

# American Nuclear Society

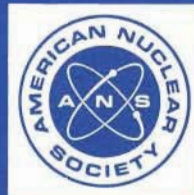
**WITHDRAWN**

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**time response design criteria for nuclear  
safety related operator actions**

**an American National Standard**

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**ANSI/ANS-58.8-1984**

**American National Standard  
Time Response Design Criteria for Nuclear  
Safety Related Operator Actions**

Secretariat  
**American Nuclear Society**

Prepared by the  
**American Nuclear Society  
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## Foreword

(This Foreword is not a part of American National Standard Time Response Design Criteria for Nuclear Safety Related Operator Actions, ANSI/ANS-58.8-1984.)

The criteria contained in this standard establish timing requirements for determining whether the nuclear-safety systems that mitigate the consequences of design basis events may be initiated or adjusted by (a) use of operator action or (b) automatic protection systems. Functional guidelines for the instrumentation, controls, indicators, annunciators, etc., necessary for operator actions are also established.

There are now no generally accepted timing requirement criteria for nuclear-safety-related operator actions. The guidelines in current use are too ill-defined to form a basis for criteria. The criteria of this standard fill this void and provide a basis for future designs.

During normal operation of nuclear power plants, the operator makes many decisions and initiates many actions that are related to the safety of the plant. In the course of design basis events, it is worthwhile, prudent, and often necessary to use the memory, reasoning, and decision-making capability of the operator to augment automatic nuclear-safety system responses to ensure that the safety of the plant and the environment is maintained.

Operator actions are considered to be of four basic types: (1) nuclear-safety-related, (2) required, (3) optional, and (4) unplanned. Nuclear-safety-related operator actions are part of the plant design basis and are used to initiate or adjust nuclear-safety system equipment. Required operator actions are required by the plant emergency procedures but do not accomplish a nuclear-safety function. Optional operator actions may be useful in improving the consequences following an event; however, the consequences must also be acceptable in the absence of such actions. Unplanned operator actions may be useful in correcting unforeseen situations after an event or in coping with an unforeseen event. Although plant design features need to facilitate optional and unplanned operator actions, unplanned actions are not addressed in these criteria since they are applicable to non-design basis events.

These criteria are not intended to address human factor design concerns. The time response criteria given in this standard include conservative time margins, time delays, and other restrictions to provide an adequate nuclear-safety margin for the purposes of system and plant design and nuclear-safety evaluations. They are not intended to serve as a basis for plant staffing or actual operator action times in procedures or training. In actual practice, the operator should be capable of reacting to design basis events correctly and performing the nuclear-safety-related operator action(s) in a shorter time.

The application of these criteria may result in system design modifications or in automation of some protective actions that have historically been performed by the operator. The latter option would not be applied where application would require automation of protective actions that are either beyond the state-of-the-art or so complex as to jeopardize plant safety in the event of unplanned occurrences.

The scope of the criteria of this standard for nuclear-safety-related operator actions have been deliberately limited to those associated with the accidents required to be analyzed by safety analysis reports (SAR) via Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants." The intent of this limitation is to bound the analyses and the potential automation required. The intent

is also to stay with known nuclear-safety-related operator actions. Events not covered by Regulatory Guide 1.70 would be considered unforeseen events to be responded to by unplanned operator actions and those portions of the automatic protection system that would be actuated. This standard is to be applied to new design basis events if and when the scope of the SAR is expanded.

The early drafts of these criteria developed by ANS-58.8, were based on an extension of the simple "ten-minute rule" that has gained some acceptance in the industry. Several ANS-51 members, including the NRC representatives, felt strongly that this approach was an inadequate time allowance for some cases. After meetings with the U.S. Nuclear Regulatory Commission (NRC) and the Institute of Electrical and Electronics Engineers, Inc. (IEEE) Nuclear Power Engineering Committee (NPEC) SC-6, the Working Group for Operator Actions decided to adopt the more comprehensive and, in some cases, more conservative requirements reflected in these criteria.

