



# Infection Control in HVAC Systems

This Nano-Session Qualifies for 0.25 AIA HSW Learning Educational Units



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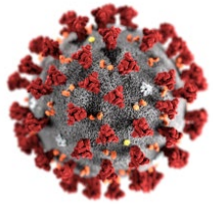
**[Enhanced HVAC Control Infection White Paper Series:](https://schnackel.com/insights/whitepapers/)**

<https://schnackel.com/insights/whitepapers/>



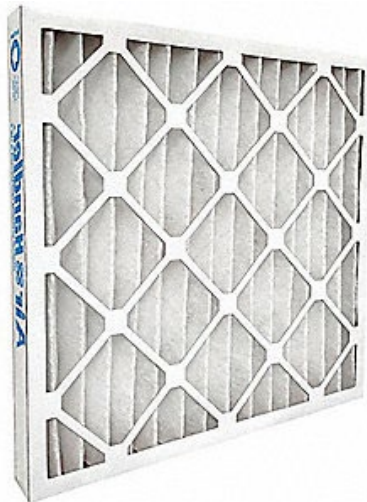
# FILTRATION





0.12 microns

SARS-CoV-2 Virus

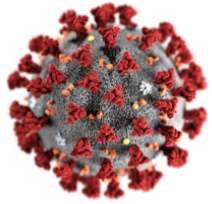


MERV FILTER 13

## MERV ASHRAE Standard 52.2

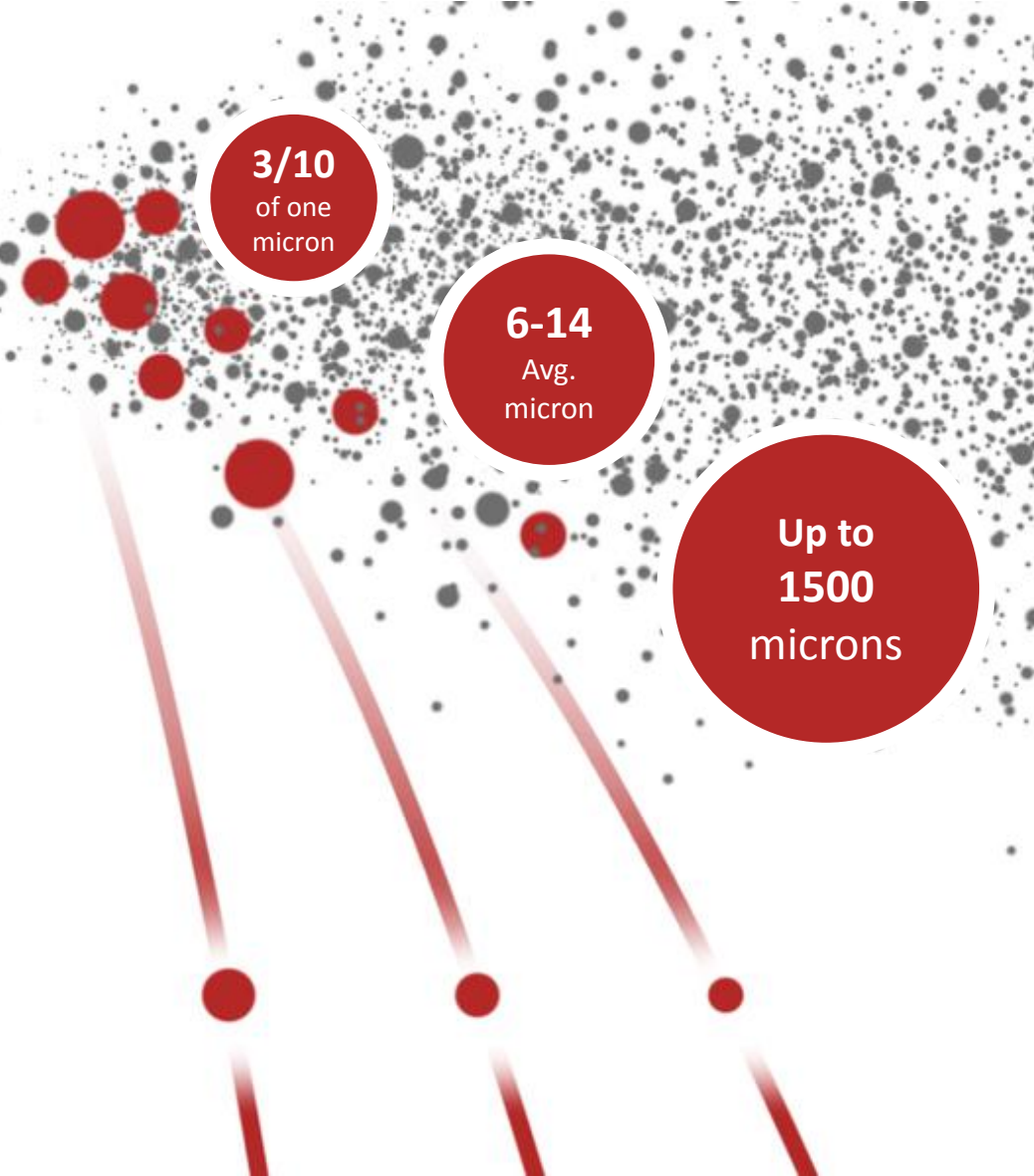
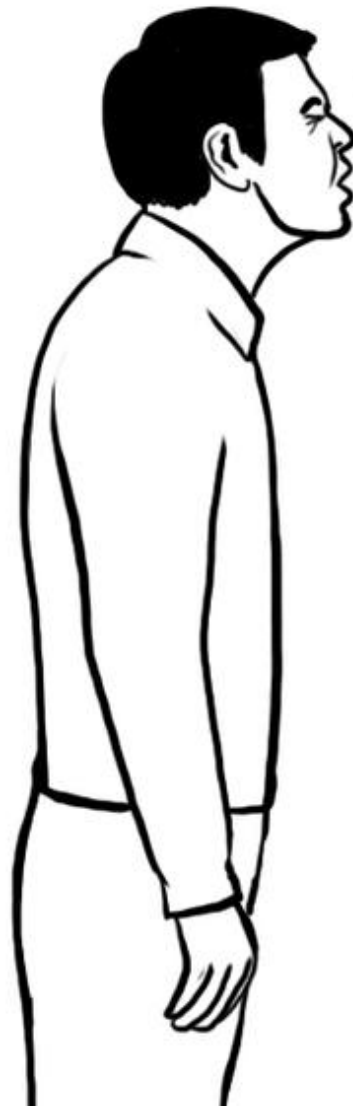
Standard 52.2 MERV	Composite Avg. Particle Size Efficiency % In Size Range, $\mu\text{m}$			Average Arrestance, %
	0.3 - 1.0	1.0 - 3.0	3.0 - 10.0	
1	n/a	n/a	<20	<65
2	n/a	n/a	<20	65 - 69
3	n/a	n/a	<20	70 - 74
4	n/a	n/a	<20	>74
5	n/a	n/a	$\geq 20$	n/a
6	n/a	n/a	$\geq 35$	n/a
7	n/a	n/a	$\geq 50$	n/a
8	n/a	$\geq 20$	$\geq 70$	n/a
9	n/a	$\geq 35$	$\geq 75$	n/a
10	n/a	$\geq 50$	$\geq 80$	n/a
11	$\geq 20$	$\geq 65$	$\geq 85$	n/a
12	$\geq 35$	$\geq 80$	$\geq 90$	n/a
13	$\geq 50$	$\geq 85$	$\geq 90$	n/a
14	$\geq 75$	$\geq 90$	$\geq 95$	n/a
15	$\geq 85$	$\geq 90$	$\geq 95$	n/a
16	$\geq 95$	$\geq 95$	$\geq 95$	n/a

