

**4022            Review of Freight Container Related Provisions  
                  in the IAEA Transport Regulations**

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**Abstract**

In the 2012 Edition of the IAEA Transport Regulations (SSR-6, the Regulations), the requirement of “a permanent enclosed character” has been deleted from the definition of the freight containers (para. 223). Consequently, open-type containers, which may not have a roof or side walls, used for the transport of radioactive material are to be defined as freight containers. Since open-type containers may not have a roof or side walls, requirements in the Regulations such as listed below need interpretation to be applied with considerations of consistency among the countries.

- Categorization (small/large freight containers) based on its internal volume
- Determination of the Transport Index (TI) by the measurement
- Application of exclusive use and TI/CSI (Criticality Safety Index) limits based on the freight container definition
- Labels and placards to be affixed on side walls

From the viewpoint of consistency between SSR-6 and United Nation Recommendations on the Transport of Dangerous Goods – Model Regulations (UNOB) and other transport modal regulations, incorporation of conformance with the International Convention for Safe Containers (CSC) to the definition of freight containers in SSR-6 was also considered. When incorporated, the following changes were foreseen.

- Simplification of freight container related provisions in SSR-6 and other modal regulations.
- No “small freight container” in SSR-6 and other modal regulations.
- Containers without CSC conformance would be defined as overpacks.

Change proposals related to freight containers were submitted to the 2015 initiated review cycle of SSR-6 by Japan who led the Corresponding Group on Freight Containers. The proposals were discussed in TRANSSC31 and approved except the introduction of CSC since its consequences were unclear. As a result, following proposals have been forwarded to the revision cycle.

Regulations (SSR-6): Configuration of labels, placards to be consistent with UNOB

Advisory Material (SSG-26): Interpretations on the internal volume, TI determination by the measurement and how to fix labels and placards to open type freight containers.

## Introduction

At the time of the publication of the first Edition of IAEA Transport Regulations (the Regulations) in 1961, the new movement “containerization” gained momentum in the field of maritime transport, and transformed aspects of modal and intermodal transport considerably. Following the movement, the International Convention for Safe Containers was adopted at a conference jointly convened by the United Nations and IMO in 1972, and the definition of the containers were determined.

*Container* means an article of transport equipment:

- (a) of a permanent character and accordingly strong enough to be suitable for repeated use;
- (b) specially designed to facilitate the transport of goods, by one or more modes of transport, without intermediate reloading;
- (c) designed to be secured and/or readily handled, having corner fittings for these purposes;
- (d) of a size such that the area enclosed by the four outer bottom corners is either:
  - (i) at least 14 sq. m. (150 sq. ft.) or
  - (ii) at least 7 sq. m. (75 sq. ft.) if it is fitted with top corner fittings;

The term *container* includes neither vehicles nor packaging; however, containers when carried on chassis are included.

The Regulations incorporated the definition of freight containers as follows in the 1973 Edition [1], together with some technical provisions on the freight containers for their categories, labelling and placarding, Transport Index (TI), and TI/CSI limits.

### Freight container

118. Freight container shall mean an article of transport equipment designed to facilitate the carriage of goods by one or more modes of transport without intermediate reloading. Small freight containers are those which have either any overall outer dimension less than 1.5 m, or internal volume of not more than 3.0 m<sup>3</sup>. All other freight containers are considered to be large freight containers. Each freight container shall meet the following requirements:

- (a) It shall be of a permanent enclosed character and rigid and strong enough for repeated use.
- (b) It shall be fitted with devices facilitating its handling, particularly in transfer from one mode of transport to another.

It should be noted that, from the beginning, there was a distinction between large freight containers and small ones and requirement of a permanent enclosed character in the definition. In spite of the incorporation of technical provisions on freight containers, their technical background or justifications has not been given in the Advisory Material (paras A-130.1 and 130.2 of Ref. [2]) or the Explanatory Material (para E-130 of Ref. [3]).

