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Industry study on regulatory harmonisation of transport frames

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Abstract

Transport frames are used to secure transport packagings (casks) to conveyances. The IAEA Regulations for the Safe Transport of Radioactive Material (SSR-6 2012) states “Any features added to the package at the transport that are not part of the package shall not reduce its safety”.

Industry has noted that there are different views on approaching about how transport frames during transport and handling, where they exist, should be taken into account in the safety design. The World Nuclear Transport Institute (WNTI) has followed this subject for a long while and WNTI investigated domestic regulations, guidelines and standards on spent nuclear fuel transport frames under all transport modes (land, sea and air) in several countries transporting nuclear fuel, namely, the United States of America, the United Kingdom, France, Germany and Japan, in 2014.

The study was carried out according to a detailed inquiry form by experts of these countries. In this study, transport frames don't include lashing materials (rope, cable, etc.).

Main results are as below;

- Transport frames are not parts of transport packages and not parts of conveyances basically in all countries. However, transport frames expected of some safety functions such as shock absorbing functions are considered parts of packages.
- Transport frames are not within the regulatory control explicitly.
- The transport frames are considered features added to packages and they must be demonstrated that under normal and accident conditions the integrity of the packages is not reduced.
- Transport operators are in charge for the safe transport.
- Transport frames are required the safety functions supporting packages basically.

In conclusion, all regulations on transport frames in the countries are similar to each other and they are almost harmonised.

Introduction

1. About WNTI

The World Nuclear Transport Institute (WNTI) was founded in 1998 to represent the collective interests of the nuclear transport industry, and those who rely upon it in the safe, se-

cure, efficient and reliable packaging and transport of radioactive materials. Through its non-governmental status WNTI supports the work of key intergovernmental organisations in promoting a harmonised international transport safety regime.

2. Transport Frames

Transport frames are used to secure transport packagings to conveyances (e.g. trains, ships and trailers). In this study, transport frames don't include lashing materials (rope, cable, etc.), when packagings are directly secured to conveyances. The IAEA Regulations for the Safe Transport of Radioactive Material (SSR-6 2012) states "Any features added to the package at the transport that are not part of the package shall not reduce its safety (para 612) ".

3. Purposes of this study

Industry has noted that there are different views on approaching about how the transport frames during transport and handling, where they exist, should be taken into account in the safety design.

WNTI has followed this subject for a long while and WNTI investigated domestic regulations, guidelines and standards on spent nuclear fuel transport frames to perceive whether there are significant differences or not.

Investigation

1. Procedures of the investigation

We selected target countries which transport nuclear spent fuel and have experts from the WNTI members, namely, the United States of America, the United Kingdom, France, Germany and Japan. And we prepared a detailed inquiry form to prevent from missing any survey item.

2. Results of the investigation

As a result of the investigation, we collected the answers from the experts as below.

2.1 The United Kingdom

The UK regulations are based on the IAEA regulations and the modal regulations such as ADR (European Agreement Concerning the International Carriage of Dangerous Goods by Road), RID (Regulations Concerning the International Transport of Dangerous Goods by Rail) and INF Code (International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on Board Ships) and so on.

Generally, transport frames are not parts of transport packages and not parts of conveyances. Transport frames are not within the regulatory control explicitly. Meanwhile, to comply

with SSR-6 2012 para 612, the transport frame is considered a feature added to the package and it must be demonstrated that under normal and accident conditions the integrity of the package is not reduced. Otherwise, a weak link mechanism will be required to prevent this.

Transport frames are required the safety functions supporting packages. Transport operators are in charge for the safe transport. Therefore, transport operators take responsibility for verifying transport frames as meeting the modal regulations. Practically, some parameters given in Transport Container Standardisation Committee (TCSC 1006) are applied and some acceptance criteria for structural designs are generally derived from the standard for the design of cranes BS 2573.

2) France

The French regulations are based on the IAEA regulations and modal regulations such as ADR, RID, ADN (European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways), INF Code and so on.