62.1 2019



0.12 microns

SARS-CoV-2 Virus







## HEPA

**99.99%**

of particles down to

**0.3 micrometers**

## ULPA

**99.9995%**

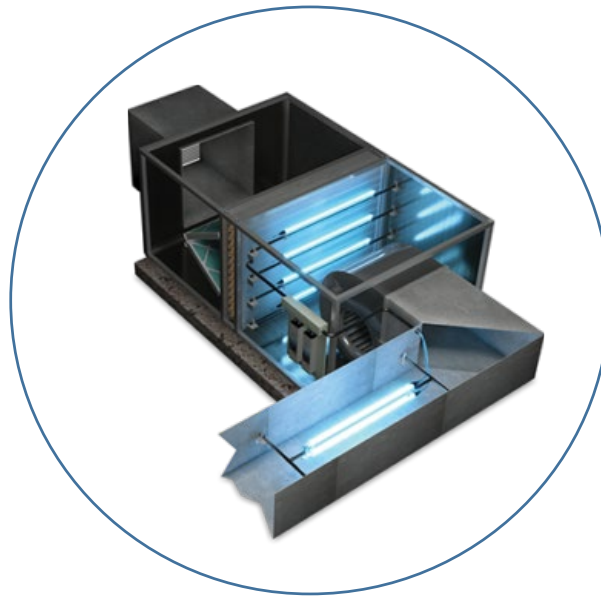
of particles down to

**.12 micrometers**

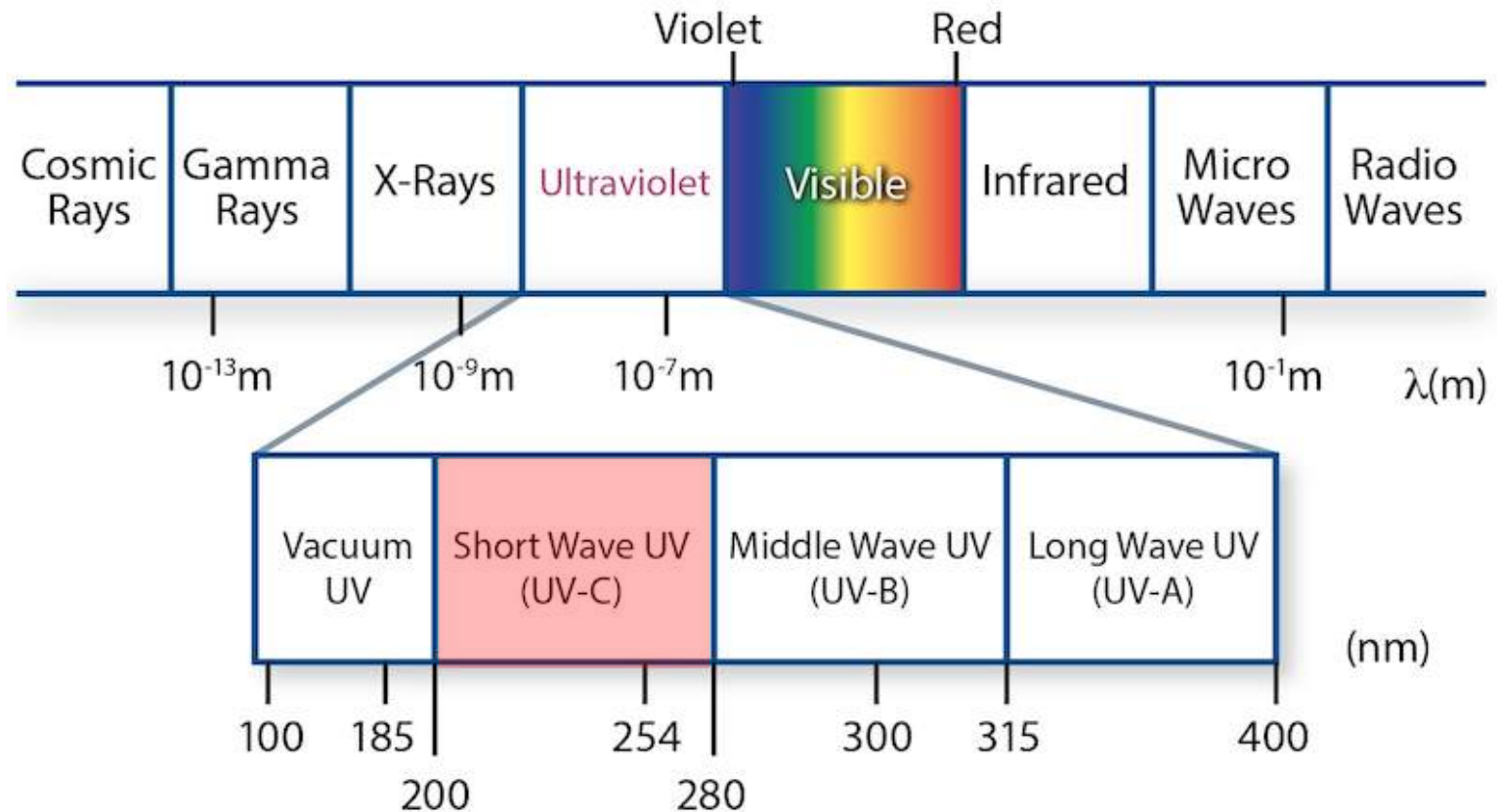
Standard 52.2MERV	Composite Avg. Particle Size Efficiency %			Average Arrestance
	0.3 – 1.0 $\mu\text{m}$	1.0 – 3.0 $\mu\text{m}$	3.0 - 10 $\mu\text{m}$	
17 (HEPA)	$\geq 99.97$	$\geq 99$	$\geq 99$	n/a
18 (HEPA)	$\geq 99.997$	$\geq 99$	$\geq 99$	n/a
19 (ULPA)	$\geq 99.9997$	$\geq 99$	$\geq 99$	n/a
20 (ULPA)	$\geq 99.99997$	$\geq 99$	$\geq 99$	n/a



# DISINFECTION

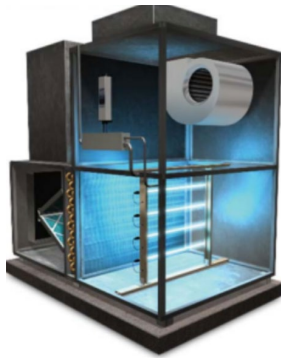


## THE ELECTROMAGNETIC SPECTRUM

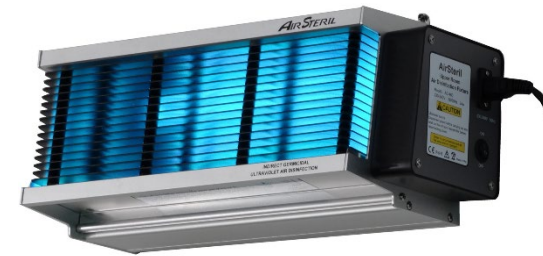




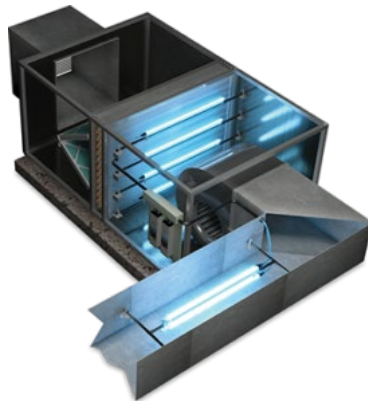
## Coil/Drain Pan



## Upper Room UV Lighting



## In-Duct



## Portable Units



## THE WALL STREET JOURNAL.

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The Cleanse Portal is one of the first examples of a device that uses far-UVC to sanitize the skin and clothes of people as they enter a building.

