How to Reduce Viral Carriers in the Environment

New SARS-CoV-2 (COVID-19) Research

Viable SARS-CoV-2 found detectable in aerosols

- **SARS-CoV-2 is now the official name for the virus that causes the coronavirus disease COVID-19.**
- Causes acute respiratory disease and gastrointestinal disease
- Survivability rates per new study in *The New England Journal of Medicine, a*uthored by scientists from National Institutes of Health, CDC, UCLA, and Princeton University:
  - 3 hours = Aerosol
  - 4 hours = Copper
  - 24 hours = Cardboard
  - 2-3 days = Plastic/Steel

Study results suggest that viable SARS-CoV-2 may be locally aerosol transported which could explain transmission in community settings.

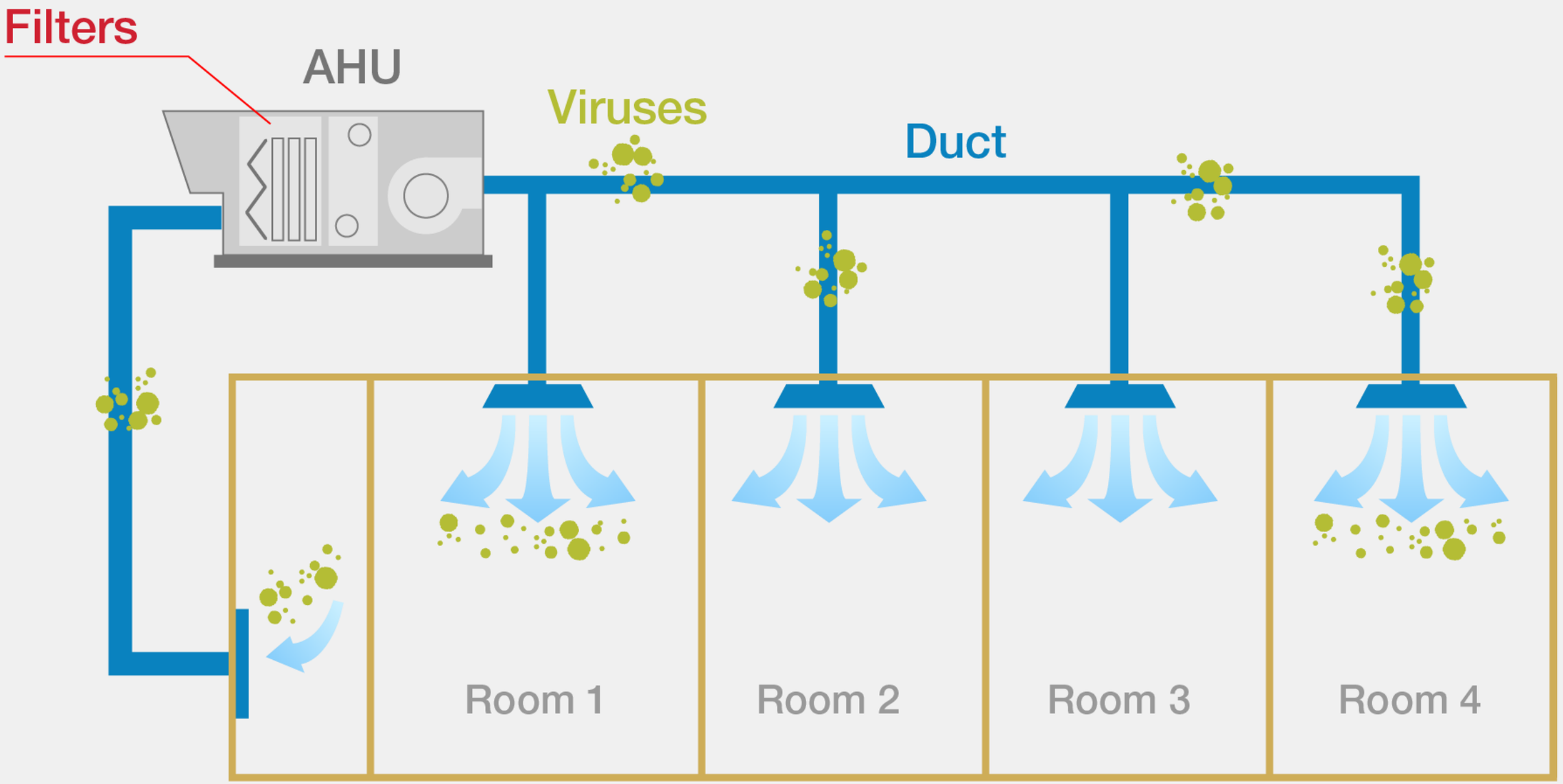
Sources:

