

VENTILATION AIR CLEANING CODES

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Abstract

The ASME Committee on Nuclear Air and Gas Treatment (CONAGT) has been organized as CONAGT since 1976 to develop standards for high reliability air cleaning equipment for nuclear facilities, and to develop corresponding tests to confirm equipment performance. These standards are organized as CONAGT Code AG-1, *Code on Nuclear Air and Gas Treatment*.

The CONAGT Subcommittee on Ventilation Air Cleaning Equipment is responsible for authoring and maintaining those sections of AG-1 which pertain to equipment used in high efficiency air filtration and gas treatment. What follows is a list of the air cleaning components addressed by the Subcommittee and a brief description of the order and content of the Code sections.

Introduction

Sections of CONAGT's AG-1 code which have been published on ventilation air cleaning equipment cover the following subjects:

- Moisture Separators
- Medium Efficiency Filters
- HEPA Filters
- Type II Adsorbers
- Type III Adsorbers
- Adsorbent Media
- Frames

These code sections, when used with the common articles AA of CONAGT's AG-1, comprise a set of requirements which help ensure that the desired reliability of air cleaning equipment for nuclear facilities is met when the code is invoked.

Other published portions of the CONAGT AG-1 code discuss refrigeration, housings, ductwork, fans, instrumentation, and dampers, to name a few. These are addressed by

various subcommittees responsible for those sections of the code. Subjects for which code sections are in the course of preparation by the ASME Subcommittee in Ventilation Air Cleaning Equipment are:

- Other Adsorbers
- Metal Media Filters
- Low Efficiency Filters
- Special Round and Duct Connected HEPA Filters

Code Section Content

All CONAGT AG-1 ventilation air-cleaning sections follow the same basic order and content in their arrangement. While there is some variation in the content between sections, they are normally arranged in the order shown in Table One.

TABLE ONE	
SECTION NUMBER	SUBJECT HEADING
1000	Introduction <ul style="list-style-type: none"> • Scope • Purpose • Applicability
2000	Referenced Documents
3000	Materials <ul style="list-style-type: none"> • Allowable Materials • Limits • Material Certification
4000	Design Conditions <ul style="list-style-type: none"> • Technical Requirements • Structural Requirements
5000	Inspection and Testing <ul style="list-style-type: none"> • Qualification Tests • Production Inspections and Tests
6000	Fabrication
7000	Packaging and Shipping
8000	Quality Assurance
9000	Nameplates
Appendices	Detailed Component Information Division of Responsibility

Code Section Details

Each major heading of a typical Code section will now be discussed in further detail.

Scope, Purpose and Limitations

A Code section starts with the *Introduction*, which contains the subheadings:

- Scope
- Purpose
- Applicability
- Definitions (optional)

Definitions are spelled out in individual sections only when they have special meaning within the context of that section. Otherwise, the definitions of section AA, *General Requirements*, apply.

Each of the other three subheadings is important in that it conveys to the reader the exact nature of what is covered in the code section and what is not. The **scope** statement of the HEPA filter section, for instance, is worded similarly to the other air cleaning sections, and reads as follows:

This section of the Code provides requirements for the performance, design, construction, acceptance testing and quality assurance for High Efficiency Particulate Air (HEPA) Filters used in nuclear safety-related air or gas treatment systems in nuclear facilities.

The **purpose** statements of these sections are also significant, since they clarify the expected outcome of the code application. The purpose of the medium efficiency filter (Section FB) section reads as follows:

The purpose of this Code is to assure that medium efficiency filters used in nuclear facilities for nuclear safety related air and gas treatment systems are acceptable in all aspects of performance, design, construction, acceptance testing, and quality assurance.

This is an important concept when one considers the possibility that components not suitable for use in nuclear applications could easily be put into systems which require high levels of reliability and performance, with assurance that the components will remain intact during use and will perform as expected. Experience in ventilation and filtration leads one to observe the wide variety of products available on the market for use in these applications. Manufacturing and using components built to the Code helps to assure users in nuclear power application that nuclear design experience is considered

when building the components and also helps to ensure product uniformity, even among multiple suppliers.