PHOTO: PINKSTON

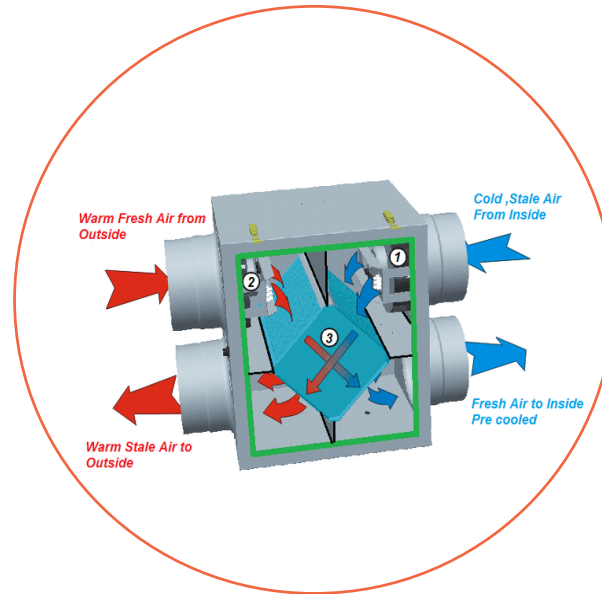


**Bipolar Ionization Module**

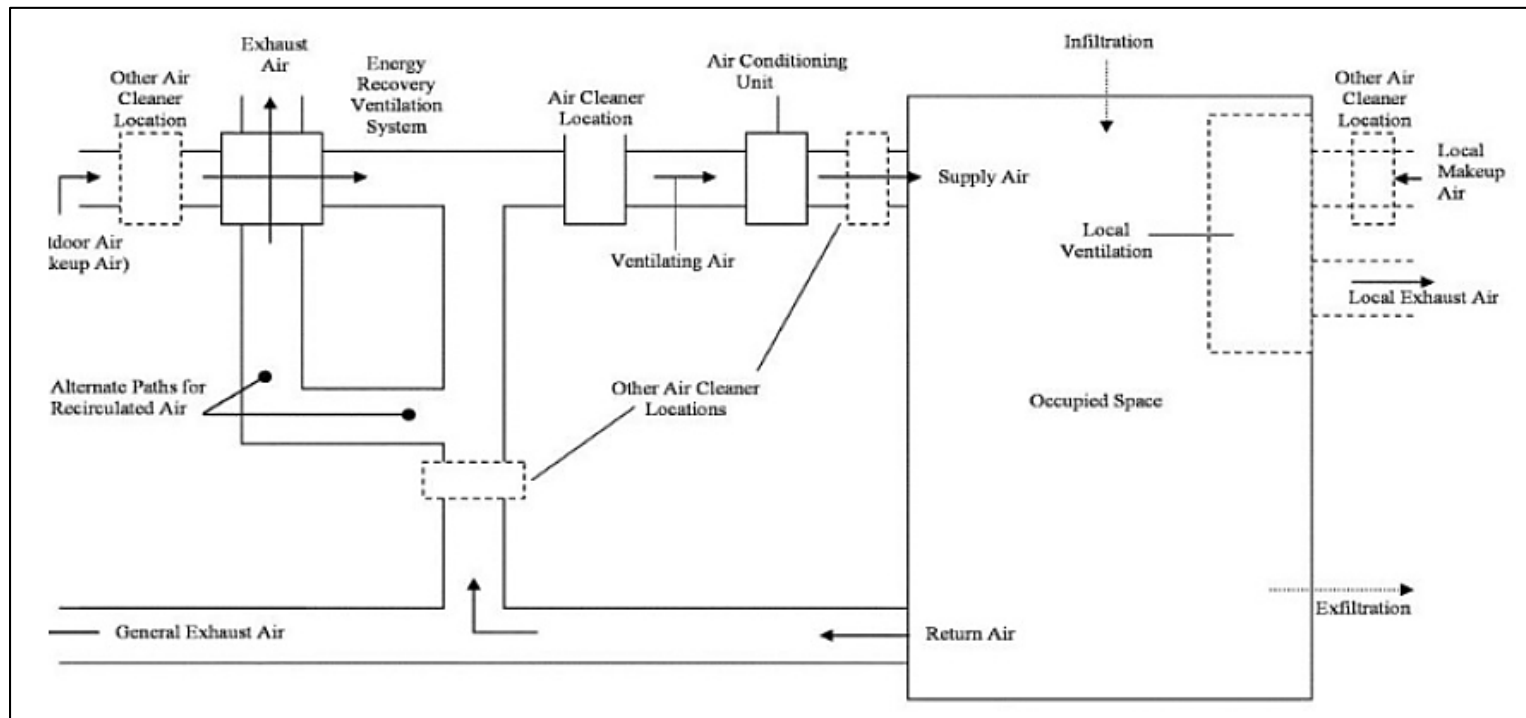


**Photocatalytic Oxidation**

# VENTILATION



- ANSI/ASHRAE 62.1 – Provides baseline requirements
- Increase Ventilation Rate – 2 to 6 Air Changes/Hour  
Minimum Target Range





