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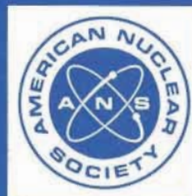
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metal fire protection in LMR plants

an American National Standard

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555 North Kensington Avenue  
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AMERICAN NUCLEAR SOCIETY

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555 North Kensington Avenue  
La Grange Park, Illinois  
60526-5592 USA

Tel: 708 / 352-6611  
E-Mail: [NUCLEUS@ans.org](mailto:NUCLEUS@ans.org)  
<http://www.ans.org>  
Fax: 708 / 352-0499

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for Liquid Metal Fire Protection in LMR Plants**

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**American Nuclear Society**

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# Foreword

(This Foreword is not a part of American National Standard for Liquid Metal Fire Protection in LMR Plants, ANSI/ANS-54.8-1988.)

Sodium/NaK fires present unique challenges to the safe operation and shutdown of the Liquid Metal Reactor (LMR) plants. As a result of the increased design and development activities directed toward the establishment of commercial LMR plants, the need for developing specific requirements and guidelines is recognized. Experiences from the ongoing LMR development programs have been included. The requirements and guidelines presented here could change with increasing operating and design and development experience.

The ANS-54.8 Working Group which prepared the final version of this standard consisted of the following membership:

C. A. Bijlani, Chairman, *Burns and Roe Enterprises*  
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C. Boasso, *Westinghouse Electric Corporation*  
J. Hagelston, *Rockwell International*

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C. Cox, <i>Westinghouse-Hanford</i>	W. J. Rowan, <i>Consultant</i>
S. Gray, <i>Electric Power Research Institute</i>	L. E. Strawbridge, <i>Westinghouse Electric Corporation</i>
G. L. Gyorey, <i>G E Advanced Nuclear Technology</i>	

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# Liquid Metal Fire Protection in LMR Plants

## 1. Introduction and Scope

**1.1 Introduction.**<sup>1</sup> Typical liquid metal reactor (LMR) designs use liquid sodium as the coolant for both the primary and intermediate heat-transport systems (HTS). In addition, liquid sodium and NaK (a mixture of sodium and potassium that is liquid at room temperature) are often used in auxiliary heat-removal systems. Since these liquid metals can react readily with oxygen, water, and other compounds, special precautions must be taken in the design, construction, testing, and maintenance of the sodium/NaK systems to ensure that the potential for leakage is very small.

**1.2 Purpose.** The purpose of this standard is to establish guidelines and requirements to ensure that the functional performance of the liquid-metal fire detection, alarm, suppression, control, and structural protection systems are adequate to protect the public health and safety, the plant personnel, and minimize or limit the economic loss in the event of a sodium/NaK leak.

**1.3 Scope.**<sup>2</sup> This standard sets forth guidelines and minimum design requirements for preventing, detecting, and suppressing liquid-metal fires and mitigating their consequences in liquid metal reactor plants.

**1.4 Limits of Application.** This standard applies to those plant protection and operating features specifically designed to prevent or mitigate the consequences of significant sodium/NaK spill accidents in nuclear power plants. It does not address those accidents involving sodium/water reactions within the boundary of the steam generators. It does not apply to liquid metals other than sodium/NaK.

The intent of this standard is to provide requirements and guidance on those aspects of fire prevention and protection that are not covered in other codes and standards. It is not intended to be a total plant fire protection standard and does not therefore supersede other applicable codes and standards of fire protection. In the event that a

conflict exists between the requirements of this standard and those of other applicable codes and standards, the requirements of this standard shall take precedence for that portion of the fire protection system specifically related to sodium/NaK releases. Nothing in this standard is intended to prevent the use of new fire protection methods, provided that sufficient technical data are available to demonstrate that the new method or device provides an equivalent level of safety and reliability as prescribed by this standard.

## 2. Definitions

**atmospheric control system.** System required to maintain predetermined composition of gases in the inerted cells.

**catch pan.** A permanently installed pan used to collect leaking sodium/NaK.

**cell.** An enclosed space in which liquid metal piping, equipment or both are located.

**cell inert gas cooling system.** Cooling system serving the inerted cells.

**design basis leak.** The calculated time dependent sodium/NaK leak rate based on a suitably conservative mechanistic scenario.

**electrical supervision.** Monitoring the circuit with an electrical current so that a trouble signal shall indicate the occurrence of a single open or a single ground fault on any installation wiring circuit that would prevent proper alarm operation.

**fire area.** That portion of a building or plant that is separated from other areas by boundary fire barriers.

**fire barrier.** A physical barrier such as a floor, wall, or ceiling having all penetrations and openings properly protected to prevent the spread of fire from one side to the other.

**fire suppression deck.** A structure located immediately above the catch pan, designed to allow sodium/NaK to drain to the catch pan while re-

<sup>1</sup>For further guidance, see A-1.1 of the appendix.

<sup>2</sup>See A-1.3 of the appendix.