Generally, transport frames are not parts of transport packages and not parts of conveyances. Transport frames are not within the regulatory control explicitly. Meanwhile, the ASN Applicant Guide for the French Approvals (Edition 2013) defines the limits of the package and what means as features of the package, that is, “Additions to the package having a potential mechanical impact to take into account are the ones which are attached to the package or placed in the contact or the quasi-contact of the package (equipments to be considered are functional sets of “first level”, for example a set of 4 arms support of trunnions or a rack in the compartments of which are positioned packages)”. To comply with SSR-6 2012 para 612, transport frame is considered a feature added to the package and it must be demonstrated that under normal and accident conditions the integrity of the package is not reduced. Otherwise, a weak link mechanism will be required to prevent this. The weak point needs to resist to the routine conditions of transport. The mechanical impact to the package for the acceleration generated at the break point of the weak point of the transport frame needs to be evaluated. Depending on the drop configuration, any part of the transport frame which may perforate or impact significantly safety functions of the package needs to be assessed.

Transport frames are required the safety functions supporting packages. Transport operators are in charge for the safe transport. Therefore, transport operators take responsibility for verifying transport frames as meeting modal regulations. For the routine conditions of transport, the ASN guide advices to take into account the accelerations in the table IV-1 of the TS-G-1.1 (Edition 2008) for the evaluation of the mechanical strength of the attachment systems belonging to the package or for the stowing devices. Other references can be used then justified.

3) Germany

The German regulations are based on the IAEA regulations and modal regulations such as ADR, RID, AND and so on.

The German Competent Authority (CA) published their interpretation of the “Aspects of safety assessment for package designs with additional equipment components”. The conclusion is “a transport frame, which is attached to the package during the entire duration of the transport, including loading and unloading of the conveyance, has to be considered as part of the package.” Notwithstanding, transport frames are under limited regulatory control in Germany. For packages requiring CA approval, the CA (German Institute for Material Testing and Properties, namely, BAM) assess within the package approval procedure the interactions of the transport frame with the package (para 231 and 232 in connection with para 612 of SSR-6 2012). However, the CA assessment does not include the successful performance and safe design of the transport frame under routine conditions of transport. This is the responsibility of the transport operators as part of the tie-down. The stresses due to the loads of routine transport conditions are calculated with packages in transport frames. Transport frames themselves have to be designed to withstand such conditions. The focus of safety is related to packages. Therefore the safety assessment is linked to the securing during routine conditions of transport and the release of packages during normal and accident conditions of transport from transport frames. For all transport frames the separation has to be shown when accelerations between routine and normal conditions occur. Otherwise the regulatory test conditions have to be performed for packages with transport frames.

Transport frames are required the safety functions supporting packages. Transport operators are in charge for the safe transport. Therefore, transport operators take responsibility for verifying transport frames as meeting modal regulations. Practically, in order to ensure the safety of transport frames, transport operators rely on the German Institute for Standardisation (DIN), Eurocode 3, European Standards (EN), the road traffic regulation (StVO) in connection with such a guideline VDI2700 “Securing of loads on road vehicles”, German accident prevention regulations (UVV), the International Union of Railways (UIC) loading guidelines, the Code of Practice for Packing of Cargo Transport Units (CTU Code), the Code of Safe Practice for Cargo Stowage and Securing (CSS Code) and so on.

4) The United States

The US has original structure of regulations. Therefore the US regulations and the IAEA regulations do not correspond necessarily. The U.S. Nuclear Regulatory Commission (NRC) has regulations, 10 CFR Part 71 (Title 10, U. S. Code of Federal Regulations, Part 71) and the U.S. Department of Transportation (DOT) has regulations, 49 CFR Part 173 for radioactive material transport.

The definition of “packaging” in both of in NRC regulations and DOT regulations states that the “vehicle, tie-down system, and auxiliary equipment may be designated as part of the packaging.” However, the design and safety assessment of transport frames is generally not specifically addressed in Safety Analysis Reports for transport packages. The definition of package in 10 CFR 71.4 (and 49 CFR 173.403) actually differs from SSR-6 2012 para 231. However, the same as package means the packaging together with its radioactive contents as presented for transport. NUREG/CR-6407 (Classification of Transportation Packaging and Dry Spent Fuel Storage System Components According to Importance to Safety) classifies package components as Category A (critical to safety), Category B (major safety impact) and Category C (minor safety impact). These safety classifications are used to apply a graded Quality Assurance (QA) approach for the components. This document generally categorises lifting and tie-down hardware as Category B safety classification and package frames as Category C safety classification. NUREG/CR-6407 does note that transport frames used as an impact limiter should be classed as Category A. The requirements of SSR-6 2012 Para 612 do not appear to be contained in NRC regulations. However, 10 CFR 71.45 (Lifting and tie-down standards for all packages) required that any lifting attachment and tie-down device that is a structural part of a package must be designed so that failure of any lifting device and tie-down device under excessive load would not impair the ability of the package to meet any other safety requirements for the package.

