



# Probabilistic Evaluation of External Flood Hazards for Nuclear Facilities

An American National Standard

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**American National Standard  
Probabilistic Evaluation of  
External Flood Hazards for  
Nuclear Facilities**

Secretariat  
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## Foreword

(This foreword does not contain any requirements of American National Standard “Probabilistic Evaluation of External Flood Hazards for Nuclear Facilities,” ANSI/ANS-2.8-2019, but is included for informational purposes.)

The purpose of this standard is to establish a process for identifying and evaluating design-basis flood hazards at nuclear facilities using a probabilistic approach. This standard represents a major revision to ANS-2.8-1992 (W2002), “Determining Design Basis Flooding at Power Reactor Sites.” ANS-2.8-1992 specifically focused on design-basis flood methodologies for “evaluating the worst site-related flood at a power reactor site caused by either a probable maximum flood on streams and rivers and any dam failures resulting therefrom; a seismically induced dam failure flood; a probable maximum surge and seiche flood; and any attendant wind-generated wave activity associated with these events or caused by a reasonable combination of less severe events.” Despite the reference to probable maximum flood hazards, the resulting hazard was established based on deterministic rules and did not rely on probabilistic concepts. As part of a periodic review of the standard’s applicability in 2002, the American Nuclear Society (ANS) judged the standard in need of revision, and therefore, it was withdrawn. The working group to revise the standard was formed in 2012. At that time, the working group—composed of members from the U.S. Department of Energy, the National Performance of Dams Program, the U.S. Geological Survey, the U.S. Nuclear Regulatory Commission, and various representatives from the nuclear industry—jointly undertook comprehensive reviews of the applicability of ANS-2.8-1992 (W2002) and recommended a major rewrite be performed. By that time, through insights gained from the events at the Blayais reactor as well as experience with Hurricane Katrina and, more recently, Fukushima, it became clear to the working group that a more formal probabilistic approach should be used for setting design flood parameters. The rewrite was therefore to focus on a probabilistically based approach for assessing the magnitude and occurrence of flood hazards that could be used in applications for the evaluation of nuclear facilities, including risk assessments, establishing the design-basis flood hazard, etc.

This standard differs from its predecessor in the following areas:

- The applicability of the standard extends to all nuclear facilities, not just power reactors.
- Probabilistic assessment: This standard replaces the prescriptive “probable maximum” approach for establishing design flood hazards with a probabilistic approach for analyzing the frequency and magnitude of flood hazards. Thus, this standard focuses on the performance of a probabilistic flood hazard assessment and development of site probabilistic hazard frequency curves. An integral part of this process is the treatment of uncertainty.
- The scope of this standard is expanded to include tsunamis.

The first issue of the standard was approved by the American National Standards Institute (ANSI) on November 1, 1976, and was published by ANS as ANSI N170/ANS-2.8-1976, “Determining Design Basis Flooding at Power Reactor Sites.”

The first revision of the standard was approved on February 17, 1981, and was published as ANS-2.8-1981.

The standard was revised in 1992 to cover material that meets the requirements of Sec. 2.4, “Hydrologic Engineering,” of Regulatory Guide 1.70, Revision 3, November

1978, “Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants: LWR Edition,” issued by the U.S. Nuclear Regulatory Commission for the flood hazards within the scope of that standard.

This standard might reference documents and other standards that have been superseded or withdrawn at the time this standard is applied. A statement has been included in the references section that provides guidance on the use of references.

The working group has incorporated risk-informed and/or performance-based requirements into this standard.

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