New Coronavirus Stable For Hours on Surfaces
https://www.nih.gov/news-events/news-releases/new-coronavirus-stable-hours-surfaces

The Species Severe Acute Respiratory Syndrome-related Coronavirus : Classifying 2019-ncov and Naming It Sars-cov-2
https://www.nature.com/articles/s41564-020-0695-z

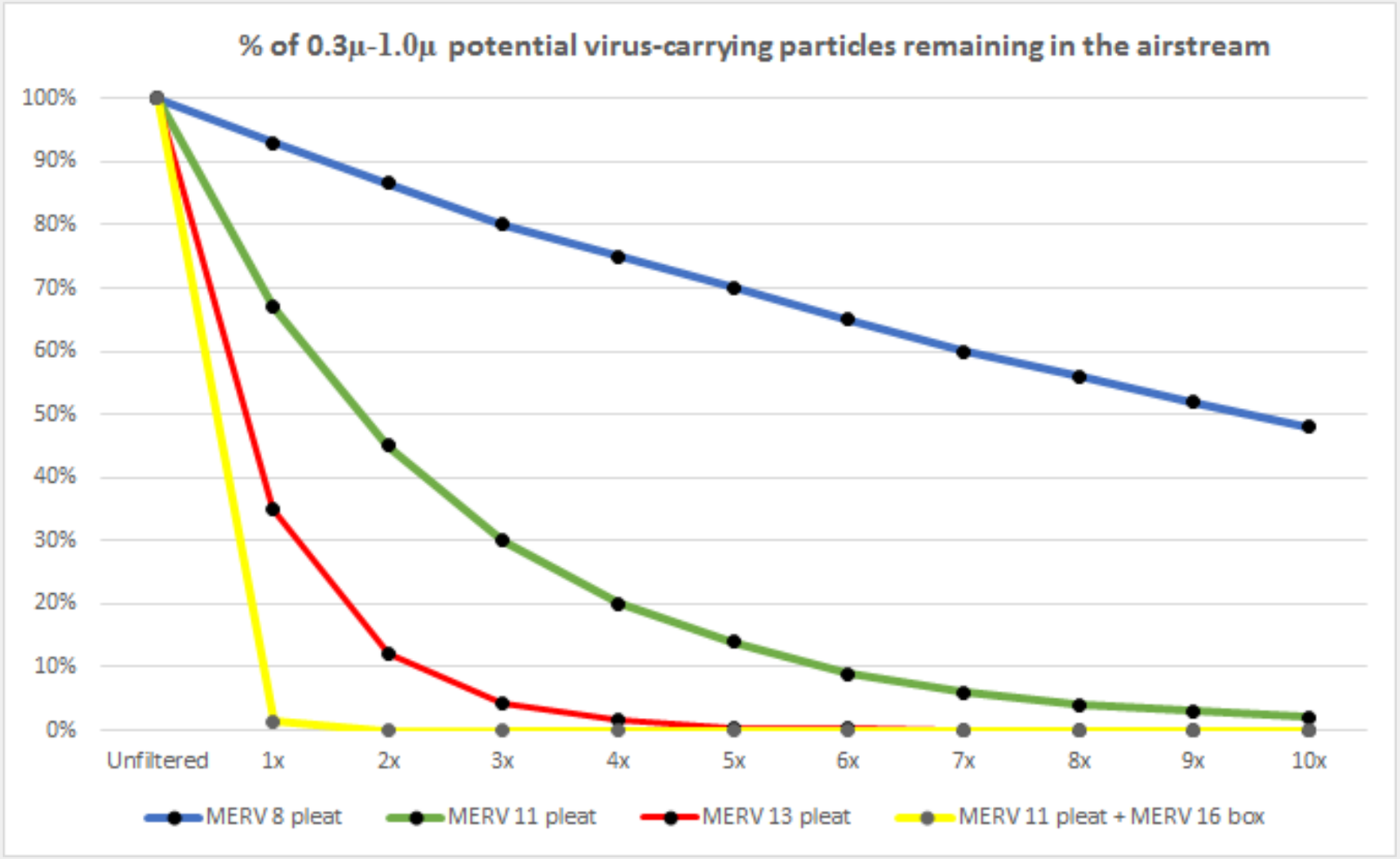
HVAC System Operational Assumptions

- HVAC equipment will circulate the air in rooms, heat/cool the air, and then re-circulate to the room.
- Given an air change rate of approx. 7 times per hour*, living viruses (assuming 3-hour life) can be carried by particles and circulate 21 times and spread throughout the building within the ducts.



*Given 60,000-sq. ft. building with AHU operating at 7000 CFM (using a bank of four 24x24 filters with an avg. airspeed of roughly 440 FPM)

Captured Virus Carriers by Filter Efficiency



Assumes virus carried by 0.3-1.0µ aerosolized droplet or dust particle

	Pleat	Box
MERV 8	7%	--
MERV 9	9%	--
MERV 11	33%	--
MERV 13	65%	--
MERV 14	--	80%
MERV 15	--	90%
MERV 16	--	98%

*Note: Some particles may settle out as they circulate through a building. However, there is no reliable way currently to predict that rate, nor is there a way to predict how many new virus-carrying particles may replace those that have settled out.

Reduce Virus-Carrier Sized Particles with High Efficiency Filters

Pre-Filter Selection			
Existing Filter	Our Proposal	# of Circulations to Capture >95%	Please Note
MERV 7	MERV 13	10X+ ==> 3X	Initial pressure drop may increase. Replacement cycle should stay the same as existing filter.
MERV 8		10X+ ==> 3X	
MERV 9		10X+ ==> 3X	

Combination of MERV 11 Pre-Filter & MERV 16 Secondary Filter				
Existing Pre	Existing 2nd	Our Proposal	# of Circulations to Capture	Please Note
MERV 7	MERV 11	MERV 11 (Pre) + MERV 16 (2nd)	1X	Higher initial pressure drop. Replacement cycle should stay the same as with existing filter. If existing secondary filter is a box type, we recommend v-bank for similar pressure drop and longer replacement cycle.
