

TECH TIPS



Sales and Marketing Information on Airguard Air Filtration Products

ASHRAE Standard 52.2 Explained Efficiency Provides New Method of Measuring Filter Performance

• ASHRAE Standard - 62.1 (Commercial) and 62.2 (Residential) both require a MERV 6 filter⁽¹⁾

The new ASHRAE Standard 52.2 provides the first industry accepted procedure for measuring filter efficiency by particle size.

The need for a more precise measurement of a filter's ability to capture specific particle sizes has become more critical as concern regarding indoor air quality (IAQ), respirable particles, as well as protection of products and processes, continues to grow.

Standard 52.2 Replaces Standard 52.1

Standard 52.2 shall be a replacement for Standard 52.1. Standard 52.2 should be relied upon as the industry accepted measurement of filter performance. The arrestance and dust holding capacity data provided by Standard 52.1 is now incorporated into Standard 52.2. As anticipated the fractional efficiency test (52.2) has become more widely understood and accepted. The Clean Air Act for Outdoor Air Quality established by the US EPA PM Standard 2.5 (2.5 micrometers) is required to comply with current version of ASHRAE Standard 62.1⁽²⁾.

Particle Size Ranges

The 52.2 procedure calls for efficiency measurements to be taken on 12 particle size ranges⁽³⁾. (See Table 1 to the right)

For reporting and rating purposes, these 12 ranges are grouped into 3 wider ranges:

E₁ - 0.3 - 1.0 Micrometers

E₂ - 1.0 - 3.0 Micrometers

E₃ - 3.0 - 10.0 Micrometers

Standard 52.2 Test Procedure

Efficiency measurements are taken on each of the 12 particle size ranges at 6 different points during the test:

Clean (after 4 increments of dust loading).

After the final resistance has been reached.

Standard synthetic ASHRAE dust, comprised of 72% SAE standard J726 test dust (fine), 23% powdered carbon, and 5% milled cotton linters is used to load the filter in 5 equal increments.

The 6 efficiency measurements for each of the 12 particle size ranges (72 total efficiency measurements) are taken by challenging the filter with potassium chloride (KCl) particles. This test aerosol provides particles over the entire range of 0.3 to 10.0 micrometers required by the test procedure.

The lowest efficiency value (of the 6 measurements taken throughout the test) for each of the 12 particle size ranges is

recorded. Note: The 6 readings for each particle size range are not averaged... the lowest efficiency value is used.

The 12 readings are grouped into the 3 wider ranges (E₁, E₂, E₃).

These values are then averaged to provide an average Particle Size Efficiency (PSE) for each range. The PSE values are used to classify the filter into one of the 16 Minimum Efficiency Reporting Values (MERV).

Standard Test Air Flow Rates

Standard 52.2 requires that the tests shall be run at one of 7 air flow rates:

118 FPM (.60 m/s)

246 FPM (1.25 m/s)

295 FPM (1.50 m/s)

374 FPM (1.90 m/s)

492 FPM (2.50 m/s)

630 FPM (3.20 m/s)

748 FPM (3.80 m/s)

Table 1 Example: MERV-14 (see Table 2 on back for MERV Schedule.)

Particle Size Range (Micrometers)	Lowest Efficiency (%) (based on 6 readings over life of test)	Average Particle Size Efficiency (PSE)
.30 - .40	74%	84% (E ₁)
.40 - .55	82%	
.55 - .70	87%	
.70 - 1.0	92%	
1.0 - 1.3	96%	98% (E ₂)
1.3 - 1.6	98%	
1.6 - 2.2	99%	
2.2 - 3.0	100%	
3.0 - 4.0	100%	100% (E ₃)
4.0 - 5.5	100%	
5.5 - 7.0	100%	
7.0 - 10.0	100%	

NOTES:

1. To determine the MERV, start with the PSE value for E₁, then E₂, then E₃ to arrive at the proper MERV number:
2. E₁ is 84%: Therefore the maximum would be MERV-14.
3. E₂ and E₃ both exceed 90% and therefore the filter would be a MERV-14.



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**Minimum Efficiency Reporting Values (MERV)
ASHRAE Standard 52.2**

Table 2:

Group Number	MERV	E ₁	E ₂	E ₃	Average Arrestance	Minimum Final Resistance (Inches w.g.)
		Average Particle Size Efficiency (PSE) 0.3 - 1.0 Micrometers	Average Particle Size Efficiency (PSE) 1.0 - 3.0 Micrometers	Average Particle Size Efficiency (PSE) 3.0 - 10.0 Micrometers		
1	MERV 1	-	-	Less than 20%	Less than 65% 65 - 69.9% 70 - 74.9% 75% or greater	0.3"
	MERV 2	-	-	Less than 20%		0.3"
	MERV 3	-	-	Less than 20%		0.3"
	MERV 4	-	-	Less than 20%		0.3"
2	MERV 5	-	-	20 - 34.9%	-	0.6"
	MERV 6	-	-	35 - 49.9%	-	0.6"
	MERV 7	-	-	50 - 69.9%	-	0.6"
	MERV 8	-	-	70 - 84.9%	-	0.6"
3	MERV 9	-	Less than 50%	85% or greater	-	1.0"
	MERV 10	-	50% - 64.9%	85% or greater	-	1.0"
	MERV 11	-	65% - 79.9%	85% or greater	-	1.0"
	MERV 12	-	80% - 89.9%	90% or greater	-	1.0"
4	MERV 13	Less than 75%	90% or greater	90% or greater	-	1.4"
	MERV 14	75% - 84.9%	90% or greater	90% or greater	-	1.4"
	MERV 15	85% - 94.9%	90% or greater	90% or greater	-	1.4"
	MERV 16	95% or Greater	95% or greater	95% or greater	-	1.4"

Notes:

- ASHRAE Standard 52.2 tests shall be conducted at one of 7 air flow rates:

118 FPM (.60 m/s)	492 FPM (2.50 m/s)
246 FPM (1.25 m/s)	630 FPM (3.20 m/s)
295 FPM (1.50 m/s)	748 FPM (3.80 m/s)
374 FPM (1.90 m/s)	
 - The air flow rate at which the filter was tested is included in the MERV (MERV-14 @ 492 FPM/ 2.5 m/s).
 - Final resistance must be at least twice the initial resistance at the test air flow rate, or the values shown in the table above, whichever is greater.
 - 3rd party independent test reports with products procured from the "open market" should be included when specifying filters in accordance to ASHRAE Standard 52.2-2007⁽⁴⁾.
- Reference:**
- ASHRAE Standard 62.1 and 62.2 "Ventilation for Acceptable Indoor Air Quality"
 - ASHRAE Standard 62.1 Section 4; Table No. 4 US EPA National Primary Ambient Air Quality Standards
 - One (1) micrometer is one (1) millionth of a meter which is equivalent to approximately 1/25,400th of an inch
 - Note Number 4, See NAFA Guide Chapter 7 "HVAC Air Filter Testing" for more information on sample tested obtained from open market. ASHRAE Standard 52.2 Appendix C-2 "Reading a Test Report" see item No. 5 on Air Cleaner Performance Report Summary

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