# Transport packages for nuclear material and waste



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# Authorisation

By virtue of section 55, second paragraph, point 3 of the Nuclear Energy Act (990/87) and section 29 of the Council of State Decision (395/91) on General Regulations for the Safety of Nuclear Power Plants, the Finnish Centre for Radiation and Nuclear Safety (STUK) issues detailed regulations concerning the safety of nuclear power plants.

YVL Guides are rules an individual licensee or any other organisation concerned shall comply with, unless STUK has been presented with some other acceptable procedure or solution by which the safety level set forth in the YVL Guides is achieved. This Guide does not alter STUK's decisions which were made before the entry into force of this Guide, unless otherwise stated by STUK.

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# 1 General

Nuclear materials and nuclear waste are radioactive materials. In the transport of nuclear materials it is necessary to take into account that in addition to radiation danger, the materials are fissionable. In Finland the most significant nuclear material and nuclear waste transportations are those of fresh and spent fuel.

The transport package is of great importance in ensuring the safety of the transport. The packaging with its radioactive material contents forms a single transport unit, a package. The basis of the design, manufacture and use of the packaging is that it maintains its most important protective characteristics under all normal transport conditions and in postulated accident conditions. The required characteristics of the packaging depend on how dangerous the contents are.

The regulations for the transportation of dangerous goods ([3]…[13]) set requirements based on the dangerous nature of the transported material. In the case of radioactive materials they include requirements necessary for ensuring radiation and criticality safety during transportation. The basis for transportation regulations is the Safety Standard on the safe transport of radioactive materials ([1]) compiled and updated by the International Atomic Energy Agency (IAEA).

In Finland, the Finnish Centre for Radiation and Nuclear Safety (STUK) is the competent authority controlling the transport of radioactive materials as prescribed in decrees and decisions concerning the various forms of transportation.

The Nuclear Energy Act (990/87, 1420/94) requires, that the holder of the transport license is competent and has the necessary prerequisites to carry out transportation safety and in compliance with international contractual obligations. The licensee shall also take care of the necessary emergency preparedness and physical protection.

General principles for nuclear material control and specific principles for the control of nuclear fuel transport are presented in Guides YVL 6.1 and YVL 6.5.

# 2 Regulations and responsibility concerning the packages

The requirements for nuclear material and nuclear waste packages are set forth in the transport regulations for dangerous goods where radioactive materials are class 7. National road and railway transport regulations are based on an international agreement (ADR) and international regulations (RID). The national road and railway transportation regulations have been translated into Finnish and Swedish and they have been published in the Statutes of Finland. In maritime and air transport the international transportation regulations for dangerous goods are applied. These have not been translated into Finnish and have not been published in the Statutes of Finland.

In the road and railway transportation regulations ([3]…[8]), concerning the requirements for packages and their testing methods reference is made directly to the relevant paragraphs of the IAEA Safety Standard ([1]). Also in this Guide reference is made directly to the IAEA publication in question.

The Nuclear Energy Act and the Nuclear Energy Decree set no direct requirements for the packagings, but general nuclear safety requirements and the requirements set for the transportation of nuclear materials and nuclear waste also affect the control of packagings.

Transportation packagings are not classified according to safety, but their design, manufacture and use are subject to control analogous to that of safety class 3 systems,

structures and components of nuclear facilities. As regards criticality safety, principles analogous to safety class 2 shall be followed.

According to the Nuclear Energy Act, the holder of a transport license is responsible for the safety of the transportation in Finland and, accordingly, also for the safety of the package. According to regulations about the transport of dangerous goods, the shipper is responsible for the package to conform to the relevant regulations. The responsibility of the shipper covers all countries along the route of a transportation. The applicant for the original approval of a package design can also be some other organisation.

# 3 Approval procedure

As a rule, the packages of nuclear material require the package design approval of STUK ([1], section 710). In [1], section 560, those cases are listed where no approval of the nuclear material packaging is needed but the classification is based on radiation safety.

Of nuclear waste packages containing non-nuclear material, those of the type B(M) and those of the type B(U), which are of Finnish origin, shall have approval of the Finnish Centre for Radiation and Nuclear Safety (STUK). Other B(U)-type packages shall have the approval of a competent foreign authority following the same regulations.

The safety requirements set for packagings and packages are presented in [1] paragraph V "Requirements for Radioactive Materials and for Packagings and Packages" and the procedures used in testing in paragraph VI "Test Procedures".

