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American Nuclear Society

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containment isolation provisions for fluid systems after a LOCA

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April 26, 1989

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ERRATA

American National Standard Containment Isolation Provisions for Fluid Systems After a LOCA, ANSI/ANS-56.2-1984

Page 8, Subsection 3.4, Valve Design Criteria, second sentence:

The word "inside" should replace the word "outside" in the second sentence of subsection 3.4; it should read:

> A containment isolation valve can be an automatic isolation valve, a sealed closed valve (see sealed closed isolation valve, Section 2, Definitions), a simple check valve inside containment, or a remote manual valve.

Page 8, Subsection 3.5, Criteria for Closed Systems Inside Containment, item (3):

The words "or 3" should be inserted in (3), as follows:

> A closed system inside containment shall: . . .
>
> (3) Meet Safety Class 2 or 3 design requirements,

November 1988

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Foreword

(This Foreword is not a part of American National Standard Containment Isolation Provisions for Fluid Systems After a LOCA, ANSI/ANS-56.2-1984.)

This revision to N271-1976 has been prepared by Working Group ANS-56.2 of the American Nuclear Society. The working group was asked by the Nuclear Power Plant Standards Committee (NUPPSCO) of the American Nuclear Society to reconvene for the purpose of reviewing N271-1976, in light of the events of March 28, 1979, at Three Mile Island - Unit 2.

The ANS-56.2 Working Group was reconstituted in August 1979. Upon reviewing this standard, the Working Group found that N271-1976 provides proper guidance for the design of the containment isolation provisions of fluid systems which penetrate the primary containment boundary of light water reactors. It was determined, however, that more specific guidance was required for the actuation of these containment isolation provisions. Accordingly, this revision to N271-1976 contains criteria for containment isolation provisions actuation, including diversity of actuation parameters and the concept of phased isolation.

Other modifications made to this standard include an updating of the references, an updating of Appendix A, the addition of criteria for the protection of the isolation provisions against overpressure from thermal expansion, and the inclusion of criteria for the use of relief valves in the forward flow direction as containment isolation valves.

The purpose of this revision to N271-1976 remains the same as that of the original standard, i.e., to specify minimum design requirements for fluid systems which penetrate the primary containment boundary of light water reactors to provide for isolation of the containment. The objective of the standard is to assist designers of containment isolation provisions in providing systems which meet applicable standards, codes, and regulations. Designers of the fluid systems, containment penetrations, electrical systems, etc., which are involved with a containment isolation function must consider the requirements of the isolation function as well as the fluid system requirements. This standard is also intended to assist the plant operating staff with respect to performance testing and maintenance.

As of November 1983, the membership of ANS-56.2 was:

P. A. Totten, Chairman, *Gibbs & Hill, Incorporated*
R. A. Berry, *Stone & Webster Engineering Company*
R. A. Bruce, *Westinghouse Electric Corporation*
E. V. Imbro, *U.S. Nuclear Regulatory Commission*
J. O. Schuyler, *Pacific Gas & Electric Company*
R. S. Turk, *Combustion Engineering, Inc.*

C. Christensen (General Electric Company) and J.C. Evans (Babcock & Wilcox Company) were also members of the working group during part of the revision process.

This standard provides guidance in satisfying several of the General Design Criteria of Title 10 of the Code of Federal Regulations, Part 50, Appendix A and the systems criteria developed by the ANS NUPPSCO.

This standard considers only a single active failure after the loss-of-coolant accident or any other accident requiring actuation of the same containment isolation provisions. Any other failure requirements are not addressed in this standard. Specific guidance on the single failure for LWR fluid systems is contained in American National Standard Single Failure Criteria for LWR Safety-Related Fluid Systems, ANSI/ANS-58.9-1981.

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The Working Group still notes that there is no standard which identifies an explicit list of plant conditions requiring protection system function including containment isolation. It was believed inappropriate for the present standard to develop those conditions requiring containment isolation. The working group has recommended to NUPPSCO that a separate working group should be formed for the purpose of preparing a standard dealing with containment isolation requirements for accidents other than LOCAs, if NUPPSCO believes it is necessary to address the subject of accident isolation.

