

ASHRAE Guidelines for Healthcare



Leadership in Filtration

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Eliminating the Danger of Filter Bypass

Standards for minimal filter efficiency requirements, like ASHRAE 170, are very useful but there are many factors that can affect the actual performance realized from a filtration system in a ‘real world’ application.

To this end, there is additional guidance provided by ASHRAE as to the importance of proper installation/maintenance of the filters as well as the filter frame/housing:

At the design phase, filters and air cleaners are generally assumed to be installed and operating correctly. In actual installations, there could be air and contaminant bypass around air cleaning devices (Ward and Siegel 2005), degradation in the performance of some technologies over time (Lehtimäki et al. 2002), and potential for the emission of primary and/or secondary by-products (Zhao et al. 2007; Rim et al. 2013).

ASHRAE Position Document on Filtration and Air Cleaning 2015

So using a filter that meets minimal standards is just the first step in ensuring the filtration system is meeting the performance criteria. The bypass of unfiltered air around an improperly installed or gasketed filter as well as around a poorly installed or maintained filter frame/housing can have dramatic effects on the air cleanliness. Studies have documented a significant decrease in filter removal efficiency when bypass is present. High efficiency filters suffered the most dramatic efficiency loss – a MERV 15 filter decrease to a MERV 8 level. Lower efficiency filters were also affected, a MERV 6 filter decreased to <MERV 5 levels (Modeling Filter Bypass: Impact on Filter Efficiency by Jeffery Siegel and Matthew Ward).

The impact of the bypass of unfiltered air as well as the impact of unexpected environmental issues or even the degradation of performance all lend themselves to the continual monitoring of the filtration systems. Advancements in technology make this available and practical today.



It is no longer simply good enough to use an equivalent product or service. MANN+HUMMEL's products and services provide real solutions to your filtration issues in the healthcare industry and prepare you for tomorrow's demands.

Design Parameters

Inpatient Spaces

Function of space	Pressure relationship to adjacent areas	Minimum outdoor ACH	Minimum total ACH	All room air exhausted directly to outdoors	Minimum filtration efficiencies	Design relative humidity [%]	Design temperature [°F]
NURSING UNITS AND OTHER PATIENT CARE AREAS							
All anteroom	e	NR	10	Yes	MERV 8	NR	NR
All room	Negative	2	12	Yes	MERV 14	Max. 60	70 - 75
Cesarean Delivery room	Positive	4	20	NR	MERV 16	20 - 60	68 - 75
Combination All/PE anteroom	e	NR	10	Yes	HEPA	NR	NR
Combination All/PE room	Positive	2	12	Yes	HEPA	Max. 60	70 - 75
Continued care nursery	NR	2	6	NR	MERV 14	30 - 60	72 - 78
Critical care patient care station	NR	2	6	NR	MERV 14	30 - 60	70 - 75
Emergency dept. exam/treatment room	NR	2	6	NR	MERV 14	Max. 60	70 - 75
Emergency dept. human decontamination	Negative	2	12	Yes	MERV 14	NR	NR
Emergency dept. public waiting area	Negative	2	12	Yes	MERV 8	Max. 65	70 - 75
Emergency dept. trauma/resuscitation room	Positive	3	15	NR	MERV 14	20 - 60	70 - 75
Emergency service triage area	Negative	2	12	Yes	MERV 8	Max. 60	70 - 75
Intermediate care patient room	NR	2	6	NR	MERV 14	Max. 60	70 - 75
Labor/delivery/recovery	NR	2	6	NR	MERV 14	Max. 60	70 - 75
Labor/delivery/recovery/postpartum	NR	2	6	NR	MERV 14	Max. 60	70 - 75
Laser eye room	Positive	3	15	NR	MERV 14	20 - 60	70 - 75
Neonatal intensive care	Positive	2	6	NR	MERV 14	30 - 60	72 - 78
Newborn nursery	NR	2	6	NR	MERV 14	30 - 60	72 - 78
Nourishment area or room	NR	NR	2	NR	MERV 8	NR	NR
Nursery workroom	NR	2	6	NR	MERV 8	Max. 60	72 - 78
Operating room	Positive	4	20	NR	MERV 16	20 - 60	68 - 75
Operating/surgical cystoscopic rooms	Positive	4	20	NR	MERV 16	20 - 60	68 - 75
Patient care area corridor	NR	NR	2	NR	MERV 14	NR	NR
Patient room	NR	2	4	NR	MERV 14	Max. 60	70 - 75
Patient toilet room	Negative	NR	10	Yes	MERV 8	NR	NR
PE anteroom	e	NR	10	NR	HEPA	NR	NR

NR = not required. e = see Section 7.2.1 of the ASHRAE document.

