



Relative Sizes of Bacteria and Filter Efficiency

Air conditioning filters are rated as follows.

MERV Std 52.2	Intended Dust Spot Efficiency Std 52.1 (1)	Average Arrestance	Particle Size Ranges	Typical Applications	Typical Filter Type
1 - 4	<20%	60 to 80%	> 10.0 µm	Residential/Minimum Light Commercial/ Minimum Equipment Protection	Permanent / Self Charging (passive) Washable / Metal, Foam / Synthetics Disposable Panels Fiberglass / Synthetics
5 - 8	<20 to 60%	80 to 95%	3.0-10.0 µm	Industrial Workplaces Commercial Better / Residential Paint Booth / Finishing	Pleated Filters Extended Surface Filters Media Panel Filters
9 - 12	40 to 85%	>90 to 98%	1.0-3.0 µm	Superior/Residential Better/Industrial Workplaces Better/Commercial Buildings	Non-Supported / Pocket Filter / Rigid Box Rigid Cell / Cartridge V-Cells
13 - 16	70 - 98%	>95 to 99%	0.30-1.0 µm	Smoke Removal General Surgery Hospitals & Health Care Superior/ Commercial Buildings	Rigid Cell / Cartridge Rigid Box / Non-Supported / Pocket Filter V-Cells

Note: This table is intended to be a general guide to filter use and does not address specific applications or individual filter performance in a given application. Refer to manufacturer test results for additional information.
(1) ANSI/ASHRAE 52.1 ranges are provided for reference only. The ANSI/ASHRAE 52.1 Standard was discontinued as of January 2009.

Source: National Air Filtration Association (USA) www.nafahq.org/understanding-merv/

4 points to note:

- 1) Average Arrestance (column 3) shows the level of contaminant captured by the filter. Subtract this figure from 100 to determine the percentage that passes through the filter.
- 2) Although every effort is made by the plant design engineers, and servicing contractors to ensure that filters fit tightly. There can be some additional air bypass of the filters.
- 3) Air, like water, will always find the path of least resistance.
- 4) The higher the MERV rating, the greater the resistance is to the air trying to pass through. This therefore requires more powerful fans (higher energy cost) and a greater likelihood of air bypassing the filter.

Therefore, some tiny amount of unfiltered air could enter the system and find its way into the ductwork and eventually the building.

This will carry bacteria, mould spores, plus minute particles of skin, paper, hair and fabric fibre that can then settle in the ducting. The super fine debris provides an excellent carbon based food source for various bacteria, yeast, and moulds. Proper end-to-end duct cleaning every 3 – 5 years is recommended by the American National Air Duct Cleaners Association (NADCA). The use of Original Safe T air will inhibit the growth of harmful microorganisms in between cleaning.



Bacteria are microscopic organisms which are probably the most widely distributed of all living matter.

Bacteria sizes are listed here as rod length and rod or coccus diameter .

Organism	Rod length μm	Rod or Coccus Diameter μm	Significance
Acetobacter Melanogenus	1.0 – 2.0	0.4 – 0.8	Strong beer, vinegar bacterium
Alcallgenes viscolactis	0.8 – 2.6	0.6 – 1.0	Causes ropiness in milk.
Bacillus anthracis	3.0 – 10.0	1.0 – 1.3	Causes Anthrax in mammals. Pain in chest or muscles, Skin blisters, coughing, headache.
Bacillus stearothermophilus	2.0 – 5.0	0.6 – 1.0	Biological indicator for steam sterilization
Clostridium botulinum (B)	3.0 – 8.0	0.5 – 0.8	Can enter the food chain and be ingested. Produces exotoxins causing botulism
Clostridium perfringens	4.0 – 8.0	1.0 – 1.5	Produces toxins causing food poisoning. Outbreaks in Nursing Homes, canteens, etc
Clostridium tetani	4.0 – 8.0	0.4 – 0.6	Produces exotoxins causing tetanus
Diplococcus pneumonia		0,5 – 1.25	Causes lobar pneumonia, sepsis, meningitis. Renamed Streptococcus pneumonia in 1974
Erwinia aroidae.	2.0 – 3.0	0.5	Causes soft rot in vegetables.
Escherichia coli (E-Coli)	1.0 – 3.0	0.5	Indicator of fecal contamination in water. Causes urinary tract infections, diarrhea, gastroenteritis and hospital acquired infections.
Haemophilus influenzae	0.5 – 2.0	0.2 – 0.3	Causes influenza severe headache, stiff neck, convulsions or seizures, severe drowsiness, and acute respiratory inflammations. https://www.betterhealth.vic.gov.au/health/healthyliving/haemophilus-influenzae-type-b-hib
Klebsiella pneumoniae	5.0	0.3 – 0.5	Causes lobar pneumonia and other respiratory inflammations, urinary tract infections and infant diarrhea.
Lactobacillus delbrueckii	2.0 – 9.0	0.5 – 0.8	Causes souring of grain mashes.



Organism	Rod length μm	Rod or Coccus Diameter μm	Significance
Legionella pneumophila	2.0 – 20	0.3 – 0.9	Causes flu like symptoms, progressing to Legionella in immune-compromised victims.
Mycoplasma pneumoniae (PPLO)		0.15 – 0.8	Smallest known free-living organism. Able to pass through 0.2 μm anti-bacterial filters. Causes urinary tract infections, flu & pneumonia.
Pediococcus acidilactici		0.6 – 1.0	Causes mash spoils in brewing
Pediococcus cerevisiae		1.0 – 1.3	Causes deterioration in beer.
Salmonella enteritidis	2.0 -3.0	0.7 – 0.7	Causes food poisoning. Vomiting, diarrhea, fever, abdominal cramps.
Salmonella hirschfeld	1.0 – 2.5	0.3 – 0.5	Causes enteric fever
Salmonella typhimurium	1.0 – 1.5	0.5	Causes food poisoning in humans. Vomiting, diarrhea, fever, abdominal cramps.
Salmonella typhosa	2.0 – 3.0	0.6 – 0.7	Causes typhoid fever
Serratia marcescens	0.5 – 1.0	0.5	Causes urinary tract and respiratory infections, arthritis, hospital epidemics of septicaemia and peritonitis. Also a test organism of 0.45 μm membranes.
Shigella dysenteriae	1.0 – 3.0	0.4 – 0.6	Causes dysentery in humans
Staphylococcus aureus (Golden Staph)		0.8 – 1.0	Causes pus forming infections, conjunctivitis, wound infections, lung infections, food poisoning.
Streptococcus lactis		0.8 – 1.0	Contaminant in milk. Used as a starter culture.
Streptococcus pyogenes		0.6 – 1.0	Causes pus forming infections. Exotoxin – toxic shock syndrome (Sep C).

Please note:- Not all of these bacteria or their spores are harmful or airborne. Please see our chart of the most common harmful microorganisms found in air conditioning systems.