American National Standard

REAFFIRMED
December 15, 1986
ANSI/ANS-15.8-1976
(R1986)

WITHDRAWN
September 12, 1995
ANSI/ANS-15.8-1976
(R1986)

quality assurance program requirements for research reactors

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ANS-15.8
ANSI N402-1976

published by the
American Nuclear Society
244 East Ogden Avenue
Hinsdale, Illinois 60521, USA

American National Standard
Quality Assurance Program Requirements for Research Reactors

Secretariat
American Nuclear Society

Prepared by the
American Nuclear Society
Standards Committee
Working Group ANS-15.8

Published by the
American Nuclear Society
244 East Ogden Avenue
Hinsdale, Illinois 60521

Approved August 19, 1976
by the
American National Standards Institute, Inc.

American National Standard

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Published by

American Nuclear Society
244 East Ogden Avenue, Hinsdale, Illinois 60521

Price: $8.00

Printed in the United States of America

Foreword

(This Foreword is not part of American National Standard Quality Assurance Program Requirements for Research Reactors, N402-1976/ANS-15.8)

The American Nuclear Society Standards Secretariat 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 the multiple tasks of preparing all standards for research reactors. To implement this enlarged responsibility, a number of Subcommittee Work Groups have been established to develop standards for consideration and complementary action by Subcommittee ANS-15. ANS-15.8 is one of these groups.

Working Group ANS-15.8 was assigned the task of developing a draft standard for quality assurance program requirements in December, 1972. The proposed standard was under development by ANS-15.8 for over two years. It has been reviewed and revised three times by Subcommittee ANS-15 in addition to several working group sessions. The membership of Working Group ANS-15.8 is as follows:

A. C. Ellingson (Chairman), *Sandia Laboratories*
J. R. Bohannon, *North Carolina State University*
J. A. Cox, *Oak Ridge National Laboratory*
J. L. Meem, *University of Virginia*

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

(1) It is not intended that the standard be used as a demand model for backfitting purposes.
(2) It should be a vital aid for the new owner-agency.
(3) It should be helpful for the facility undergoing change/modification.
(4) Its thoughtful use by industry should ease the burden of regulatory agencies.

We affirm, 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 on technical advisement. The institutionalizing of a standard can and almost must be conditional; i.e., high probability exists that some exception or addition will compromise the absolute, unconditional application of a document which was composed to cross lines of functional and material discipline.

It is a management function to ameliorate or mitigate conditional matters. It is not the function of a standard to attempt to accommodate the many different management systems. Neither is its function to preempt management prerogatives.

With regard to this particular Standard, it must be noted that research reactors have two characteristics which affect the type of quality assurance program that may be applied to them, when compared to power reactors. First, the reliability of most of the parts used in a research reactor is not relevant to the safety and health of the public, since failure of the item shuts the system down and nothing else happens. Secondly, the typical research reactor operates on a small budget, with its continued existence dependent upon maintaining a low cost of operation. Because of these characteristics, the quality assurance program applied to research reactors must be limited to safety-related items, and must be less complex than other quality assurance programs, if it is to be economically feasible. It is the intent of this Standard to state the requirements for such a program.

For those not yet exposed to vigorous quality assurance requirements, it is difficult to grasp the value of total documentation. Although documentation is not the totality of a quality assurance program, it is the key to an adequate program for research reactors, and is therefore stressed in this Standard. On the other hand, much of the documentation required by a quality assurance program already exists for an operating research reactor, and very little additional documentation is needed when the quality assurance program is initiated.

Correct interpretation of a standard is very important, and a careful and comprehensive reading of this Standard before application to a specific reactor is highly recommended. Two comments are presented as aids to interpretation:

(1) It is recognized that it is neither necessary nor possible to apply the same degree of control to all items in a reactor. Where this Standard uses words such as "appropriate" or "as necessary" these are to be interpreted as meaning such variation in the degree of control.

(2) It is not intended that this Standard require modification of existing license requirements and should not be so interpreted. For example, although proper calibration of measuring and test equipment is required under this Standard, it is not intended that calibration procedures stricter than those specified in the technical specifications be imposed.

In the context of the body of standards generated or in process for research reactors, this Standard is nominally but not totally the vehicle for assurance of quality. Operations and safety committee functions are covered elsewhere, as are record keeping practices and other matters related to the functional assurance of a quality operation which meets all the requirements and conditions for the safety of the public.

The definition of research reactor used in this Standard and all other ANS-15 standards is being revised. Until such revision is complete, the present definition will apply.

