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American National Standard

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Updated Foreword for 2006 Reaffirmation of ANSI/ANS-15.21-1996;R2006

Foreword

(This Foreword is not a part of American National Standard Format and Content for Safety Analysis Reports for Research Reactors, ANSI/ANS-15.21-1996;R2006.)

The American Nuclear Society Standards Committee established subcommittee ANS-15 in the fall of 1970 with the task of preparing a standard for the operation of research reactors. In January 1972, this charter was expanded to include the task of preparing standards for all aspects of research reactor needs. To implement this enlarged responsibility, a number of working groups were established to develop standards for consideration and complementary action by Subcommittee ANS-15. This standard addresses itself to the format and content of safety analysis reports for research reactors.

Working Group ANS-15.21 was formed in 1991 to develop ideas and concepts leading to a standard for guidance on the format and content of a research reactor safety analysis report (SAR), taking into account available guidance and recognizing that many research reactor SARs have successfully presented descriptive and analytical information through the use of a simple format and limited content.

This standard recognizes the merits of the historical guidance (Regulatory Guide 1.70, "Guide for the Content and Format for Safety Analysis Reports for Nuclear Power Plants"), the International Atomic Energy Agency work which encompasses safety analysis documentation (Safety Series 35), and the Nuclear Regulatory Commission's SAR guidance for research and test reactors (NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors").

It is recognized that a power station has huge and variable sources of stored energy, dedication to highly reliable on-line power, massive containment and energy control features, and extremely harsh equipment operating environments. Research reactors, on the other hand, are small, non-invasive facilities with low fission product inventories, minimal stored energy, and simple equipment environments, resulting in small risk compared to nuclear power plants. This standard recognizes the considerably reduced risks, markedly simpler systems, and unique mission of research reactors. A graded approach to content, level of description, and level of analysis is thus very important. It is recognized that it is neither necessary nor possible to apply the same degree of description or analysis for all systems or events. Where this standard uses terms such as "appropriate" or "as necessary", these are to be interpreted as meaning such variation in the degree of description and analysis.

Nuclear critical assemblies (facilities operating in the context of American National Standard Conduct of Critical Experiments, ANSI/ANS-1-2000) often have flexible cores and generally do not have coolant systems, fission product inventories, radioactive waste streams, or confinement systems. Therefore many of the requirements of this standard are not appropriate for nuclear critical assembly facilities, and it is beyond the scope of the working group to include alternative guidance.

Since the standard provides guidance on how facility descriptive information is presented and does not introduce new criteria for any aspect of design, construction, or operation, a very limited" definition section" is included, while a broader "Glossary of Definitions Found in Research Reactor Standards (ANS-15 Series)" is provided as an appendix (the terms were compiled from the various ANS research reactor standards).

SARs are used extensively by analysts, operations staff, review groups, and licensing and chartering agencies in support of the research reactors' unique mission. The SAR provides the central repository of information used for performing analysis, determining bounding conditions, and establishing the foundation of technical specifications. The first ten chapters of an SAR might provide information valuable in the development of preliminary safety analysis reports.

Foreword

(This Foreword is not a part of American National Standard Format and Content for Safety Analysis Reports for Research Reactors, ANSI/ANS-15.21-1996.)

The American Nuclear Society Standards Committee established Subcommittee ANS-15 in the fall of 1970 with the task of preparing a standard for the operation of research reactors. In January 1972, this charter was expanded to include the task of preparing standards for all aspects of research reactor needs. To implement this enlarged responsibility, a number of subcommittee working groups were established to develop standards for consideration and complementary action by Subcommittee ANS-15. This standard addresses itself to the format and content of safety analysis reports for research reactors.

Working Group ANS-15.21 was formed in 1991 to develop ideas and concepts leading to a standard for guidance on the format and content of a research reactor safety analysis report (SAR), taking into account available guidance and recognizing that many research reactor SARs have successfully presented descriptive and analytical information through the use of a simple format and limited content.

This standard recognizes the merits of the historical guidance (Regulatory Guide 1.70, "Guide for the Content and Format for Safety Analysis Reports for Nuclear Power Stations"), the work by the United States Nuclear Regulatory Commission on guidance for non-power reactors, the work of the United States Department of Energy (Order 5480.23), and the International Atomic Energy Agency work which encompasses safety analysis documentation (Safety Series 35).

