ASME AG-1–2015
(Revision of ASME AG-1–2012)

Code on Nuclear Air and Gas Treatment

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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The next edition of this Code is scheduled for publication in 2017.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Code. Periodically certain actions of the ASME Committee on Nuclear Air and Gas Treatment may be published as Cases. Cases and interpretations are published on the ASME Web site under the Committee Pages at http://cstools.asme.org/ as they are issued.

Errata to codes and standards may be posted on the ASME Web site under the Committee Pages to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in codes and standards. Such errata shall be used on the date posted.

The Committee Pages can be found at http://cstools.asme.org/. There is an option available to automatically receive an e-mail notification when errata are posted to a particular code or standard. This option can be found on the appropriate Committee Page after selecting "Errata" in the "Publication Information" section.

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FOREWORD

In 1971, the ANSI N45.8 Committee was organized to develop standards for high reliability air cleaning equipment for nuclear facilities and corresponding tests to confirm performance of the equipment. Two standards, ASME N509 and ASME N510, were published in 1975 and 1976.

In 1976, under the accredited organization rules, the Committee was reorganized as the ASME Committee on Nuclear Air and Gas Treatment. The scope of responsibility increased to include the development of codes and standards for design, fabrication, inspection, and testing of air cleaning and conditioning components and appurtenances used in safety-related systems in nuclear facilities. ASME AG-1 was the new Code resulting from the increased scope.

This Code contains mandatory requirements, specific prohibitions, and nonmandatory guidance for construction activities. Construction, as used in this Foreword, is an all-inclusive term relating to material, design, fabrication, inspection, testing, and certification. The Code does not address all aspects of these activities and those not specifically addressed may be considered. The Code is neither a handbook nor a replacement for education, experience, and the use of engineering judgment. The phrase "engineering judgment" refers to technical judgments made by knowledgeable designers experienced in the application of the Code. Engineering judgments must be consistent with Code philosophy and such judgments shall never be used to overrule mandatory requirements or specific prohibitions of the Code. The user is cautioned to carefully review these Code requirements for suitability to specific applications other than nuclear power and nuclear fuel cycle facilities.

The Code requirements established by the Committee shall not be interpreted as approving, recommending, or endorsing any proprietary design.

The Committee on Nuclear Air and Gas Treatment meets regularly to consider revisions of the Code requirements, new Code requirements as dictated by technological development, Code Cases, and requests for interpretations. Only the Committee on Nuclear Air and Gas Treatment has the authority to provide official interpretations of this Code. Requests for revisions, new Code requirements, Code Cases, or interpretations shall be addressed to the Secretary in writing and shall give full particulars in order to receive consideration and action. (See Mandatory Appendix I covering preparation of technical inquiries.)

The first edition of this Code was approved by the American National Standards Institute (ANSI) on April 30, 1985, and issued on February 28, 1986. This edition was approved by ANSI on November 9, 2015.

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(The following is the roster of the Committee at the time of approval of this Code.)

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ORGANIZATION OF ASME AG-1

1. GENERAL

The ASME Code on Nuclear Air and Gas Treatment consists of Divisions I through IV. All Divisions are broken down into Sections designated by two capital letters. Each Division is made up as follows:

Division I: General Requirements
- Section AA: Common Articles

Division II: Ventilation Air Cleaning and Ventilation Air Conditioning
- Section BA: Fans and Blowers
- Section DA: Dampers and Louvers
- Section SA: Ductwork
- Section HA: Housings
- Section RA: Refrigeration Equipment
- Section CA: Conditioning Equipment
- Section FA: Moisture Separators
- Section FB: Medium Efficiency Filters
- Section FC: HEPA Filters
- Section FD: Type II Adsorber Cells
- Section FE: Type III Adsorbers
- Section FF: Adsorbent Media
- Section FG: Mounting Frames for Air-Cleaning Equipment
- Section FH: Other Adsorbers
- Section FI: Metal Media Filters
- Section FJ: Low Efficiency Filters
- Section FK: Special HEPA Filters
- Section FL: Deep Bed Sand Filters
- Section FM: High-Strength HEPA Filters
- Section IA: Instrumentation and Controls

Division III: Process Gas Treatment
- Section GA: Pressure Vessels, Piping, Heat Exchangers, and Valves
- Section GB: Noble Gas Hold-Up Equipment
- Section GC: Gas Compressors and Exhausters
- Section GD: Other Radionuclide Equipment
- Section GE: Hydrogen Recombiners
- Section GF: Gas Sampling
- Section GG: Scrubbers
- Section GH: Cyclones
- Section GI: Membranes
- Section GJ: Filters
- Section GK: Mist Eliminators
- Section GL: Elastomeric Precipitators
- Section GM: Adsorbent Media

Division IV: Testing Procedures
- Section TA: Field Testing of Air Treatment Systems
- Section TB: Field Testing of Gas-Processing Systems

2. SECTIONS

Sections are divided into articles, subarticles, paragraphs, and, where necessary, subparagraphs and subsubparagraphs.

