

Coronavirus and Air Filtration

What is Coronavirus?

The World Health Organization (WHO) defines the family of Coronaviruses (CoV) as a large family of viruses that cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). A novel coronavirus (nCoV) is a new strain that has not been previously identified in humans. ¹

The Center for Disease Control (CDC) has named the 2019 novel coronavirus “SARS-CoV-2”, or COVID-19 for short. The virus that causes COVID-19 probably emerged from an animal source but is now spreading from person to person. The virus is thought to spread mainly between people who are in close contact with one another (within about 6 feet) through respiratory droplets produced when an infected person coughs or sneezes. ²

Existing literature regarding COVID-19 and other coronaviruses suggest that the incubation period may range from 2–14 days. ³

Further results published by the U.S. government has found that a viable virus could be detected up to three hours later in the air, and up to 2-3 days on plastic and stainless steel. ⁴

How does that relate to ventilation and filtration?

Currently, the term “droplet” refers to droplets $>5\ \mu\text{m}$ in diameter that fall rapidly to the ground. In contrast, the term droplet nuclei refers to droplets $\leq 5\ \mu\text{m}$ in diameter that can remain suspended in air for significant periods of time. ⁵

Published data have suggested that sneezing may produce as many as 40,000 droplets between $0.5\text{--}12\ \mu\text{m}$ in diameter that may be expelled at speeds up to 100 m/s, whereas coughing may produce up to 3,000 droplet nuclei, about the same number as talking for five minutes. Despite the variety in size, large droplets comprise most of the total volume of expelled respiratory droplets. ⁵

The ASHRAE Position Document on Airborne Infectious Diseases’ scope is limited to aerosols, which can travel longer distances through the airborne route, including by HVAC systems. The terms airborne, aerosol, and droplet nuclei are used throughout the PD to refer to this route. HVAC systems are not known to entrain the larger particles. The size demarcation between droplets and small particles has been described as having a mass median aerodynamic diameter

(MMAD) of 2.5 to 10 μm . Even particles with diameters of 30 μm or greater can remain suspended in the air. ⁶

How do I make sense of this data?

The MMAD, as mentioned by ASHRAE, is the equivalent of 2.5 to 10.0 microns. Table 3 of the NAFA guide defines MERV rating as a system that identifies efficiency removal by particle size. A list of the MERV ratings and the particle sizes for which they are most efficient is described below. ⁷

- MERV 8 removes 70% of all particles 3.0 microns and greater.
- MERV 11 removes 65-85% of particle size 1.0 to 3.0 microns and 85% of particle size 3.0 to 10.0 microns.
- MERV 13 efficiency removal is less than 70% on particle size 0.3 to 1.0 microns and 90% on particle size 1.0-10.0 microns.
- MERV 14 efficiency removal is greater than 75-85% on particle size 0.3 to 1.0 microns and 90% on particle size 1.0-10.0 microns.
- MERV 15 efficiency removal is greater than 85-95% on particle size 0.3 to 1.0 microns and 90% on particle size 1.0-10.0 microns.
- MERV 16 efficiency removal is greater than 95% on particle size 0.3 to 1.0 microns and 95% on particle size 1.0-10.0 microns.

See Appendix A for a graphic of contaminants by particle size.

What can I do about it?

