



**International
Standard**

ISO 23137-1

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

**Part 1:
General requirements**

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

Partie 1: Exigences générales

**First edition
2024-04**

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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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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] ISO 26802^[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](#), 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.

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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.

This document provides 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).

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.

This document applies only to the filters used for nuclear 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 (e.g. fire, high radioactive challenge).

Filter housing qualification is not part of this 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/>

3.1 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.

3.2 loss of coolant accident LOCA

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

Note 1 to entry: 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.

3.3 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 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.

3.4 most penetrating particle size MPPS

particle size at which the minimum of the particle size efficiency curve occurs under test conditions

Note 1 to entry: This MPPS is dependent on the filter medium and the test applications conditions.

[SOURCE: ISO 29464:2017, 3.2.136]

3.5 most penetrating particle size range MPPS range

particle size range covering the most penetrating particle size of the filter

Note 1 to entry: Dispersed oil particulates (not to be confused with dioctyl phthalate) of 0,3 µm mass median cover the MPPS range for HEPA filters.

4 General requirements

4.1 General design requirements of the filters

4.1.1 Layout requirements

The filter element shall be designed or marked so as to prevent incorrect mounting (e.g. upside down).

The filter element shall be designed so that when correctly mounted in the ventilation housing, the leak that would occur along the sealing edge does not challenge its performances.

If, for any reason, dimensions do not allow testing of a filter under standard test conditions, assembly in parallel of two or more filters of the same type or model at the testable dimensions is permitted (as a global resulting filter), provided it does not modify the leak that would occur in the resulting filter.

[Annex B](#) provides examples of general sizes and layout of filters used in nuclear ventilation systems.

4.1.2 Materials

The filter is comprised of the filter medium, separators, adhesive, faceguards and seals. The filter shall be made of suitable material to withstand normal and severe usage and exposures to the loads that are likely to be encountered (e.g. temperatures, humidity, chemical, radioactive and corrosive environments). The filter element shall be designed so that it will withstand mechanical constraints that are likely to be encountered during normal and severe use.

Dust or fibres released from the filter media by the air flow through the filter element shall not constitute a nuisance for the people (or devices) potentially exposed to filtered air (e.g. when the air is recycled).

The fire and temperature resistance of the materials depends on the customer requirements with regards to hot temperatures and fire risk in the nuclear facility. When fire and hot temperature risks are a nuclear safety issue for a specific filter, the filter element shall have capabilities to limit its flammability or when a flame is no longer present, the filter shall not continue its combustion.

NOTE Even though the filter medium is made with non-flammable materials, the dust loaded on the filter can still be flammable.

The filter, including its casing, should be able to be compacted such as to minimize radioactive waste volumes. When fire and hot temperature risks are not a nuclear safety issue for a specific filter, consideration should be given to use materials which allows incineration for disposal.

The filter materials and its casing materials submitted to a corrosive atmosphere should be chosen or treated to avoid corrosion.

Potential leaks from the interfacing parts between the filter and the filter housing shall not modify the filter global efficiency or the different qualifying loads.

The filter and its casing envelope materials should be selected such as to minimize their activation (where neutron activation is possible on the filter materials) and to allow their processing or disposal in a radioactive waste facility.

4.1.3 Nominal air volume flow rate

The filter element shall be tested at its nominal air volume flow rate for which the filter has been designed by the manufacturer.

4.1.4 Pressure difference

The pressure difference across the filter element is recorded at the nominal air volume flow rate. Maximum resistance to clogging shall be defined as well as the ultimate burst structural strength as ratio functions of their nominal pressure difference obtained when the filter is new.

4.1.5 Filtration performance

The filtration performance is expressed by the efficiency or the penetration as described by the procedures in ISO 29463-1. After testing in accordance with ISO 29463-1:2017, Clause 7, filters used as HEPA filters in nuclear facilities shall have an efficiency that meets or exceeds ISO 35H defined in ISO 29463-1:2017, Table 1.

Depending on national regulations required by nuclear safety authorities, the filtration performances can also be specified according to approved national standards.

NOTE For nuclear aerosols filters used for confinement systems, ISO 26802^[2] related to ventilation systems for nuclear reactors and ISO 17873^[1] related to ventilation systems for nuclear facilities other than nuclear reactors provide general requirements on filters to be used. The minimal performance is generally set for filter and housing at a minimal efficiency of 99,95 % for overall MPPS values (minimal decontamination factor of 2 000), even though in most safety cases, the minimal decontamination factor at MPPS range is 1 000. The minimal efficiency of 99,95 % corresponds to ISO 35H according to ISO 29463-1.