3. ARTICLES

Articles are designated by the application letters indicated above for the sections, followed by Arabic numbers in units of 1000, such as BA-1000 or RA-2000. Where possible, articles dealing with the same topics are given the same number in each section in accordance with the following:

Article Number	Title
1000	Introduction
2000	Referenced Documents
3000	Materials
4000	Structural Design
5000	Inspection and Testing
6000	Fabrication, Joining, Welding, Brazing, Protective Coating, and Installation
7000	Packaging, Shipping, Receiving, Storage, and Handling
8000	Quality Assurance
9000	Nameplates and Stamping

The numbering of articles and the material contained in the articles may not, however, be consecutive. Because the complete outline may cover phases not applicable to a particular section or article, the rules have been prepared with some gaps in the numbering.

4. SUBARTICLES

Subarticles are numbered in units of 100, such as BA-1100 or RA-1200.

5. SUBSUBARTICLES

Subsubarticles are numbered in units of 10, such as BA-2130, and generally have no text. When a number such as BA-1110 is followed by text, it is considered a paragraph.

6. PARAGRAPHS

Paragraphs are numbered in units of 1, such as BA-2131 or RA-2132.

7. SUBPARAGRAPHS

Subparagraphs, when they are major subdivisions of a paragraph, are designated by adding a decimal followed by one or more digits to the paragraph number, such as BA-1111.1 or RA-1111.2. When they are minor subdivisions of a paragraph, subparagraphs may be designated by lowercase letters in parentheses, such as BA-1111(a) or RA-1111(b).

8. SUBSUBPARAGRAPHS

Subsubparagraphs are designated by adding lower case letters in parentheses to major subparagraph numbers, such as BA-1111.1(a) or RA-1111.2(b). When further subdivisions of minor subparagraphs are necessary, subsubparagraphs are designated by adding Arabic numerals in parentheses to the subparagraph designation, such as BA-1111(a)(1) or RA-1111(a)(2).

9. APPENDICES

Appendices pertaining to each section appear at the end of each section and are designated with the section prefix. Nonmandatory appendices are designated by letters of the alphabet, and mandatory appendices are designated by Roman numerals. Metric appendices carry the same designators as customary appendices, with the prefix “M.”

ASME AG-1–2015
SUMMARY OF CHANGES

Following approval by the ASME Committee on Nuclear Air and Gas Treatment (CONAGT), and after public review, ASME AG-1–2015 was approved by the American National Standards Institute on November 9, 2015.

ASME AG-1–2015 consists of ASME AG-1–2012; editorial changes, revisions, and corrections; as well as the following changes identified by a margin note, (**15**).

Page	*Location*	*Change*
7	Article AA-2000	Revised
15	AA-4110	Revised
21	AA-4341.3	Revised
	AA-4350	Title revised
	AA-4351	First sentence revised
68	Nonmandatory Appendix AA-B	*(1)* Title revised *(2)* Title of Article AA-B-1000 revised
80	Article BA-2000	Revised
101	Article DA-2000	Revised
108	DA-4271	*(1)* Title revised *(2)* Last sentence added
111, 112	DA-5130	*(1)* Title revised *(2)* Last sentence added
	DA-5140	Revised in its entirety
117	Mandatory Appendix DA-1	Revised in its entirety
124, 125	Table DA-A-1000	In first column, DA-5142 revised to DA-5143
129	Article SA-2000	Revised
172	Article HA-2000	Revised
206	Article RA-2000	Revised
210	RA-4412	Revised
211	RA-4510	Revised
213	RA-5100	Revised
221	RA-9100	Revised
	RA-9200	Revised
236	Article RA-I-1000	First paragraph, second sentence revised
	RA-I-1200	Second and third sentences revised
240	Article RA-MI-1000	First paragraph, second sentence revised
	RA-MI-1200	Second and third sentences revised

Page	*Location*	*Change*
251	Article CA-2000	Revised
255	CA-4126	Subparagraph (b) revised
257	CA-4221	Subparagraph (b) revised
258	CA-4227	Subparagraph (b) revised
264	CA-5211.1	First paragraph, second sentence revised
272	CA-9310	Revised
	CA-9320	Revised
	CA-9330	Revised
278	CA-II-1300	Subparagraph (c) revised
312	FC-1121	Revised
	FC-1130	*(1)* Definitions of *filter, HEPA filter, medium,* and *penetrometer* revised *(2)* Definition of *media velocity* deleted *(3)* Definition of *medium face velocity* added
313	Article FC-2000	Revised
314, 315	FC-3120	Revised
	FC-3130	Revised
	FC-3150	Revised
	FC-3160	Revised
316–320	FC-4100	*(1)* Revised *(2)* Figs. FC-4100-1 through FC-4100-5 redesignated as Figs. FC-4110-1 through FC-4110-5, respectively, and Fig. FC-4100-6 redesignated as Fig. FC-4142-1 *(3)* FC-4110, FC-4130, FC-4142, and FC-4160 revised
	Table FC-4110	"Maximum Resistance" column revised
	Fig. FC-4110-1	Formerly designated Fig. FC-4100-1; title revised
	Fig. FC-4110-3	Formerly designated Fig. FC-4100-3; callout on lower right of figure deleted, and title revised
321	FC-4210	Title and first sentence revised
322–324	Article FC-5000	Title revised
	FC-5100	*(1)* Third paragraph revised *(2)* FC-5120, FC-5130, FC-5140, FC-5150, and FC-5170 revised
	Table FC-5100-1	"Requirement" column revised
	Table FC-5120-1	Title Revised
	Table FC-5140-1	Revised
	FC-5200	Revised
	FC-5300	Revised
325	FC-6212	Last sentence revised
	FC-6220	Revised
	FC-6300	Revised

