

ASHRAE Air Filter Testing Chart

(see backside for more detailed information on 52.1 & 52.1 testing)

Typical Applications	ASHRAE 52.2-1999 MERV	Composite Average Efficiency in Size Range			Typical Euro Class EN 779	Average Arrestance by 52.1-1992	Typical Average Dust Spot Efficiency ASHRAE 52.1
		Range 1	Range 2	Range 3			
		0.3 – 1.0u	1.0 – 3.0u	3.0 – 10.0u			
Group 1: Minimum Filtration, Residential, Window Air Conditioners, etc.							
Particle Size (>10.0um): Pollen, Spanish Moss, Dust Mites, Sanding Dust, Spray Paint Dust, Textile Fibers, Carpet Fibers	1	N/A	N/A	E3 < 20%	G1	Avg < 65%	< 20%
	2	N/A	N/A	E3 < 20%	G2	65 < Avg < 70	< 20%
	3	N/A	N/A	E3 < 20%	G2	70 < Avg < 75	< 20%
	4	N/A	N/A	E3 < 20%	G2	75 < Avg	< 20%
Group 2: Commercial Buildings, Better Residential, Industrial Workplace, Paintbooth Inlet Air, etc.							
Particle Size (3.0-10.0um): Mold, Spores, Hair Spray, Fabric Protector, Dusting Aids, Cement Dust, Pudding Mix, Snuff, Powdered Milk	5	N/A	N/A	20% < E3 < 35%	G3	N/A	< 20%
	6	N/A	N/A	35% < E3 < 50%	G3	N/A	< 20%
	7	N/A	N/A	50% < E3 < 70%	G4	N/A	25 - 30%
	8	N/A	N/A	70% < E3	G4	N/A	30 - 35%
Group 3: Superior Residential, Better Commercial Buildings, Hospitals Offices, Laboratories, etc.							
Particle Size (1.0-3.0um): Legionella, Humidifier Dust, Lead Dust, Milled Flour, Coal Dust, Auto Emissions, Nebulizer Drops, Welding Fumes	9	N/A	E2 < 50%	85% < E3	F5	N/A	40 - 50%
	10	N/A	50% < E2 < 65%	85% < E3	F5	N/A	50 - 60%
	11	N/A	65% < E2 < 80%	85% < E3	F6	N/A	60 - 70%
	12	N/A	80% < E2	90% < E3	F6	N/A	70 - 80%
Group 4: Hospital Inpatient Care, General Surgery, Smoking Lounges, Superior Commercial Buildings, etc.							
Particle Size (0.30-1.0um): All Bacteria, Most Tobacco Smoke, Droplet Nuclei (sneeze), Cooking Oil, Most Smoke, Insecticide Dust, Copier Toner, Most Face Powder, Most Pigments	13	E1 < 75%	90% < E2	90% < E3	F7	N/A	80 - 90%
	14	75% < E1 < 85%	90% < E2	90% < E3	F8	N/A	90 - 95%
	15	85% < E1 < 95%	90% < E2	90% < E3	F9	N/A	95 - 98%
	16	95% < E1	95% < E2	95% < E3	F9	N/A	98%+
Group 5: Cleanrooms, Radioactive Materials, Pharmaceutical MFG, Carcinogenic Materials, Orthopedic Surgery, etc.							
Particle Size (<0.30um): Virus (unattached) Carbon Dust, Sea Salt, All Combustion Smoke, Radon Progeny	17	E1 > 99.97% on 0.30um Particles	N/A	N/A	F7	N/A	80 - 90%
	18	E1 > 99.99% on 0.30um Particles	N/A	N/A	F8	N/A	90 - 95%
	19	E1 > 99.999% on 0.30um Particles	N/A	N/A	F9	N/A	95 - 98%
	20	0.10-0.20um Particles	N/A	N/A	F9	N/A	98%+

