Radiation Protection at Research Reactor Facilities

An American National Standard

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Foreword

(This foreword is not a part of American National Standard "Radiation Protection at Research Reactor Facilities," ANSI/ANS-15.11-2016.)

In the fall of 1970, the American Nuclear Society Standards Committee established ANS-15, Operation of Research Reactors, under the auspices of the N17 Consensus Committee, Research Reactors, Reactor Physics, Radiation Shielding, and Computational Methods, to provide needed standards for the operation, use, and regulation of research reactors. Since then, numerous standards have been developed, and several working groups have been established, among them ANS-15.11.

In 1977, two standards dealing with radiation protection at research reactors were published: ANSI/ANS-15.11-1977 (N628), "Radiological Control at Research Reactor Facilities," and ANSI/ANS-15.12-1977 (N647), "Design Objectives for and Monitoring of Systems Controlling Research Reactor Effluents." These two standards were revised later and combined into a single standard, ANSI/ANS-15.11-1987, "Radiation Protection at Research Reactor Facilities." Major changes to the regulations on standards for radiation protection and to the recommendations of the National Council on Radiation Protection and Management and the International Commission on Radiological Protection, significantly impacting research reactors, were incorporated into the revision, ANSI/ANS-15.11-1993, "Radiation Protection at Research Reactor Facilities." The standard was revised in 2009 with minor changes.

Work on this standard began in November of 2013 and culminated in March of 2016 with approval by the Research and Advanced Reactor Consensus Committee. The current revision addresses applicable changes and provides directions on implementation, including meeting the objectives and principles of as-low-as-is-reasonably-achievable (ALARA) levels of radiation.

In preparing this standard, the intent has been to specify objectives that will achieve the following results:

(1) Establish a comprehensive radiation protection program that deals with all matters involving radiation and radioactive materials at research reactors;

(2) Limit exposures and releases to ALARA levels without seriously restricting the operation of existing reactors, inhibiting growth and upgrade, or discouraging the development of new research reactors;

(3) Set a reasonably low activity level threshold, above which measurements will be required that will allow for the use of readily available instrumentation without resorting to extraordinary means.

In the process of creating standards with respect to existing and varied practices in many operating facilities, it is important to consider the following:

(1) It is not intended that the standard be used as a demand model for backfitting purposes;

(2) The standard can be a significant aid for existing and new owners or operators;

(3) The standard can be helpful for a facility undergoing change or modification;

(4) The standard's considered use can assist in implementing regulatory requirements.

Prior to using the standard, individual facilities ought to carefully examine their license, permit, or other requirements for limiting conditions that might not be compatible with the

standard or new regulatory requirements and that might require change, amendment, or special authorization. Care also ought to be exercised in using appropriate units as might be specified by authorities.

The standard does not address certain conditions that do not occur or are known not to exist at research reactor facilities such as planned special exposures, facilities-specific public dose limits, and hot particle contamination. Individual facilities ought to address these issues, if needed, in their programs.

The family of American National Standards developed by ANS-15 for research reactors are the following:

- ANSI/ANS-15.1-2007 (R2013), "The Development of Technical Specifications for Research Reactors";
- ANSI/ANS-15.2-1999 (R2009), "Quality Control for Plate-Type Uranium-Aluminum Fuel Elements";
- ANSI/ANS-15.4-2016, "Selection and Training of Personnel for Research Reactors";
- ANSI/ANS-15.7-1977 (R1986), "Research Reactor Site Evaluation" (withdrawn);
- ANSI/ANS-15.8-1995 (R2013), "Quality Assurance Program Requirements for Research Reactors";
- ANSI/ANS-15.10-1994, "Decommissioning of Research Reactors" (withdrawn);
- ANSI/ANS-15.11-2016, "Radiation Protection at Research Reactor Facilities";
- ANSI/ANS-15.15-1978 (R1986), "Criteria for the Reactor Safety Systems of Research Reactors" (withdrawn);
- ANSI/ANS-15.16-2015, "Emergency Planning for Research Reactors";
- ANSI/ANS-15.17-1981 (R2000), "Fire Protection Program Criteria for Research Reactors" (withdrawn);
- ANSI/ANS-15.19-1991, "Shipment and Receipt of Special Nuclear Material (SNM) by Research Reactor Facilities" (withdrawn);
- ANSI/ANS-15.21-2012, "Format and Content for Safety Analysis Reports for Research Reactors."

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

This standard does not incorporate the concepts of generating risk-informed insights, performance-based requirements, or a graded approach to quality assurance. The user is advised that one or more of these techniques could enhance the application of this standard.

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Radiation Protection at Research Reactor Facilities

1 Scope

This standard establishes the elements of a radiation protection program and the criteria necessary to provide an acceptable level of radiation protection for personnel at research reactor facilities and the public consistent with keeping exposures and releases as low as is reasonably achievable (ALARA).

2 Acronyms and definitions

2.1 Shall, should, and may

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

2.2 List of acronyms

(the) Act: Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.)

ALARA: as low as is reasonably achievable

ALI: annual limit on intake

DAC: derived air concentration

DAC-hour: derived air concentration-hour

ICRP: International Commission on Radiological Protection

ICRP 60: ICRP Publication 60

ICRP 103: ICRP Publication 103

ICRU: International Commission on Radiation Units and Measurements

LDE: lens dose equivalent

MQA: measurement quality assurance

NCRP: National Council on Radiation Protection and Measurements

NCRP 91: NCRP Report No. 91

NRC: U.S. Nuclear Regulatory Commission

NVLAP: National Voluntary Laboratory Accreditation Program

TEDE: total effective dose equivalent

TLD: thermoluminescent dosimeter