



U.S. NUCLEAR REGULATORY COMMISSION

REGULATORY GUIDE

OFFICE OF STANDARDS DEVELOPMENT

REGULATORY GUIDE 8.12
(Task OH 015-4)

CRITICALITY ACCIDENT ALARM SYSTEMS

A. INTRODUCTION

Section 70.24, "Criticality Accident Requirements," of 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," requires licensees who are authorized to possess special nuclear material in excess of certain amounts to maintain a criticality accident alarm system. This guide describes a system acceptable to the NRC staff for meeting the Commission's requirements for a criticality accident alarm system.

B. DISCUSSION

Section 70.24 requires, in part, the detection of a criticality that produces an absorbed dose in soft tissue of 20 rads of combined neutron and gamma radiation at an unshielded distance of 2 meters from the reacting material within 1 minute. This sensitivity should be enough to detect any accidental criticality. Criticality accident alarm systems are also discussed in American National Standard ANSI/ANS 8.3-1979,¹ "Criticality Accident Alarm System," which has the same detection criterion.

Paragraph 4.1 of ANSI/ANS 8.3-1979 requires criticality accident alarms "wherever it is deemed that they will result in a reduction in total risk." The use of criticality alarms is not intended to produce a hazard for workers, but to reduce any hazard that may exist from working with materials that have a potential for criticality. Some situations exist in which the workplace could be evacuated as a result of a false alarm and a hazard could be posed by the evacuation. Such situations should be avoided. For example, where the quantities or form of special nuclear material make criticality practically impossible or where geometric spacing is used to preclude criticality, such as in some storage spaces for unirradiated nuclear power plant fuel, alarms are not needed. However, § 70.24 requires alarms whenever licensees are authorized to possess special nuclear material

* The substantial number of changes in this revision has made it impractical to indicate the changes with lines in the margin.

¹ Copies may be obtained from the American Nuclear Society, 555 North Kensington Avenue, La Grange Park, Illinois 60525.

in excess of certain amounts. Thus, Regulatory Position 1 discusses certain situations where an exemption from the criticality accident alarm system is appropriate.

C. REGULATORY POSITION

The guidance on criticality accident alarm systems contained in ANSI/ANS 8.3-1979, "Criticality Accident Alarm System," is generally acceptable to the NRC staff, subject to the following:

1. Section 70.24 of 10 CFR Part 70 requires alarm coverage "in each area in which such licensed special nuclear material is handled, used, or stored..." whereas paragraph 4.2.1 of the standard states that the need for criticality alarms shall be evaluated for such areas. If such an evaluation does not determine that a potential for criticality exists, as for example where the quantities or form of special nuclear material make criticality practically impossible or where geometric spacing is used to preclude criticality, such as in some storage spaces for unirradiated nuclear power plant fuel, it is appropriate to request an exemption from § 70.24.

2. Paragraph 70.24(a)(1) of 10 CFR Part 70 requires that each area be covered by two detectors, in contrast to paragraph 4.5.1 of the standard, which allows coverage by a single detector.

3. The signal for evacuation should be sounded automatically upon detection of an accident.

4. A quick screening capability as required in paragraph 70.24(b) of 10 CFR Part 70 may be provided instead of the more extensive dosimetry requirements stated in paragraph 6.6 of the standard.

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the NRC staff's plans for using this regulatory guide. Except in those cases in which an applicant or licensee proposes an acceptable alternative

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Comments and suggestions for improvements in these guides are encouraged at all times, and guides will be revised, as appropriate, to accommodate comments and to reflect new information or experience. This guide was revised as a result of substantive comments received from the public and additional staff review.

Comments should be sent to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

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method, the staff will use the methods described herein after March 1, 1981, in evaluating designs of criticality accident alarm systems to meet the requirements of § 70.24 of the Commission's regulations.

If an applicant or licensee wishes to use the method described in this regulatory guide before March 1, 1981, the applicant's alarm system design or the licensee's alarm system will be evaluated on the basis of this guide.

VALUE/IMPACT STATEMENT*

This revision to Regulatory Guide 8.12, "Criticality Accident Alarm Systems," clarifies, in Regulatory Position 1, where criticality accident alarm systems are not appropriate and adds the position that in situations where alarm systems have been installed, the alarm should automatically sound when criticality is reached. These positions have been reached as a result of staff review of the draft guide and evaluation of public comments on it.

As indicated in Regulatory Position 1, a request for an exemption to the requirements of § 70.24, "Criticality Accident Requirements," of 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," is appropriate when there is no real possibility of a criticality, for example in situations where geometric spacing is used to preclude criticality, such as in storage spaces for unirradiated nuclear power plant fuel.

* Draft Guide OH 015-4 and its associated value/impact statement dated May 1980 are available for inspection or copying for a fee at the NRC Public Document Room, 1717 H Street NW., Washington, D.C.

This revision to the guide describes a criticality accident alarm system acceptable to the NRC staff for meeting the Commission's regulations for such a system.

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