STUK can, based on its consideration, get acquainted with the program and results of the quality control of the design, manufacture and use of a package regardless of the safety classification of the package type and the requirements concerning the official approval of the package type ([1], section 209). The quality assurance program shall comply with the instructions of Guide YVL 1.4, as applicable. As a complementary guide for quality assurance, the appendices IV "Quality assurance in the Safe Transport of Radioactive Material" and V "Guide for Quality assurance programme" of [2] can be used.

In special cases STUK can acquire information for the approval of a package type also directly from the competent authorities of other countries.

## 3.1 New package design

The approval procedure for a new package design applies to situations where Finland is the country of origin of approval of the new nuclear material package or a type B package design. For the approval of the new package design, its design and testing material ([1], sections 705, 708 and 711) shall be submitted to STUK by the applicant.

If practical tests (prototype or scale model) are performed for approval, the documentation concerning the package design and a description of the testing methods to be used shall be submitted to STUK not later than six months before the planned date of testing. The applicant shall inform STUK of the testing date. STUK supervises the tests as considered necessary. The documentation of the package design shall be completed with the test results. If the practical tests are to be replaced with theoretical analyses, conservative and reliable methods shall be used ([1], section 601).

As an indication of approval of the design and test material, STUK gives an approval certificate and an identification mark for the package design ([1], sections 724…729).

### 3.2 Package approved by foreign authority

If a foreign authority following the same transport regulations has approved a package design, the approval procedure in Finland depends on the type of the package.

For approval of the design of a type B package containing nuclear material and type B(M) package containing nuclear waste, the licensee shall submit to STUK, in addition to the foreign approval certificate, the design documentation and a description and the results of the tests performed with the packaging.

For approval of industrial packages (IP) containing nuclear material and type A packages, the applicant shall submit to STUK, in addition to the approval certificate, a description of the design and criticality safety of the packaging as well as the tests performed and their results.

In case of a type B(U) package containing non-nuclear material, the shipper of the package shall submit to STUK a copy of the original approval certificate of design well in advance before using the package for the first time for transportation in Finland.

Other packages do not require STUK's approval.

The approval application of a package design and documents attached to it shall be submitted to STUK at least three months before the planned date of using the type of packaging in Finland.

The package design approved by a foreign authority will be approved by STUK for use in Finland either by validation of the approval certificate issued by a foreign authority, in which case STUK does not give the package a new identification mark ([1], section 730), or by issuing an approval certificate ([1], sections 724 and 729), in which case the new identification mark for the package is mentioned. A Finnish identification mark is normally given only if the type of the package design differs from the original type.

# 4 Control of manufacturing and commissioning of the packaging

Before the manufacturing of the packaging can be started according to the approved package design, the orderer shall submit the construction plan for approval to the authority regulating the manufacturing. In the construction plan reference can be made to documents submitted in connection with the approval of the package design.

The construction plan shall include:
— description of the manufacturer
— design bases
— description of structure materials
— quality control plan
— dimensioning of the packaging
— drawings.

The contents of the different sections of the construction plan shall comply with Guide YVL 5.8, as applicable.

The regulatory authority shall have the possibility to supervise the manufacturing of the packaging.

If a package design was originally approved in Finland manufacturing schedules shall be submitted to STUK well in advance to arrange measures related to manufacturing control. Primary responsibility for notification rests with the organisation using the packagings. By mutual agreement between authorities following the same regulations, manufacturing control can be transferred to authorities in the country where the packaging is used or manufactured. If packaging subject to approval is primarily used and maintained in Finland but its design was originally approved and it is manufactured in some other country, the organisation using the package shall submit to STUK the documentation required for manufacturing control. Also, in accordance with what is mentioned

above, STUK shall be reserved the possibility to make inspections required to control manufacturing.

If STUK is the authority controlling the manufacture of the packaging or if the packaging will primarily be used in Finland , STUK controls, as presented in Guide YVL 1.15, that the packaging has been manufactured and that quality control has been implemented according to the accepted construction plan. Correspondingly, the packaging shall not be taken into use before STUK has approved it in a commissioning inspection. In the commissioning inspection it will also be inspected, that the safety of the packaging has been assured according to [1], section 401 before the first transportation.

The organization to whose ownership the packaging is manufactured, shall ensure that the packaging is marked with a serial number and it shall give the serial number of the packaging to the authorities of the country of origin of the package design. The authority of the country of origin keeps a list of packagings manufactured according to the package design.

# 5 Control of use

The holder of the transport license shall present to STUK the following documents before packaging is taken into use in Finland:
— instructions for handling and use
— instructions for inspections to be carried out prior to each transport ([1], section 402)
— periodic inspection programme.

