

AirMedia



Air Filtration Efficiencies for Hospital & Healthcare Facilities

Stephen W. Nicholas, CAFS, Air Industries, Inc.

Based on the 2001 Edition of The American Institute of Architects Academy of Architecture for Health, The Facilities Guidelines Institute with assistance from the U.S. Department of Health and Human Services.

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History:

In 1947 on February 14, the filtration efficiencies for Hospital & Healthcare Facilities originally appeared as General Standards in the Federal Register, as part of the implementing regulations for the Hill-Burton program. The 1974 Edition was the first to request public input and comment. The document was re-titled Minimum Requirements of Construction and Equipment for Hospital and Medical Facilities to emphasize the requirements were minimum, rather than recommendations of ideal standards.

In 1984, The Department of Health and Human Services (DHHS) removed from regulation the requirements relating to minimum standards of construction, renovation, and equipment of Hospitals and other Medical Facilities, as cited in the Minimum Requirements Department Health Education & Welfare (DHEW) Publication No. [HRA] 81-14500. To reflect the non-regulatory status the title was changed to "Guidelines for Construction and Equipment of Hospital & Medical Facilities." In 1984 DHHS asked the American Institute of Architects Committee on Architecture for Health (AIA/CAH) to form an advisory group. The AIA finally reached an agreement with the DHHS to publish the 1987 edition of the Guidelines.

The AIA published and distributed the 1992-93 edition of the Guidelines. The Steering Committee from the 1992-93 cycle requested and received federal funding from the DHHS for another cycle.

To better reflect the content the title of the document was changed to "Guidelines for Design and Construction of Hospital & Health Care Facilities." It was during this revision that the AIA/CAH became the AIA Academy of Architecture for Health (AIA/AAH). The Health Guidelines Revision Committee (HGRC) reviewed the 1996-97 edition line-by-line to ascertain areas that needed to be addressed, including infection control, safety, and environment of care.

In 1998, in an effort to create a formal procedure and process, as well as to keep the document current, the Facilities Guidelines Institute (FGI) was formed. The main objective of the FGI is to see that the Guidelines are reviewed and revised on a regular cycle with a consensus process by a multidisciplinary group of experts from federal, state, and private sectors.

Currently:

The 2001 edition of the Guidelines has more than 1,500 changes to the previous edition. The newest edition was the first cycle to be completed under the aegis and direction of the FGI. At the beginning of this revision cycle, a notice that the document was being revised was publicized to interested parties along with a request that they make proposals for change. The HGRC received and gave careful consideration to 1,030 comments on the proposed changes. For the first time the Internet

was used extensively to distribute the document and to receive proposals and comments. The 2001 edition of the Guidelines was approved by the FGI and turned over to the AIA for publication and distribution.

While the Guidelines started as a federal document, the AIA has made it a national document with assistance from the DHHS, to improve the health of the nation. From the time it was first issued and enforced, U.S. hospitals have become the ideal and the goal to be achieved by those building hospitals in all nations.

When possible, the Guidelines standards are performance oriented for results. Prescriptive measurements, when given, have been carefully considered relative to generally recognized standards.

"The Guidelines are also used by state licensure agencies as a model... and for this reason regulatory language has been retained."

Today, health care providers reference the Guidelines when planning new or renovated health facility construction. Authorities in 42 states, the Joint Commission for the Accreditation of Healthcare Organizations, and several

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federal agencies also use the Guidelines as a reference code or standard when reviewing, approving, and financing plans and when surveying, licensing, certifying, or accrediting completed facilities. The Guidelines are also used by state licensure agencies as a model for writing their codes and for this reason regulatory language has been retained.

Filtration Efficiencies:

Facility Classifications for Filter Efficiency for Central Ventilation and Air Conditioning Systems.

- General Hospital and Rehabilitation Facilities
- Nursing Facilities
- Outpatient Facilities
- Psychiatric Hospitals

Additional Requirements:

- Filter frames shall be durable and proportioned to provide an air tight fit with enclosing ductwork.
- All joints between filter segments and enclosing ductwork shall have gaskets or seals to provide positive seal against air leakage.
- A manometer shall be installed across each filter bed having a required efficiency higher than 75% including hoods requiring HEPA filters.
- Where two filter beds are required, filter bed No. 1 shall be located upstream of air conditioning equipment and filter bed No. 2 shall be located downstream of any fan or blowers.
- If humidifiers are installed they shall be located at least 15 feet upstream from final filters.