The family of standards and task assignments includes:

ANS-15.1 (N378-1974)	Development of Technical Specifications for Research Reactors
ANS-15.2 (N398-1974)	Quality Control for Plate-Type Uranium-Aluminum Fuel Elements
ANS-15.3 (N399-1974)	Records and Reports for Research Reactors
ANS15.4 (N380)	Standard for Selection and Training of Personnel for Research Reactors
ANS-15.6 (N401-1974)	Review of Experiments for Research Reactors
ANS-15.7 (N379)	Siting for Research Reactors
ANS15.8 (N402-1976)	Quality Assurance Program Requirements for Research Reactors
ANS-15.10 (N550)	Decommissioning of Research Reactors
ANS-15.11 (N628)	Radiological Control at Research Reactor Facilities
ANS-15.12 (N647)	Design Objectives for and Monitoring of Systems Controlling Research Reactor Effluents
ANS-15.14 (N700)	Standard for Physical Security of Research Reactors
ANS-15.15 (N701)	Criteria for the Reactor Safety Systems of Research Reactors
ANS-15.16 (N17.2)	Emergency Planning for Research Reactors

Subcommittee ANS-15, Operation of Research Reactors, of the American Nuclear Society Standards Committee had the following members at the time it processed and approved this Standard:

D. F. Hanlen, Chairman, *Brown and Root, Inc.*
M. A. Bell, *U.S. Energy Research and Development Administration*
J. R. Bohannon, *North Carolina State University*
L. Bonzon, *Sandia Laboratories*
J. A. Cox, *Oak Ridge National Laboratory*
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R. Schemel, *U.S. Nuclear Regulatory Commission*
R. R. Walston, *U.S. Nuclear Regulatory Commission*
W. L. Whittemore, *General Atomic*

The American National Standards Committee N17, Research Reactors, Reactor Physics, and Radiation Shielding, which reviewed and approved this Standard in 1976 had the following membership:

W. L. Whittemore, Chairman
R. S. Carter, Secretary

Organization Represented	*Name of Representative*
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American Institute of Chemical Engineers	R. Duffy
American Nuclear Society	W. L. Whittemore
American Physical Society	W. W. Havens, Jr.
	H. Goldstein (Alt.)
American Public Health Association	C. G. Amato
	W. A. Holt (Alt.)
American Society of Mechanical Engineers	R. A. Axford
American Society of Radiologic Technologists	J. H. Tolan
Health Physics Society	C. A. Willis
Institute of Electrical & Electronics Engineers	H. A. Thomas
National Bureau of Standards	R. S. Carter
National Council on Radiation Protection and Measurements	A. B. Chilton
Society of Nuclear Medicine	No representative designated
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	R. J. Schemel (Alt.)
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	J. W. Lewellen (Alt.)
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	A. M. Perry
	E. A. Warman

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Quality Assurance Program Requirements for Research Reactors

1. Introduction

This Standard provides requirements for establishing, managing, conducting, and evaluating quality assurance programs for the design, construction, testing, modification and maintenance of research reactors and associated experiments, but not routine reactor operations. In terms of this Standard:

(1) Quality assurance comprises those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service

(2) A research reactor is one used for scientific, engineering, or training purposes which operates at:

(a) A thermal power level of 1 megawatt or less; or

(b) A thermal power level of 10 megawatts or less and does not contain:

(i) A flow loop through the core in which fueled experiments are conducted, or

(ii) A liquid fuel loading; or

(iii) An experimental facility in the core in excess of 16 square inches (103.2 cm^2) in cross-section.

The level of quality assurance effort applied by the owner/operator to research reactor activities is to be consistent with the importance of these activities to safety. Quality assurance effort is applied to safety-related items, which are defined as those physical structures, systems, and components whose intended functions are to either prevent accidents that could cause undue risk to the health and safety of the public, or to control and mitigate the consequences of such accidents. The safety-related items included in the quality assurance program shall be, as a minimum, those of the reactor safety and protection system, engineered safety features, and the radiation monitoring system, as identified in the Limiting Conditions for Operations section in the Technical Specifications for a given reactor.

2. Program Requirements

2.1 Responsibility. It is the responsibility of the owner/operator to provide for the establishment and implementation of a quality assurance program consistent with the schedule for accomplishing the activities. The owner/operator shall identify the structures, systems and components to be covered by the quality assurance program and the major organizations participating in the program, together with the designated functions of these organizations.

2.2 Organization. The organizational structure and functional responsibilities for direction and implementation of the quality assurance program shall be documented.

Persons and organizations performing quality assurance functions shall have the organizational freedom, authority, and capability (by training or experience) to identify quality problems; to initiate, recommend, or provide solutions; and to verify implementation of solutions.

In structuring the organization and assigning responsibility, it must be recognized that activities for achieving quality are part of the design, construction, and operation phases of any system or facility, and incorporation of a formal quality assurance program does not mean duplication of these activities. Existing line organizations may perform these activities, provided the requirements of this Standard are met. In particular, the independent safety review committee required by the technical specifications of research reactors may, within the terms of this Standard, be assigned the responsibility for review, verification, or audit functions required by the standard.

2.3 Documentation. All activities affecting the safety-related items, as defined in Section 1, Introduction, to be covered by the quality assurance program, shall be formally identified and documented. Documentation shall include the applicable procedures, reviews, and other measures to be applied.

2.4 Design Control. Measures shall be established and documented to assure that applicable codes, standards and regulatory