Classification for Transportation Cask of Radioactive Materials

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1. Introduction

According to the regulations and guidelines for packaging and transporting of radioactive materials [1], [2], the design requirements and test requirements of the transportation cask of radioactive materials are different depending on the characteristics of contents. In this paper, a scheme to efficiently classify the types of the transportation cask is presented based on the (specific) activity and types of the radioactive materials.

2. Classification of Radioactive Material [3]

Before classifying the types of the transportation cask, characteristics of radioactive nuclide in the content should be checked first. In general, the characteristics are determined by defining the (specific) activity of the radioactive nuclides. The basic explanations are as following subsections 2.1 to 2.4.

Fig. 1 Transportation casks of radioactive materials

Note that, detailed descriptions to determine the types of radioactive materials are illustrated in [1], [2].

2.1 Excepted material

Excepted material is composed of the radioactive materials that have a very small quantity of activity that would present insignificant hazards in the event even when the contents are released. Representatively, radio-pharmaceuticals for medical use are an example of an excepted material.

2.2 Low specific activity (LSA) material

Low specific activity (LSA) material is radioactive material that has a low specific activity (activity per unit mass). Depending on the specific activity values, LSA is divided into LSA-I, LSA-II, LSA-III. Representatively, uranium, thorium ores and low level radioactive wastes are examples of a LSA material.

2.3 Surface contaminated objects (SCO)

Surface contaminated object (SCO) is a solid object which doesn't contains radioactive in the content, however, the radioactive material is distributed on its surface. Depending on the levels of fixed and non-fixed contamination, SCO is divided into SCO-I, SCO-II. Representatively, items with decommissioning of nuclear power plant are examples of a SCO material.

2.4 Fissile material

Fissile material includes the capability of undergoing nuclear fission. Therefore, additional consideration and requirement for assuring the nuclear criticality safety should be required during transportation.

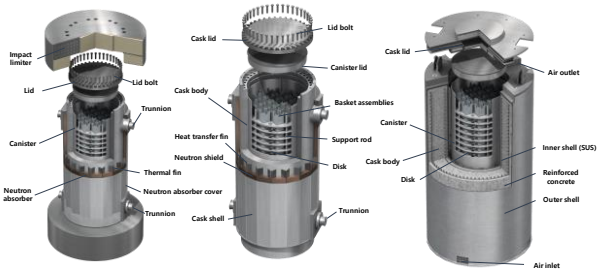

Fig. 2 Examples of the transportation cask: KORAD-21

3. Classification of Transportation cask

Based on the regulations and guides [1], [2] and the classification of the radioactive materials mentioned in the section 2, the transportation cask which treats the radioactive materials can be designed and tested to meet its purpose.

First of all, the transportation cask can be classified by types of radioactive materials as shown in Table 1. In Table 1, A1 and A2 indicate the activity value.

Table 1 Classification for transportation cask according to the types of radioactive materials

		Type L	Type IP			Type A	Type B	Type C
			IP-I	IP-II	IP-III			
Solid	Special form	1E-3A1	LSA-I SCO-I	LSA-II LSA-III (exclusive use) SCO-II	LSA-III	A1≦1	1≦A1	3E3≦A1 or 1E5≦A2
	Other form	1E-3A2				A2≦1	1≦A2	3E3≦A2
Liquid		1E-4A2	LSA-I (exclusive use)	LSA-I LSA-II (exclusive use)	LSA-II			

Table 1 summarizes the types of transportation cask according to the types of radioactive materials. Because the radioactive materials are determined by the (specific) activity values, the transportation cask also can be classified using the (specific) activity values. It is summarized in Fig. 3.

By using the Table 1 and Fig. 3, the transportation cask can be determined, and the tests to ensure the integrity of the cask can be performed according to the regulations [4]. It is schematically summarized in Fig. 4. Moreover, the overall procedure to determine the types of transportation cask is summarized in Fig. 5.

4. Conclusions

In this paper, the scheme to classify the transportation cask is confirmed based on the (specific) activity values of the radioactive materials of the content.

REFERENCES

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Requirements No. SSR-6, Regulations for the Safe Transportation of Radioactive Material, 2018.
[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Specific Safety Guide No. SSG-26, Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material, 2012.
[3] INTERNATIONAL ATOMIC ENERGY AGENCY, Safe Transport of Radioactive Material, Fourth Edition, 2006.
[4] U.S. Nuclear Regulatory Commission, 10 CFR Part 71, Packaging and transportation of radioactive material.

