Säteilyturvakeskus
Finnish Centre for Radiation and Nuclear Safety

YVL-ohje
YVL Guide
1 March 1984

YVL 6.4
1 (10)

Translated 27 Sept. 1984

SUPERVISION OF NUCLEAR FUEL TRANSPORT PACKAGES

CONTENTS

Helsinki 1984
Government Printing Centre

ISBN 951-46-8343-9
ISSN 0781-4321

PL.P.O.BOX 268
SF-00101 HELSINKI 10
FINLAND

Ydinturvallisuusosasto
Department of Nuclear Safety
Kalevankatu 44

Puh.-Tel.
(90) 616 71

Telex
122691 STUK SF

STUK 41.01.1984 - 05

8084023195 12/6545/PTP

1 GENERAL

Due to its radioactive, fissile nature, nuclear fuel shall be transported so that an adequate safety level is maintained. The transport package has a central part in the safe transport of nuclear fuel. The design, manufacture and use of the package shall be realized so that the package maintains all its essential qualities in all postulated situations. In Finland, The Finnish Centre for Radiation and Nuclear Safety (STUK) acts as the competent authority supervising transport packages and transports of radioactive materials.

This guide is valid for packages of fresh and irradiated fuel used both in international transports and in transports within the boundaries of Finland. This guide may also be applied to the approval of transport packages for some other nuclear material. With the exceptions defined in section 6, only packages approved by STUK may be used in the transport.

Nuclear fuel transports are included in the scope of the Atomic Energy Act and the Act on Radiation Protection and the regulations set for various transportation modes. The general principles of supervision for nuclear fuel and other nuclear materials are explained in Guide YVL 6.1 "Licensing of nuclear fuel and other nuclear materials". Supervision of nuclear fuel transports is dealt with in Guide YVL 6.5 "Supervision of nuclear fuel transports".

2 REQUIREMENTS REGARDING THE PACKAGE AND THE VARIOUS TRANSPORTATION MODES

The stipulations of the Atomic Energy Act (356/57), the Act on Radiation Protection (174/57), and the statutes, regulations and guides based on them, as well as the regulations concerning the various transportation modes (Appen-

dix 1) shall be followed in the transports of nuclear fuel. As per Guide YVL 6.5, the recommendations of the International Atomic Energy Agency (IAEA) for safe transport of radioactive materials /1/ are considered as minimum requirements for transports and transport packages. IAEA's recommendations are used as the main references of this guide because when a package fulfils the recommendations of IAEA, it also meets the requirements on radiation and nuclear safety set forth in the regulations concerning various transportation modes. The definitions of the terms used in this guide can also be found in Reference 1, sections 1, 5 and 6.

3 APPROVAL PROCEDURE OF NEW PACKAGE DESIGNS

The approval procedure of a new package design applies to a situation where Finland acts as the country of origin of the design. Thus the new package design has no approval certificate issued by the competent authority in any other country. The supervision performed by STUK concerning new package designs includes the inspection of the design documentation of the package design, and inspections during manufacture and use of individual packagings manufactured in accordance with the design. The documentation concerning a new package design shall be delivered to STUK not later than three months before the prototype or a scale model is tested.

After approving the design material completed with the test results, STUK gives an approval certificate (/1/, 822-824) for the package design.

3.1 Design documents

The documents included in the design material shall contain the information presented in sections 3.1.1 - 3.1.4.

3.1.1 Design bases

The design bases shall be presented and an account shall be given of the application of the requirements laid down in paragraphs 201 - 244, 401 - 411, 601 - 610, 615 - 619, and 621 of reference 1 in the design of the package. It shall be stated what kind of materials are intended to be transported in the package in question. Quality, radionuclides, chemical composition and physical condition of the material to be transported shall be specified. The design limits of quantity, isotopic enrichment level, specific activity and emitted radiation and, when spent nuclear fuel is concerned, the corresponding limit values of burn-up and residual heat shall be presented. Any other dangerous properties of the material to be transported, such as being explosive, corrosive or oxidative, shall be presented. Also the requirements concerning possible neutron absorbers shall be given.