4.1.6 Filter lifetime

The lifetime of the filter under storage or usage in specified conditions shall be provided by the manufacturer.

[Annex E](#) provides general information related to service life or storage conditions of the filters.

Depending on national regulations required by nuclear safety authorities, the filtration service life can also be specified according to approved national standards.

4.2 General qualification principles

HEPA filter designs shall be verified against their technical specifications. Tests shall be performed at a test facility, based on criteria agreed between the manufacturer and the user, when criteria are not available in existing standards.

A qualification sample of filters shall be manufactured using the same methods, materials, equipment, and processes as will be used during production.

Each filter in the qualification sample shall be visually examined for any macroscopic defects that would appear to question the integrity of the filter. The acceptance criterion for the filter pack is no visual indication of damage to the filter media, no tears on the surface edge of the filter pleats, and no tears where the filter pack is embedded in the adhesive at the frame/case. The acceptance criterion for the frame/case and faceguards is no visual indication of dents or deformation. The acceptance criterion for the gel channel and gasket sealing is no visual indication of dents that can interfere with proper sealing. The acceptance criterion for the gasket seal is no visual indication of looseness or tears.

Acceptance shall be contingent on no visual indications of improper assembly, physical damage, structural deformations and no degradation that would impair the ability of a component to perform its intended function.

The qualification samples shall be tested for those requirements specified by the end user as critical to safety for their systems or processes. Failure of any filter to comply with the requirements of [4.2](#) shall be cause for the rejection of the qualification testing. An appropriate number of samples of a filter showing adequate performances should be provided to allow for testing of the specified loads (generally at least four).

The verification of the compliance shall comprise all the specified loads. After the test, the filter is sent to a qualified test rig where its performances are measured. The level of performances is measured, including its filtration performances, and reported in a sheet certificate.

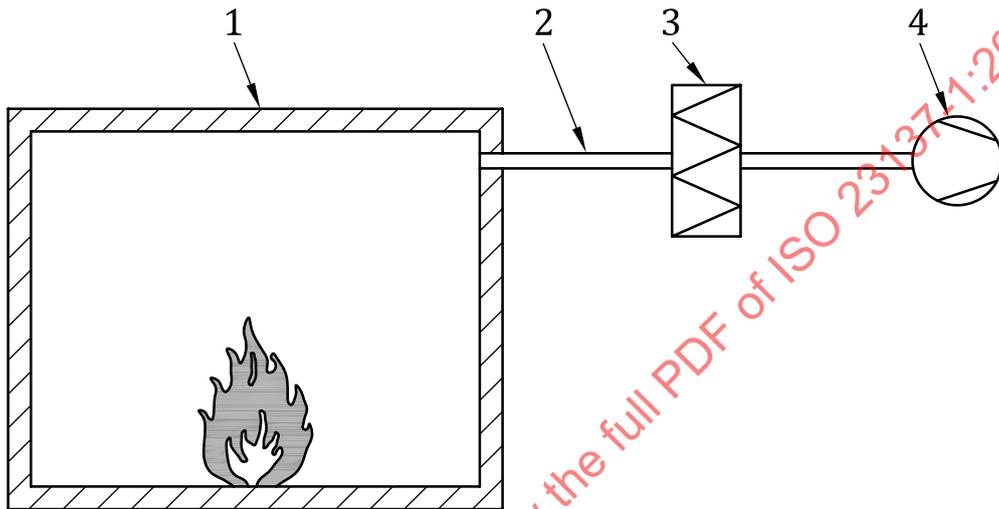
HEPA filter manufacturers shall provide evidence that qualified HEPA filters meet the test requirements against the qualifying loads. Requalification of the filter series is required every five years in order to continue to specify that the filter is still in compliance with its technical specifications, otherwise it shall be demonstrated that the production process (including materials) does not change. In case there is a same filter technology, it may be possible to qualify only a specific size, but the manufacturer shall provide substantiated evidences that the specific selected size covers all the other sizes.

Generally, the bigger size is the one to qualify. In case a filter that is already certified does not comply with the requirements, the agreed test laboratory shall inform the manufacturer. Before publishing the failed results for a failed filter, the test laboratory shall allow the manufacturer to propose a new filter to test.

