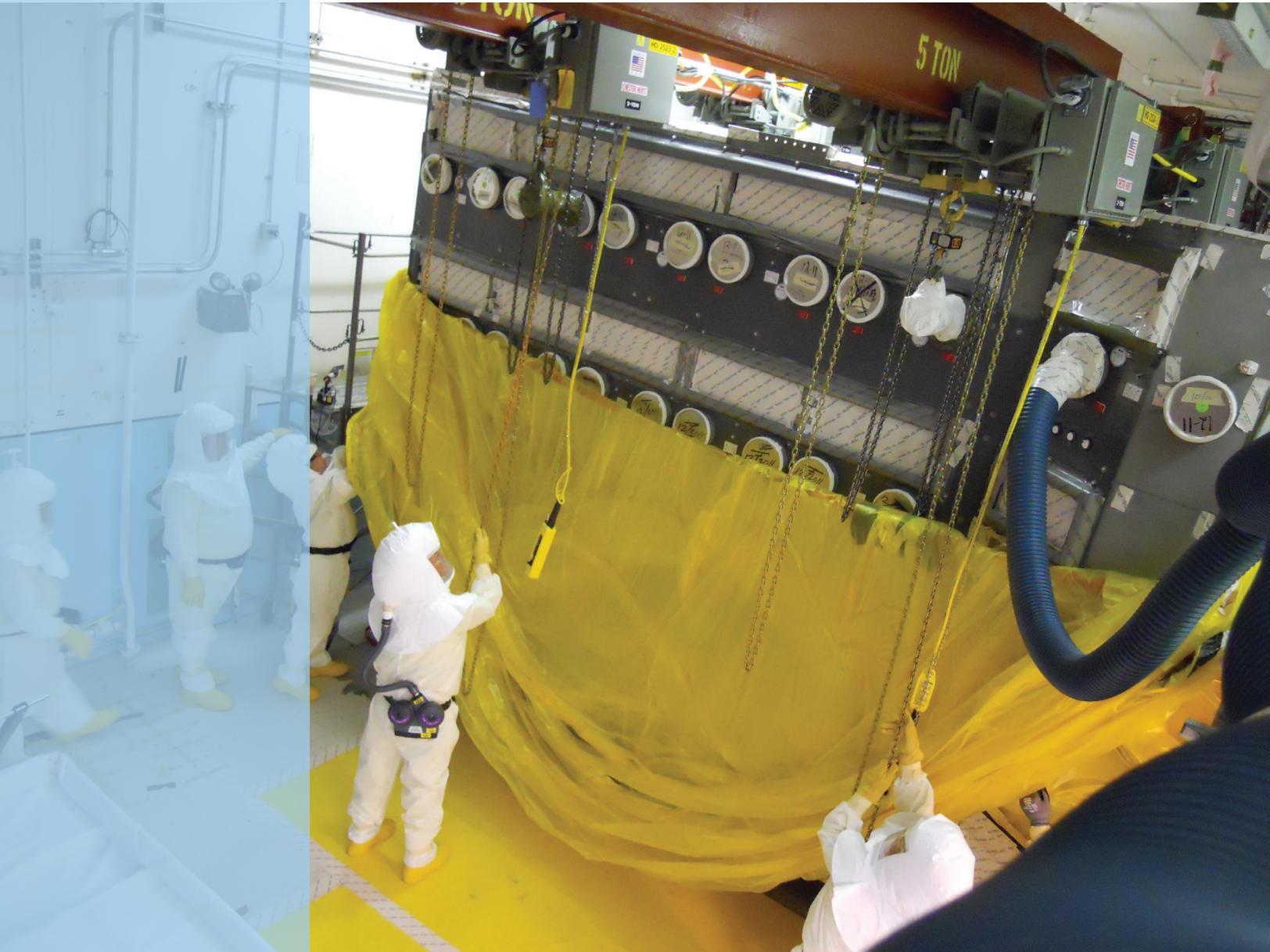




# ANS



## **ANSI/ANS Standards for Use in Areas Related to Nuclear Technology**



## Introduction

This pamphlet has been designed to help U.S., international firms, and government agencies understand and access American Nuclear Society (ANS) voluntary consensus standards that may be applicable for evaluating, siting, building, operating, supporting, and/or decommissioning nuclear facilities and other nuclear-related activities. ANS is an international, not-for-profit 501(c)(3) scientific and educational organization with a membership of approximately 11,000 scientists, engineers, educators, students, and other associate members.

ANS standards are developed using a strict set of rules that allows each standard to gain American National Standards Institute (ANSI) approval and to achieve the status of American National Standard.



ANS presently has more than 75 current American National Standards with at least 50 more currently being developed or revised. ANS standards, and standards of other similar professional societies, are used to support the general welfare by providing methods for users that are based on the extensive professional experience of cost-effective, deterministic, performance-based, risk-informed ways to insure nuclear safety. Standards provide the “how” for nuclear regulatory authorities, engineers, scientists, designers, operators, constructors, and nuclear organizations to safely meet federal and state regulations through application of long-standing experience and good engineering practice to insure public health and environmental protection.

## Standards Usage

Standards provide logical, consensus-based methods for nuclear power plant suppliers, personnel, constructors, and operators so that they can perform in a manner that has been judged by their peers to be acceptable and, in some cases that satisfy federal regulations and enhance safety, public health, and environmental protection.

Consensus standardization is a social process in which technical experts from public, private, and nonprofit sectors negotiate the direction and shape of technological change. Scholars, engineers, and other personnel in a variety of disciplines have recognized the importance of voluntary consensus standards as alternatives to other types of standards that arise through market mechanisms or to standards mandated by regulators.