All information taken from the ANSI/ASHRAE/ASHE Standard 170-2021. Check for updates and purchase a copy of the standard from www.ashrae.org before using this information as guidance.

Design Parameters

Inpatient Spaces

Function of space	Pressure relationship to adjacent areas	Minimum outdoor ACH	Minimum total ACH	All room air exhausted directly to outdoors	Minimum filtration efficiencies	Design relative humidity [%]	Design temperature [°F]
NURSING UNITS AND OTHER PATIENT CARE AREAS (CONTINUED)							
Phase I PACU and Phase II recovery	NR	2	6	NR	MERV 14	20 - 60	70 - 75
Procedure room	Positive	3	15	NR	MERV 14	20 - 60	70 - 75
Protective environment room	Positive	2	12	NR	HEPA	Max. 60	70 - 75
Radiology waiting rooms	Negative	2	12	Yes	MERV 8	Max. 60	70 - 75
Seclusion room	NR	2	4	NR	MERV 14	Max. 60	70 - 75
Sterile processing room	NR	2	6	NR	MERV 8	NR	NR
Treatment room	NR	2	6	NR	MERV 8	20 - 60	70 - 75
Wound intensive care (burn unit)	Positive	2	6	NR	HEPA	40 - 60	70 - 75
BEHAVIORAL AND MENTAL HEALTH FACILITIES							
Patient bedroom, resident room	NR	2	2	NR	MERV 8	NR	NR
Seclusion room	NR	4	2	NR	MERV 8	NR	NR
DIAGNOSTIC AND TREATMENT							
Bronchoscopy, sputum collection and pentamidine administration	Negative	2	12	Yes	MERV 14	NR	68 - 73
Class I imaging room	NR	2	6	NR	MERV 8	Max. 60	72 - 78
Class 2 imaging room	Positive	3	15	NR	MERV 14	Max. 60	70 - 75
Class 3 imaging room	Positive	4	20	NR	MERV 16	20 - 60	68 - 75
Dialysis treatment area	NR	2	6	NR	MERV 8	NR	72 - 78
Dialyzer reprocessing room	Negative	NR	10	Yes	MERV 8	NR	NR
ECT procedure room	NR	2	4	NR	MERV 8	Max. 60	72 - 78
Gastrointestinal endoscopy procedure room	NR	2	6	NR	MERV 8	20 - 60	68 - 73
General examination room	NR	2	4	NR	MERV 8	Max. 60	70 - 75
Hydrotherapy	Negative	2	6	NR	MERV 8	NR	72 - 80
Instrument processing room	Negative	2	10	Yes	MERV 8	NR	NR
Medication room	NR	2	4	NR	MERV 8	Max. 60	70 - 75
Nuclear medicine hot lab	Negative	NR	6	Yes	MERV 8	NR	70 - 75
Physical therapy	Negative	2	6	NR	MERV 8	Max. 65	72 - 80
Special examination room	NR	2	6	NR	MERV 14	Max. 60	70 - 75
Treatment room	NR	2	6	NR	MERV 8	Max. 60	70 - 75

