

Class 7 – Radioactive materials

Class 7 – Radioactive materials is a designation for one group of products with hazardous properties. It is possible to divide them into 2 sub-categories according to their radioactive properties:

- Materials that it is in general possible for all ships to carry (traditional class 7 products) and
- irradiated nuclear fuel, plutonium and high-level radioactive waste (INF Code products) that must be carried by ships that are especially designed and operated for this purpose and subject to a separate approval scheme.

Traditional class 7 products

Typically, these are products with low radioactivity, for example smoke detectors, medical equipment, process control equipment, measuring equipment, etc.

In addition to the general requirements for ships' safety stipulated in the International Convention for the Safety of Life at Sea (SOLAS), ships are not required to be separately certified for the carriage of these products and the only requirement is that the cargo holds in which the goods are to be located are fitted with a fixed fire-extinguishing system.

INF Code products

Typically, these are high-level radioactive products,¹ including:

- a) Irradiated nuclear fuel; i.e. materials containing uranium, thorium and/or plutonium isotopes that have been used to maintain a self-sustaining nuclear chain reaction, and
- b) plutonium (plutonium isotopes) extracted from irradiated nuclear fuel by means of reprocessing, and
- c) high-level radioactive solid or liquid waste extracted in a system for reprocessing irradiated fuel.

INF Code products

Products with hazardous properties are identified through an international classification, the so-called UN numbers. Since the type and properties of the material can, however, vary within the same product category, the UN number does, however, not provide a unique identification of an INF Code product.

Typically, carriages of INF Code products in large quantities will, however, take place under the following UN numbers/official goods designations:

- UN-3327 Radioactive material, Type A package, fissile (typically rather small quantities).
- UN-3328, Radioactive material, Type B(U) package, fissile.
- UN-3329, Radioactive material, Type B(M) package, fissile.
- UN-3331, Radioactive material, Transported under special arrangement, fissile (which occurs only exceptionally).

¹ However, when forwarding for example fuel samples (INF), low activity quantities may be involved.

The transportation

In addition to the general requirements for traditional class 7 products, ships transporting INF Code cargoes must also meet the provisions of the so-called INF² Code and hold a certificate to that effect: An International Certificate of Fitness for the Carriage of INF Cargo.

Thus, there are special requirements for the ship's survivability (damage stability and fire safety), temperature control in the cargo holds, securing the cargo, electrical supplies and irradiation protection equipment. To this should be added a number of operational conditions such as safety management, training, contingency plans, including for informing the company, flag State, coastal State, etc. in case of an accident with INF Code materials.

There is no lower limit for classification of INF Code products. The requirements for each individual ship are established in relation to the irradiation activity that the INF Code product to be carried liberates. For this purpose, the requirements for the ships are divided into 3 classes:

- "Class INF 1 ship". Ships which are certified to carry INF cargo with an aggregate activity less than 4,000 TBq.
- "Class INF 2 ship". Ships which are certified to carry INF cargo with an aggregate activity less than 2×10^6 TBq.
- "Class INF 3 ship". As stated under a "Class INF 2 ship", but without any limitations in the aggregate activity.

A ship's flag State surveys and certifies ships that are intended to carry INF Code products. As regards Danish ships, the Danish Maritime Authority (DMA) performs this task. Currently 3 Danish ships have been issued with an INF certificate and have thus been approved to carry INF class 1 and 2 products.

There are also especially strict requirements for the casks that are to be used to carry INF Code products. Thus, the casks must have been constructed and tested so that they are able to withstand very intense impacts as established in the "Regulations for the Safe Transport of Radioactive Material" published by the International Atomic Energy Agency (IAEA).

The casks must be approved by the authorities of the flag State; as regards Danish ships, the Danish Institute for Radiation Protection (SIS).

Approval of the transport

All transports of INF Code products must be approved by both the ship's flag State and the countries that the ship is to call at (host States).³

In this connection, it should be noted that the provisions on innocent passage in United Nations' Convention on the Law of the Seas stipulate that a coastal State cannot require foreign ships undertaking an international transit passage of, for example, Danish waters to be approved.

² IMO Resolution A.748(18), the International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on Board Ships (INF Code).

³ Calls mean transports to and from the ports of the host State, respectively transports where the voyage is interrupted with a view to stays in the territorial waters of the host State, for example for bunkering, the receipt of stores, etc.

When Danish ships are to perform INF Code transport, the ship, the carrier, the cargo and the transport packages intended to be used must be approved in each individual case. This applies irrespective of whether the ship calls at Danish ports in connection with the carriage.

Danish Institute for Radiation Protection

Where an approval certificate from a Danish competent authority is required for a carriage of radioactive material, an application to this effect must be forwarded to the SIS.

An application must contain information about the period of the transport, the radioactive contents, the expected mode of transport, the transport route as well as detailed information about any special measures and special administrative or operational measures required according to the approval certificate for the package design (the unit in which the material is carried).

Typically, the SIS will recommend that the carriage takes place following a validation of the cargo and the transport packages used, including the relevant cask certificates as well as the knowledge of the carrier.

Similarly, permission may be granted to carry radioactive substances as a "special arrangement", i.e. a transport where the relevant normal requirements cannot be met. In such cases, the application must also contain an account of the areas in which the transport will not be carried out in accordance with the relevant normal requirements as well as of the reasons for this as well as an account of any special measures, including administrative and operational measures to be taken during the transport in order to compensate for the lack of compliance with the relevant requirements.

Danish Maritime Authority

The DMA grants the approval for carrying out the specific voyage on the basis of the ship's overall suitability (certification) for performing the relevant transport, including its INF Code certification as well as the recommendation from the SIS.