Furthermore, the information given of the classification of the package shall include

- package type (section 7.1)
- fissile class (section 7.3)
- estimated allowable number of packages (section 7.4)
- estimated transport index (section 7.5)
- estimated category (section 7.6).

3.1.2 Tests

Tests mentioned in reference 1, section VII, shall be performed according to the design requirements.

Demonstration of compliance with the design requirements may be accomplished by the following methods:

a) Tests are performed with prototypes or with samples of packagings used in normal transports. However, the contents of the package shall as closely as possible simulate the nuclear material to be transported.

b) Reference is made to previous demonstrations approved by STUK.

c) Tests are performed with scale models. The design parameters of the models have to be adapted to the scale. The correlations used in evaluating the results have to be presented.

d) Compliance with requirements is shown with analyses.

The design documents concerning the tests are presented and the date of the tests is announced to STUK. STUK supervises the performance of the tests to the extent it considers adequate. The design documents of the transport package type shall be supplemented with test results and revised accordingly.

In addition, any other tests intended for describing the safety of the package type shall be presented (vibration test, neutron absorber tests etc.).

3.1.3 Technical specifications and safety analyses

Dimensioning of the package, drawings, and a list of construction materials, as well as a description of the manufacturing methods of the package and the quality control program shall be presented in the document.

The specification shall follow the guide concerning the treatment and storage of nuclear fuel, where applicable.

Safety analyses concerning the

- strength properties,
- radiation protection properties,
- heat transfer properties, and
- criticality safety

of the package shall further be presented.

Presumptions with adequate safety margins shall be used in all calculations.

3.1.4 Quality assurance

The quality assurance program (/1/, 839) for design and fabrication of packagings shall be presented. Requirements of Guide YVL 1.4 "Quality assurance program for nuclear power plants" shall be complied with, where applicable.

For type A packagings, a quality control program, supplemented with applicable descriptions of the design and manufacturing organizations, is sufficient for quality assurance.

3.2 Inspections related to manufacture and use of packagings

The supervision of the manufacture and use of a packaging belonging to a package design approved by STUK comprises the following stages:

a) Supervision of manufacture of type B packagings.

b) Structural inspection. STUK prepares an inspection record of the performed structural inspections. In connection with the structural inspection, an identification mark mentioned in the certificate of approval is stamped on the packaging. The structural inspection is carried out before the packaging is placed in service.

c) Periodic inspections. STUK prepares inspection records of the supervision of the performed periodic inspections of a packaging. The frequency of the inspections depends on the type of packaging.

The organization responsible for the manufacture and use of a package shall request STUK to perform the afore-said inspections.

4 APPROVAL PROCEDURE OF A PACKAGE DESIGN APPROVED BY FOREIGN AUTHORITIES

In order to obtain STUK's approval for a package design approved by a foreign authority, a valid approval certificate given by the competent authority of the country of origin of the design, the design documents and a list of the inspections made for the packaging during use are delivered to STUK. The design documents may primarily consist of specifications included in the application for an approval certificate presented to a foreign authority. However, STUK shall be given an opportunity to examine the complete design documents and the manufacturing quality control documents of the packaging to the extent required by STUK, especially if a transport packaging for irradiated fuel is concerned. In some special cases, part of the material needed for the acceptance of the package design can be obtained directly through the information exchange between the authorities in various countries.

The Finnish Centre for Radiation and Nuclear Safety may approve a package design accepted by a foreign authority to be used for transport of fissile materials in Finland either by

a) validation of the original approval certificte issued by a foreign authority, in which case STUK does not give the package a new identification mark (/1/, 822), or

b) issuing an approval certificate (/1/, 822-824), in which the new identification mark for the package is mentioned.

Supervision procedures mentioned in sections 3.2 b) and c) are applied depending on the future use and ownership of the packaging and on the place where actions are taken.

STUK does not take the actions described in section 3.2 for packages approved by a foreign authority, if these actions are taken abroad with methods which are approved by a competent foreign authority, and of which STUK is informed.