	MERV 13			
	MERV 16			
MERV 8	MERV 11			
	MERV 13			
	MERV 16			
MERV 9	MERV 11			
	MERV 13			
	MERV 16			

Recommended Filtration Solutions

PREpleat® M11 HC

Prefilter

- 3x higher efficiency on 0.3-1µm particles as-compared to MERV 8 filters
- 2x more efficient on 1-3µm particles as-compared to MERV 8 filters
- Increase life of downstream final filters
- Significantly improve protection from bioaerosol hazards
- Reinforced with corrosion-resistant heavy metal backing
- Diagonal face strips enhance strength
- MERV 11

MEGApleat® M9

Prefilter

- Longest-lasting prefilter
- Fewer changeouts reduces exposure of personnel to dirty filters
- No significant change in system-level small particulate efficiency vs. MERV 11 when paired with MERV 16 final filter
- Strongest pleated prefilter
- Sturdiness protects against possible contamination from filter failure
- Higher dust-holding capacity saves energy over the life of the filter
- MERV 9

PREpleat® M13

Prefilter

- Highest small particle efficiency in a pleated prefilter
- Low initial resistance
- 100% synthetic high-loft media
- Double-wall heavy duty die cut frame
- Expanded metal backing
- Diagonal grid supports for maximum strength
- MERV 13

VariCel® VXL

Secondary Filter

- 50% more media area provides greater airflow capacity and lowers resistance
- Maximum dust-holding capacity extends filter life, minimizing operating costs
- Higher overall particle efficiency as compared to box filters with similar MERV ratings
- Excellent performance in difficult operating conditions
- Can be used in high-velocity systems, operating at up to 750 FPM
- Fiberglass media increases in efficiency over the filter's life, will not decrease due to loss of charge
- Single- and double-header models
- Available in MERV 15, MERV 14, MERV 13, and MERV 11 efficiencies
- MERV 15 and MERV 14 available with antimicrobial

