

# American Nuclear Society

**calculation and measurement of direct and scattered  
gamma radiation from LWR nuclear power plants**

**an American National Standard**

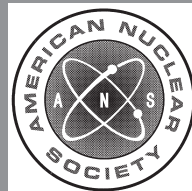
**REAFFIRMED**

**March 5, 2007**

**ANSI/ANS-6.6.1-1987; R1998;  
R2007**

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**ANSI/ANS-6.6.1-1987 (R1998)**  
Revision of  
**ANSI/ANS-6.6.1-1979**

**American National Standard  
for Calculation and Measurement of Direct and Scattered  
Gamma Radiation from LWR Nuclear Power Plants**

Secretariat  
**American Nuclear Society**

Prepared by the  
**American Nuclear Society  
Standards Committee  
Working Group ANS-6.6.1**

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## **American National Standard**

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## Foreword

(This Foreword is not a part of American National Standard for Calculation and Measurement of Direct and Gamma Radiation from LWR Nuclear Power Plants, ANSI/ANS-6.6.1-1987.)

In mid 1973, a need for a standard on this subject was identified by D. K. Trubey, chairman of ANS-6. The proposed standard had been listed among those having a high priority by the Atomic Energy Commission Directorate of Regulatory Standards. The project was assigned by the NTAB Executive Committee in September 1973. Working Group ANS-6.6 was formed and E. A. Warman was appointed chairman in September 1973. The first meeting of the working group was held in November 1973. Twelve subsequent meetings were held from February 1974 through June 1978.

The first working draft was completed in June 1975. A revised working draft was distributed for initial review by ANS-6 chairmen in June 1976. The completed Draft 1 was submitted to ANS-6 for ballot in September 1977. This draft was unanimously approved in subsequent balloting by ANS-6 subcommittee chairmen, with the sole negative ballot being changed to affirmative after resolution of comments. A reorganized working group, ANS-6.6.1, was established in 1984 to reconsider the status of the standard. In December 1985, that working group recommended reaffirmation of the standard with minor editorial changes.

In preparing this standard, the working group decided to provide a series of reference calculations with which a radiation analyst should compare results obtained by the method he elected to use in a given application. Comparison with the results of these reference calculations is intended to provide some assurance that the methods being considered by the user of this standard produce results which are in reasonable agreement with those of other methods. These reference calculations are intentionally simplistic to make this comparison effort easier to accomplish.

This standard addresses contained sources of direct and scattered radiation and specifically excludes effluent releases and accident sources. Measurements at some operating plants, which have no local shielding to reduce reactor cavity/nozzle inspection port streaming, have indicated that localized streaming can be measurable outside the containment. Such localized streaming effects are not addressed in this standard.

Particular emphasis is placed on the direct and scattered radiation from  $^{16}\text{N}$  sources in Boiling Water Reactors (BWRs). This emphasis reflects the fact that analysis and measurement of radiation associated with  $^{16}\text{N}$  sources at BWRs was identified as a major area of interest in establishing priority for development of this standard. The three appendices to the standard are included as examples of the type of measurements and analyses which have been performed in connection with the  $^{16}\text{N}$  sources at BWRs. In Appendices 1 and 2, the assumption is made that the observed dose rates are entirely due to  $^{16}\text{N}$  activity. The net effect of this assumption is to increase the amount of conservatism in the quantification of the source terms, in that other radiations are included in the measurements from which the  $^{16}\text{N}$  source terms are developed.

Working Group ANS-6.6.1 of the ANS Standards Committee had the following membership:

R. E. Faw, Chairman, *Kansas State University*  
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J. Celnik, *Stone & Webster Engineering Corporation*  
F. J. Congel, *U.S. Nuclear Regulatory Commission*  
K. O'Brien, *U.S. Department of Energy*

J. V. Pace III, *Martin-Marietta Energy Systems, Inc.*  
J. K. Shultis, *Kansas State University*  
Shiaw-der Su, *GA Technologies, Inc.*  
M. B. Wells, *Radiation Research Associates*  
N. B. Willoughby, *Consultant*

The membership of Subcommittee ANS-6, Radiation Protection and Shielding, at the time of its approval of this standard was:

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E. T. Boulette, <i>Maine Yankee Atomic Power Company</i>	W. C. Hopkins, <i>Bechtel Corporation</i>
J. C. Celnik, <i>Stone &amp; Webster Engineering Company</i>	E. Normand, <i>Boeing Aerospace Company</i>
	P. J. Persiani, <i>Argonne National Laboratory</i>
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Consensus Committee N17, Research Reactors, Reactor Physics, and Radiation Shielding, had the following membership at the time it reviewed and approved this standard:

**R. S. Carter, Chairman**  
**T. M. Raby, Secretary**

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A. D. Callihan (Subcommittee ANS-1)	Individual
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C. Thomas (Alt.)	
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