Design Parameters

Inpatient Spaces

Function of space	Pressure relationship to adjacent areas	Minimum outdoor ACH	Minimum total ACH	All room air exhausted directly to outdoors	Minimum filter efficiencies	Design relative humidity [%]	Design temperature [°F]
PATIENT SUPPORT FACILITIES							
Bedpan room	Negative	NR	10	Yes	MERV 8	NR	NR
Environmental services room	Negative	NR	10	Yes	MERV 8	NR	NR
Food and supply storage	NR	NR	2	NR	MERV 8	NR	72 - 78
Food preparation areas	NR	2	10	NR	MERV 8	NR	72 - 78
Laboratory work area - bacteriology	Negative	2	6	Yes	MERV 8	NR	70 - 75
Laboratory work area - biochemistry	Negative	2	6	Yes	MERV 8	NR	70 - 75
Laboratory work area - cytology	Negative	2	6	Yes	MERV 8	NR	70 - 75
Laboratory work area - general	Negative	2	6	NR	MERV 8	NR	70 - 75
Laboratory work area - glasswashing	Negative	2	10	Yes	MERV 8	NR	NR
Laboratory work area - histology	Negative	2	6	Yes	MERV 8	NR	70 - 75
Laboratory work area - media transfer	Positive	2	4	NR	MERV 8	NR	70 - 75
Laboratory work area - microbiology	Negative	2	6	Yes	MERV 8	NR	70 - 75
Laboratory work area - nuclear medicine	Negative	2	6	Yes	MERV 8	NR	70 - 75
Laboratory work area - pathology	Negative	2	6	Yes	MERV 8	NR	70 - 75
Laboratory work area - serology	Negative	2	6	Yes	MERV 8	NR	70 - 75
Laboratory work area - sterilizing	Negative	2	10	Yes	MERV 8	NR	70 - 75
Pharmacy services: pharmacy areas	Positive	2	4	NR	MERV 8	Max. 60	70 - 75
Toilet room	Negative	NR	10	Yes	MERV 8	NR	72 - 78
Warewashing	Negative	NR	NR	Yes	MERV 8	NR	NR

NR = not required. e = see Section 7.2.1 of the ASHRAE document.

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Design Parameters

Inpatient Spaces

Function of space	Pressure relationship to adjacent areas	Minimum outdoor ACH	Minimum total ACH	All room air exhausted directly to outdoors	Minimum filter efficiencies	Design relative humidity [%]	Design temperature [°F]
GENERAL SUPPORT FACILITIES: STERILE PROCESSING							
Clean assembly/workroom	Positive	2	4	NR	MERV 8	Max. 60	68 - 73
Soiled workroom/decontamination room	Negative	2	6	Yes	MERV 8	NR	60 - 73
Sterile storage room	Positive	2	4	NR	MERV 8	Max. 60	Max. 75
OTHER GENERAL SUPPORT FACILITIES							
Autopsy room	Negative	2	12	Yes	MERV 8	NR	68 - 75
Clean linen storage room	Positive	NR	2	NR	MERV 8	NR	72 - 78
Hazardous material storage	Negative	2	10	Yes	MERV 8	NR	NR
Laundry, processing room	Negative	2	10	Yes	MERV 8	NR	NR
Linen and refuse chute room	Negative	NR	10	Yes	MERV 8	NR	NR
Nonrefrigerated body holding room	Negative	NR	10	Yes	MERV 8	NR	70 - 75
Regulated waste holding spaces	Negative	NR	10	Yes	MERV 8	NR	NR
Toilet	Negative	NR	10	Yes	MERV 8	NR	NR
SUPPORT AREAS FOR NURSING UNITS AND OTHER PATIENT CARE AREAS							
Clean supply room	Positive	NR	NR	NR	MERV 8	NR	NR
Clean workroom	Positive	2	NR	NR	MERV 8	NR	NR
Soiled workroom or soiled holding	Negative	2	10	Yes	MERV 8	NR	NR