BioCel® VXL

Secondary Filter

- Minimum 95% efficient on 0.3µm
- 98% avg. on particles 0.3-1.0µm
- Greater than 99% efficiency on 1.0µm & larger
- Increased protection against the transmission of airborne diseases
- Improved IAQ and reduced level of respirable particulate
- Initial resistance 0.62″ w.g @ 500 FPM, (comparable to MERV 14 std. aluminum separator box filters)
- Media area approx. 200 sq. ft. (24x24x12)
- Directly interchangeable with all single-header products
- MERV 16
- Antimicrobial available

MEGAcel® I eFRM

HEPA Filter

- Expanded fluororesin membrane (eFRM) media offers up to 50% lower resistance than glass media
- 8X stronger than glass media
- Highly resistant to corrosive environments (acids, alkalis, and organic substances)
- Lowest off-gassing properties available
- Withstands pressure up to 20 in. w.g. (5,000 Pa)
- Minimum 99.99% at 0.3µm, H13; and 99.995% at MPPS, H14
- Compatible with all common test methods, including high-concentration oil-based aerosol testing with PAO.

MEGAcel® II eFRM

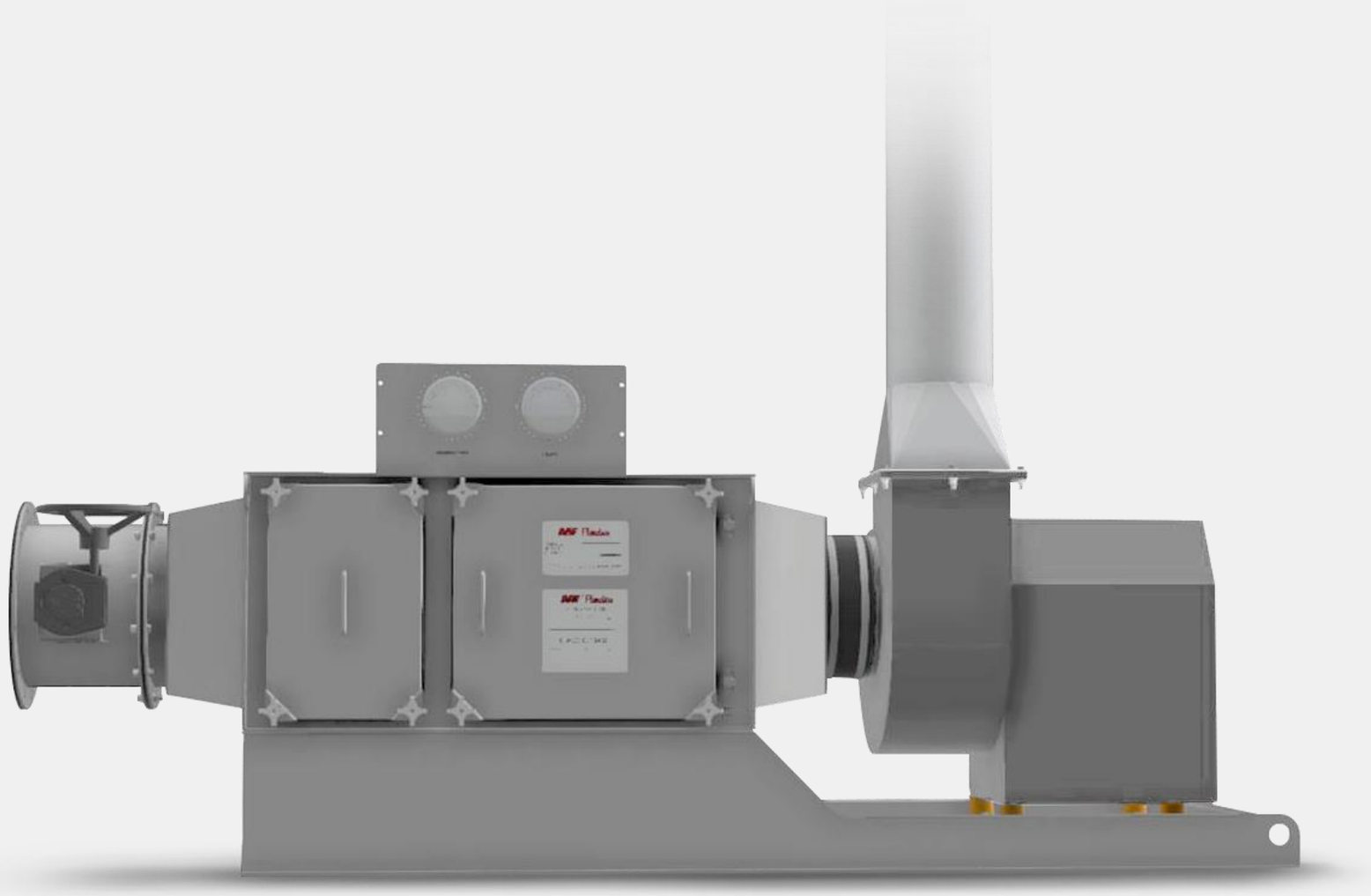
HEPA Filter

- Expanded fluororesin membrane (eFRM) media is 8X stronger than fiberglass media
- Highly resistant to corrosive environments (acids, alkalis, and organic substances)
- Compatible with all common test methods, including high-concentration oil-based aerosol testing with PAO.
- Lowest pressure drop mini-pleat HEPA filter available for pharma & life sciences
- Minimum 99.99% at 0.3µm, H13; and 99.995% at MPPS, H14
- Lightweight anodized aluminum frame
- Gel, gasket, and knife-edge seals available
- Thermoplastic hot-melt separators

AstroSafe SC1000