Significant changes have been

incorporated into these Guidelines with regard to infection control. To every extent possible, these changes conform to the most current Centers for Disease Control and Prevention's "Guidelines for Preventing the Transmission of Myobacterium Tuberculosis in Health Care Facilities" and "Guidelines for Prevention of Nosocomial Pneumonia, 1994," published by the CDC in the American Journal of Infection Control (22:247-292).

Three patient segregation categories have been identified as follows:

(1) Airborne infection isolation room:

In airborne infection rooms the air may be re-circulated if HEPA filters are used. In rooms with reversible airflow provision for the purpose of switching between protective environment and airborne infection isolation, these functions are not acceptable. Pressure differential shall be 0.01" w.c.

(2) Protective environment room:

Protective environment rooms shall have HEPA filters at 99.97% efficiency

"Reversible air flow switching between protective environments and airborne infection isolation is not acceptable."

on 0.3 um size particles in the supply air-stream. Pressure differential shall be 0.01" w.c.

(3) Immune suppressed host in airborne infection isolation:

Anterooms are recommended for patients who are immune suppressed and potential transmitters of airborne infection. Rooms with dual-purpose or switch reversible airflow mechanisms between positive and negative are no longer acceptable.

Area Designation	No. of filter beds	Filter bed No.1 (%)	Filter bed No.2 (%)
All areas for inpatient care, treatment and diagnosis, and those areas providing direct service or clean supplies such as sterile and clean processing, etc.	2	30	90
Protective environment room	2	30	99.97
Laboratories	2	80	—
Administrative, bulk storage, soiled holding areas, food preparation areas, and laundries.	1	30	—

Notes: Additional roughing or prefilters should be considered to reduce maintenance required for filters with efficiency higher than 75 percent. The filtration efficiency ratings are based on dust spot efficiency per ASHRAE 52.1-1992.

Area Designation	No. of filter beds	Filter bed No.1 (%)	Filter bed No.2 (%)
All areas for inpatient care, treatment and/or diagnosis, and those areas providing direct service or clean supplies such as sterile and clean processing, etc.	2	30	90
Laboratories	1	80	—
Administrative, bulk storage, soiled holding areas, food preparation areas, and laundries.	1	30	—

Notes: Additional roughing or prefilters should be considered to reduce maintenance required for main filters. The filtration efficiency ratings are based on dust spot efficiency per ASHRAE

Area Designation	No. of filter beds	Filter bed No.1 (%)	Filter bed No.2 (%)
All areas for inpatient care, treatment and/or diagnosis, and those areas providing direct service or clean supplies.	2	30	90
Administrative, bulk storage, soiled holding areas, food preparation areas, and laundries.	1	30	—

Notes: The filtration efficiency ratings are based on dust spot efficiency per ASHRAE 52.1-1992.

Area Designation	No. of filter beds	Filter bed No.1 (%)	Filter bed No.2 (%)
All areas for inpatient care, treatment and/or diagnosis, and those areas providing direct service or clean supplies.	2	30	90
Administrative, bulk storage, soiled holding areas, food preparation areas, and laundries.	1	30	—

Notes: The filtration efficiency ratings are based on dust spot efficiency per ASHRAE 52.1-1992.

Tables indicate area designation with proper air filtration efficiencies. Filtration efficiencies are based on average dust spot efficiency per ASHRAE Standard 52.1-1992.

Summary:

The 2001 edition of Guidelines for Design and Construction of Hospital and Healthcare Facilities offers those responsible for health care design and construction a detailed, up-to-date document. This new edition also covers equipment requirements for hospice care, adult day care and assisted living facilities. There are

several other important revisions and additions in the Guidelines that should be reviewed by those professionals serving the healthcare industry:

References:

The American Institute of Architects Academy of Architecture for Health The Facilities Guidelines Institute with assistance from the U.S. Department of Health and Human Services.

ANSI/ASHRAE Standard
52.1-1992.

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