for some packages)

The certification process differs per package type. For Excepted, Industrial, and Type A packages, self-certification by the manufacturer is often possible, provided all design requirements are met. For Type B and C packages, approval by the competent authority is required. In the Netherlands, this is the Authority for Nuclear Safety and Radiation Protection (ANVS).

During certification, the manufacturer must provide extensive technical documentation, including design specifications, material analyses, test results, and safety analyses. After approval, the package receives a certificate number that must be indicated on the package.

Which documents are mandatory for the transport of radioactive substances?

For the transport of radioactive materials, proper documentation is essential for safety and legal compliance. The following documents are usually required:

1. **Transport document** – This contains detailed information about the shipment, including:
 - UN number and proper shipping name
 - Hazard class (Class 7 for radioactive material)
 - Name or symbol of radionuclides
 - Description of the physical and chemical form

- Maximum activity of the radioactive contents during transport
 - Category of the package (I-WHITE, II-YELLOW, or III-YELLOW)
 - Transport index (TI) and, if applicable, criticality safety index (CSI)
2. **Package certificates** – For Type B and C packages, approval certificates from the competent authority are required.
 3. **Written instructions** – Detailed instructions for the carrier on how to act in case of an emergency.
 4. **Transport license** – Depending on the type and quantity of radioactive material, a specific transport license may be required.
 5. **Radiation protection program** – Documentation demonstrating that adequate measures have been taken to limit exposure to radiation.
 6. **Quality assurance documents** – These demonstrate that all aspects of the transport comply with the relevant quality standards.

For international transport, additional documents may be required, such as customs forms and specific declarations required by the countries of transit and destination.

It is important to know that the carrier is obliged to carry these documents during transport and to be able to present them to the competent authorities upon request.

What are the specific safety measures during radioactive transport?

During the transport of radioactive material, various safety measures must be taken to protect people, property, and the environment. These measures include:

Radiation monitoring and control:

- Regular monitoring of radiation levels around the package
- Compliance with maximum allowable radiation levels (2 mSv/h at the surface and 0.1 mSv/h at 2 meters distance for standard transport)
- Use of radiation shielding where necessary
- Dose monitoring for personnel involved in transport

Labeling and marking:

- Clear labeling of packages with the appropriate hazard symbols (I-WHITE, II-YELLOW, or III-YELLOW)
- Vehicle marking with orange plates and, if necessary, large labels (placards)
- UN numbers and other identification data must be clearly visible

Segregation and stowage:

- Segregation of radioactive materials from other dangerous goods
- Minimum distance from inhabited areas, regularly used workspaces, and unprotected photosensitive materials
- Limitation of the total transport index in one vehicle or container

Emergency procedures:

- Detailed emergency plans for various accident scenarios
- Special training for drivers and other personnel on how to respond to incidents
- Emergency contact information that must always be available
- Specific equipment for managing leaks or other emergency situations

For high-activity sources or fissile materials, additional security measures may be required, such as armed escort, vehicle tracking, and pre-approved routes.

For [transport of sensitive materials for defense applications](#), even stricter safety protocols often apply. The combination of radioactive material and defense applications requires expertise in both radiation safety and military standards such as MIL-SPEC.

It is important to emphasize that these safety measures are not optional – they are legally required and are strictly monitored by national and international supervisory authorities.

Conclusion

The regulations for the transport of radioactive material are complex but necessary to ensure safety. From the international IAEA regulations to specific packaging requirements and documentation – every aspect is carefully elaborated to minimize risks.

Compliance with these regulations requires specialized knowledge and experience. At Faes, we understand the challenges involved in safely transporting sensitive materials. Our expertise in developing packaging solutions that meet the strictest standards and certifications, including UN standards, makes us a reliable partner for organizations working with radioactive material.

Whether it's Type A, B, or C packages – proper protection is essential for safe transport and storage without risks to people and the environment.

Frequently Asked Questions

How do I prepare my company for the first transport of radioactive material?

Start by appointing a radiation expert or hiring an external advisor with knowledge of radioactive transport. Then ensure you have the proper permits from the ANVS, invest in certified packaging appropriate for your material type, and train your personnel according to ADR requirements. Additionally, develop a detailed safety protocol and emergency plan before scheduling the first transport, and consider working with an experienced transport partner for the first few times.

What are the most common mistakes in the transport of radioactive material?

The most common mistakes are incomplete transport documentation, incorrect labeling of packages, failure to observe separation distances between radioactive materials and other goods, and insufficient training of personnel. Using packages that are not suitable for the specific type of radioactive material or underestimating activity levels when determining the packaging category are also common problems that can lead to serious safety risks.

How do I handle an incident during the transport of radioactive material?

In case of an incident, you should immediately cordon off the area and keep unauthorized persons at a distance. Immediately inform the emergency services via 112 and report that it concerns radioactive material. Then contact the ANVS via their 24/7 incident number. Do not attempt to repair or clean up damaged packages without the proper protective equipment and expertise. Document all details of the incident for later

reporting and evaluation.

Are there alternative transport methods for very sensitive radioactive material?

For very sensitive or high-activity radioactive material, specialized transport methods are available, such as specially designed transport containers with extra shielding, dedicated transport where no other goods are carried, or secured transport with escort. In some cases, air transport with special Type C packages or ship transport via specific routes may offer a safer alternative to road transport, depending on the distance and risk assessment.