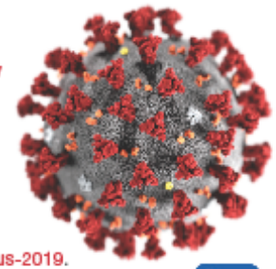
Bag In/Bag Out Containment System

- Safe, reliable method for removing contaminated particles in hazardous environments
- Turn-key solution for containment of bacteria and viruses
- Maintenance personnel are protected from direct contact with hazardous contaminants
- Self-contained unit includes HEPA filter, prefilter, Bag In/Bag Out system, Isolation Damper, Base, Exhaust Stack



Supporting Marketing Materials

coronavirus
What You Need to Know

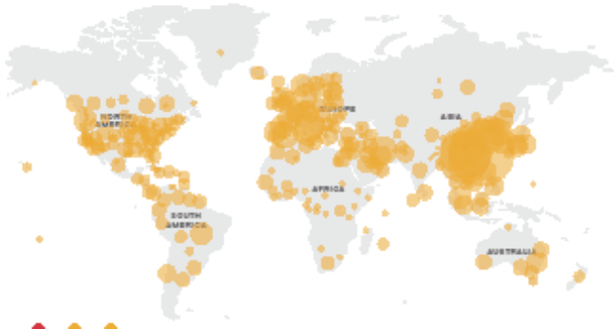


Because of our commitment to clean air, AAF Flanders® wants to arm you with information on this latest threat. This document is intended to serve as a reference on the 2019-nCoV outbreak.
However, for the most up-to-date news and updates, please visit the Centers for Disease Control and Prevention website at www.cdc.gov/coronavirus/2019-ncov/index.html or the World Health Organization website at www.who.int/emergencies/diseases/novel-coronavirus-2019.

Image, courtesy of the CDC

Coronavirus COVID-19 Global Cases by Johns Hopkins CSSE

Case numbers updated as of this publication. For the most current case update, visit:
www.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6



Total Confirmed*
250,856

Total Deaths*
10,389

Total Recovered*
87,284

How is it transmitted?

- Via droplets from coughs or sneezes
- Contact with an infected person or contaminated surface

When is a mask recommended?

It is advisable to wear an appropriate facemask or respirator depending on infected status.

Who is most vulnerable?

- Older people
- People with medical conditions such as diabetes and heart disease

What precautions can be taken?