It is recognized that a power station has huge and variable sources of stored energy, dedication to highly reliable on-line power, massive containment and energy control features, and extremely harsh equipment operating environments. Research reactors, on the other hand, are small, non-invasive facilities with low fission product inventories, minimal stored energy, and simple equipment environments, resulting in small risk compared to nuclear power plants. This standard recognizes the considerably reduced risks, markedly simpler systems, and unique mission of research reactors. A graded approach to content, level of description, and level of analysis is thus very important. It is recognized that it is neither necessary nor possible to apply the same degree of description or analysis for all systems or events. Where this standard uses terms such as "appropriate" or "as necessary", these are to be interpreted as meaning such variation in the degree of description and analysis.

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Since the standard provides guidance on how facility descriptive information is presented and does not introduce new criteria for any aspect of design, construction, or operation, a very limited "definition section" is included, while a broader "Glossary of Definitions Found in Research Reactor Standards (ANS-15 Series)" is provided as an appendix (the terms were compiled from the various ANS research reactor standards).

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In this process of creating standards against the background of established and varied practices in many operating facilities, it is important to consider that:

a. It is not intended that the standard be used as a demand model for backfitting purposes.
b. The standard should be a vital aid for the new owner-agency.
c. The standard should be helpful for the facility undergoing change or modification.
d. Thoughtful use of the standard by the industry should ease the burden of licensing and chartering agencies.

It is affirmed further that the use of any standard of performance, conduct, or excellence is volitional. The decision to use a standard is a management matter, presumably based on technical advisement.

Guidance may be found in the following supplementary American National Standards developed for research reactors:

ANSI/ANS-15.1-1990, Development of Technical Specifications for Research Reactors
ANSI/ANS-15.2-1990, Quality Control for Plate-Type Uranium-Aluminum Fuel Elements
ANSI/ANS-15.4-1988, Selection and Training of Personnel for Research Reactors
ANSI/ANS-15.7-1977 (R1986), Research Reactor Site Evaluation
ANSI/ANS-15.8-1976 (R1995), Quality Assurance Program Requirements for Research Reactors
ANSI/ANS-15.10-1994, Decommissioning of Research Reactors
ANSI/ANS-15.11-1993, Radiation Protection at Research Reactor Facilities
ANSI/ANS-15.15-1978 (R1986), Criteria for the Reactor Safety Systems of Research Reactors
ANSI/ANS-15.16-1982 (R1988), Emergency Planning for Research Reactors
ANSI/ANS-15.17-1981 (R1987), Fire Protection Program Criteria for Research Reactors
ANSI/ANS-15.19-1991, Shipment and Receipt of Special Nuclear Material by Research Reactor Facilities

The working group included a broad spectrum of expertise in research reactor operations, experiment and reactor analysis, safety analysis reports, and interactions with chartering and licensing agencies. The members represent a wide variety of research reactors—including those at universities, national laboratories, and government facilities—and participation in international standards work. Working Group ANS-15.21 of the Standards Committee of the American Nuclear Society had the following membership:

R. R. Walston, Chairman, *U. S. Department of Energy*
A. Adams, Jr., *U.S. Nuclear Regulatory Commission*
T. L. Bauer, *University of Texas*
P. French, *Atomic Energy Control Board, Canada*
D. E. Hughes, *Pennsylvania State University*
R. E. Malenfant, *Los Alamos National Laboratory*
K. Perkins, *Brookhaven National Laboratory*
W. J. Richards, *U. S. Department of Defense*
J. Weeks, *Brookhaven National Laboratory*

The membership of Subcommittee ANS-15, Operation of Research Reactors, at the time of the approval of this standard, was:

W. J. Richards, Chairman, *U. S. Department of Defense*
A. Adams, Jr., *U. S. Nuclear Regulatory Commission*
T. L. Bauer, *University of Texas*
S. K. Bhatnagar, *U. S. Department of Energy*
L. M. Bobek, *Worcester Polytechnic Institute*
W. J. Brynda, *Brookhaven National Laboratory*
A. F. DiMeglio, *Individual*
P. C. Ernst, *Individual*
J. P. Farrar, *University of Virginia*
D. E. Feltz, *Texas A&M University*
M. L. Gildner, *Oak Ridge National Laboratory*
D. R. Harris, *Rensselaer Polytechnic Institute*
D. E. Hughes, *Pennsylvania State University*
E. Lee, *Oak Ridge National Laboratory*
R. E. Malenfant, *Los Alamos National Laboratory*
R. C. Nelson, *Jason Associates Corporation*
P. B. Perez, *North Carolina State University*
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J. Razvi, *GA Technologies, Inc.*
T. R. Schmidt, *Sandia National Laboratory*
M. H. Voth, *Pennsylvania State University*
R. R. Walston, *U. S. Department of Energy*