A standard can be defined as common and repeated use of rules, conditions, guidelines, or characteristics for products or related processes and production methods as well as related management systems practices.



Voluntary consensus standards give a common direction to follow for technical individuals on an engineering project, eliminating the need to invent or research guidelines on how to initially proceed on the project.

ANS standards, as well as those of many other organizations and industries, set forth the requirements for the design, manufacture, or operation of a piece of equipment. ANS standards can also address computer firmware and software or the necessary physical and functional features of equipment, its safe application, or some combination of these.

To operate a typical nuclear power plant, about 1,000 engineering codes and standards are needed, and some are used only for reference. A typical nuclear power plant has about 100,000 discrete components, and the various standards help orchestrate the integration of these components into a workable, reliable, and safe plant.

Some examples of nuclear facilities include

1. critical assemblies,
2. pressurized water reactor and boiling water reactor nuclear power plants,
3. sodium fast reactors (SFRs)
4. molten salt reactors (MSRs)
5. fluoride salt-cooled high-temperature reactors (FHRs)
6. gamma irradiation facilities,
7. nuclear waste storage sites,
8. industrial X-ray or neutron radiography facilities,
9. nuclear-powered vessels,
10. circular and linear particle accelerators,
11. radioactive calibration and check sources,
12. high-temperature gas-cooled reactor nuclear power plants,
13. spent fuel pools for research, test, and commercial nuclear power reactors,
14. radiochemical separations plants.



ANS standards can be classified into general categories and into more specific subcategories within the general categories. The presently used general categories are listed below, with some specific subcategories listed beneath each general category.

## ANS Standards Categories and Subcategories

- I. Reactors and Nuclear Facilities
  - a. Nuclear power plant simulators for use in operator training and examination
  - b. Fuel fabrication facility design criteria
  - c. Containment system leakage testing requirements
  - d. Criteria for planning, development, conduct, and evaluation of drills and exercises for emergency preparedness at nuclear facilities
  - e. Facility structures, systems, and component (SSC) design
2. Operational Analysis and Criticality Safety
  - a. Radiation protection and shielding
  - b. Radioactive source term for normal operation of light water reactors
  - c. Nuclear criticality safety in operations with fissionable materials outside reactors
  - d. Criteria for nuclear criticality safety controls in operations with shielding and confinement



3. Nuclear Environmental
  - a. Earthquake criteria for nuclear power plants
  - b. Determine design-basis flooding at power reactor sites
  - c. Mobile radioactive waste processing systems
  - d. Reactor decommissioning
4. Risk Management
  - a. Criteria for modeling design-basis accidental releases from nuclear facilities
  - b. Probabilistic seismic hazards analysis
  - c. Criteria for modeling real-time accidental release consequences at nuclear facilities
  - d. Conduct of probabilistic risk assessments (PRA)

Some examples of ANS standard numbers and their titles include

- ANSI/ANS-19.3-2011, “Steady-State Neutronics Methods for Power Reactor Analysis”
- ANSI/ANS-3.11-2015, “Determining Meteorological Information at Nuclear Facilities” [revision of ANSI/ANS-3.11-2005 (R2010)]
- ANSI/ANS-8.1-2014, “Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors” [revision of ANSI/ANS-8.1-1998 (R2007)]
- ANSI/ANS-58.14-2011, “Safety and Pressure Integrity Classification Criteria for Light Water Reactors” [revision of ANSI/ANS-58.14-1993 (W2003)]
- ANSI/ASME/ANS RA-S-2008 (RA Sa-2009/RA Sb-2013), “Standard for Level/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications” [incorporates ANSI/ANS-58.21-2007 (W2009), “External-Events PRA Methodology,” and ANSI/ANS-58.23-2007 (W2009), “Fire PRA Methodology”]

Some examples of ANS standards under development or in revision include

- ANS-2.2, “Earthquake Instrumentation Criteria for Nuclear Power Plants” [revision of ANSI/ANS-2.2-2002 (W2012)]
- ANS-2.8, “Determining External Flood Hazards for Nuclear Facilities” [revision of ANSI/ANS-2.8-1992 (W2002)]
- ANS-3.13, “Nuclear Facility Reliability Assurance Program (RAP) Development” (new standard)
- ANS-20.2, “Nuclear Safety Design Criteria and Functional Performance Requirements for Liquid-Fuel Molten Salt Reactor Nuclear Power Plants” (new standard)
- ANS-30.1, “Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs” (new standard)
- ANS-30.2, “Classification of Structures, Systems, and Components for New Nuclear Power Plants” (new standard)
- ASME/ANS RA-S-1.3, “Radiological Accident Offsite Consequence Analysis (Level 3 PRA) to Support Nuclear Installation Applications” (new standard previously designated ANS/ASME-58.25)

## **ANS Standards Information and Purchasing**

Interested parties can go to the ANS standards website at [www.ANS.org/store/c\\_9](http://www.ANS.org/store/c_9) to:

- search for standards by title, designation, or keyword,
- review titles, abstracts, scopes, and costs for ANS standards, and
- purchase standards

ANS standards are reasonably priced and are readily available in hard copy (postal delivery) or electronic download (PDF format).

Please contact ANS at [orders@ans.org](mailto:orders@ans.org) or 708-579-8210 (toll free 800-323-3044) for questions regarding purchasing ANS standards. Contact [standards@ans.org](mailto:standards@ans.org) or 708-579-8269 with questions regarding the status of an ANS standard.

For more information visit [www.ANS.org/standards](http://www.ANS.org/standards)

