

FINAL DISPOSAL OF RADIOACTIVE WASTES  
- SAFETY AND QUALITY -

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ABSTRACT

A close relationship exists between safety and quality. Quality assurance is a vital instrument for ensuring the safety of final disposal. The quality assurance measures must be oriented with respect to the potential hazard encountered in different fields of final disposal. It is the responsibility of the Quality Assurance Department to ensure that quality is properly planned, created, and maintained to the extent necessary for final disposal.

INTRODUCTION

The following discussion is concerned with fundamental principles of safety and quality for the final disposal of radioactive waste materials.

Final disposal in a broader sense already begins with the handling of waste at the source. It continues through transport, accommodation in the final repository, back-filling of the final repository, and shutting down of the facility.

In a more specialised sense, final disposal encompasses the deposition of radioactive wastes in a final repository.

Radioactive materials destined for final disposal may originate from reprocessing plants, nuclear power stations, research centers, medical facilities, and industry. They occur in both liquid and solid form, and must be treated in correspondence with the conditions for final disposal. In the case of liquid radioactive wastes, injection into recipient geological formations underground is possible.

In conjunction with the present discussion, safety is defined as the objective which must be achieved in order to protect the facility, the operating personnel, and the environment against the hazards which might occur in connection with final disposal. Equipment and measures which ensure the necessary degree of safety are required for the purpose.

Safety and quality must be viewed in mutual relationship.

The concept of quality is understood differently in various fields. In the present case, the term quality refers to that property which a product or service must possess in order to satisfy the specified requirements.

Quality must be ensured; the assurance thereby involved encompasses all necessary organisational and technical measures.

Quality assurance comprises especially quality planning and quality inspection. Quality assurance also includes the responsibility of ensuring the compliance of the selected technical safety specifications with legal standards, regulations, and guidelines during the individual phases of final disposal.

Quality Assurance Fields

Under the provisions of the Nuclear Energy Act, the Physikalisch-Technische Bundesanstalt (PTB: Federal Physical-Technical Institution) is the governmental authority responsible for the final disposal of radioactive waste materials in the Federal Republic of Germany. The PTB has defined three fields of quality assurance for the planning, construction, operation, and shut-down of final repositories. Services and plant components are assigned as follows to these three fields, in correspondence with their technical significance for safety:

Quality assurance field 1:	Scientific investigations, analyses, experiments, tests, etc. within the framework of siting investigations, and for appraising the safety of the final repository
Quality assurance field 2:	Planning, construction, operation, and shut-down of plant sections, systems, and components for which quality assurance requirements are defined only by the conventional compiled specifications
Quality assurance field 3:	Planning, construction, operation, and shut-down of plant sections, systems, and components for which supplementary requirements are to be specified from the standpoint of nuclear technology

An essential protective goal for final disposal consists in planning, designing, and maintaining the long-term integrity of the geological structure in conjunction with the mine and the waste destined for final disposal therein, in such a way that the environment continues to be protected against ionising radiation after shut-down, too. Operations with this objective are assigned to quality assurance field 1.

For achieving this goal, the operations are conducted with great care. Numerous scientific and technical accomplishments have been achieved in the Federal Republic of Germany during the past twenty years. Thus, it can be expected that the safety objective will in fact be realized.

The following aspects are thereby emphasized:

- the investigation of possible sites, formations for final disposal, overlying and adjacent rock strata,
- the demonstration of long-term stability of the underground repositories, as well as
- back-filling and tamping of the final repositories.

For the assignment of plant components of the final repository to quality assurance fields 2 and 3, it must be ascertained whether or not requirements are to be imposed from the standpoint of nuclear engineering.

For those plant components which are not affected by such demands, quality assurance is defined in accordance with the requirements of the conventional compiled specifications.

For plant components assigned to quality assurance field 3, the demands imposed on quality assurance can be derived from the compiled specifications for nuclear engineering.

Thus, a specification of the structural and procedural organisation for quality assurance is required in writing on the part of both the ordering party and consignee, with the essential demands for

- the establishment of independent agencies for inspecting the documents, products, and activities,

- controlled procedures for the inspection and release of documents, as well as
- controlled procedures for the flow of information, revision of documents, identification of documents, and the documentation itself.

The implementation of these organizational measures is required for all phases of the

- planing and designing,
- procurement,
- manufacture,
- commissioning,
- operation, and
- shut-down

of plant components, in compliance with this field of quality assurance.

The selection of qualified consignees for the performance of all necessary services is thereby especially vital. For this purpose, a requirement profile formulated in a so-called quality assurance program is prepared. The demands thereby imposed must be fulfilled by the consignee.

Detailed, product-specific quality assurance measures for the manufacture of plant components are defined in the so-called procurement documents, for example, in the form of specifications. These measures refer to design and functional characteristics, material and structural testing and inspection, functional tests, commissioning, etc.

Furthermore, appropriate organizational and product-specific measures must be adopted for operation and shut-down.