Design Parameters

Specialized Outpatient

Function of space	Pressure relationship to adjacent areas	Minimum outdoor ACH	Minimum total ACH	All room air exhausted directly to outdoors	Minimum filter efficiencies	Design relative humidity [%]	Design temperature [°F]
SURGERY AND EMERGENCY DEPARTMENT (ED)							
Delivery (Caesarean)	Positive	4	20	NR	MERV 16	20 - 60	68 - 75
ED human decontamination	Negative	2	12	Yes	MERV 14	NR	NR
ED exam/treatment room	NR	2	6	NR	MERV 14	Max. 60	70 - 75
ED public waiting area	Negative	2	12	Yes	MERV 8	Max. 65	70 - 75
Operating room	Positive	4	20	NR	MERV 16	20 - 60	68 - 75
Procedure room	Positive	3	15	NR	MERV 14	20 - 60	70 - 75
Phase I recovery	NR	2	6	NR	MERV 8	Max. 60	70 - 75
Phase II recovery	NR	2	2	NR	MERV 8	Max. 60	70 - 75
Pre -procedure patient care	NR	2	2	NR	MERV 8	Max. 60	70 - 75
Trauma room (crisis or shock)	Positive	3	15	NR	MERV 14	20 - 60	70 - 75
Triage	Negative	2	12	Yes	MERV 8	Max. 60	70 - 75
STERILE PROCESSING							
One-room sterile processing	NR	2	6	NR	MERV 14	NR	NR
Sterilizer equipment room	Negative	NR	10	Yes	MERV 8	NR	NR
Clean workroom	Positive	2	4	NR	MERV 14	Max. 60	60 - 73
Clean supply storage	Positive	2	4	NR	MERV 14	Max. 60	72 - 78
Supply receiving	Negative	NR	10	Yes	MERV 8	NR	NR
Decontamination room	Negative	2	6	Yes	MERV 8	NR	60 - 73

NR = not required. e = see Section 7.2.1 of the ASHRAE document.
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Design Parameters

Specialized Outpatient

Function of space	Pressure relationship to adjacent areas	Minimum outdoor ACH	Minimum total ACH	All room air exhausted directly to outdoors	Minimum filter efficiencies	Design relative humidity [%]	Design temperature [°F]
DIAGNOSTIC AND TREATMENT							
Class I imaging room	NR	2	6	NR	MERV 8	Max. 60	72 - 78
Class 2 imaging room	Positive	3	15	NR	MERV 14	20 - 60	70 - 75
Class 3 imaging room	Positive	4	20	NR	MERV 16	20 - 60	68 - 75
Diagnostic imaging waiting	Negative	2	12	Yes	MERV 8	Max. 60	70 - 75
All anteroom	e	NR	10	Yes	MERV 8	NR	NR
All room	Negative	2	12	Yes	MERV 8	Max. 60	70 - 75
PE anteroom	e	NR	10	NR	HEPA	NR	NR
Protective environment room	Positive	2	12	NR	HEPA	Max. 60	70 - 75
Cancer treatment area	NR	2	6	NR	MERV 8	Max. 60	70 - 75
Dialysis treatment area	NR	2	6	NR	MERV 8	NR	72 - 78
Dialyzer reprocessing room	Negative	NR	10	Yes	MERV 8	NR	NR
Bronchoscopy	Negative	2	12	Yes	MERV 14	NR	68 - 73
Instrument processing room	Negative	2	10	Yes	MERV 8	NR	NR
Endoscopy procedure room	NR	2	6	NR	MERV 8	Max. 60	68 - 73
Examination/observation	NR	2	4	NR	MERV 8	Max. 60	70 - 75
Specialty IC exam room	Negative	2	6	Yes	MERV 8	Max. 60	70 - 75
Laboratory work room	Negative	2	6	Yes	MERV 8	NR	70 - 75
Pharmacy/med prep	Positive	2	4	NR	MERV 8	NR	NR
Laser eye room	NR	2	6	NR	MERV 8	Max. 60	68 - 73
Nuclear medicine	Negative	2	6	Yes	MERV 8	NR	70 - 75
Toilet or Toilet/Shower room	Negative	NR	10	Yes	MERV 8	NR	NR
SERVICE/SUPPORT SPACE							
Environmental services room	Negative	NR	10	Yes	MERV 8	NR	NR
Laundry/linen processing	Negative	2	10	Yes	MERV 8	NR	NR
Clean workroom or clean supply	Positive	2	4	NR	MERV 8	NR	NR
Regulated waste holding	Negative	2	10	Yes	MERV 8	NR	NR
Soiled workroom or soiled holding	Negative	2	6	Yes	MERV 8	NR	72 - 78