The definition and requirements on freight containers were established more or less in the current

shape in the 1985 Edition of the Regulations, and only minor changes have been employed since then. In 1996 the Advisory Material and Explanatory Material were merged into one volume as the Advisory Material (the Guidance, currently, SSG-26 [4]) with the slightest information added. In recent several review and revision cycles of the Regulations and the Guidance, changes on the definition of freight containers have been constantly proposed in order to maintain consistency to UNOB. After continuous minor changes, the definition has settled as below in the 2012 Edition of the Regulations, SSR-6 [5].

*Freight container – small, large*

223. *Freight container* shall mean an article of transport equipment that is of a permanent character and accordingly strong enough to be suitable for repeated use; specially designed to facilitate the transport of goods, by one or other modes of transport, without intermediate reloading, designed to be secured and/or readily handled, having fittings for these purposes. The term “*freight container*” does not include the *vehicle*.

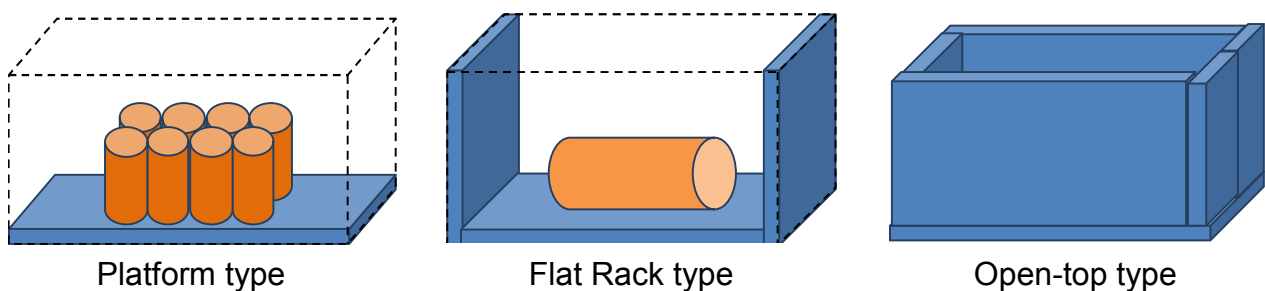
A *small freight container* shall mean a *freight container* that has an internal volume of not more than 3 m<sup>3</sup>. A *large freight container* shall mean a *freight container* that has an internal volume of more than 3 m<sup>3</sup>.

The vital change of the definition of freight containers in the 2012 Edition from the previous Editions was the elimination of “a permanent enclosed character”. This does not mean that open-type freight containers can newly be used for the transport of radioactive material since they have been used for radioactive material transport for a long time without being defined as freight containers, but that they will be defined as freight containers under the 2012 Edition of SSR-6 and shall be complied with the requirements on freight containers.

### Issues in Use of Open-type Freight Containers under SSR-6

The followings are typical open-types of freight container (see Fig. 1):

- Platform: only the base with no side walls nor a roof
- Flat Rack: a platform with four corner posts or two end framed that may be collapsible.
- Open-top: without roof or the roof is removable
- “Platform” and “Flat Rack” may be called as “open-sided”.



**Fig. 1 Typical Configurations of Open-type Freight Container**

In the 29th Meeting of the Transport Safety Standards Committee (TRANSSC29) in November 2012, before the enforcement of radioactive material transport regulations based on 2012 Edition of SSR-6 in the Member States, Japan pointed out issues in the use of open-type containers such as:

- How to categorize open-type freight containers to small/large ones by their internal volumes, while open-type containers may not have internal volume?
- Is the exclusive use applicable? It is applicable only to large freight containers.
- How can labels and/or placards be fixed on 4 sides? Some open-type containers do not have 4 sides. Do we need labels or placards when we can see labels on the packages on the containers?
- How can we determine the TI of open-type freight container based on measurement? The radiation level at 1 m from the container surface should be measured, but there may be no surface in a certain directions. Then, how can we apply TI limits for freight containers?

And, TRANSSC29 recommended to form a corresponding group to resolve the issues in international consensus.