The nuclear-safety-related operator action response times in these criteria are based in part on simulator measurements of operator performance. The measurement programs were conducted by the General Physics Corporation, under the sponsorship of the Electric Power Research Institute, and by Westinghouse Electric Corporation. The measurement programs included a range of operator skill levels from operators completing the initial simulator training program to operators returning to the simulator for periodic refresher training. The operator response to various anticipated operational occurrences and accident situations was measured to determine the promptness of the operator's actions. Following the automatic collection of the data, reductions using statistical methodology were accomplished.

The data upon which the response times of this standard are based support assignment of a confidence level to those times being sufficient for operator response. The data do not allow assignment of a given confidence level that the operator action will necessarily be correct. Therefore, this design standard assumes that if the intervals specified are used, then other performance shaping factors, e.g., training level, panel layout, and procedures, may dominate the response time factor in influencing the correctness of operator response.

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\*ANS-58.8 was under the management of Subcommittee ANS-51, Pressurized Water Reactor Criteria (C. J. Gill, Chairman); it has been incorporated into MC-1.

\*\*The American Nuclear Society's Nuclear Power Plant Standards Committee (NUPPSCO) had the following membership at the time of its approval of this standard:

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# Time Response Design Criteria for Nuclear-Safety-Related Operator Actions

## 1. Introduction

**1.1 Scope.** This standard establishes criteria for determining the minimum time response to be used for nuclear-safety-related operator actions to mitigate design basis events as set forth in safety analysis reports (SAR). These criteria specify time test requirements that shall be met for credit to be taken in the design and nuclear-safety analysis for operator actions to initiate, to control, or to initiate and control nuclear-safety system actions.

Specifically, they establish:

(1) Certain requirements for determining whether a particular action to initiate or adjust a nuclear-safety system may be accomplished by operator action or must be accomplished by automatic protection system or system redesign.

(2) A basis for determining when design modifications can obviate the need for automatic protective actions that would otherwise be required.

(3) Functional guidelines for the hardware, such as instrumentation, controls, indicators, and annunciators necessary to support the nuclear-safety-related operator actions.

**1.2 Purpose.** The criteria presented in this standard permit the designer to determine the time response requirements that are acceptable for relying on operator actions to mitigate the consequences of design basis events in nuclear power plants.

In addressing operator actions, the scope of these criteria is limited to that required for operator actions used in the design basis events examined in the SAR for the plant where manual actions are used to prevent exceeding design requirements.

Performance shaping factors that must be considered in the design to use the operator to perform nuclear-safety functions include: control panel design, and emergency procedures.

The criteria set forth in this standard include conservative time intervals and other restrictions to

provide an adequate safety margin for the purpose of nuclear-safety system design and nuclear-safety analysis of the design basis events. They are not intended to serve as a basis for actual operator action times in procedures or training, nor do they set requirements for operator staffing or qualification. The time periods given in these criteria shall be considered as a minimum the plant design shall provide to permit credit for operator actions.<sup>1</sup>

**1.3 Bases and Assumptions.** The criteria for this standard are based on the following assumptions.

(1) Instrument displays are adequately and centrally located, as described in Sections 7, Availability and Reliability of Information and Controls, and 8, Safety Analyses and Emergency Procedures, of these criteria, and are provided to alert and guide the operator.

(2) The plant has been designed to meet single failure criteria as specified in American National Standards Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants, ANSI/ANS-51.1-1983 [1]<sup>2</sup>, and Nuclear Safety Criteria for the Design of Stationary Boiling Water Reactor Plants, ANSI/ANS-52.1-1983 [2].

(3) Written emergency procedures are clear, complete, unambiguous, available and used. The operating staff is familiar with the procedures from use in the plant qualification and requalification programs.

(4) A sufficient number of shift operators are available, based upon plant staffing requirements, to perform any nuclear-safety-related or required operator actions.

(5) The operators are qualified in accordance with American National Standard for Selection, Qualification and Training of Personnel for Nuclear Power Plants, ANSI/ANS-3.1-1981. [3]

<sup>1</sup>The bases for the time tests in the standard are contained in the Appendix. Rationale behind these criteria and examples to clarify specific sections are also presented.

<sup>2</sup>Numbers in brackets refer to corresponding numbers in Section 10, References.