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safety criteria for HVAC systems located outside primary containment

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American National Standard
Safety Criteria for HVAC Systems Located Outside Primary Containment

Secretariat
American Nuclear Society

Prepared by the
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Foreword

(This Foreword is not a part of American National Standard Safety Criteria for HVAC Systems Located Outside Primary Containment, ANSI/ANS-59.2-1985.)

The primary objective of this standard is to set forth minimum requirements for new light water reactor nuclear plants for the design of heating, ventilating and air conditioning (HVAC) systems, located outside of primary containment. It is written to assist design engineers in evaluating and developing HVAC systems necessary for the accomplishment of required nuclear safety functions.

Other design considerations such as occupational safety including "as low as reasonably achievable" (ALARA) power generation criteria, and property protection may indicate a need for HVAC in areas not specifically covered by this standard. The designer should also consider potential adverse conditions that may result from misoperation or malfunction of HVAC systems.

Application of this standard requires close coordination between HVAC design engineers and engineers of other disciplines such that HVAC system limitations and interactions with other systems are considered. It is also essential that the various modes of operation of the plant are reviewed against the operational modes of HVAC systems.

Each nuclear power plant at its selected site has varied conditions that affect the design parameters of the HVAC systems. Site dependent conditions such as plant layout, environmental surroundings, etc. must be coordinated with the site related engineering efforts.

The development of this standard began in 1973 under Working Group ANS-32.2 at which time it was entitled, "Safety-Related HVAC Systems." A reorganization of the working group took place in early 1978 with an initial meeting being held in May, 1978. At the time of approval, the membership of the working group was:

N. Tolle, Secretary, *Burns and Roe, Inc.*
L. T. Ahlman, *Ebasco Services Incorporated*
C. P. Chen, *Battelle/Office of Nuclear Waste Isolation*
G. E. German, *Tennessee Valley Authority*
J. G. Hahn, *Bechtel Power Corporation*
E. Nicolaysen, *Gibbs and Hill, Inc.*
D. P. Notley, *U.S. Nuclear Regulatory Commission*
J. Robinson, *M&M Protection Consultants*

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

L. J. Cooper, Chairman
M. D. Weber, Secretary

Representative	*Organization*
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	(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	Pacific Gas and Electric Company
L. J. Cooper	Nebraska Public Power District
	(for the American Nuclear Society)
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L. Stanley	Quadrex/Nuclear Services Corporation
J. D. Stevenson	Structural Mechanics Associates
	(for the American Society of Civil Engineers)
C. D. Thomas	Science Applications, Inc.
G. P. Wagner	Commonwealth Edison Company
G. L. Wessman	Torrey Pines Technology
J. E. Windhorst	Individual Member

*This roster indicates NUPPSCO members' affiliations at the time of consensus committee ballot.

Contents

Safety Criteria for HVAC Systems Located Outside Primary Containment

1. Scope and Purpose

1.1 Scope. This standard establishes criteria for the design of Heating, Ventilating and Air Conditioning (HVAC) Systems located outside the primary reactor containment of light water reactor (LWR) nuclear power plants that could affect nuclear safety functions.

The radiological release control functions of LWR secondary containment systems are covered in American National Standards for Pressurized Water Reactor Containment Ventilation Systems, ANSI/ANS-56.6-1978 [1] and Boiling Water Reactor Containment Ventilation Systems, ANSI/ANS-56.7-1978 [2][1], and are not covered in this standard.

1.2 Purpose. This standard provides criteria and establishes the basis for design of those HVAC systems located outside primary containment whose operation may affect nuclear safety functions and are essential to achieving one or more of the following objectives.

(1) Provide suitable environment for plant personnel so they may perform required nuclear safety functions.

(2) Provide a suitable environment for plant equipment so it may perform required nuclear safety functions.

(3) Control, limit, or prevent the release or transfer of airborne radiological contaminants and airborne intake of hazardous chemicals that could affect nuclear safety functions.

(4) Control, limit, or prevent the release or transfer of airborne products of combustion that could affect nuclear safety functions.

The standard includes requirements as applicable for:

(1) Heating
(2) Ventilation
(3) Cooling
(4) Smoke and heat control and
(5) Releases control.

Requirements are set forth for acceptable design.

This document specifies detailed requirements where related standards do not provide the necessary details. Where details are available in other standards, these are referenced, and when used in conjunction with this standard, will provide a complete statement of minimum design requirements necessary to assure nuclear safety.

2. Definitions

design basis accident (DBA). A limiting Plant Condition (PC) postulated and analyzed to conduct the site evaluation required by Title 10, Code of Federal Regulations, Part 100, "Reactor Site Criteria" [3].

HVAC systems, related to safety. Those HVAC Systems that are required to accomplish the objectives listed in 1.2 of this standard.

may. Denotes permission, neither a requirement nor a recommendation.

plant condition (PC). Categorization of normal operations and events in terms of their likelihood of occurrence for the purpose of establishing nuclear safety criteria.

non-nuclear safety (NNS). Classification of structures, systems, or components that are not in Safety Class 1, 2 or 3.

safe shutdown. A Shutdown with (1) the reactivity of the reactor kept to a margin below criticality consistent with technical specifications, (2) the core decay heat being removed at a controlled rate sufficient to prevent core or reactor coolant system thermal design limits from being exceeded, (3) components and systems necessary to maintain these conditions operating within their design limits, and (4) components and systems necessary to keep doses within prescribed limits operating properly.

[1]Numbers in brackets refer to corresponding numbers in Section 8, References.