5 INSTRUCTIONS

The following documents have to be presented to STUK before a packaging is placed in service:

- instructions for use and handling
- instructions for periodic inspections
- instructions for other measures considered necessary for the safe use and handling of the packages
- instructions for inspections that are performed before the first shipment (/1/, 738) and before each shipment (/1/, 739).

6 EXCEPTIONS

The above requirements do not apply to packages containing minor amounts of radioactive materials in accordance with chapter III in reference 1. However, the regulations in paragraph 318 of the reference have to be taken into account in packing nuclear materials.

Reference 1, section VI sets forth special requirements for nuclear materials. These requirements are not applied

in cases listed in paragraphs 601 a)...g) but then the other applicable rules of reference 1 shall be followed.

On request, STUK gives more accurate instructions for cases where, according to the regulations of reference 1, an approval of a national authority would not be necessary.

7 REFERENCES

1 Regulations for the Safe Transport of Radioactive Materials, 1973 Revised Edition (As Amended) IAEA, Safety Series No 6, Vienna 1979.

2 Decision of the Ministry of Communications on the carriage of dangerous goods by road, 610/78 and its amend ments.

3 Regulations concerning carriage of dangerous goods by rail (VAK), VR 2696/79,1979, Finnish State Railways.

4 International Maritime Dangerous Goods Code, (IMDG-Code), IMO,1981, London.

5 The Safe Transport of Dangerous Goods by Air, ICAO, 1981.

6 Guide YVL 6.1 "Licensing of Nuclear Fuel and Other Nuclear Materials"

7 Guide YVL 6.5 "Supervision of Nuclear Fuel Transports".

In the event of any differences in interpretation of this guide, the Finnish version shall take precedence over this translation.

REGULATIONS CONCERNING VARIOUS TRANSPORTATION MODES

The regulations concerning the various transportation modes are as follows:

a) Road transports

- Act on carriage of dangerous goods by road, 510/74 and amendment 346/79
- Decree on carriage of dangerous goods by road, 861/74 and amendment 28/79
- Decree on the enforcement of the European Agreement concerning the International Carriage of Dangerous Goods by Road, 289/79 (Enforcement of the ADR-agreement from 28.3.1979) and amendment 185/82
- Decision of the Ministry of Communications on the carriage of dangerous goods by road, 610/78 and amendments 344/79, 995/79, 218/82 and 935/83
- European Agreement concerning the International Carriage of Dangerous Goods by Road, ADR and Appendix A.6, Geneva

b) Railway transports

- Decree on railway transports 714/75
- Regulations concerning carriage of dangerous goods by rail (VAK), VR 2696/79, 1.10.1979, Finnish State Railways

- Act on the acceptance of certain regulations in the international conventions concerning carriage of passengers and luggage (CIV) and carriage of dangerous goods by rail (CIM), 147/75
- Decree on the enactment of the international conventions concerning carriage of passengers and luggage (CIV) and carriage of dangerous goods by rail (CIM), 148/75
- The International Convention concerning the Carriage of Dangerous Goods by Rail (CIM), Annex 1 (RID)
- Regulations concerning carriage of dangerous goods in the railway traffic in Finland and in the USSR, VR 4785/77, 1.7.1977, Finnish State Railways
- Regulations concerning safe carriage of spent nuclear fuel in the direct railway traffic from Finland to the USSR, 8.7.1981, Finnish State Railways

c) Sea transports

- Maritime Act 167/39
- Decree on transportation of dangerous goods on a seagoing vessel, 357/80
- Decision of the National Board of Navigation on transport of dangerous goods on a seagoing vessel 27.11.1980 (require that IMO's IMDG-code is followed after 1.1.1981)
- The International Maritime Dangerous Goods Code (IMDG-code) including Annex 1 concerning packaging and Amendments 1-19
- Decision of the National Board of Navigation on transport of dangerous goods on Ro/Ro-ships in restricted traffic in the Baltic, 1.10.1980

d) Air transports

- Aviation Act, 595/64
- Aviation Decree, 525/68
- The Safe Transport of Dangerous Goods by Air, Annex 18 to the Convention on International Civil Aviation (ICAO), applied since 1.1.1984.