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Requirements for aerosol filters used in nuclear facilities against specified severe conditions —

Part 1: General requirements iTeh Standards

Exigences pour les filtres à aérosols utilisés dans les installations nucléaires dans des conditions sévères spécifiées —

Partie 1: Exigences générales

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 142, *Cleaning equipment for air and other gases*.

A list of all parts in the ISO 23137 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

In the nuclear industry, as well as in many other applications using radioactive materials, some dangerous products are used/handled/stored/produced. The radioactive particles can be in aerosol form which implies the need for aerosol filters on the ventilation systems used at the exhaust of the facilities in order to protect workers, the members of the public and the environment against the risks of spread of radioactive materials.

These aerosol filters are used in normal operation for process filtration systems (e.g. for glove boxes, hoods, fume cupboards...), or on buildings ventilation systems. These aerosol filters are also used to cope with accidents conditions, creating severe specified conditions on the filters.

Some standards exist on the requirements to be associated with the filters used on these ventilation or process systems (e.g. ISO 17873^{[1], [1]} ISO 26802^{[2], [2]}). These standards propose some specifications related to the need for high efficiency particulate air (HEPA) filters, their classification, the number of HEPA filters in series and on their monitoring.

Many nuclear operators have their own process for qualified filters with regards to those specified severe conditions. But no standard exists on the requirements associated with the conditions in which the filters are used against specific loads (e.g. high radioactive environment, fire conditions).

In the ISO 23137 series, ISO 23137-1 provides only the general requirements (e.g. types of filters to be tested, standardised sizes, principles for the qualification of the tests against loads such as repetition of tests, need for filter certificates, etc.). Other parts of the ISO 23137 series are intended to specify the expected performances, the detailed requirements, with regards to the loads for which the filters need to be qualified.

The loads against which the filters will have to be designed/fabricated/tested/certified, are reported in [Annex A](#) for information. This document covers the fundamental qualification requirements for HEPA filters for use in nuclear/radiological facilities while the other parts are intended to cover specific hazards in more detail.

In each part of the ISO 23137 series, specific detailed loads applicable to the HEPA filters are intended to be described, every part being related to a different type of loads. Every part will intend to present how the expected performances against these specific loads are, in order to specify how they will have to be designed, fabricated, tested and verified according to the technical specifications. Examples of loads that are intended to be specified in the series are presented in [annex A, Annex A](#), such as:

- — thermal loads (heated air flow, spot flame resistance) or pressure load (resistance to pressure, dust loading, water spray, air flow increase);
- — radiation and radioactive contamination deposits;
- — chemical loads;
- — vibration/seismic/rough handling loads;
- — combined loads (e.g. in a fire thermal loads are combined with dust loading and humidity).

These other parts of the series are intended to refer to this document for the general requirements (e.g. qualification requirements for filter being verified against technical specifications).

The specificities of process ventilation system protecting the workers inside the facilities are intended to be specified by another part of the ISO 23137 series.

Requirements for aerosol filters used in nuclear facilities against specified severe conditions —

Part 1: General requirements

1 Scope

This document provides the general requirements associated with the specific characteristics of high efficiency particulate air (HEPA) filters used in nuclear facilities ~~with special performances described in the ISO 23137 series.~~

This document provides ~~to~~ the manufacturer with general requirements for the performance, design, construction, acceptance testing, and quality assurance for HEPA filters used in nuclear facilities (for qualification and production tests).

This document applies only to the filters used for nuclear ~~Heating Ventilation Air Conditioning~~ heating ventilation air conditioning (HVAC) or control rooms habitability applications or applications related to the exposure to radioactive ionizing radiations (e.g. medical or radioactive aerosols applications) in the severe conditions ~~intended to be defined in the ISO 23137 series (e.g. (e.g. fire, high radioactive challenge, etc.).~~

All types of HEPA filter used in such applications are covered, from the large size HEPA filters in exhaust HVAC systems to small size low flow rate cylindrical HEPA filters for glove boxes.

The design, fabrication, inspection and testing, certificates with regards to their expected performances are mentioned.

This document does not provide the specific conditions against which the nuclear filters are designed, tested and qualified.

Filter housing qualification is not part of this ~~standard~~ document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 29463-1:2017, *High efficiency filters and filter media for removing particles from air — Part 1: Classification, performance, testing and marking*

ISO 29463-5:2022, *High-efficiency filters and filter media for removing particles in air — Part 5: Test method for filter elements*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ~~ISO~~ Online browsing platform: available at <https://www.iso.org/obp/ui>
- ~~IEC~~ Electropedia: available at <https://www.electropedia.org/>

All other terms and definitions related to this document are taken from ISO 29464 [5].

3.1

~~D.O.P~~

~~dispersed oil particulates~~

[SOURCE: ISO 29464:2017, 3.2.48]

3.2

load

forces caused by any physical or chemical hazard

EXAMPLE Pressure, thermal, radiation, vibration, ground motion, humidity, clogging, chemical hazards ~~as~~ well as cumulated loads such those involved in hazards such as natural or accelerated ageing.

Note 1 to entry: In nuclear facilities or in facilities handling radioactive aerosols, the confinement function of radioactive materials is a nuclear safety function, creating confined spaces modifying the loads that can challenge filters compared to the ones that occur in open (not confined) spaces.

3.3

loss of coolant accident

LOCA

accident scenario in nuclear facilities induced by a pipe break leading to lose the radioactive hot pressurised coolant, and adds pressure, steam and thermal loads in the rooms served by the ventilation systems equipped with HEPA filters

Note-1-to-entry: ~~in In~~ some nuclear reactor designs (for which the rooms are in a static confinement mode), the LOCA would not affect directly the HEPA filters in operational conditions (except shutdown states for which the LOCA directly expose the HEPA filters). But, in some others, the rooms where a LOCA can occur are permanently served by a confinement system, exposing the HEPA filters to LOCA loads.

3.4

~~DOP~~

~~dioctyl phthalate~~

[SOURCE: ISO 29464:2017, 3.2.49]

3.5

high energy line break

HELB

accident scenarios in nuclear facilities induced by a high-pressure pipe whipping onto another pipe

Note-1-to-entry: ~~when~~ When charged with hot pressurised fluids, it can lead to lose the radioactive hot pressurised coolant from the first pipe and to the discharge into the rooms of the fluid contained in the target pipe, and to pressure, steam and thermal loads in the rooms served by the ventilation systems equipped with HEPA filters.