

# American Nuclear Society

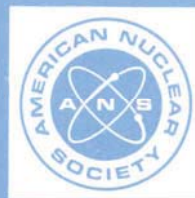
**WITHDRAWN**

July 28, 2000  
**ANSI/ANS-56.6-1986**

**pressurized water reactor  
containment ventilation systems**

an American National Standard

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**ANSI/ANS-56.6-1986**  
**Revision of ANSI/ANS-56.6-1978**

**American National Standard  
for Pressurized Water Reactor Containment  
Ventilation Systems**

Secretariat  
**American Nuclear Society**

Prepared by the  
**American Nuclear Society  
Standards Committee  
Working Group ANS-56.6**

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## Foreword

(This Foreword is not a part of American National Standard for Pressurized Water Reactor Containment Ventilation Systems, ANSI/ANS-56.6-1986.)

The need for the development of an industry standard for PWR ventilation systems was recognized by the American Nuclear Society in 1972 and it identified this standard as being one of the high priority system standards.

This standard is a revision to ANSI/ANS-56.6-1978 and has been revised in accordance with NUPPSCO policy requiring a five year review of all standards. The major areas of revision include:

1. Reference to and terminology from updated codes and standards.
2. Elimination of the "boxing technique" for identifying nuclear safety-related auditable design criteria.
3. An overall review of the technical adequacy of the standard.
4. An overall review of the justification of requirements and recommendations used throughout the standard.

The objective of this standard is to specify the functional design requirements, for the ventilation systems addressed, in sufficient detail to insure that the systems will perform in a manner that protect the health and safety of the public (including plant personnel) and to enhance the efficient and reliable operation of the facility.

This standard does not address systems designed to perform the following functions:

1. Clean up of the containment airborne radioactivity following a design basis accident.
2. Mixing of combustible gases or venting of combustible gases following a design basis accident. This is addressed in a separate standard. See proposed American National Standard Criteria for the Evaluation of Post Accident Hydrogen Generation and Flammability Control in LWR, ANS-56.1; assigned correspondent: N. Willoughby, 77 Seventh Avenue, New York, NY 10011.
3. Ventilation exhaust from the surface of the refueling canal.
4. Secondary Containment Ventilation Systems.
5. Normal Operating Pressure Relief Systems.

Due to the number of systems covered by this standard and the various functions that each system may provide, it is necessary to cover each system independently except in the areas of pipe whip, missile protection, and fire protection, which are addressed in the following American National Standards: Design Basis for Protection of Light Water Nuclear Power Plants Against Effects of Postulated Pipe Rupture, ANSI/ANS-58.2-1980 and Generic Requirements for Light Water Nuclear Power Plant Fire Protection, ANSI/ANS-59.4-1979; also proposed American National Standard for Plant Design Against Missiles, ANS-58.1; assigned correspondent: W. H. D'Ardenne, General Electric Company, 175 Curtner Ave., MC 682, San Jose, Calif. 95125.

Recirculation filtration systems inside the containment providing nuclear safety functions are not incorporated into nuclear power plants presently under construction. These systems require excessive amounts of iodine adsorbing material requiring frequent testing and replacement due to aging, even without usage. The iodine removal function in the containment following a design basis accident is currently performed primarily by containment spray systems with chemical additives. These systems are addressed in American National Standard for PWR and BWR Containment Spray System Design Criteria, ANSI/ANS-56.5-1979.

Ventilation systems for refueling canals are not addressed by this standard since they tend to create these problems:

- a) increased evaporation of canal water,
- b) visibility problems caused by ripples on the water surfaces,
- c) increased, sometimes excessive, noise levels, and
- d) obstruction of refueling operations from supply and return ducts located at the sides of the canal.

This standard does not preclude the use of such ventilation systems.

Secondary containments are design features required at certain sites to reduce offsite exposures from design basis accidents. The need for a secondary containment and the type of secondary containment ventilation design is dictated to a large extent by site meteorology. For this reason, specific criteria for secondary containment ventilation systems are not included.

This standard was prepared by Working Group ANS-56.6 of the American Nuclear Society, whose membership at the time of its approval was:

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C. Changelian, *Stone & Webster Engineering Corporation*  
R. Mays, *Bechtel Power Corporation*  
P. White, *Duke Power Company*

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# Pressurized Water Reactor Containment Ventilation Systems

## 1. Scope and Introduction

**1.1 Scope.** This standard provides criteria for the design of ventilation systems, including equipment, ductwork, and control devices, utilized for providing heat removal, heating, atmospheric cleanup, and general ventilation within pressurized water reactor primary containment structures. It addresses systems used to ventilate containment structures, even though the systems are physically located outside the containment.

**1.2 Purpose.** This standard provides design requirements for containment ventilation systems and equipment including basic requirements and system arrangements with due consideration for construction, fabrication, surveillance, maintenance, and operation. This standard does not include liquid spray systems, secondary containment ventilation systems, closed water systems, or process support systems for maintaining subatmospheric or ice condenser compartment environment. This standard is based on the systems engineering criteria presented in American National Standard Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants, ANSI/ANS-51.1-1983 [1].<sup>1</sup>

**1.3 Introduction.** The following systems are covered by this standard:

- containment air cooling system (CACs)
- purge supply and exhaust system (PSES)
- control rod drive mechanism cooling system (CRDMCS)
- reactor cavity cooling system (RCCS)
- containment heating system (CHS)
- containment cleanup system (CCS)

This standard is not intended to be an equipment standard. Equipment codes and standards are covered by American National Standard Nuclear Air and Gas Treatment Code, ANSI/ASME AG-1 (CA)—1985 [2].

<sup>1</sup>Numbers in brackets refer to corresponding numbers in Section 11, References.

PWR containment ventilation systems are a part of the complex of structures, systems, and components used in conjunction with the primary reactor containment. Functional requirements for these systems are dependent on the plant conditions for which the systems are designed to remain operative.

In ANS-51.1-1983 [1], five categories of plant conditions are specified. The plant conditions are frequency ranges defined in the order of decreasing frequency. The requirement for heating, heat removal, or ventilation in order to satisfy the off-site radiological dose criterion or the nuclear safety criterion for any event determines whether heating, ventilation, or heat removal is a nuclear safety function. If a ventilation system must be available for heating, air circulation, or heat removal required to satisfy ANS-51.1-1983 [1] off-site dose or nuclear safety criteria, then the system performs a nuclear safety function. The designer is expected to evaluate each limiting normal operation and limiting event to determine the nuclear safety function, if any, of a pressurized water reactor containment ventilation system.

The PWR containment ventilation systems are designed to meet the functional requirements of one or more of these limiting normal operations or events. The choice of normal or limiting events for design is dependent to a degree on the other structures, systems and components. Should a containment ventilation system serve a nuclear safety function, in whole or in part, the system, or appropriate portions of the system, shall be designed to meet the requirements of the limiting event(s).

**1.3.1 Typical PWR Containment Ventilation Systems.** The following containment ventilation systems are normally provided:

**1.3.1.1** The containment air cooling system (CACs) transfers a sufficient quantity of heat from the containment atmosphere to ensure that the containment design temperature for normal operation is not exceeded. Other ventilation systems such as the reactor cavity cooling system