Danish Emergency Management Agency

Danish ships carrying fissile/nuclear/fissionable material, respectively foreign ships intending to call at Danish ports or Danish territorial waters with such cargoes must have notified the Danish Emergency Management Agency (BRS) about the transport and acquired its approval.

Thus, the BRS must ensure that the provisions of the IAEA Convention on the Physical Protection of Nuclear Material are complied with in connection with transport in Danish territorial waters as well as international transports by ships flying the Danish flag. The same applies to foreign ships calling at Danish ports or Danish territorial waters. The BRS makes an independent validation of these transports with the aim of preventing as much as possible the risk of the cargo getting into the hands of unauthorised persons.

The BRS has access to information about Danish ships' route, position, etc. when they carry INF Code material.

As regards international transports, the BRS is not responsible for planning the physical protection, but must in connection with each individual transport secure that such physical protection is available. Physical pro-

tection includes, inter alia, appropriate locking mechanisms, alarms and communication systems. As regards nuclear transports in Danish territorial waters, they are carried out in cooperation with the relevant Danish authorities.

If the BRS is informed that a ship loaded with fissile material has planned to move into Danish territorial waters, the BRS will – on the basis of information about the nature of the cargo – ensure that the necessary physical protection is available. This will be done in cooperation with the authorities affected.

Education and training of the ship's crew

The international regulations on education and training⁴ stipulate that ship's officers who handle radioactive products must be educated and trained in this.

The INF Code also stipulates that – depending on the activity level of the substances carried and the ship's design – it may be necessary with additional arrangements or equipment for protection against radiation. Thus, the SIS can in each individual case make special requirements for the education and training as well as the protection of the crews as well as for the possibilities for measuring the radiation, etc. from the cargo.

Normally, the SIS requires an especially competent person to be on board Danish ships carrying INF Code cargoes. The Danish shipowners that carry INF Code cargoes have, in this connection, had a number of the ships' officers trained as especially competent persons. Furthermore, there are requirements for the availability of appropriate measuring equipment as well as dosimeters for the entire crew.

According to the order on the carriage of radioactive substances, the carriers must, inter alia, ensure that personnel involved in the transport of radioactive substances have been instructed in all relevant transport provisions as regards, for example, loading, transit storage, separation from workplaces, separation from other dangerous goods, measures to be taken in case of accidents, etc. Furthermore, carriers must ensure that a quality assurance programme is carried out with the purpose of ensuring and documenting compliance with the relevant transport provisions.

Emergency preparedness

The emergency tactics to be used in connection with accidents when transporting radioactive substances are described in the guidelines "Handling accidents with radioactive substances" (*Håndtering af uheld med radioaktive stoffer*, 2001), which has been drawn up in cooperation between the Danish Emergency Management Agency, the Association of Municipal Emergency Managers, the Commissioner of Police and the Danish Health Authority (the Danish Institute for Radiation Protection). The guidelines are available from the webpage of the Danish Health Authority in Danish (www.sst.dk) under "Udgivelser" (*Publications*) in 2001.

⁴ STCW, Section B-V/c, "Guidance regarding training of officers and ratings responsible for cargo handling on ships carrying dangerous and hazardous substance in packaged form", requirement for a general introduction to class 7.

Monitoring

The monitoring of ship traffic in Danish waters must, to the widest extent possible, be carried out without causing any inconvenience to ships in innocent passage that therefore are entitled to pass freely and unimpededly.

The design of SafeSeaNet, which is used to record information about dangerous goods on board ships to or from EU ports, requires the use of considerable resources to screen available information with a view to identifying transports of radioactive products. Furthermore – as explained above – it is complicated to make an unambiguous identification of an INF Code transport solely on the basis of the cargo details available from SafeSeaNet.

Thus, it is not possible for the Admiral Danish Fleet to secure a positive identification of all INF Code transports in Danish waters. The safe identification of ships carrying INF cargoes through the Danish area thus requires knowledge about specific ships via agreements on the exchange of information with the other Baltic Sea countries – work that is already being carried out in the cooperation bodies established in the Baltic Sea area.

Furthermore, the Danish Nature Agency is currently considering the submission of a proposal to the European Commission to lay down requirements for a separate notification on INF Code transports in connection with a future amendment of the monitoring directive.

Safety of navigation

United Nations' International Maritime Organization (IMO) recommends, in resolution MSC.138(76), that ships navigating Route T (from the Skaw to Gedser via the Great Belt) and the Sound with INF Code cargoes take a pilot.

Information exchange

To the extent that it is relevant and compatible with the protection of a specific INF Code transport, the involved authorities will inform the Admiral Danish Fleet (SOK/MAS) about this.

Similarly, the DMA, SIS and BRS will be informed when the SOK/MAS gets knowledge about INF transports in Danish waters via their monitoring of the waters.

Previously, a number of thematic presentations on how to handle accidents with radioactive substances have been held for the fire-fighting services, the police, the emergency management centres and the environmental authorities. Such presentations will also be given in the future in cooperation between, for example, the BRS, the DMA, the national police, the Association of Municipal Emergency Managers and the SIS – depending on the theme chosen.

Annual briefing

Since 1993, the SIS has drawn up an annual briefing on the carriage of radioactive substances. The briefing accounts for general and specific conditions related to the transport of both nuclear and non-nuclear materials. In addition, the briefing gives the extent of transports of these materials in/through Danish territory or by Danish carriers, and the number of required and non-required advance notifications is given. Furthermore, each individual carriage of nuclear materials requiring advance notification is described, irrespective of the mode of transport. Any accidents are described and categorised and, finally, national and international developments and cooperation are described. The briefing is available from the webpage of the SIS (www.sis.dk).

Cooperation with neighbouring countries

The SIS has concluded an agreement with the Swedish authorities, according to which they give advance notice of transports of radioactive reactor fuel or operational waste from the Swedish plants which are to take place through the Sound.