Transport frames are required the safety functions supporting packages. Transport operators are in charge for the safe transport. Therefore, transport operators take responsibility for verifying transport frames as meeting the transport regulations such as 49 CFR 177 (Carriage by Public Highway), 49 CFR 174 (Carriage by Rail), 49 CFR 176 (Carriage by Vessel) and 49 CFR 175 (Carriage by Aircraft). In addition, 10 CFR 71.45 (Lifting and tie-down standards for all packages) provide the requirements for lifting attachments and tie-down devices.

5) Japan

Transport packages (including trunions) are regulated by the Nuclear Regulation Authority (NRA) and conveyances including tie-down system on them are regulated by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). Japanese regulations require that transport packages shall not move and fall down during transport.

Transport frames are not parts of transport packages and not parts of conveyance. Transport frames are not within the regulatory control explicitly. Meanwhile, the regulations require that transport frames shall not reduce safety of the transport packages. Related to the requirement, there is an example that a full scale drop test for a transport packaging with a transport frame was demonstrated to confirm this (by the Central Research Institute of Electric Power Industry (CRIEPI)).

Transport frames are required the safety functions supporting packages. Transport operators are in charge for the safe transport. Therefore, transport operators take responsibility for verifying transport frames as meeting the transport regulations such as the Regulation for Vehicle Transport of Nuclear Material, the Regulation for the Carriage and Storage of Dangerous Goods by Ships and The Generic Letter on “Items to be described in the Transport Plan attached to the Application for the Confirmation of Radioactive Package Transport” and so on. In addition, Road Transport Bureau of MLIT issued “Implementation Guideline of Technical Standards on Safety of Loading Method for Vehicle Transportation of Radioactive Materials” to support the regulation. For the transport packages requiring CA approval, the CA confirms safety of tie-down for transport measures including safety design of transport frames at inspections of transport methods before shipment. Practically, in order to ensure the safety of transport frames, transport operators rely on the Atomic Energy Society of Japan (AESJ) standard “Standard on safety design and inspection for spent fuel, mixed oxide fuel and high-level radioactive waste transport packagings”.

Consideration

The results of the investigation are organised as below;

- Transport frames are not parts of transport packages. However, transport frames expected of some safety functions such as shock absorbing functions are considered parts of packages.
- Transport frames are considered features added to packages and they must be demonstrated that the integrity of the package is not reduced under transport conditions. Otherwise a weak link mechanism will be required to prevent this.
- Tie-down design is regulated by the modal regulations such as ADR, RID, ADN, INF Code or domestic regulations.
- Structural design of transport frames is not regulated. Industry refers international standards or domestic standards.
- Industry has responsibility on tie-down basically.

The US has original structure of regulations, so that some of requirements are different from those of other countries. Notwithstanding, in all countries we investigated, including the US, transport frames are still not parts of transport packages, and there is no deviation from “Any features added to the package at the transport that are not part of the package shall not reduce its safety”.

We consider all regulations on transport frames in the countries are similar to each other and they are almost harmonised. WNTI is keeping on following this subject. Furthermore, WNTI will propose interpretation of the requirement if necessary, for example, if some com-

petent authorities require extra considerations for drop test conditions to demonstrate no reduction of safety during their review for transport package approval.

Conclusions

WNTI investigated domestic regulations, guidelines and standards on spent nuclear fuel transport frames under all transport modes (land, sea and air) in several countries transporting spent nuclear fuel to perceive whether they are harmonised or not. We found transport frames are not parts of packages and there is no deviation on SSR-6 2012 para 612 “Any features added to the package at the transport that are not part of the package shall not reduce its safety”. However, WNTI is keeping on following this subject. Furthermore, WNTI will propose interpretation of the requirement if necessary, for example, if some some competent authorities require extra considerations for drop test conditions to demonstrate no reduction safety during their review for transport package approval.

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References

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