Page	*Location*	*Change*
330	Article FC-I-2000	Revised
331	FC-I-3220	Title revised
332	FC-I-3272	Title revised
	FC-I-3280	Last sentence added
333	FC-I-4110	Last sentence revised
	FC-I-4210	Revised
334	FC-I-4231	Revised
	FC-I-4262	Title revised
335	Table FC-I-4330-1	"Property" column revised
353–359	Mandatory Appendix FD-II	Added
363	Article FE-2000	Revised
367	FE-4610	Revised in its entirety
393–397	Mandatory Appendix FE-V	Added
402	Article FF-2000	Revised
458	FK-1130	Definition of *penetrometer* revised
459	Article FK-2000	Revised
464	Fig. FK-4100-2	Title revised
466	Fig. FK-4100-4	Title revised
470	FK-4300	Subparagraph (c) revised
472	FK-5120	*(1)* Title revised *(2)* First paragraph, first and second sentences revised
473	Table FK-5000-1	"Requirement" column revised
	FK-5150	Second paragraph, first sentence revised
474	Table FK-5000-2	"Requirement" column revised
475	FK-5220	*(1)* Title revised *(2)* First paragraph, first and second sentences revised
476	FK-5250	Second paragraph, first sentence revised
477	Table FK-5000-3	*(1)* "Requirement" column revised *(2)* In "Test Paragraph" column, fifth entry revised from "FK-5430" to "FK-5410"
	FK-5420	*(1)* Title revised *(2)* First paragraph, first and second sentences revised
478	FK-5450	Second paragraph, first sentence revised
479	FK-5610	First sentence revised
488	Article FL-2000	Revised
522, 523	Article IA-2000	Revised
548–568	Section GC	Added
582	Article TA-2000	Revised

SPECIAL NOTE:
The Interpretations to ASME AG-1 are included in this edition as a separate section for the user's convenience.

Division I
General Requirements

SECTION AA
COMMON ARTICLES

ARTICLE AA-1000
INTRODUCTION

AA-1100 SCOPE

This Code provides requirements for the performance, design, fabrication, installation, inspection, acceptance testing, and quality assurance of equipment used in air and gas treatment systems in nuclear facilities.

AA-1110 PURPOSE

The purpose of this Code is to ensure that equipment used in nuclear facilities for air and gas treatment systems is acceptable in all aspects of design and operation.

AA-1120 APPLICABILITY

This Code applies only to individual components in a system. This Code does not cover any functional system design requirements or sizing of complete systems, or any operating characteristics of these systems. The responsibility for meeting each requirement of this Code shall be assigned to the Owner or assigned designee.

The requirements of AG-1 for air and gas treatment components may be used for engineered safety features systems and normal systems in nuclear power generation facilities, and for air cleaning systems in other nuclear facilities. The design and procurement specifications shall delineate the design, qualification and quality assurance requirements appropriate for the application.

AA-1130 DEFINITIONS AND TERMS

Each Code section shall delineate the definitions and terms unique to that section. Definitions that have common application are listed in this section.

acceptance test: a test made upon completion of fabrication, installation, repair, or modification of a unit, component, or part to verify to the user or Owner that the item meets specified requirements.

active component: any component that must perform a mechanical motion or change of state during the course of accomplishing a nuclear safety-related function.

air density: 0.075 lb/ft^3 (1.201 kg/m^3) for standard air. This corresponds to air at a pressure of 29.92 in. Hg (760 mm Hg) at a temperature of 69.8°F (21°C) with a specific volume of 13.33 ft^3/lb (0.832 m^3/kg).

airflow (acfm, scfm, acms, scms): expressed in terms of cubic feet of air per minute (cfm). Actual cfm (acfm) is a cubic foot of air with a density at actual existing conditions. Standard cfm (scfm) is a cubic foot of air with a standard density. The terms *acms* and *scms* correspondingly apply to cubic meters per second under actual and standard conditions.

allowable deflection (d_{all}): the deflection resulting from each of the component loading conditions defined in AA-4212.

allowable stress value (S): the maximum stress limit to be used in the design.

assembly: two or more devices sharing a common mounting or supporting structure.

broadband response spectrum: a response spectrum that describes the motion indicating that multiple frequency excitation predominates.

Certificate of Compliance: a written statement attesting that the materials are in accordance with specified requirements.