



Criticality Accident Alarm System

An American National Standard

ANSI/ANS-8.3-2022



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American National Standard Criticality Accident Alarm System

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Foreword

(This foreword does not contain any requirements of American National Standard ANSI/ANS-8.3-2022, *Criticality Accident Alarm System*, but is included for informational purposes.)

This standard provides guidance for the establishment and maintenance of a criticality accident alarm system (CAAS). The usefulness and personnel protective features of CAAS have been demonstrated by criticality accidents that have occurred. However, the evolution of improved and (largely) uniform operating practices have reduced accident likelihoods since this standard's forebear ANSI N16.2 was first developed in the late 1960s. On the contrary, revisions to this standard over that time have not been in harmony with changes in these operating practices. This revision attempts to close that gap with updated guidance on practical assessments of the need for an alarm system.

Preparation of a CAAS standard, begun in 1966, resulted in the issuance of N16.2-1969 (withdrawn), and an initial revision was issued and redesignated ANS-8.3 in 1979. A second revision, issued in 1986, incorporated relevant features of ANSI N2.3-1979 (withdrawn), *Immediate Evacuation Signal for Use in Industrial Applications*. The 1986 revision also deleted the section that addressed emergency planning. This guidance is now provided in ANSI/ANS-8.23-2019, *Nuclear Criticality Accident Emergency Planning and Response*. The 1997 revision of ANS-8.3 added guidance on other detection methods for accidents below the detection threshold and guidance on the use of portable alarms.

The minimum accident of concern (MAC) topic has been revisited in light of concerns that it might not have been as inclusive of slightly above delayed critical excursions as was originally thought, for solution accidents [see the words “few cents” in the last sentence of ANS-8.3-1997 (R2017) (withdrawn), Appendix A]. The underlying basis for the current MAC had not been revisited since awareness and publication of information about the Russian and Japanese accidents occurred; this has now been done. It has resulted in a firmer foundation for a new MAC based on fission rate, for the most likely accident medium, a solution or solution-like system. These new data, coupled with a much longer history and reduced accident frequency have also enabled the standard to definitively focus on the most likely accident profile, namely, a prompt critical or near-prompt critical power pulse. The significantly increased accident data also enabled a firmer statement on non-solution accident likelihoods, provided in Appendix A. In light of the above, the term “minimum accident of concern” has been replaced in the body of the standard and in the appendixes with the term “minimum accident for system design” (MASD). The standard also mentions that detection methods other than a CAAS may be used to detect accidents. This is consonant with ANSI/ANS-8.23-2019, *Nuclear Criticality Accident Emergency Planning and Response*.

Most of the changes incorporated into this revision of ANS-8.3 are oriented toward clarification, rather than change of standard requirements and recommendations. The structure has also been revised to more clearly establish the domain and interrelationships of the recommendations and requirements. Some requirements and recommendations have been removed or altered to correctly reflect the scope of this standard in relation to those containing administrative and emergency response requirements.

This standard is compatible with ISO 7753:1987, *Nuclear Energy—Performance and Testing Requirements for Criticality Detection and Alarm Systems*. Standard IEC 60860-2014, *Radiation Protection Instrumentation—Warning Equipment for Criticality Accidents*, contains useful information regarding electrical characteristics and testing procedures for alarm equipment.

This standard incorporates the concepts of generating risk-informed insights and gives performance-based requirements. The user is advised to apply appropriate quality assurance criteria.

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.

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