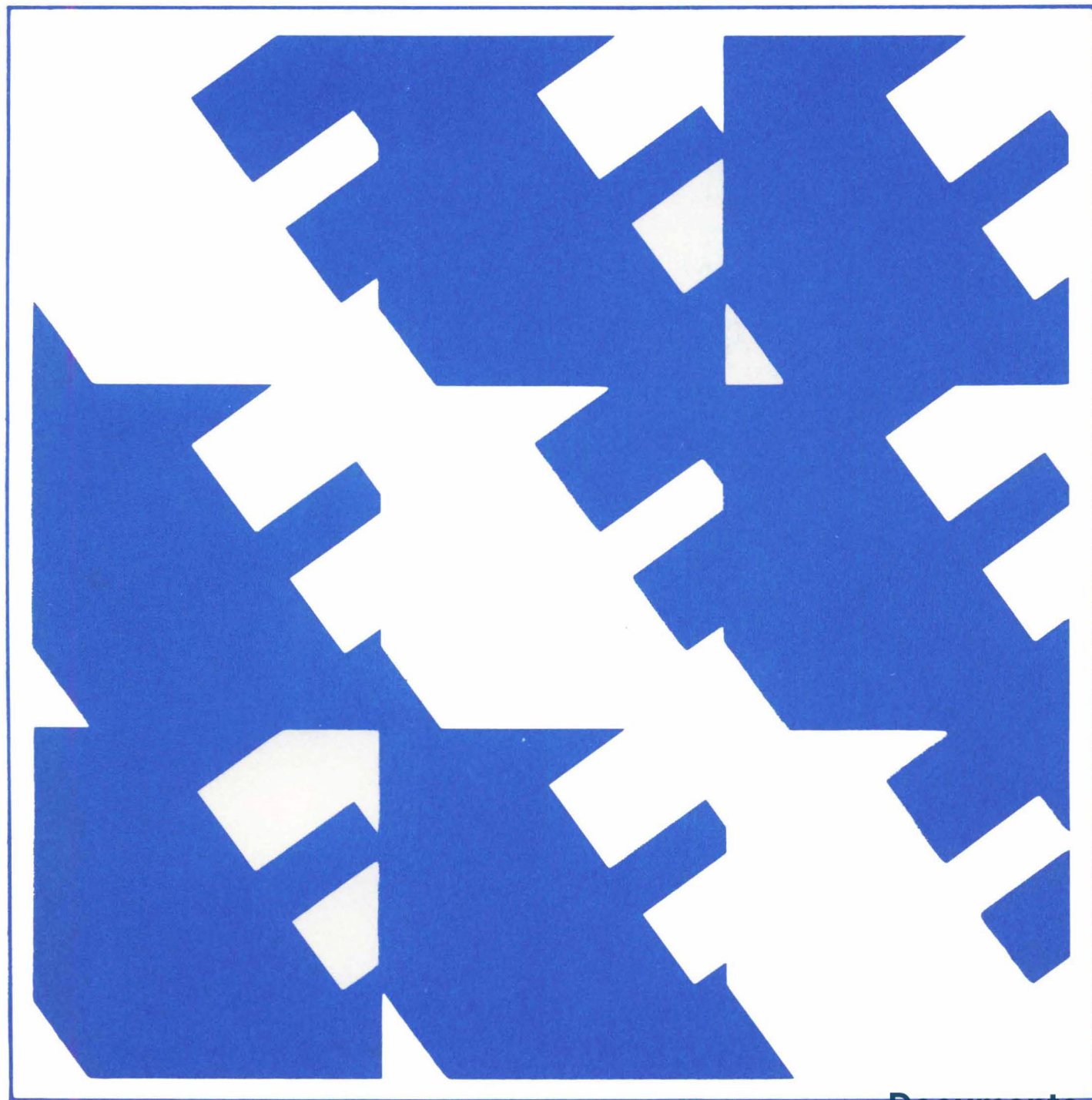


IEEE Standard Application of the Single Failure Criterion to Nuclear Power Generating Station Class 1E Systems

ANSI/IEEE Std 379-1977



An American National Standard
**IEEE Standard Application of the
Single Failure Criterion to
Nuclear Power
Generating Station Class 1E Systems**

Sponsor

**Nuclear Power Engineering Committee of the
IEEE Power Engineering Society**

Approved October 19, 1978

American National Standards Institute

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Approved December 9, 1976

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Foreword

(This foreword is not a part of ANSI/IEEE Std 379-1977, IEEE Standard Application of the Single Failure Criterion to Nuclear Power Generating Station Class 1E Systems.)

The requirement for Class 1E systems to meet a single failure criterion is found in many documents, including standards of the Institute of Electrical and Electronics Engineers (IEEE), the American Nuclear Society (ANS), and in federal regulations. It is recognized that the single failure criterion is applicable to the aggregate of electrical and mechanical systems; however, the criterion statement, as found in this document, has been developed for Class 1E systems. Where the interface with mechanical systems is unavoidable (for example, sensing lines), the mechanical portions are considered to be part of the Class 1E system with which they interface. It should be noted that the Class 1E systems include the actuation and protection systems as well as the electrical power system.

Several areas which do not have greater development than the limited scope of this guide could provide are noted here.

Relationship with Other Guides and Standards. Other guides and standards should be incorporated in any good design in order to produce an acceptable and reliable system. The relationship of the single failure criterion to these other guides and standards, documentation requirements, reliability and probability studies, testing and operation is not within the scope of this guide.

Shared Systems. In order to provide guidance, the application of the single failure criterion was developed for shared systems. This criterion was to be applied to systems which are shared by two units only and is repeated here for information purposes:

(1) The Class 1E systems shall be capable of performing their required protective actions with a single failure assumed within the shared systems, or within the auxiliary supporting features with which the shared system interfaces.

(2) The Class 1E systems of each unit shall be capable of performing their required protective actions with a single failure initiated concurrently in each unit within the systems which are not shared.

The failures in (1) and (2) need not be considered simultaneously in the performance of the single failure analysis.

Consensus could not be achieved regarding the adequacy of this position and the implied justification for sharing systems by meeting the criterion (although a note was included which disallowed the justification). There was not sufficient basis on which to justify the subcommittee's application of the single failure criterion to shared systems and therefore the Nuclear Power Engineering Committee (NPEC) directed that this section be removed from the document. Additional work is required to more accurately define shared systems and to develop the criteria to be applied. An ad hoc committee has been formed under NPEC to develop the criteria required. Pending the result of this committee work, the application of the single failure criterion to shared systems may be included in future revisions of this document.

The state of the art is limiting in other areas which are related to the single failure criterion. Examples include the following.

Single Operator Error. Operator actions should be considered but are beyond the scope of this document.

Common Mode Failure. Common mode failures are multiple failures resulting from a single cause and are typically characterized by the failure of identical components. In the design and analyses of the plant, these components are determined to be independent and any failures of these components are considered to be truly random.

Common mode failures can be the result of a number of causes such as external environmental effects, including natural phenomena such as earthquakes and floods, design and manufacturing errors, and operator and maintenance errors.

In order to obtain protection from possible common mode failures resulting from external environmental effects, the system components are designed, qualified, and installed to be immune to such anticipated challenges.