Air Change Rate =  $\text{CFM} \times 60 / \text{Room Volume in Cubic Feet}$

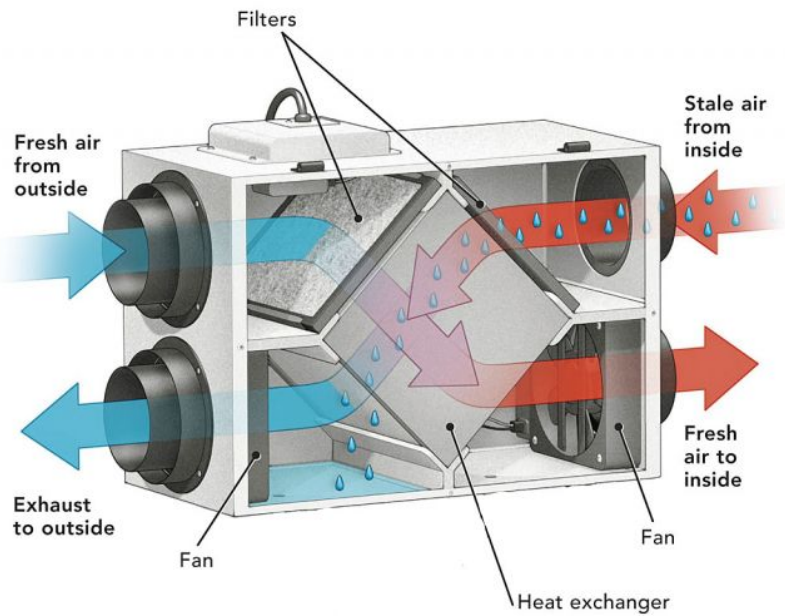




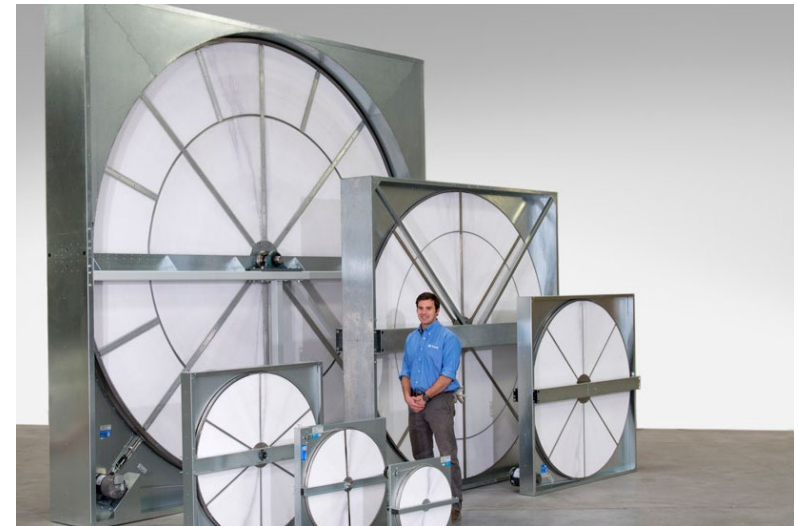
Sample Ventilation Codes and Standards

Air Changes per hour	<u>Minutes required for removal efficiency</u>	
	99%	99.99%
2	138	207
4	69	104
6	46	69
12	23	35
15	18	28
20	14	21
50	6	8
400	< 1	1

Time required for infectious agent removal based on the number of air changes per hour  
(adapted from CDC guideline [28])

