American Nuclear Society

REAFFIRMED
April 3, 1987
ANSI/ANS-15.17-1991
(R1987)

REAFFIRMED
May 3, 2000
ANSI/ANS-15.17-1981
(R2000)

fire protection program criteria for research reactors

an American National Standard

WITHDRAWN
May 3, 2010
ANSI/ANS-15.17-1981
(R1987) (R2000)

No longer being maintained as an American National Standard. This standard may contain outdated material or may have been superseded by another standard. Please contact the ANS Standards Administrator for details.

published by the
American Nuclear Society
555 North Kensington Avenue
La Grange Park, Illinois 60525 USA

ANSI/ANS-15.17-1981

American National Standard Fire Protection Program Criteria for Research Reactors

Secretariat
American Nuclear Society

Prepared by the
American Nuclear Society
Standards Committee
Working Group ANS-15.17

Published by the
American Nuclear Society
555 North Kensington Avenue
La Grange Park, Illinois 60525 USA

Approved September 30, 1981
by the
American National Standards Institute, Inc.

American National Standard

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether he has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. American National Standards are subject to periodic review and users are cautioned to obtain the latest editions.

CAUTION NOTICE: This American National Standard may be reviewed or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of publication. Purchasers of this standard may receive current information, including interpretation, on all standards published by the American Nuclear Society by calling or writing to the Society.

Published by

American Nuclear Society
555 North Kensington Avenue, La Grange Park, Illinois 60525 USA

Price: $15.00

Printed in the United States of America

Foreword

(This Foreword is not a part of American National Standard Fire Protection Program Requirements for Research Reactors, ANSI/ANS-15.17-1981.)

The American Nuclear Society Standards Committee established Subcommittee ANS-15, Operation of Research Reactors, 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 were established to develop standards for consideration and complementary action by Subcommittee ANS-15. ANS-15.17 is one of these groups.

Working Group ANS-15.17 was assigned the task of developing a draft standard for fire protection requirements in June 1978. The membership of Working Group ANS-15.17 is as follows:

A. C. Ellingson, Chairman, *Sandia National Laboratories*
W. J. Brynda, *Brookhaven National Laboratory*
R. E. Carter, *U.S. Nuclear Regulatory Commission*
D. B. Davidson, Jr., *Los Alamos National Laboratory*
V. L. Duke, *Sandia National Laboratories*
H. K. Hasegawa, *Lawrence Livermore Laboratory*
F. Krause, *Sandia National Laboratories*
A. J. Pryor, *U. S. Department of Energy*
R. Sanacore, *American Nuclear Insurers*

Research reactors vary in size from a small, self-contained package operating at a very low power level to much larger reactors of the "swimming pool" type. In many cases, the amount of combustible material on the research reactor site may be fairly modest. On the other hand, on some research reactor sites, space is so limited that the experimental area could become quite congested with auxiliary instrumentation and apparatus, and related combustibles not usually associated with power reactor operation. Also, research reactors are frequently installed in buildings of multiple use occupancy.

Because of frequent changes in experimental goals and the periodic additions of new procedures or equipment, the configuration of a research reactor may change markedly from the original concepts of the designer. Such changes will often defeat the capability of initially-installed fire protection features, such as automatic sprinklers and fire barriers, to achieve the fire protection objective. For this reason, a fire protection program is needed which will continuously evaluate fire protection adequacy and make necessary changes.

This standard is based upon achieving fire protection objectives through the provision of a flexible program to meet these objectives rather than compliance with a list of fixed requirements. This philosophy allows maximum freedom in the selection of program elements and specific fire protection systems to meet the loss criteria. Loss criteria are established by the responsible research reactor management in accordance with rules and regulations established by higher management, by the licensing or chartering authority, by the insurance carrier, or any combination of these bodies.

The adequacy of a fire protection program developed in accordance with this standard must, of course, be evaluated by these other bodies—on the basis of programmatic effects, radiological effects, and property loss effects. When the program is approved by these agencies (after any necessary negotiation and modification), there must still be a continuing assessment of the program by the responsible operating management. Such assessment, using suitable guidance from professional fire protection consultants if necessary, assures the continuing adequacy of fire protection under changing experimental conditions.

The key to continuing program assessment and program updating, under this standard, is found in 4.7(a) which requires that controls shall be included which determine and evaluate the effect of changes in the facility and institute the necessary compensatory changes in the program. Each change that occurs must trigger an identification, evaluation, and program correction process which must take place before operations can continue. The evaluation and correction portion of this process includes a reconsideration of the pertinent elements in Section 5, "Program Components," of the standard. And, of course, this self-correction process must always be documented (see 4.7(c), so that program status information is always available to the approval agencies.