Consensus Committee N17, Research Reactors, Reactor Physics, Radiation Shielding, and Computational Methods, had the following membership at the time it reviewed and approved this standard:

T. M. Raby, Chairman
A. Weitzberg, Vice Chairman

H. Alter ..... U. S. Department of Energy
A. D. Callihan ..... Individual
R. E. Carter ..... Individual
D. Cokinos ..... Brookhaven National Laboratory
A. De La Paz ..... Vista Technology
B. Dodd ..... Health Physics Society
D. Duffey ..... American Institute of Chemical Engineers
H. Goldstein ..... American Physical Society
W. A. Holt ..... American Public Health Association
W. C. Hopkins ..... Bechtel Power Corporation
L. I. Kopp ..... Individual
J. Miller ..... Institute of Electrical and Electronics Engineers, Inc.
J. E. Oelhoeft ..... Individual
T. M. Raby ..... American Nuclear Society
W. J. Richards ..... U. S. Department of Defense
T. R. Schmidt ..... Sandia National Laboratory
R. L. Seale ..... University of Arizona
A. O. Smetana ..... Westinghouse Savannah River Company
M. M. Ter Pogossian ..... American College of Radiology
J. F. Torrence ..... National Institute of Standards and Technology
D. K. Trubey ..... Individual
S. H. Weiss ..... U. S. Nuclear Regulatory Commission
A. Adams, Jr. (Alt.)
A. Weitzberg ..... Halliburton NUS Corporation
W. L. Whittemore ..... GA Technologies, Inc.

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Format and Content for Safety Analysis Reports for Research Reactors

1. Introduction

1.1 Scope. This standard provides the criteria for the format and content for safety analysis reports for research reactors.

1.2 Definitions

research reactor. A device designed to support a self-sustaining neutron chain reaction for research, developmental, educational, training, or experimental purposes, and which may have provisions for the production of radioisotopes.

shall, should, and may. The word "shall" is used to denote a requirement; the word "should" to denote a recommendation; and the word "may" to denote permission, neither a requirement nor a recommendation.

1.3 Application

1.3.1 Purpose. Research reactors require safety analysis and documentation showing that they are safe to operate for their allowed envelope of operation, and in combination with experiments which may be placed in or around them. This standard identifies specific information and analyses for inclusion in the safety analysis report (SAR) and establishes a uniform format for the report. Adherence to this standard will ensure completeness of the information and maximize its usefulness to research reactor staffs, support personnel, and oversight groups for current and future information needs. Sufficient detail is incorporated so that a preparer can understand the desired composition, and the technical elements, of the SAR.

Because of the special nature and diversity of research reactors, which reflect design features and operational characteristics chosen to allow the pursuit of unique missions, no general standard can be applied to research reactors without thoughtful interpretation. Therefore, the applicability of any criterion specified in this standard might range from total to nil, depending on the research reactor.

1.3.2 Format. In order to assure that all major topics that might be relevant for inclusion in the SAR have been considered, a part of the requirements of this standard is the title and numbering of each chapter as described in Section 2, Safety Analysis Report Contents. The applicable topics in each chapter shall include the following information to the extent appropriate: introductory information, descriptive information, and relevant conclusions. Where process variable limits are described in the text, the limit should be identified, as appropriate, if it is the technical basis of a specification in governance documents. Departure from the detailed contents within a given chapter is allowed in order to meet the specifics of a given facility. Departure from chapter titles and numbering shall be avoided by using statements such as "not applicable" when a chapter does not apply. Additional numbered chapters may be added as necessary for other major topics (for example, Financial Qualifications, HEU/LEU Conversions, etc.).[1]

1.3.3 Style. The reactor SAR shall be printed for ease of use, and for updates and page change-outs. The following criteria should be used:

(1) Paper: white, with size not to exceed 21.6 cm x 27.9 cm (8.5 in. x 11 in.), or finished copies when folded not to exceed 21.6 cm x 27.9 cm (8.5 in. x 11 in.).

[1] Appendix A provides a representative "Table of Contents for a Research Reactor Safety Analysis Report" and suggests a desired format. Appendix B provides a "Glossary of Terms Found in Research Reactor Standards (ANS-15 Series)," which explains terms used by the research reactor community. Although these are the commonly used terms, it is recognized that the special nature of research reactors will cause other terms to be defined as needed. Appendix C provides a list of "Selected Initiating Events for Research Reactor Accident Analysis" that may be useful in performing accident analyses for the SAR. Appendix D provides a list of "References Related to Research Reactor Safety Analysis Reports."