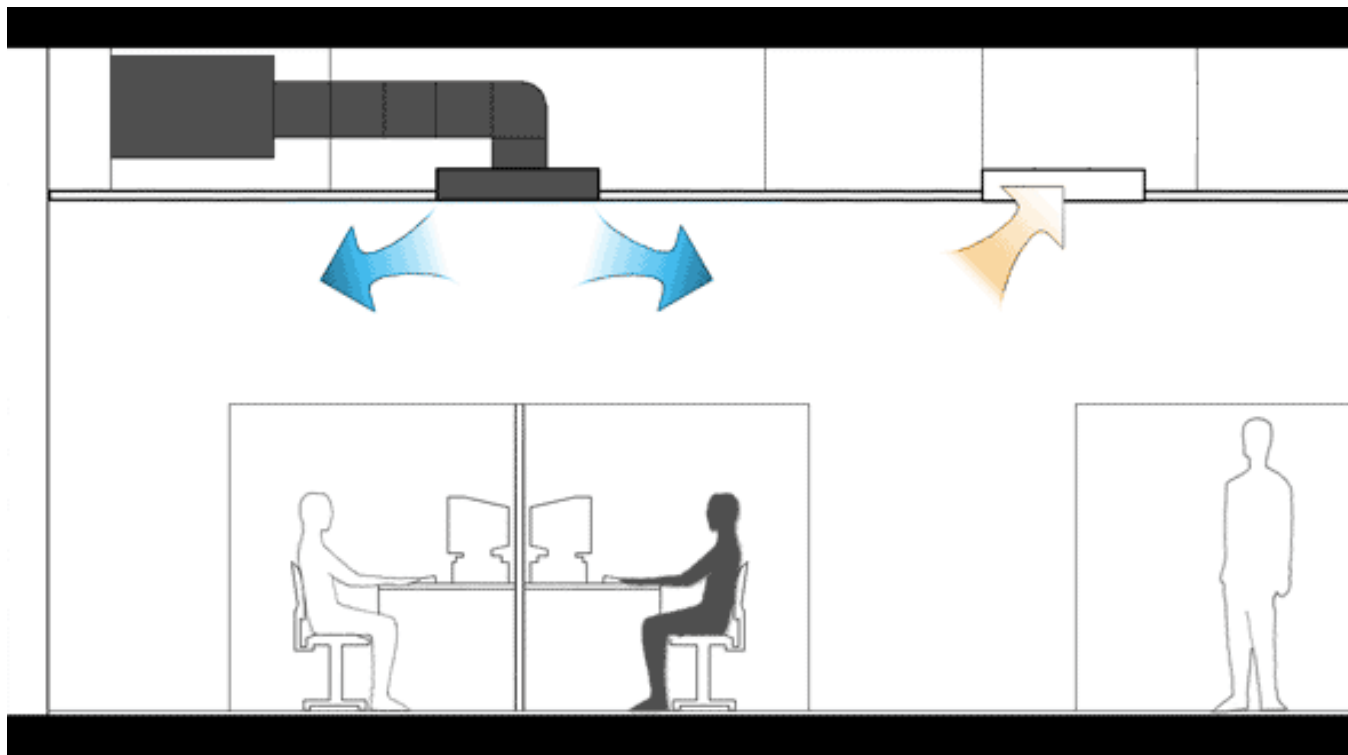


**SMALL SYSTEMS**



**LARGE SYSTEMS**

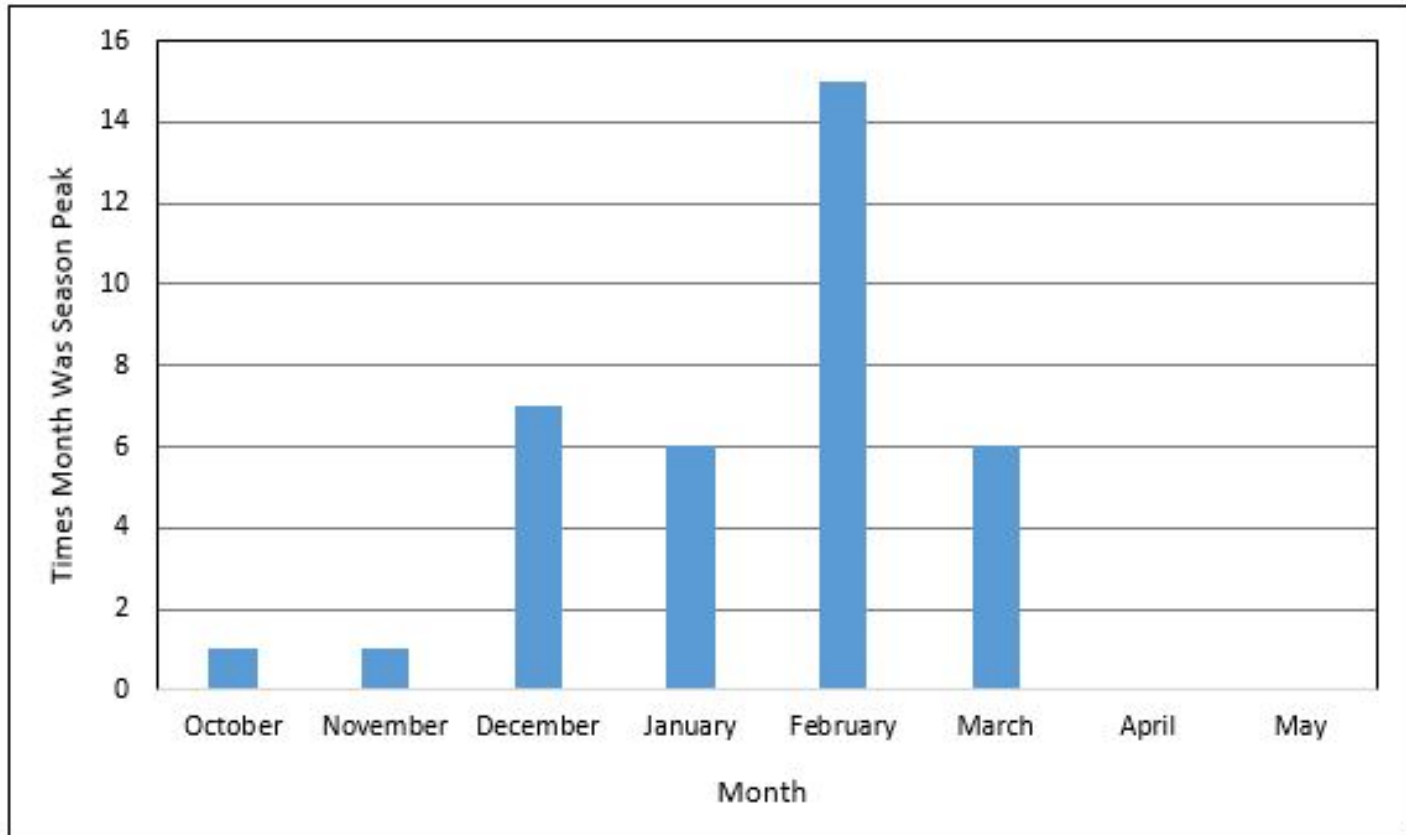
- Air Mixing Efficiency