How STUK controls the use of the packaging depends on the type of the packaging and whether STUK is the authority having primary responsibility for monitoring the condition of the package.

If packaging is subject to control in Finland in the first place, procedures prescribed for safety class 3 systems, structures and components of nuclear power plants shall be applied during the periodic inspections of packagings as applicable. As regards components relevant to criticality safety, safety class 2 procedures shall be applied. The periodic inspection program shall be submitted to STUK for approval. The inspection results shall be submitted to the Centre for information.

If packaging is subject to control by a competent foreign authority following the same regulations, the condition of the packaging shall be verified by visual inspections in connection with the transportations. The holder of the transport license shall also submit to STUK for information the periodic inspection program of type B packagings and the latest results of the periodic inspections. If this information is not available for type B packaging subject to control outside Finland the packaging shall undergo a periodic inspection according to a program approved by STUK before the transport.

The holder of the transport license shall submit to STUK for information an explanation of the periodic inspection program of type A packagings including nuclear material.

If packaging fulfilling stricter requirements than needed is used to transport nuclear material or waste (e.g. type B packaging instead of type A packaging), the procedures used by the licensee during operational inspections and by STUK during equivalent control shall be consistent with the requirements set for the type of packaging required to transport the dangerous material in question.

The holder of the transport license shall report any damage observed in the packaging and deviations from the type approval to STUK and to the shipper of the packaging. Such packaging shall not be used to transport nuclear material or waste without a separate approval by STUK (see chapter 6).

# 6 Exceptions

If a package does not fulfill all regulatory requirements STUK can approve it for use in Finland by approving the whole transport with special arrangements ([1], sections

720…722). In this case, STUK approves on a case by case basis the substituting measures that ensure overall transport safety to be at least on the same level as required of packaging which complies with the regulations.

# 7 Terminology used

**Package**

Package means the packaging and its radioactive contents together as left for transportation. A package belongs to one of the following groups: excepted package, industrial package (IP), Type A package or Type B package.

**Excepted package**

Excepted package is for minor amounts of radioactive materials. These packages require no official approval.

**Industrial package (IP-1, IP-2, IP-3)**

Industrial packages mean normal industrial packaging e.g. tanks, freight containers, or bottles that contain material with a small specific activity or contaminated objects. These packages require official approval only if they contain nuclear material.

**Type A package**

These packages are designed for specific use and contain a limited amount of radioactive material. The package shall endure normal transportation and small shocks. It requires an official approval only if it contains nuclear material.

**B(U), B(M), type B package**

These packages contain highly radioactive material. These packages shall endure severe accidents which may only have minor consequences on them. An official approval is required for:

— type B(M) and type B(U) packages containing nuclear material, as a multilateral approval
— other type B(U) packages as an approval by the country of origin.

**Package design**

The package design is the plan concerning the packaging and its contents. The need for an official approval depends on the type of the package design.

**Country of origin**

The country of origin is the country first to approve the package design or the transportation according to the relevant regulations.

The terminology is defined in more detail in [3], [5] and [7].

# 8 References

1 Regulations for the Safe Transport of Radioactive Materials 1985 Edition (As Amended 1990), IAEA, Safety Series No 6.

2 Advisory material for the IAEA Regulations for the Safe Transport of Radioactive Material, IAEA, Safety Series No. 37.

3 Act on Transportation of Dangerous Materials (719/94) and decrees for applying it in different forms of transportation.

4 Decree on Driver Permits for Transportation of Dangerous Material (724/91).

5 Decision of the Ministry of Communications (147/92) on Transportation of Dangerous Material on Road and Amendments.

6 European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), decision (23/79), Decree on coming into force (289/79) and its Amendment (185/82).

7 Decision of the Ministry of Communications (394/92) on Transportation of Dangerous Material by Rail and Amendments.

8 General Agreement on international railway transportation (COTIF), RID-regulations of the appendix B (CIM), agreements (4/85) and Agreements (5/85), Act of coming into force (58/85) and Decree (59/85).

9 The current Decision of the National Board of Navigation on Transportation of Dangerous Materials in Vessels.

10 International Maritime Dangerous Goods Code (IMDG), International Maritime Organization (IMO), Decree of coming into force (357/80) and the valid decision of the National Board of Navigation.

11 EU-directive 93/75/EEC (1995), Concerning minimum requirements for vessels bound for or leaving community ports and carrying dangerous or polluting goods (869/94) and current valid decision of the National Board of Navigation.

12 The current valid Decision of the Aviation Institution on Transportation of Dangerous Goods by Air.

13 International civilian-aviation general agreement (Decision 11/49), Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO-TI) and general European Aviation regulations.