In order to qualify a filter design against a load internal to the space served by the filter, a minimum of four filters (or according to local regulations) manufactured during the same product run using the same lots of material shall pass the established acceptable criteria established for the specific load. Test samples of the series shall be taken randomly. If filter element materials need to be changed after testing, then suitable part re-testing will need to be considered and agreed between the plant operator and filter manufacturer or the testing repeated in its entirety. Once the filter design is certified, in the production factory, the manufacturer shall provide HEPA filters that have been individually inspected and adequately tested for their efficiency/penetration/pressure difference.

The general principle of the qualification test is shown in [Figure 1](#) (dynamic challenge: filter media exposed to an internal loading challenge) and [Figure 2](#) (static challenge: filter is exposed to an external load challenge).

Case 1: filter submitted to an internal loading (load internal to the space served by the filter)



Key

- 1 room or enclosure in which the load is created (example of a fire)
- 2 duct
- 3 filter to be qualified
- 4 fan

Figure 1 — General principle for the filter test rig

The filter efficiency (key 3) shall be compliant with the ones mentioned in ISO 29463-1 classes. The qualifying load is created in the room/enclosure (key 1). This qualifying load is maintained during a specified time representative of the load. With the support of the fan (key 4), the effluent streams exhausted from the room/enclosure (key 2) are directed to the filter during the adequate time for qualifying the filter. The duct (key 2) is chosen such as to minimize load losses (e.g. if the load is a fire the duct is thermally insulated to avoid losing temperature at the filter location) and to allow representative measurement and monitoring of the load to which the filter is submitted.

NOTE [Figure 1](#) represents a fire load, but it can represent any other load internal to the filter (e.g. steam, soots, high pressure, chemicals).

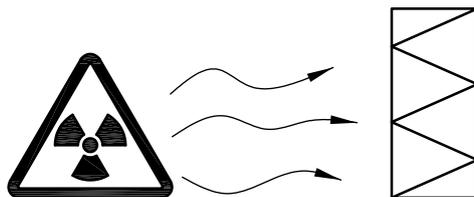
Case 2: filter submitted to an external loading (load external to the space served by filter)

Figure 2 — General principle for the filter test rig for loads external to the filter (example of radiation load)

After the test, the filter is sent to a qualified test rig where its performances are measured. The level of performances is measured, including filtration efficiency, and reported in a sheet certificate. A significant sample size under these external loading conditions should be considered, or according to local regulations.

NOTE [Figure 2](#) represents a radioactive radiation load, but it can represent any other load external to the filter (e.g. earthquake).

5 General performances against loads

5.1 Introduction

During an accident scenario in a nuclear facility, filters can be exposed to different types of loads as a result of the specificities of the scenario and/or cumulated scenarios. It is therefore important to verify that a filter design can withstand specific loads it can be exposed to during an accident scenario specific to the application.

Filter designs that have been qualified against specific loads shall demonstrate that they maintain a minimum level of performance during and/or after exposure to the load(s). The determination of acceptability of the filter design against specified loads is performed in the following process expressed in [5.2](#) to [5.5](#).

5.2 Visual inspection

The filters to be qualified against specific loads should first be visually inspected (e.g. linearity, continuity of the sealing between filtering medium and filter frame, deformation of the frame, damage to the media) to ensure that they meet the requirements for form, fit and function for the application.

5.3 Resistance to air flow and initial efficiency performance

As a baseline, the initial efficiency and resistance to air flow should be measured in accordance with ISO 29463-1 and shall meet the minimum requirements for the filter class being qualified.

5.4 Exposure to loads

The filter design being qualified should be exposed to those loads as deemed necessary as a result of the safety analysis performed for the nuclear facility that will be using the filter. The details of the load requirements, quantity of filters to be tested along with sampling requirements are not part of this document. Loads to be considered, but not limited to, for filter qualification are:

- thermal loads (heated air flow, spot flame resistance);
- pressure load (resistance to pressure, dust loading, water spray, air flow increase);
- vibrating/seismic/rough handling loads;

- chemical loads;
- humidity/steam loads;
- radioactive radiation;
- shock or blast waves loads;
- combined loads: the rules establishing how the combination is done are based on whether the loads are likely to be consequential or independent (e.g. an earthquake have a consequent potentiality to generate a fire inside the facility, while some other combined events will possibly not need to be combined, for example, a fire in one room is considered not to generate a LOCA in another room, these events being independent).