# HUMIDITY

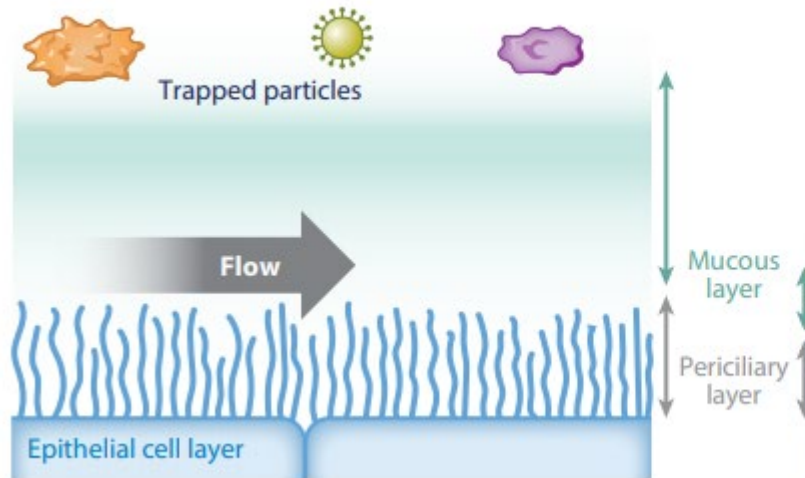




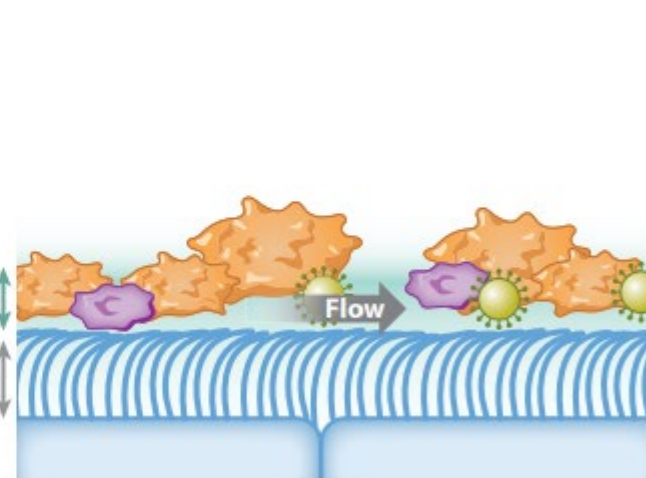
**Respiratory Flu Season According to the CDC**