### **Proposals to Resolve the Issues**

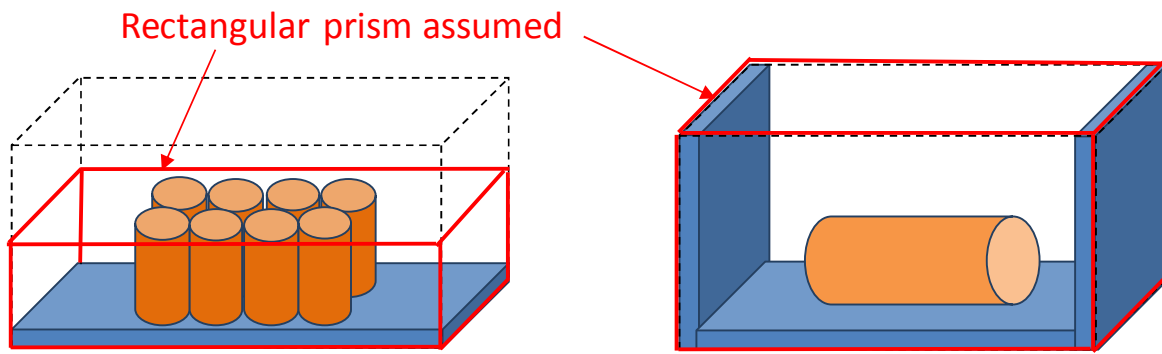
To follow the recommendation from TRANSSC29, Japan led a corresponding group on freight containers, consisted with experts from Brazil, Canada, Germany, Japan, Russia, International Maritime Organization (IMO) and World Nuclear Transport Institute (WNTI). Under the policy to minimize regulatory text changes but to provide interpretations and practical use of provisions in the Guidance, the group provided a set of change proposals to the regulatory and guidance text related to freight containers to the 2015 review cycle. Those proposals were elaborated in TRANSSC30 Meeting in June 2015 and the Extra-ordinary TRANSSC Meeting in September, and approved to be incorporated into the next editions of SSR-6 and SSG-26 by TRANSSC31 Meeting in November 2015.

The draft of revised SSR-6 is now under the 120-day review by the Member States, and is expected to be published as the 2018 Edition of the Regulation. Revision process of SSG-26 is scheduled to be proceeded a half year behind that of SSR-6. Through revisions of transport modal regulations, such as the ICAO Technical Instructions, those changes will be mandatory in Member States on 1st January 2021.

Major proposed changes are as follows.

#### **Volume of Open-type Freight Containers**

To categorize freight containers as small or large, the internal volume of container shall be defined. For this purpose, a “virtual volume”, i.e., the volume taken up by the container structure and its load, is proposed to be used as the internal volume. It is the volume of circumscribed rectangular prism (parallelepiped) as shown in Fig. 2. An open-type container with the volume not more than 3 m<sup>3</sup> is categorized as a small freight container, and cannot be used for the exclusive use.



**Fig. 2 Definition of the Volumes of Open-type Freight Containers**

This consideration is incorporated to SSG-26 together with explanations on container types as below.