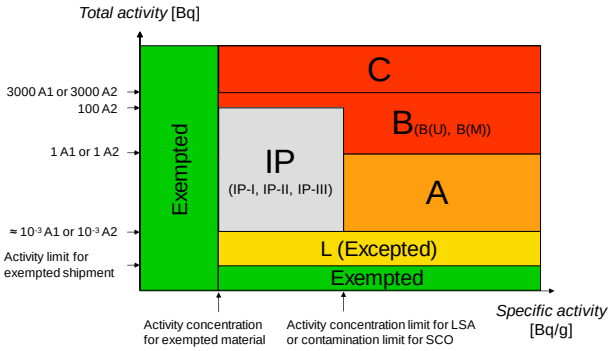

Fig. 3 Schematic description: Classification for transportation cask according to the activity and specific activity

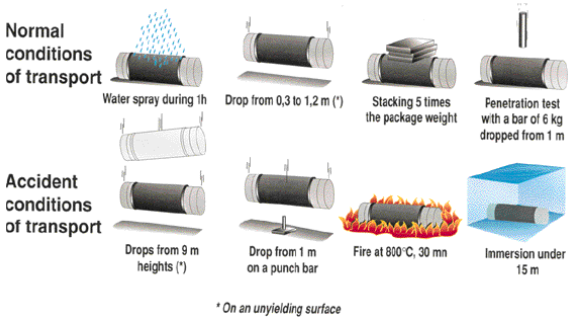

Fig. 4 Tests for the transportation cask

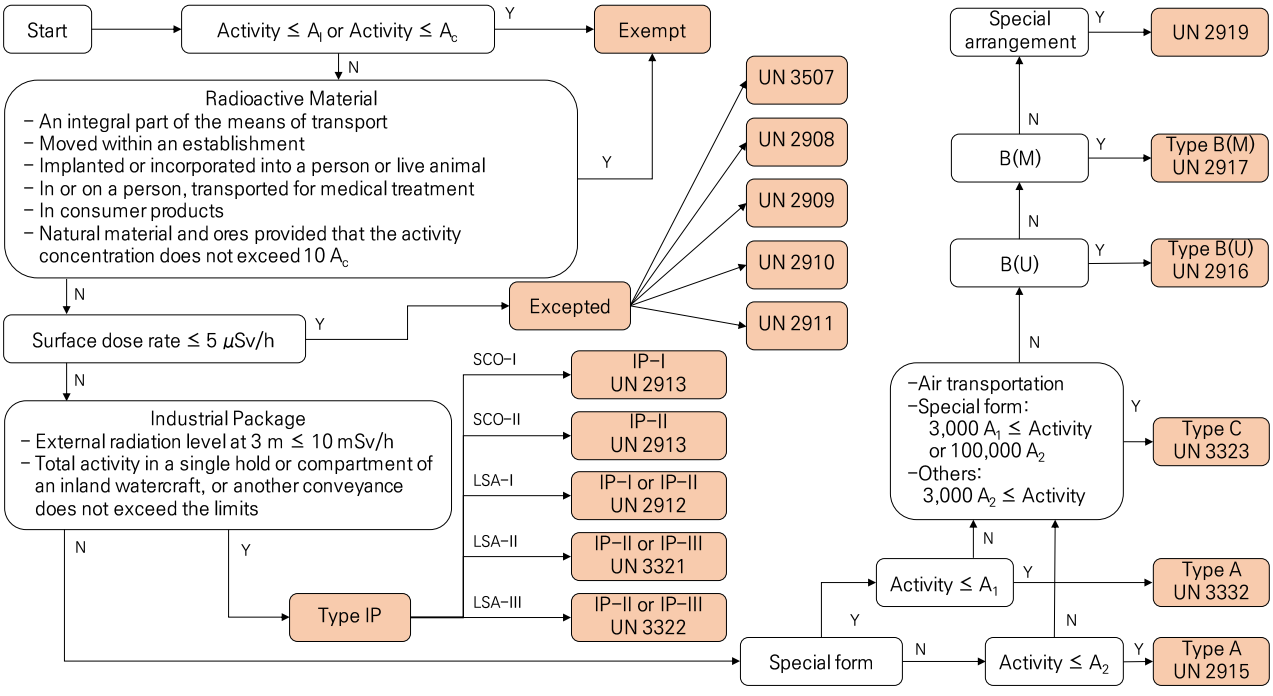

Fig. 5 Overall procedure to determine the types of transportation cask