NOTE Ageing (static/dynamic ageing) is not specifically a load by itself but is a consequence of combined loads versus time (thermal, pressure, humidity, etc.).

5.5 Specific performances related to environment likely to be present in nuclear facilities

After exposure to the specified loads, the filters shall be visually inspected if required and tested for resistance to air flow (e.g. pressure drop) and particle removal efficiency. If they meet the requirements, then the filters are qualified to meet the requirements.

6 Qualification of the test rig used for the filter loading performance

6.1 General

The test rigs are designed according to the specification of the different loads against which the filters are designed.

6.2 Qualification of the test rigs

The test rigs shall be qualified by laboratories meeting the requirements of ISO/IEC 17025 that are independent from the test rig.

The test rig shall allow adequate homogeneity of sampling downstream and upstream the filters, in accordance with ISO 29463-5:2022, Clause 6.

The test rig specifications include a range of its qualification domain regarding the conditions of temperature, humidity, pressure and radiations.

6.3 Capabilities of the test rigs with regards to certification filtration performances

Test aerosols shall be used in accordance with their properties during the specified conditions.

The temperature of the injected air shall remain constant during the entire test procedure within ± 5 °C, the relative humidity within ± 10 % for the tests performed in normal air conditions.

The cleanliness of the test air shall be ensured by appropriate pre-filtering, so that there is no addition of aerosol in operation. The test specimen should have the same temperature as the test air for the tests performed in normal air conditions.

For the testing of filters in accordance with this document, a liquid test aerosol shall be used as the reference test method. Alternatively, a solid aerosol may be used depending on the specified conditions, after written agreement between the supplier and the customer.

The concentration and the size distribution of the aerosol shall be constant over time during the tests.

The most penetrating particle size (MPPS) of the filter medium shall be determined and communicated in the tests results. The mean particle diameter of the test aerosol shall correspond to the most penetrating

particle size range for the filter medium. Using the MPPS test aerosol, the overall efficiency of the filter element shall be determined at its nominal air volume flow rate. Depending on national regulations required by nuclear safety authorities, a different method from MPPS can also be specified according to approved national standards.

The filter shall be individually tested.

7 General conditions for the shipping and storage of filters

7.1 Packaging and shipping

HEPA filters shall be shipped in a box under conditions preventing their degradation or while maintaining their protection to prevent damage, loss or deterioration.

HEPA filters shall be individually packaged and protected in an enclosure protected from the environment. These enclosures shall have extra shock absorbing material at the corners or edges of the filter that centres the filter within the carton to prevent damage.

HEPA filters shall be placed so that their pleats (deep pleats) or packs (mini-pleats) remain vertical during transit.

HEPA filters with gelatinous seals shall be packaged in a manner to prevent the gelatinous compound from sticking to the packaging material. A means shall be provided to prevent the gelatinous seal from being gouged or pulled out of the continuous channel when the filter is removed from the shipping carton/plastic bag.

Boxes for HEPA filters shall not be stacked more than two meters high during packaging, shipping, handling and storage.

7.2 Storage of HEPA filters

HEPA filters should be stored in a temperature and humidity-controlled environment, typically +5 °C to +40 °C, RH ≤70 %, with no rapid changes in temperature and humidity. The storage area should be clean, free from vermin (e.g. insects), vibration/shocks/impact and accumulation of water. The storage area should be for HEPA filters alone; storage of other unrelated equipment and materials increases the risk of damage and should be kept separate.

The HEPA filters shall be stored in their cartons, in compliance with the instructions on the carton. The storage area shall allow sufficient space for loading and unloading the HEPA filters without damage. The packaging should facilitate the removal of the filter; the opening in the packaging should allow easy access to the handles on the casing of the HEPA filter to assist operators.

Records of HEPA filters shall be kept so that individual HEPA filter inserts can be traced. [Annex D](#) gives guidelines on packing, shipping and storing the filters.

8 Reporting, evaluation and report

The filter manufacturer shall provide all specified information and ensure that the quality control, and detailed examination and tests required are performed at the stages of construction necessary to permit them to be meaningful.

The conformity compliance report shall be in accordance with [Annex C](#) and shall state that the filters conform to the specified requirements.

Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein.

The supplier shall provide objective and substantiated evidence acceptable to the purchaser that the requirements have been satisfied. This is stated in the filter data sheet serving as conformity compliance report.

Annex A (informative)

General overview of the loads characterization and their combinations on the filters used in nuclear facilities

In the safety case of nuclear facilities, several accident scenarios are postulated in the safety demonstration and safety provisions are implemented in order to demonstrate the robustness of the facilities against these scenarios.

Some HEPA filters participate in the safety function of confining radioactive materials through the filtration of the exhaust streams from the ventilation systems creating a negative pressure inside rooms. The qualification of HEPA filters against severe situations participates to these safety provisions.

Postulated accident events are events internal to the facilities (e.g. break of pipes, load drops, fire) or external to the facilities (e.g. external fires, earthquakes, strong winds).

The following single loads can be induced from these postulated accidental events:

- thermal loads (heated air flow, spot flame resistance);
- pressure load (resistance to pressure, dust loading, water spray, air flow increase);
- vibrating/seismic/rough handling loads (need to simulate transportation as well as earthquakes);
- humidity/steam loads;
- external radiation loads and radioactive contamination deposits;
- chemical loads;
- shock or blast waves loads;
- loads combination.

Some events combine several loads together, such as:

- fire combines both thermal and pressure loads with dust loading and humidity; the pressurization can come from both the fire direct effects and from the clogging effects from the soots created in the fire;
- loss of coolant accident (LOCA) or high energy line break (HELB) scenarios combine both steam/vapour and pressure loads;
- ageing is neither an event nor a load by itself, but it creates cumulated effects of different loads during the filter lifetime (pressure, humidity, thermal, etc.) and therefore creates a combined load (static/dynamic ageing).

Annex B (informative)

Examples of general sizes and layout used for aerosol filtration in nuclear facilities

B.1 Rectangular HEPA filters

Most HEPA filters have taken the dimensions from early nuclear HEPA filters developed in the USA. The origins are described in the US DoE Nuclear Air Cleaning Handbook.^[3] The standard HEPA filter was originally 24 inch (609,6 mm) by 24 inch (609,6 mm) square, 11,5 inch (292,1 mm) deep. This original HEPA filter was based on deep pleat manufacturing. Many HEPA filters are now made using machine folded mini-pleat media packs but the outer dimensions have remained the same.

The SI unit most common dimensions are generally 610 mm × 610 mm × 292 mm.

NOTE In some countries, nuclear HEPA filter standard for rectangular HEPA filters gives the dimensions as 609 mm × 609 mm × 292 mm. This minor difference has not been found to prevent interchangeability.

Smaller HEPA filters are available and are typically derived from these dimensions, 1/2 or 1/3 of those for the 610 mm × 610 mm × 292 mm standard HEPA filter.

B.2 Cylindrical HEPA filters

Cylindrical HEPA filters have become popular in nuclear applications. They can get higher air flow rate capability, improved ability to compact for waste disposal and the location of the contamination on the inner surface of the cylindrical shape of the HEPA filter, so that the contamination is further away from personnel during filter changing. There are many cylindrical HEPA filters for specialist applications such as glove boxes, pressure equalising vents and discharge lines, which are outside the scope of this document. This annex addresses the cylindrical HEPA filters used in nuclear ventilation systems as an equivalent to the 610 mm × 610 mm × 292 mm and similar rectangular HEPA filters.

NOTE Some countries are proposing to use cylindrical HEPA filters for new nuclear facilities according to ES_0_1737_2^[4] (e.g. in the UK).

Annex C
(normative)

Conformity compliance report template

The conformity compliance report shall contain at least the following information:

- a) General information about the testing: standard template for the filter
- manufacturer name;
 - filter type/serial number;
 - nominal flow rate;
 - clean pressure drop;
 - maximum pressure drop maintaining customer requested efficiency;
 - test nominal temperature and uncertainty;
 - test nominal humidity and uncertainty;
 - test efficiency and method used to test efficiency;
 - MPPS range measured;
 - loading conditions during qualification;
 - validated or recommended lifetime;
- b) Information about the laboratory qualifying the filter
- laboratory qualification agreement number (or equivalent when available) proving the adequacy of the test rigs and of the laboratory procedures with regards to the specifications of the filters to be tested;
 - test rigs number;
 - signature and date.

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