223.1. The methods and systems ... under para. 629. **Types of freight containers include:**

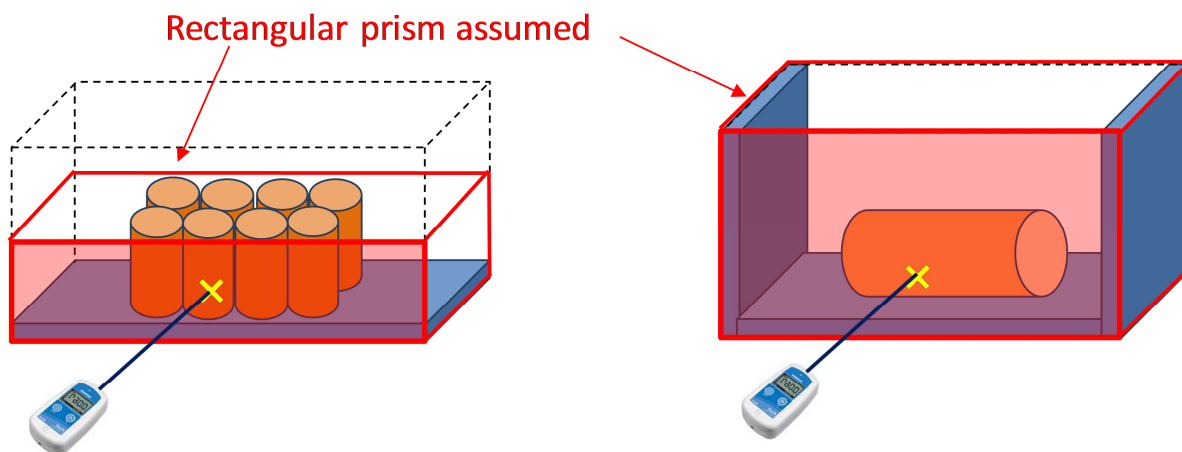
- **Standard or Dry-Cargo: completely enclosed with a base, side walls and a roof,**
- **Open-top: with a removable roof (canvas or metal) or without a roof,**
- **Platform: only the base with no side walls or a roof,**
- **Flat Rack: a platform with four corner posts or two end frames that may be collapsible.**

**“Platform” and “flat rack” may be called as “open-sided”.**

**223.1bis For open-sided or open-top freight containers, the larger of the volume of a rectangular prism encompassing the container structure or the load may be used as the internal volume.**

### Determination of Transport Index (TI)

The TI of freight container can be determined as the sum of the TIs of all the packages contained, or by direct measurement of radiation level at 1 m from the surface of the freight container. Although there may be no appropriate rigid surface for open-type freight containers, hypothetical surface can be considered as same as to define the volume of open-type containers.



**Fig. 3 Radiation Level Measurement for Open-type Freight Containers**

The idea of such surface has already incorporated to the open vehicle as seen in para. 573 of the 2012 Edition of the Regulations. Then, the TI of open-type container may be determined by direct measurement of radiation level as shown in Fig. 3.

This interpretation has been added to SSG-26 as below. Once TI has been determined, limits on conveyance TIs, and CSIs (Criticality Safety Indexes) as prescribed in the Regulations can be applied to open-type freight containers.

523.1. The TI is an indicator of the radiation level ... may be considered as zero:

(d) The TI for a freight container, tank, unpackaged LSA-I material or unpackaged SCO-I is the maximum radiation level at 1 m from the external surface of the load, expressed in mSv/h and multiplied by 100 and then further multiplied by an additional factor which depends on the largest cross-sectional area of the load. This additional multiplication factor, as specified in Table 7 of the Transport Regulations, ranges from 1 up to 10. It is equal to 1 if the largest cross-sectional area of the load is 1 m<sup>2</sup> or less. It is 10 if the largest cross-sectional area is more than 20 m<sup>2</sup>. ~~However, as noted previously,~~ The TI for a freight container may be established alternatively as the sum of the TIs of all the packages in the freight container. **For an open-sided or open-top freight container, surfaces of a rectangular prism encompassing the container structure and the load can be considered as the surfaces of the load, and the largest cross-sectional area of that prism is used to determine the additional multiplication factor in Table 7.**

### Labelling and Placarding

Labels shall be affixed on the outside of all four sides of a freight container, and placards shall be affixed to each side wall and to each end wall of the large freight container, where enlarged labels are permitted as an alternative to the placards. Fig. 4 shows an example that Placards are affixed to each side and end wall somehow.



**Fig. 4 Example of Placards affixed to an Open-type Freight Container**

Such practices are advised in SSG-26 as follows.

