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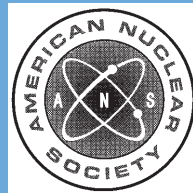
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R2011; R2019**

**use of fixed neutron absorbers
in nuclear facilities outside reactors**

an American National Standard

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**American National Standard
for Use of Fixed Neutron Absorbers
in Nuclear Facilities Outside Reactors**

Secretariat
American Nuclear Society

Prepared by the
**American Nuclear Society
Standards Committee
Working Group ANS-8.21**

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by the
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American National Standard

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Foreword

(This Foreword is not a part of American National Standard for Use of Fixed Neutron Absorbers in Nuclear Facilities Outside Reactors, ANSI/ANS-8.21-1995.)

Nuclear criticality safety is an essential part of the safety assessment of a facility or an operation involving fissionable material. Designers, operators, safety professionals, regulators, and standard writing groups dealing with non-reactor nuclear facilities need to address nuclear criticality safety. This standard provides guidance for the use of fixed neutron absorbers as an integral part of nuclear facilities and fissionable material process equipment outside reactors, where such absorbers provide criticality control as required in a safety analysis.

This standard was drafted by Working Group ANS-8.21 of Subcommittee ANS-8 of the American Nuclear Society Standards Committee. The following members participated in the preparation of the standard:

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The membership of Committee N16, Nuclear Criticality Safety, at the time of its ballot for approval of this standard, was as follows:

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Use of Fixed Neutron Absorbers in Nuclear Facilities Outside Reactors

1. Introduction

Fixed neutron absorbers (poisons) are frequently used as part of the overall criticality safety control measures. American National Standard for Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors, ANSI/ANS-8.1-1983 (R1988) [1],¹ covers general considerations of neutron absorbers for criticality prevention. The present standard supplements guidance provided in ANSI/ANS-8.1-1983 (R1988) and in American National Standard Criticality Safety Criteria for the Handling, Storage, and Transportation of LWR Fuel Outside Reactors, ANSI/ANS-8.17-1984 (R1989), [2]. Separate standards have been developed to address specific applications of neutron absorbers. An example is the guidance on the use of Raschig rings contained in American National Standard for the Use of Borosilicate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Material, ANSI/ANS-8.5-1986 [3].

This standard provides additional detailed guidance on the use of fixed neutron absorbers in the design, construction, and operation of non-reactor nuclear facilities. For the purpose of this standard, fixed neutron absorbers are materials that are an integral part of a facility, equipment, or fuel components; have neutron absorption properties; and are incorporated into designs to assure safety margins for sub-criticality as needed for normal and abnormal operating conditions. The guidance applies to the design, construction, and operation of facilities used for handling, processing, and storing of fissionable materials. This guidance also applies to equipment associated with the transportation of fissionable material.

Use of fixed neutron absorbers may reduce the need for reliance on administrative criticality safety controls. Such use may provide more cost-effective utilization of the facility or equipment while maintaining adequate safety

margins. When fixed neutron absorbers are present but are not required to maintain sub-criticality under normal or credible abnormal conditions, compliance with the requirements of this standard is not mandatory.

2. Scope

This standard provides guidance for the use of fixed neutron absorbers as an integral part of nuclear facilities and fissionable material process equipment outside reactors, where such absorbers provide criticality safety control.

3. Definitions

3.1 Limitations. The definitions given below are of a restricted nature for the purpose of this standard. Other specialized terms are defined in *Glossary of Terms in Nuclear Science and Technology* [4].

3.2 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 with this standard, all operations shall be performed in accordance with its requirements but not necessarily with its recommendations.

3.3 Glossary of Terms

benchmark experiment. An experiment appropriate for the validation of calculational methods applicable to the evaluation of the neutron absorber system.

fixed moderator. A moderator with an established geometric relationship to the locations occupied by the fixed neutron absorber and fissionable material.

fixed neutron absorber. Neutron absorbers in solids with an established geometric

¹Numbers in brackets refer to corresponding numbers in Section 6, References.