

# Overview of Radioactive Waste Acceptance Criteria for Treatment and Management of Radioactive Waste

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## 1. Introduction

To use nuclear energy as a sustainable energy source, the treatment of radioactive waste generated from the nuclear fuel cycle including nuclear power plant (NPP) decommissioning is of great importance. The establishment of acceptance criteria for radioactive waste from decommissioning nuclear power plant is seemed to play a key role for safe radioactive waste disposal strategy. This research compiles the acceptance criteria of low-and-intermediate level radioactive waste in the world and provides various cases for radioactive waste disposal from decommissioning of NPP. These materials give information to use in the new radioactive waste repository. Appropriate waste acceptance criteria for radioactive waste are essential component of facility design and operation, and should be developed for different conditions. Physically suitable standards for waste disposal facilities should be ensured, and the repository is controlled with relevant monitoring and requirement for a long-term safe performance assessment.

Clearance levels and acceptance criteria specifications are under the authority of national regulators. Although several international organizations, like the IAEA— International Atomic Energy Agency and the EC— European Commission, have their own acceptance criteria, but the differences are still significant. In this study, the standard and differences of waste acceptance criteria in national and international for radioactive waste was arranged. Radioactive waste acceptance criteria were overviewed and compared, which can be used to support radioactive waste management for the wastes from the NPP decommissioning in Korea.

## 2. Research Procedure

### *2.1 International recommendation on radioactive clearance levels and acceptance criteria*

In general, radioactive waste acceptance criteria are related to the geological environment and repository condition. Although it is not possible to establish generally quantitative waste acceptance criteria because the geological environment and the engineering concept at each repository is different, the overview of international recommendation on radioactive clearance levels and acceptance criteria is required to oversee an evaluation of suitable long-term management in repository.

### *2.2 Derivation of radioactive waste acceptance criteria for radioactive waste in different countries*

The difference and derivation of criteria for radioactive waste acceptance in each country was investigated, overviewed, and arranged. The information of criteria in each country can be used as a general guideline to the repository.

### *2.3 Waste acceptance process*

Waste acceptance criteria have to be developed to specify the radiological, mechanical, physical, chemical and biological characteristics of waste packages and unpackaged waste that are to be processed, stored, or disposed in repository. For example, radionuclide type, content or activity limits, heat and radiation output, and the properties of the waste form and package type should be considered prior to disposal.

### 3. Results and discussion

Important parameters characterizing radioactive waste are shown in Table 1. [1]

Table 1. Important parameters characterizing radioactive waste (IAEA)

Package identifier or number
Type and version
Specification
Name of the conditioning facility and site
Date of conditioning
Content of raw waste and details
Details about the container
Details about the immobilizing matrix
Details about the capping matrix
Activity content
Does rate
Heat rating
Surface contamination
Overall package weight

In most countries which have radioactive waste repository, they have their own radioactive waste acceptance criteria depending on characteristics of repository. In order to meet the waste acceptance criteria, wastes need to have allowable activities and concentration of specific radionuclides, and use acceptable waste form and container requirements.

Table 2 shows the radioactive waste acceptance criteria in South Korea. Specific test methods for radioactive acceptance criteria are following the NRC method in USA [2].

Table 2. The radioactive waste acceptance criteria of South Korea

Classification	Test Item	Relative Standards	
		Hard solidification	Soft solidification
Structural safety	Compressive	KS F2405	KS F2351
	Immersion	NRC "Technical Position on Waste Form, Rev.1"	
	Thermal cycling	ASTM B553	
	Radiation	NRC "Technical Position on Waste Form, Rev.1"	
Leachability	Leaching	ANS 16.1 (or EPA 1315 Method)	
Free water measurement	Actual size	ANS 55.1	
	Specimen and waste	EPA Method 9095B (PAINT Filter Liquid Test)	

### 4. Conclusion

The information of radioactive waste acceptance criteria in nation/international can support to radioactive waste acceptance to repository in order to store safely. The purpose of waste acceptance criteria development is for the safe transportation, handling, storage, and disposal of waste packages, and it can help to develop the criteria for the decommissioning waste in Korea. Waste acceptance criteria are facility-specific and can be also different from the package type. It is the common responsibility for the repository operator and the national regulatory bodies to establish the appropriate acceptance criteria for various wastes to any type of disposal facility.

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### REFERENCES

- [1] IAEA, "Requirements and Methods for Low and Intermediate Level Waste Package Acceptability", IAEA-TECDOC-864, Vienna. 1996.
- [2] "The Report of Safety Assessment of Low- and Intermediate-level Radioactive Waste Disposal Facility in Korea", KORAD. 2011.