Labelling:

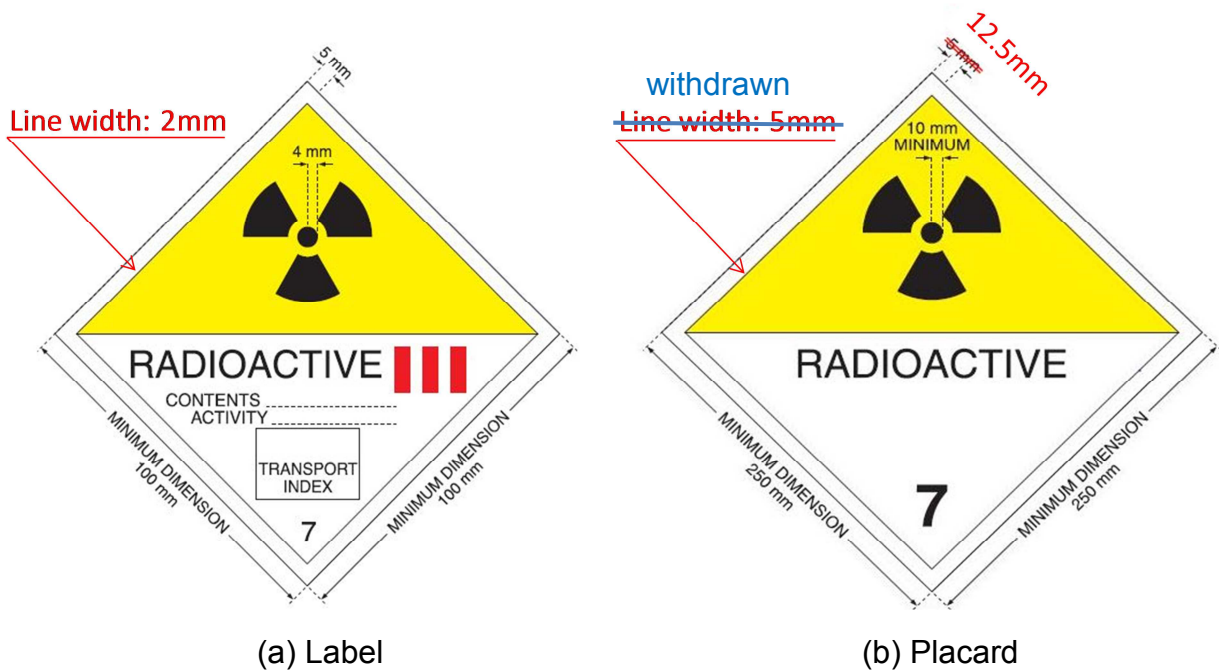
539.1. For tanks or freight containers, because of the chance that the container could be obscured by other freight containers and tanks, the labels need to be displayed on all four sides in order to ensure that a label is visible without having to be searched for, and to minimize the chance of its being obscured by other units or cargo. **For an open-sided freight container, labels should be affixed to the side of the platform or corner post, or to a plate mounted to the freight container.**

Placarding:

**543.2 For an open-sided freight container, placards should be affixed to the side of the platform or corner post, or to a plate mounted to the freight container.**

The original proposal included “When packages that have labels displayed on them are loaded into an open-sided freight container and those labels are visible and legible from outside the freight container boundaries, the labels on the packages may be considered displayed on the freight container” in para.539.1. However, it was declined since caution was raised that the TIs and CSIs written on the labels on the packages and on containers are normally different. This is one of the different points from dangerous goods of other classes.

To enhance consistency to UNOB, regulatory changes on dimensions of label and placard were proposed. Proposals to prescribe the minimum width of the line inside the edge forming the diamond of labels as 2 mm, and the width between the edge and diamond line of placards as 12.5 mm have been accepted by TRANSSC, but the line width of placard as 5 mm was withdrawn as shown in Fig.5, since it is not defined in UNOB.



**Fig. 5 Proposed Changes on Label and Placard**

## Introduction of CSC conformance to the Definition of Freight Container

As shown in below, the definition of freight containers in UNOB includes the conformance to the International Convention for Safe Containers (CSC) to be the major difference from SSR-6 and UNOB in the definitions.