**a** Humid breathing air (hydrated)

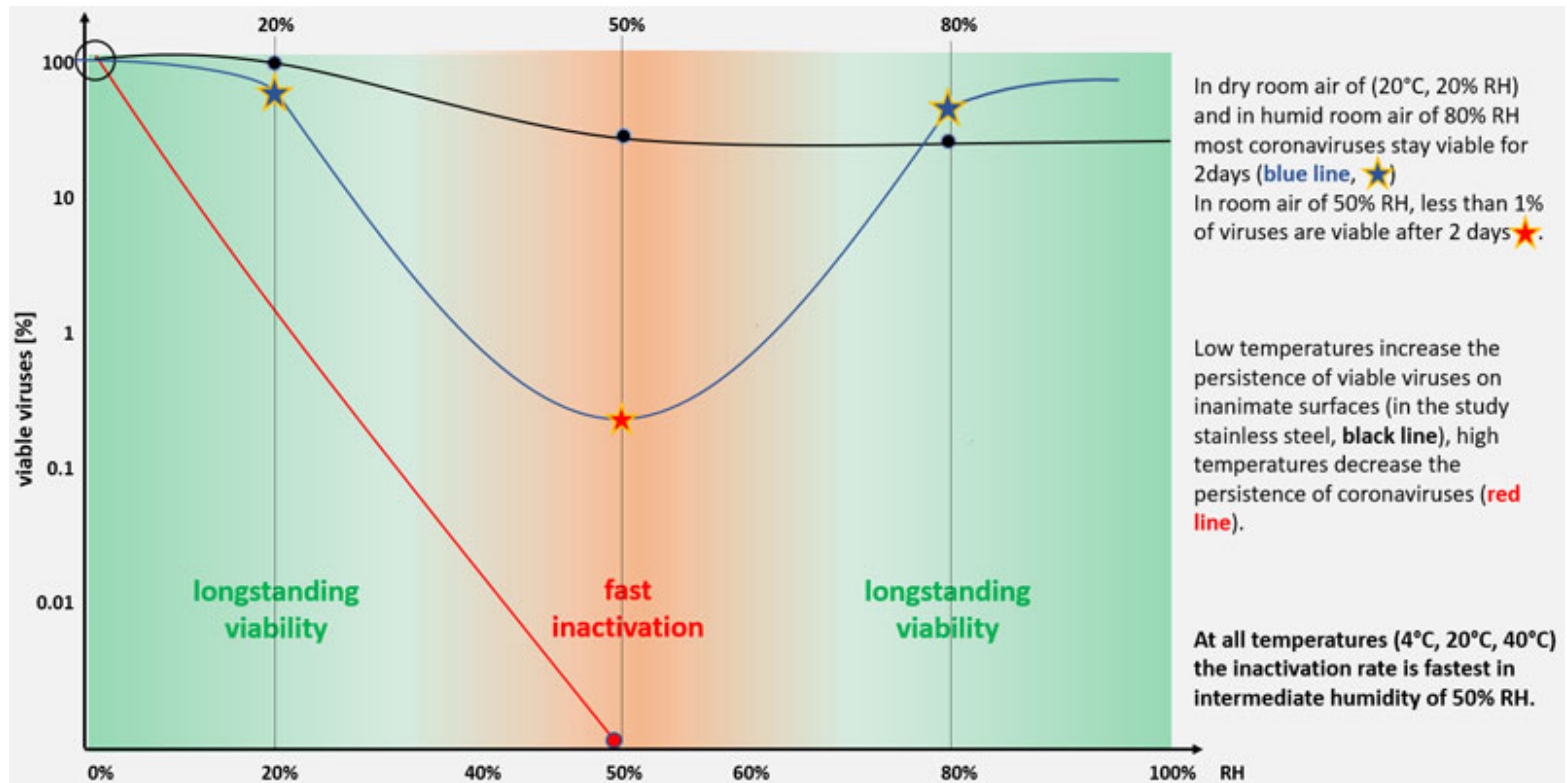


**b** Dry breathing air (dehydrated)



## Mucociliary Clearance Mechanism

## SARS Coronavirus Survivability Rate



**Graph 2** Inactivation of SARS Coronavirus–Surrogate TGEV after 2 days, at different temperatures