It must be noted that there may be research reactors for which no unacceptable consequences would result under any conceivable fire situation. In such cases, it is logical to assume that no fire protection program is needed. However, reactor management must have some basis for making this decision and such a basis can be provided through documentation of the portion of the program given in 4.3, 4.4, and 4.5 of this standard. These subsections include the identification of safety-related systems, the establishment of loss criteria, the identification of potential fire situations, and an assessment of the risk associated with each situation. If this documentation demonstrates that no fire protection is needed (particularly by demonstrating that no unacceptable radiological consequences can occur), management can stop the program development at this point and still have the documented decision basis. When such a decision is made, periodic reviews should be performed on this documentation to assure that the decision has not been invalidated by change.

Finally, it should be mentioned that some research reactors are under parent institutions which already have fire protection programs. In this case, the research reactor fire protection program, as developed under this standard, might consist largely of reference to the existing institutional program. However, all of the program elements specified in the standard must exist, even if many of them are actually implemented by an external group.

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

W. J. Richards, Chairman, *Argonne National Laboratory-West*
F. T. Binford, *Oak Ridge National Laboratory*
L. C. Brinkerhoff, *U. S. Department of Energy*
W. J. Brynda, *Brookhaven National Laboratory*
A. C. Ellingson, *Sandia National Laboratories*
J. P. Farrar, *University of Virginia*
J. R. Miller, *U. S. Nuclear Regulatory Commission*
R. D. Neff, *Texas A&M University*
T. M. Raby, *U.S. National Bureau of Standards*
J. D. Randall, *Texas A&M University*
T. R. Schmidt, *Sandia National Laboratories*
R. R. Walston, *U.S. Department of Energy*
W. L. Whittemore, *General Atomic Company*

The American National Standards Committee N17, Research Reactors, Reactor Physics, and Radiation Shielding, had the following membership at the time it reviewed and approved this Standard:

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

Organizations Represented	*Name of Representative*
American College of Radiology	M. M. Ter Pogossian
American Institute of Chemical Engineers	D. Duffey
American Nuclear Society	W. L. Whittemore
American Physical Society	W. W. Havens, Jr.
	H. Goldstein (Alt.)
American Public Health Association	W. A. Holt
American Society of Radiologic Technologists	J. H. Tolan
Health Physics Society	C. A. Willis
Institute of Electrical & Electronics Engineers, Inc. (Nuclear & Plasma Science Society)	E. A. Corte
National Bureau of Standards	R. S. Carter
	T. M. Raby (Alt.)
National Council on Radiation Protection & Measurement	A. B. Chilton
U. S. Nuclear Regulatory Commission	J. R. Miller
	R. J. Schemel (Alt.)
U. S. Department of Energy	P. B. Hemmig
	J. W. Lewellen (Alt.)
Individual Members	J. E. Olhoeft
	E. A. Warman

Contents

Fire Protection Program Criteria for Research Reactors

1. Introduction

1.1 **Scope.** This standard provides criteria for a fire protection program for research reactor facilities and for the reactor safety-related systems included in those facilities. It stresses preservation of the capability to achieve and maintain safe shutdown of the reactor, and includes consideration of both direct fire hazards and indirect or consequential hazards.

1.2 **Philosophy.** The philosophy of this standard is to require a broad fire protection program which considers current standards such as those provided by the National Fire Protection Association, the American Nuclear Insurers, and the Factory Mutual System, as well as the state-of-the-art, rather than to provide fire protection criteria in detail. Application of this standard requires input from knowledgeable personnel who are capable of identifying the safety-related systems that should be protected against fire, and from knowledgeable personnel who are capable of determining and applying fire protection principles to meet the objective of the standard.

2. Definitions

2.1 **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. In order to conform to this standard, a fire protection program shall conform to the requirements but not necessarily to the recommendations of this standard.

2.2 **Glossary of Terms**

loss criteria. Loss Criteria are those criteria established by facility management in accordance with all applicable regulations, as limits for risk to personnel, radioactive or toxic contaminant release, property damage, and programmatic interruptions which might occur from a fire of maximum credible proportions or effect.

potential fire situation. A situation where a fire may occur and result in harm to life, property, or the environment.

research reactor. A research reactor is defined as 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 non-fissile radioisotopes.

risk. The risk associated with a potential fire situation is a compound measure which includes both the likelihood and the consequences of realizing that situation's potential for adverse effects.

safety-related systems. Those systems, structures, and components that perform functions necessary to shut down the reactor and maintain it in a safe shutdown condition, and to minimize radioactive releases to the environment.

3. Fire Protection Objective

The fire protection objective is to provide a fire protection program which provides reasonable assurance that safety-related systems can perform their required functions and that the defined Loss Criteria are met. For purposes of this document, specific Loss Criteria are determined through consideration of safety-related system requirements, prevention of radioactive releases, personnel protection, minimization of property damage, and maintenance of program continuity. The fire protection program necessary to achieve the overall objective can be described in terms of its three program components: passive fire protection, active fire protection, and fire prevention. These program components are described as follows:

Program Components

(1) Passive fire protection is achieved by limiting fire effects through inherently fire safe