*Freight container* means an article of transport equipment that is of a permanent character and accordingly strong enough to be suitable for repeated use; specially designed to facilitate the transport of goods, by one or other modes of transport, without intermediate reloading; designed to be secured and/or readily handled, having fittings for these purposes, and approved in accordance with the International Convention for Safe Containers (CSC), 1972, as amended. The term “freight container” includes neither vehicle nor packaging. However a freight container that is carried on a chassis is included. For freight containers for the transport of Class 7 material, a freight container may be used as a packaging.

In addition: Small freight container means a freight container that has an internal volume of not more than 3 m<sup>3</sup>. Large freight container means a freight container that has an internal volume of more than 3 m<sup>3</sup>.

There have also been proposals to introduce CSC conformance into the freight container definition in the Regulations in 2013 review cycles. In the current review/revision cycle, consequences to introduce CSC conformance were closely investigated. The following changes in the Regulations were pointed out when CSC conformance was taken in the definition of freight containers.

- There will be no “small freight containers” due to the dimensional limitations in CSC.
  - Containers compliant with CSC shall have a size such that the area enclosed by the four outer bottom corners is either at least 14 m<sup>2</sup>, or, at least 7 m<sup>2</sup> if it is fitted with top corner fittings, then its internal volume practically exceeds 3 m<sup>3</sup>.
  - Words “small” and “large” in front of freight container in the Regulations will be deleted.
  - All freight containers can be used for exclusive use, since there is no small freight container.
  - Conveyance loading limits for small freight containers will be deleted (Table 10 and 11).
- Container shaped enclosure or transport equipment that is not approved in accordance with the CSC (hereinafter referred as Other Container) will be classified as overpack (otherwise, new definition for such containers will be required).
  - Other Containers cannot be used for the exclusive use (para. 221).
  - Multiplication factors in Table 7 may not be applied to Other Containers (para. 523(b)).
  - Other Containers shall bear marking “OVERPACK” when the inside is not visible and identification of consignor and/or consignee (paras 531 and 532).
  - Other Containers shall display labels on two opposite sides, while freight containers on all four sides (para. 539)
  - Other Containers bear no placard (para. 543).



Discussion in TRANSSC was mainly focused on the deletion of small freight container without knowledge where the technical requirements on such containers came from, and a certain impacts was envisaged since small freight containers are actually used in some Member States. Another concern was that Other Containers may cause considerable confusion between two kinds of container shaped transport equipment have different requirements, respectively. Hence, TRANSSC concluded not to introduce CSC conformance at this moment due to unknown consequences.

### **Further Issues**

An urgent issue related to open-type freight container is inconsistency in the International Maritime Dangerous Goods (IMDG) Code. In the tables under paras 7.1.4.5.3.1 (TI limits) and 7.1.4.5.3.4 (CSI limits) of current IMDG Code (Amdt. 37-14), large freight containers are specified as “large freight containers (closed containers)”. This implies that no packages containing radioactive material loaded on open-type freight containers can be accommodated on seagoing vessel. Before the 2012 Edition of the Regulations came in force, radioactive material packages could be transported by sea on open-type containers as they were not classified as freight containers. Although the intent of the text “(closed container)” added in Amdt.36-12 of IMDG Code is not clear, this inconsistency should be promptly resolved, since it negatively impacts shipments of radioactive material such as UF<sub>6</sub>.

One of important aspects in the review and revision of the Regulations is to promote consistency to the modal transport regulations including UNOB, and efforts towards it have been paid continuously. In order to fill the gaps among these regulations, intent of each provisions related should be studied and well understood, and consequences should be investigated when any change is proposed. Especially on SSR-6, technical background of prescriptions specific to radioactive material should be clarified and documented in the Guidance or other material such as the Technical Basis Document.

### **Conclusions**

In the 2012 Edition of the Regulations, open-type containers used for the transport of radioactive material are newly be defined as freight containers. Some issues in the application of the Regulations to such containers have been indicated, and they will be resolved by interpretations proposed in the revision of the Regulations and the Guidance underway.

### **Acknowledgement**

The authors thank efforts from experts of Member States and International Organizations who have participated in the discussion on proposed changes to SSR-6 and SSG-26, or reviewed and offered their comments to the proposals on freight containers.

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