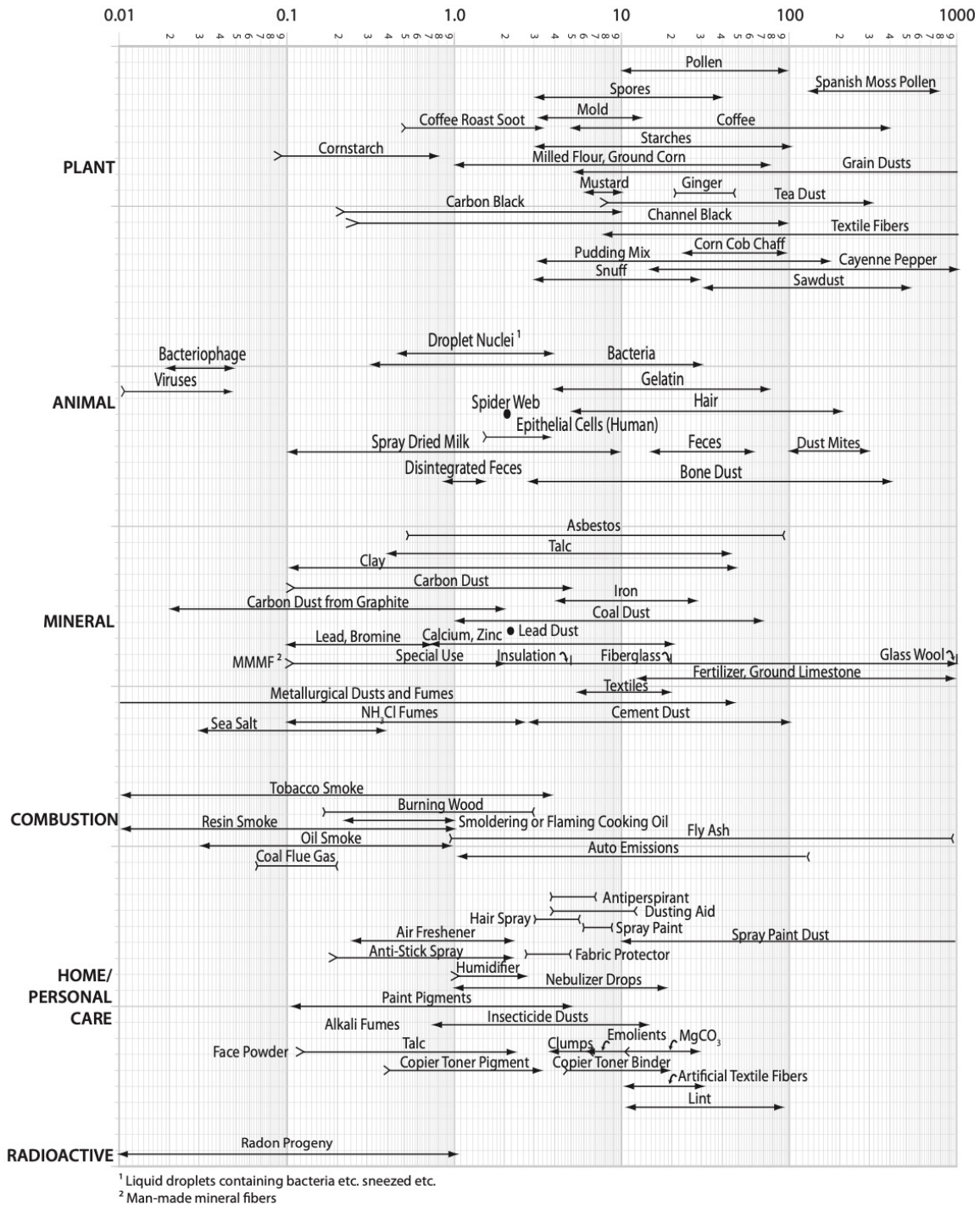
Please be aware, a contagious person can spread COVID-19 by touching surfaces or by producing aerosols via coughing and sneezing, which then may contaminate surfaces before they reach the filters. To mitigate against the spread of COVID-19 through the ventilation system, Air Filter Supply recommends MERV 14 efficiency or greater.

As a precaution, the technicians changing filters should be advised to wear latex gloves and masks when handling dirty filters and dispose of the spent filters in plastic bags.

This recommendation is for filtration within an enclosed space for reducing the spread of airborne droplets and droplet nuclei. If you are diagnosed with, or show symptoms of, COVID-19, please follow the guidelines issued by the CDC.

Appendix A

PARTICLE DIAMETER (μm)



1. <https://www.who.int/health-topics/coronavirus>
2. <https://www.cdc.gov/coronavirus/2019-nCoV/summary.html>
3. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/faq.html>
4. <https://www.medrxiv.org/content/10.1101/2020.03.09.20033217v1.full.pdf>
5. https://apps.who.int/iris/bitstream/handle/10665/44167/9789241547857_eng.pdf?sequence=1&isAllowed=y
6. <https://www.ashrae.org/file%20library/about/position%20documents/airborne-infectious-diseases.pdf>
7. <https://www.nafahq.org/understanding-merv-nafa-users-guide-to-ansi-ashrae-52-2/>