- Group 1:** Electrostatic - Self charging (passive) woven polycarbonate panel filter
Washable - Aluminum mesh, latex coated animal hair, or foam rubber panel fibers
Throwaway - Disposable fiberglass or synthetic panel filters
- Group 2:** Throwaway - Disposable synthetic media panel filters
Cartridge Filters - Graded density viscous coated cube or pocket filters, synthetic media
Pleated Filters - Disposable, extended surface, 25 to 125 mm (1 to 5in.) thick with cotton-polyester blend media, cardboard frame
- Group 3:** Box Filters - Rigid style cartridge filters 150 to 300 mm (6 to 12 in.) deep may use lofted (air laid) or paper (wet laid) media
Bag Filters - Nonsupported (flexible) microfibre fiberglass or synthetic media 300 to 900 mm (12 to 36 in.) deep, 6 to 12 pockets
- Group 4:** Box Filters - Rigid style cartridge filters 150 to 300 mm (6 to 12 in.) deep may use lofted (air laid) or paper (wet laid) media
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- Group 5:** HEPA/ULPA 99.97% efficiency on 0.30um Particles, IEST Type A
HEPA/ULPA 99.99% efficiency on 0.30um Particles, IEST Type C
HEPA/ULPA 99.999% efficiency on 0.30um Particles, IEST Type D
HEPA/ULPA 99.999% efficiency on 0.10-0.20um Particles, IEST Type F

ASHRAE 52.1-1992 & 52.2 Overview

ASHRAE 52.1-1992 Overview

In the ASHRAE 52.1-1992 several important performance characteristics are tested.

Initial and Final Resistance:

The resistance to airflow is measured in inches of water gage before the test (Initial Resistance) and at the end of the test (Final Resistance). These are important to determine if your system can handle the resistance of a filter and to compare the energy consumption between filters.

Initial Atmospheric Dust Spot Efficiency:

Discoloration test that measures the discoloration of white target paper disc before and after the air filter when atmospheric air is fed to them. Initial efficiency is performed on a clean filter.

Average Atmospheric Dust Spot Efficiency:

It is the same test as above but is an average over the life of the filter. This is often referred to as the ASHRAE Efficiency. It is important to understand that this test does not really indicate the test filters efficiency on a specific size particle but is really just a comparative measurement to compare one filter versus another.

Average Synthetic Dust Weight Arrestance:

This test reflects the percent value of weight collected by the test filter when synthetic dirt is fed to it. There are two basic faults with this test:

- 1st: the artificial test dusts are quite different from atmospheric dusts
- 2nd even low efficiency filters rate quite high by percentage, not offering a good evaluation between low and high efficiency filters. Arrestance

ASHRAE Dust:

ASHRAE synthetic dust consist of
 72% standardized aircleaner test dust fine by weight.
 23% by weight Molocco black
 5% by weight No.7 cotton linters ground in a wiley mill with a 4mm screen.

ASHRAE 52.2-1999 Overview

ASHRAE Standard 52.2-1999 is fundamentally different from the older ASHRAE 52.1 Standard. This new standard measures air filter efficiency by how well the filter captures specific particle sizes. ASHRAE 52.2 classifies these sizes into 12 ranges that the test facility counters must recognize and measure. These ranges are part of the process of determining a filter 's Minimum Efficiency Reporting Value (MERV).

MERV:

The overall efficiency of 52.2 tested air filters is expressed as a MERV at a specific air velocity. To determine a MERV, solid particles of varying sizes are introduced into the test system, upstream from the test filter. A laser particle counter alternately samples air upstream and downstream from the test filter. This is done on the clean filter and after five dust feedings. The lowest efficiency for each range is used to determine the Composite Minimum Efficiency. Once this efficiency is determined, the table below is used to determine a MERV.

The ASHRAE 52.2 Standard does not completely replace the ASHRAE 52.1 but is to be used with the older standard. See chart below for a comparison between the two standards.

Filter Test Description	Test Standard	What It Measures	Comments
Arrestance	ASHRAE 52.1	The percentage of test dust by weight that a filter is able to capture.	Only useful for comparing low efficiency filters.
Dust Spot Efficiency	ASHRAE 52.1	The filter's ability to remove naturally occurring atmospheric dust.	A more measure of performance than arrestance; however, the use of atmospheric dust can result in variable results.
Particle Size Efficiency (PSE)	ASHRAE 52.2	The filter's ability to remove airborne particles in specific size ranges from 0.30 to 10.0 microns in diameter using controlled aerosol potassium chloride (KCI).	A much more comprehensive measure of filter performance because it pinpoints efficiencies on specific particle sizes. Also yields a more consistence and reliable results then dust spot efficiency testing.
Dust-Holding Capacity (DHC)	ASHRAE 52.1	The weight of test dust a filter can holds at a specified finial pressure drop.	A useful way to compare relative service life of filters of similar designs.
Pressure Drop (DP)	ASHRAE 52.1 ASHRAE 52.2	The filter's resistance to airflow.	Resistance relates to energy usage. A lower resistance filter uses less energy at the same airflow.