



Standard Guide for Drying Behavior of Spent Nuclear Fuel¹

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1. Scope

1.1 This guide discusses three steps in preparing spent nuclear fuel (SNF) for placement in a sealed dry storage system: (1) evaluating the needs for drying the SNF after removal from a water storage pool and prior to placement in dry storage, (2) drying the SNF, and (3) demonstrating that adequate dryness has been achieved.

1.1.1 The guide addresses drying methods and their limitations when applied to the drying of SNF that has been stored in water pools. The guide discusses sources and forms of water that may remain in the SNF, the container, or both after the drying process has been completed. It also discusses the important and potential effects of the drying process and any residual water on fuel integrity and container materials during the dry storage period. The effects of residual water are discussed mechanistically as a function of the container thermal and radiological environment to provide guidance on situations that may require extraordinary drying methods, specialized handling, or other treatments.

1.1.2 The basic issues in drying are: (1) to determine how dry the SNF must be in order to prevent problems with fuel retrievability, container pressurization, or container corrosion during storage, handling, and transfer, and (2) to demonstrate that adequate dryness has been achieved. Achieving adequate dryness may be straightforward for undamaged commercial fuel but complex for any SNF where cladding damage has occurred prior to or during placement and storage at the spent fuel pools. Challenges in achieving adequate dryness may also result from the presence of sludge, CRUD, and any other hydrated compounds. These may be transferred with the SNF to the storage container and may hold water and resist drying.

1.1.3 Units are given in both SI and non-SI units as is industry standard. In some cases, mathematical equivalents are given in parentheses.

1.2 *This standard only discusses SNF drying and does not purport to address all of the handling and safety concerns, if any, associated with the drying process(es). It is the responsibility*

of the user of this standard to establish appropriate safety and health practices and to meet regulatory requirements prior to and during use of the standard.

2. Referenced Documents

2.1 ASTM Standards:²

C859 Terminology Relating to Nuclear Materials

C1174 Practice for Prediction of the Long-Term Behavior of Materials, Including Waste Forms, Used in Engineered Barrier Systems (EBS) for Geological Disposal of High-Level Radioactive Waste

C1562 Guide for Evaluation of Materials Used in Extended Service of Interim Spent Nuclear Fuel Dry Storage Systems

2.2 ANSI/ANS Standards:³

ANSI/ANS 8.1-1998 Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors

ANSI/ANS-8.7-1998 Nuclear Criticality Safety in the Storage of Fissile Materials

ANSI/ANS-57.9 American National Standard Design Criteria for Independent Spent Fuel Storage Installation (Dry Type)

2.3 *Government Documents:*⁴The U.S. government documents listed in 2.3 or referenced in this standard guide are included as examples of local regulations and regulatory guidance that, depending on the location of the dry storage site, may be applicable. Users of this standard should adhere to the applicable regulatory documents and regulations and should consider applicable regulatory guidance.

Title 10 on Energy, Code of Federal Regulations, Part 60, 10 CFR 60, U.S. Code of Federal Regulations, Disposal of High Level radioactive Wastes in Geologic Repositories

Title 10 on Energy, Code of Federal Regulations, Part 63, 10 CFR 63, U.S. Code of Federal Regulations, Disposal of

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁴ The Code of Federal Regulations is available at <https://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR>. SFST-ISG-1 is available at <http://www.nrc.gov/reading-rm/doc-collections/isg/spent-fuel.html>.