- Stay at least 6 feet (1.8 meter) away from people who are sick.
- Stay home when you are sick.
- Seek medical care if you are coughing, sneezing, and running a fever.
- Wash your hands often with soap and water for at least 20 seconds.
  - If soap and water aren't available, use an alcohol-based hand sanitizer with at least 60% alcohol.
- Avoid touching your eyes, nose, and mouth with unwashed hands.
- Cover your cough or sneeze with a tissue, then throw the tissue in the trash.
- Clean and disinfect frequently touched objects and surfaces using a household cleaning spray or wipe.

The Importance of Clean Air Environments

Airborne Contaminants in the Workplace

The U.S. Environmental Protection Agency (EPA) identified indoor air quality (IAQ) as one of the top five most urgent environmental risks to public health. The air we breathe at home, work, and school may contain a variety of contaminants, such as bacteria, pollen, and viruses.

An extensive body of scientific evidence demonstrates that short- and long-term exposure to fine particle pollution negatively affects the cardiovascular system. Poor IAQ are commonly associated with improperly operated and maintained heating, ventilating, and air conditioning (HVAC) systems.

Indoor Air Quality

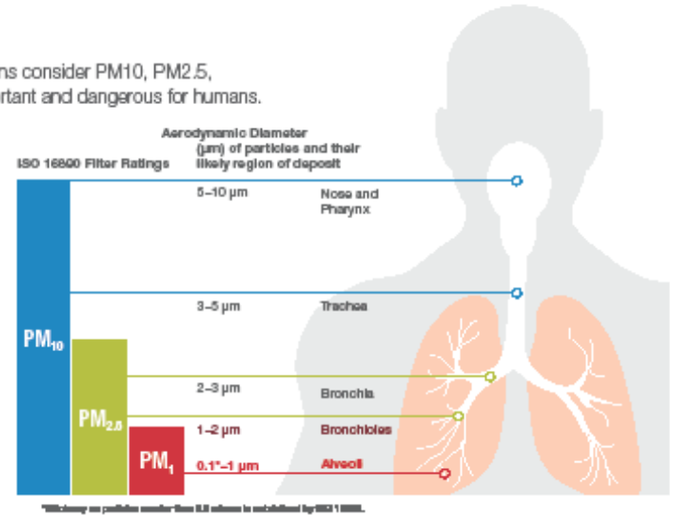
The world's leading health-related organizations consider PM10, PM2.5, and PM1 fine dust fractions as the most important and dangerous for humans.

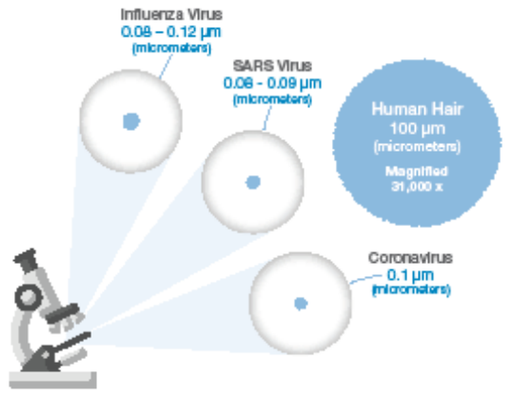
Particles with an aerodynamic diameter of:

10 micron (ePM10)
deposit in the **nose and pharynx** of the human respiratory system

2.5 micron (ePM2.5)
are small enough to reach the **human lung** and deposit in the bronchia

1 micron (ePM1) or smaller
are small enough to find their way through the cell membranes of the alveoli into the **human blood stream** and cause life-threatening diseases





Particulate Size and Air Filtration

Our ability to measure and identify particulate and airborne molecular contamination changes the way we think about air filtration. Because these particles are so small, viruses and other contaminants can penetrate deep into the lungs and bloodstream, where they pose a grave threat to human health.

Fortunately, proper air filtration has been proven to reduce the spread of viruses and other contaminants. For example, research has demonstrated that appropriate air filtration limits the pass-through of virus particles, which frequently hitch a ride on larger particles, into downstream areas. This result may be achieved with MERV 14-16 air filters, as well as with high-efficiency particulate air (HEPA) filters, when installed in suitable air handling systems.