The appendices are provided to illustrate methods of application of the standard, but are not mandatory or part of the standard. The footnotes are provided for guidance, but are not mandatory or part of the standard.

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*The American Nuclear Society's Nuclear Power Plant Standards Committee (NUPPSCO) had the following membership at the time of its approval of this standard in May 1980.

J. F. Mallay, Chairman
M. D. Weber, Secretary

Name of Representative	*Organization Represented*
G. A. Arlotto	*U.S. Nuclear Regulatory Commission*
R. E. Allen (Alt.)	*United Engineers & Constructors, Inc. (for the Institute of Electrical and Electronics Engineers Inc.)*
R. V. Bettinger	*Pacific Gas and Electric Company*
P. Bradbury	*Westinghouse Advanced Reactor Division*
D. A. Campbell	*Westinghouse Electric Corporation*
C. O. Coffer	*Kaiser Engineers*
L. J. Cooper	*Nebraska Public Power District*
W. H. D'Ardenne	*General Electric Company*
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*This roster indicates NUPPSCO members' affiliations at the time of consensus committee ballot.

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Containment Isolation Provisions for Fluid Systems After a LOCA

1. Purpose and Scope.

1.1 Scope. This standard specifies minimum design, actuation, testing, and maintenance requirements for the containment isolation of fluid systems after a LOCA. These fluid systems penetrate the primary containment of light water reactors and include piping systems (including instrumentation and control) for all fluids entering or leaving the containment. Electrical systems are not included. The provisions for containment isolation impose additional requirements which are not required for the fluid system function. This standard does not consider any isolation requirements that may exist for controlled leakage areas either enclosing the primary containment or contiguous to the primary containment. Also, this standard does not address containment isolation requirements for events other than LOCAs.

This standard presents requirements and conditions that are needed for the isolation of the containment and covers requirements for isolation barriers, their actuation, their operators, and connecting piping between isolation barriers. The standard does not cover penetration assemblies, protection systems, power supplies, and equipment qualification.

The design requirements in this standard consider: the system isolation and actuation function, isolation function testing, leakage rate monitoring and testing, and maintenance. This standard gives general requirements or refers to other standards, codes, and regulations for the following requirements: fire protection; protection against natural phenomena such as earthquake, tornado, or flood; environmental conditions such as normal operation, maintenance, testing, and postulated accidents (including the dynamic effects from missiles, pipe whip, and discharging fluids); and separation criteria.

1.2 Purpose. Containment isolation is the closure of isolation provisions in lines penetrating the containment in the event of the loss-of-coolant accident within the containment or any other accident which calls for actuation of the same containment isolation provisions. Containment isolation provisions are, therefore, provided for these accidents. If such accidents occurred, fluid systems penetrating the containment would be isolated except those which are engineered safety feature systems, or systems which are not required to function following a loss-of-coolant accident but, if available, can be used to accomplish a function similar to an engineered safety feature system (examples of such systems are BWR feedwater systems and PWR fluid systems required for reactor coolant pump operation).

Other accidents may require isolation of a specific fluid system or group of systems. The isolation provisions for such accidents are defined as accident isolation, and in many instances the provisions of this standard apply.

The objective of containment isolation shall be to allow the normal or emergency passage of the following through the containment boundary while preserving the integrity of the containment boundary:

(1) Engineered safety feature system fluids, or

(2) Fluids of systems which are not required to function following a loss-of-coolant accident but, if available, can be used to accomplish a function similar to an engineered safety feature system.

Other fluid systems shall be isolated immediately after a postulated loss-of-coolant accident.

2. Definitions and Terminology

accident. For the purposes of this standard, a single event, excluding a loss-of-coolant accident within the containment, that has been hypothesized for analyses purposes or postulated from unlikely but conceivable situations and that causes or threatens to cause a violation of one or more fission product barriers.

accident isolation. Establishment of isolation barrier(s) in a specific fluid system or group of