Design Parameters

General Outpatient

Function of space	Pressure relationship to adjacent areas	Minimum outdoor ACH	Minimum total ACH	All room air exhausted directly to outdoors	Minimum filter efficiencies	Design relative humidity [%]	Design temperature [°F]
GENERAL DIAGNOSTIC AND TREATMENT							
Birthing room	NR	2	3	NR	MERV 14	Max. 60	70 - 75
Urgent care exam	NR	2	3	NR	MERV 8	NR	70 - 75
Urgent care treatment	NR	2	3	NR	MERV 8	NR	70 - 75
Urgent care triage	Negative	2	3	Yes	MERV 8	Max. 60	70 - 75
Urgent care observation	NR	2	2	NR	MERV 8	NR	70 - 75
General examination room	NR	2	2	NR	MERV 8	NR	70 - 75
Specialty IC exam room	Negative	2	3	Yes	MERV 8	Max. 60	70 - 75
Laboratory work room	NR	2	3	NR	MERV 8	NR	70 - 75
Medication room	NR	2	2	NR	MERV 8	Max. 60	70 - 75
Class I Imaging rooms	NR	2	3	NR	MERV 8	Max. 60	72 - 78
Psychiatric examination room	NR	2	3	NR	MERV 8	NR	70 - 75
Psychiatric consultation room	NR	2	3	NR	MERV 8	NR	70 - 75
Psychiatric group room	NR	2	3	NR	MERV 8	NR	70 - 75
Psychiatric seclusion room	NR	2	2	NR	MERV 8	NR	70 - 75
ECT procedure room	NR	2	2	NR	MERV 8	NR	70 - 75
Physical therapy individual room	NR	2	3	NR	MERV 8	NR	70 - 75
Physical therapy exercise area	NR	2	3	NR	MERV 8	NR	70 - 75
Hydrotherapy	Negative	2	3	Yes	MERV 8	NR	72 - 80
Physical therapeutic pool	Negative	2	10	Yes	MERV 8	NR	72 - 80
Speech therapy room	NR	2	2	NR	MERV 8	NR	70 - 75
Occupational therapy	NR	2	3	NR	MERV 8	NR	70 - 75
Prosthetics and orthotics room	NR	2	3	NR	MERV 8	NR	70 - 75
Dental treatment	NR	2	3	NR	MERV 8	NR	70 - 75
Other dental treatment areas	NR	2	3	NR	MERV 8	NR	70 - 75
Toilet room	Negative	NR	4	Yes	MERV 8	NR	NR
SERVICE/SUPPORT SPACE							
Environmental services room	Negative	NR	6	Yes	MERV 8	NR	NR
Clean supply	NR	2	2	NR	MERV 8	NR	NR
Soiled holding	Negative	NR	6	Yes	MERV 8	NR	NR

Air Filtration Requirements for Compounding Pharmacies

The United States Pharmacopeia (USP) is an independent scientific nonprofit organization that has as their main focus to ensure safe and reliable medicine, dietary supplements and foods.

USP 797/800 OVERVIEW:

USP 797 - ENSURES THE STERILITY OF COMPOUNDED STERILE PREPARATIONS TO PROVIDE SAFE MEDICINE.

- The compounding environment is critical to providing a sterile preparation. USP 797 requires a dedicated space designed to minimize the risk of contamination, this Cleanroom suite includes a Cleanroom including buffer and ante areas. This Cleanroom is constructed and maintained to meet rigorous purity standards.

USP 800 - COVERS THE HANDLING OF HAZARDOUS DRUGS THAT PROTECTS PATIENTS, WORKERS AND ENVIRONMENT.

- UPS 800 has requirements for containment engineering controls like local containment devices, ventilation systems and air pressure differential to minimize the release of hazardous particles. These controls help prevent cross-contamination, safeguard staff and patients, and maintain the integrity of the cleanroom environment.

Both standards emphasize the importance of maintaining a sterile and controlled environment for compounding sterile preparations and handling hazardous drugs. They share focus on personnel training, PPE, and environmental controls, this includes factors such as proper ventilation, air filtration, and environmental monitoring.



MANN+HUMMEL
has over 1,000
engineers working
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for the future.



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