Regarding **limitations** of the Code sections, they are written on a component basis. Each addresses the specific component itself, but, as phrased in Section FD, on Type II Adsorbers, it *does not include the integration of the Type II cell into a complete air cleaning system mounting frame.*

Referenced Documents

The list of referenced documents in each Code section may be fairly brief, since the majority of this information is contained in Section AA. In the Section on HEPA filters, however, one finds references to standards that were used to write the section, which include Military ASTM, U. S. Product, TAPPI, Federal, and Underwriter Laboratories Standards. The Institute of Environmental Sciences is also cited.

Materials

This portion of the Code provides specific lists of allowable materials and defines, in applicable cases, materials that are not allowed. Material certification requirements may also be listed here. Typically, each sub-component is listed with the appropriate materials for its manufacture. For Type II absorbers, for instance, this includes screen material, casings, gaskets and seal pads, adhesives, threaded fasteners, and rivets. For moisture separators, it includes material specifications for media, filter frame, separators, gaskets, sealants, and adhesives.

Design

The General Design portion of the Code describes the component, and generally gives some description of testing conditions for operation. This may take the form of tables or text that describe the required criteria. This is followed by specific technical and structural requirements, which may include manufacturing tolerances, component drawings, load definitions and acceptance criteria.

Inspection and Testing

Tests found in this segment of the Code section, depending on the component, may include:

- Dimensional inspections
- Welding inspections
- Qualification tests
- Filling method qualification (for Type II Adsorbers)
- Air flow resistance tests
- Rough handling qualifications
- Performance tests

Fabrication

This portion of the Code section calls out dimensions and tolerances for the component, welding and brazing requirements, repairs, cleaning, and coating requirements.

Packaging and Shipping

Packaging and shipping stipulations are placed in the code to protect the product from damage as it is transported to the end user. Special requirements are needed to protect carbon adsorbent media, for instance, to avoid poisoning prior to use. HEPA filters are susceptible to damage to media and separators if packaged incorrectly or stacked too high. Storage requirements are also quoted here, as applicable, to protect the components from damage due to environmental conditions and to ensure product integrity when ready for use. In some Code sections, the title is expanded to include receiving and handling as well.

Quality Assurance

This section typically refers the user to section AA *General Requirements*, which stipulates Quality Assurance requirements that are common to the air cleaning components included in each of the individual sections. Specific documentation requirements of the air cleaning component are listed in this section.

Nameplates (and Certification)

In some Code sections, this part of the Code contains only the nameplate requirements. Nameplate standards ensure that the units are labeled to identify what the component is, its date of manufacture, manufacturer's symbol, serial number, orientation, and ratings,

where applicable. It also assures that the equipment labels will be permanent. Some sections, as in the medium efficiency filter section, this category has been expanded to Labels and Marking, and includes package marking along with the product marking. This is important to protect the product from damage that could be incurred due to improper orientation.

Appendices

Several of the Code sections contain appendices to provide additional information to the user. These appendices may contain sketches to assist in dimensioning and visualizing the component. There are two types of appendices that may be present in a section, mandatory and non-mandatory.

Section FE, *Type II Adsorber Cells* contains four mandatory appendices which detail:

1. Residence time calculation
2. Screen waviness inspection test
3. Adsorber filling qualification test procedure
4. Type III adsorber qualification test procedure

It also contains a non-mandatory appendix titled, *Visual Inspection Recommendations for Type III adsorbers*.

A non-mandatory appendix is normally provided in each section to identify the roles assumed by the organizations responsible for fulfilling Code requirements. This *Division of Responsibility* appendix is a guideline to assist with Code compliance.

Code Sections in the Course of Preparation

The following subjects are currently undergoing the process to be added to ASME CONAGT's AG-1. They are at various stages in their development and all are actively progressing. Titles are:

- Other Adsorbers
- Metal Media Filters
- Low Efficiency Filters
- Special Round and Duct Connected HEPA Filters

The ASME Subcommittee on Ventilation Air Cleaning Equipment is pursuing these additions to the code in response to industry requests.

Conclusion

Specific detailed ASME Code sections are available to assist air-cleaning specialists in the design, manufacture, and testing of air filtration and gas treatment equipment. They are under the umbrella of ASME's Committee on Nuclear Air and Gas Treatment, Code AG-1, and are organized in a manner similar to the general requirements of AG-1. This paper serves as an introduction to the content and order of CONAGT AG-1 Code sections on nuclear air cleaning equipment.

References

ASME Code on Nuclear Air and Gas Treatment, AG-1, 1997