

American Nuclear Society

solid radioactive waste processing system for light-water-cooled reactor plants

an American National Standard

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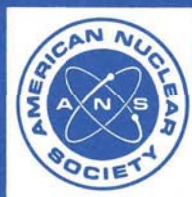
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for Light-Water-Cooled Reactor Plants**

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Foreword (This Foreword is not part of American National Standard for Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants.)

A major aspect of nuclear power plant operation is management of the solid radioactive waste generated as a by-product of commercial nuclear power. The development of facilities and equipment to handle and process solid radioactive waste has provided the nuclear industry with the capability to ensure that shipments of radioactive solid wastes are packaged in accordance with applicable regulatory requirements for transportation and disposal.

It is the purpose of this standard to identify acceptable practices and minimum requirements for the design, construction, and performance of solid radioactive waste processing systems; to reduce radiation exposures to operating personnel; and to reduce the probability of releases of radioactivity from accidents. It is not the intent of this standard to develop a "standard system" for processing solid radioactive waste; it is clearly recognized that there is a wide variety of systems and equipment in use, and others are continually being developed. In addition, the criteria specified in this standard are applicable to the in-plant solid radioactive waste processing system and the temporary (up to 30 days of anticipated normal waste generation) storage of packaged radioactive waste ready for shipment. This standard is not intended to address the interim storage (up to 5 years) of radioactive waste.

A number of designs, concepts, operating system histories, and practices were reviewed in the preparation of this standard. In addition, applicable U.S. Nuclear Regulatory Commission (NRC) Regulations, Standard Review Plans, Regulatory Guides, and Branch Technical Positions were considered. It is not intended that this standard limit the development or application of alternate methods of processing, provided that such alternate methods meet the design and performance requirements of this standard.

Various quantities of solid radioactive waste are generated by operation and maintenance activities and are dependent on several factors, including design conditions, type of equipment, equipment arrangements, and operating philosophy. The origin (input sources); the normal expected (averages); the maximum (short-term) quantities; and the method of handling, processing, and disposing of these wastes are the subjects of this standard.

The requirements of this standard consider that the solid radioactive waste processing system is operated on a level commensurate with other facility operations. This standard establishes the minimum quality requirements for the design, construction, and performance of the system.

The Appendixes are not a part of this standard. However, the Appendixes are intended to provide useful information and guidance when considering design, construction, and operation of a solid radioactive waste system. Appendix A, Federal Regulations and State Compacts, provides a necessary reference source and overview of federal and state regulations affecting solid radwaste management. Appendix B, Testing for Free Liquids in Solidified Matrices, discusses the criteria necessary for meeting free liquid requirements in radioactive waste containers. Appendix C, Mixed Waste Management, provides the information necessary to define, treat, store, and dispose of radioactive waste having hazardous waste properties. Appendix D, Alternative Solidification Technologies, presents alternative technologies for solidification that should be considered when selecting a solid radioactive waste system. Appendix E, Product Quality Control Requirements, provides guidance for the implementation of Title 10, "Energy," Code of Federal Regulations, Part 61, "Waste Form and Stability."

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Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants

1. Scope. This standard sets forth the design, construction, and performance requirements for a solid radioactive waste processing system for light-water-cooled reactor plants. For the purposes of this standard, the solid radioactive waste processing system begins at the interface with the liquid radioactive waste processing system boundary and at the inlets to the spent resin, filter sludge, evaporator concentrate, and phase separator tanks. In addition, this standard pertains to dry active waste, mixed waste, and other solid radioactive waste forms that are generated as part of the operation and maintenance of light-water-cooled reactor plants. The system includes facilities for temporary (up to 30 days of anticipated normal waste generation) on-site storage of packaged waste but terminates at the point of loading the filled drums and other containers on a vehicle for shipping off-site to a licensed disposal site or transfer to interim (up to 5 yr) on-site storage facilities. The solid radioactive waste processing system is not a safety-class system as defined by American National Standard Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants, ANSI/ANS-51.1-1983 (R1988) [1]¹ or as defined in American National Standard Nuclear Safety Criteria for the Design of Stationary Boiling Water Reactor Plants, ANSI/ANS-52.1-1983(R1988) [2].

2. Definitions

2.1 Limitations. The definitions provided in 2.2 are of a restricted nature for the purposes of this standard.

2.2 Glossary of Terms

ALARA. As low as reasonably achievable.

class A, B, and C waste. (See Title 10, "Energy," Code of Federal Regulations, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste" [3].)

container. The primary receptacle forming an isolation boundary between the contained waste and the environment.

de-watered. Liquid or slurry wastes that have had excess water removed to meet applicable burial site criteria.

dry active waste (DAW). Radioactively contaminated compactible and noncompactible material, such as rags, paper, plastic, and rubber; and wood, glass, concrete, and metal, respectively.

free liquid. Uncombined liquid not bound by the solid matrix of the solid waste mass, such as liquid that can be drained from a container.

hazardous waste. Waste that is

(a) listed as a hazardous waste in Subpart D of Title 40, "Protection of Environment," Code of Federal Regulations, Part 261, "Hazardous Waste Identification and Listing" [4], or

(b) exhibits any of the hazardous characteristics identified in Subpart C of 40 CFR 261 [4], or

(c) is otherwise identified as a hazardous waste by applicable state regulations.

high-integrity container (HIC). An NRC or state-approved container that provides waste stability for near-surface disposal in accordance with 10 CFR 61 [3].

homogeneous. The condition in which the waste and radionuclides are uniformly distributed throughout the package.

low-level radioactive waste. Radioactive (low-level) waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or by-product material as defined in Section IIe.(2) of the Atomic Energy Act (uranium or thorium tailings and waste).

mixed waste. A waste that meets both the definition of a low-level radioactive waste (LLRW) and the definition of a hazardous waste.

normalized inputs. The design basis values for a plant of specific power rating.

¹Numbers in brackets refer to corresponding numbers in Section 11, References.