and humidities. Outdoor temp. 4°C, room temp. 20°C und desert temp. 40 °C. Fastest inactivation at all temperatures in intermediate humidity.

## Target Humidity Range: 40% - 60% RH



In-Duct distribution

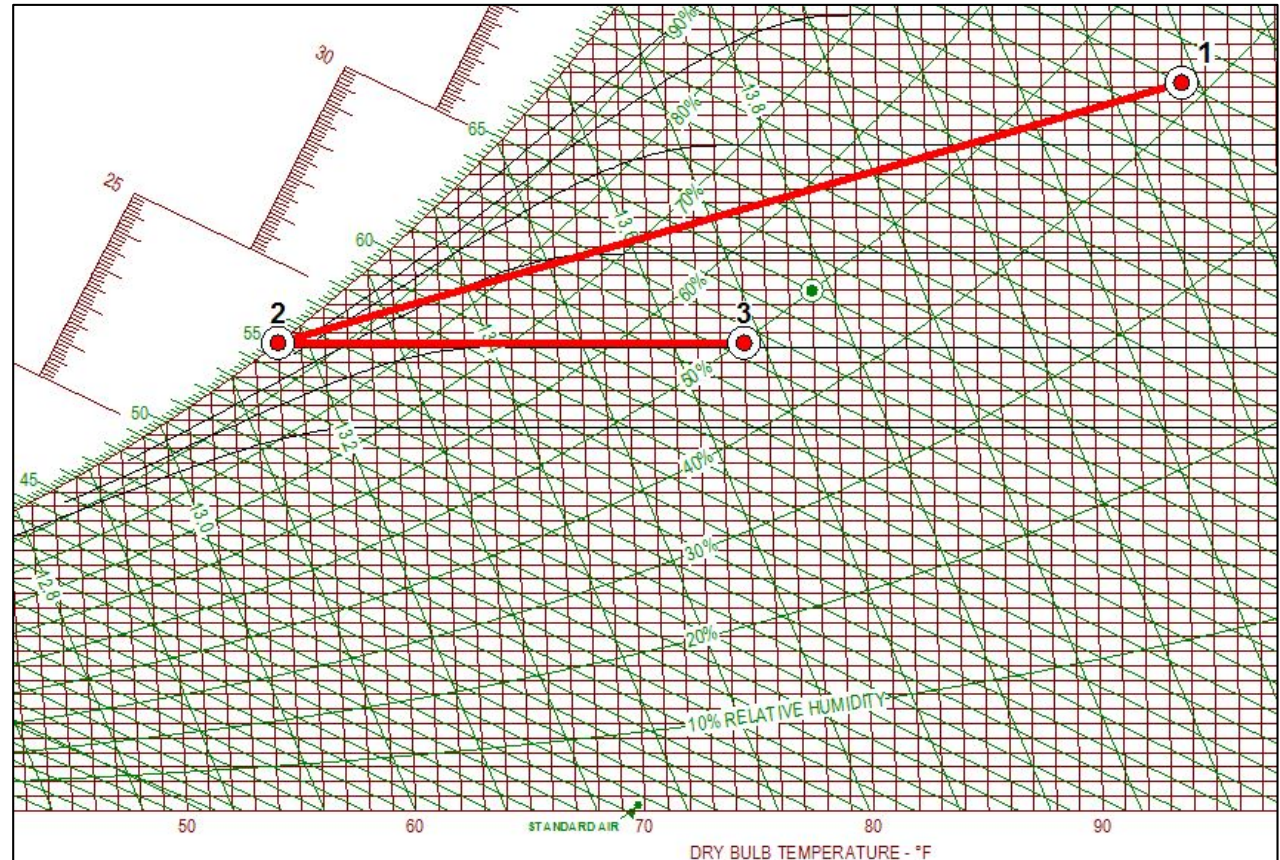


Room humidifiers



## DEHUMIDIFICATION METHODS

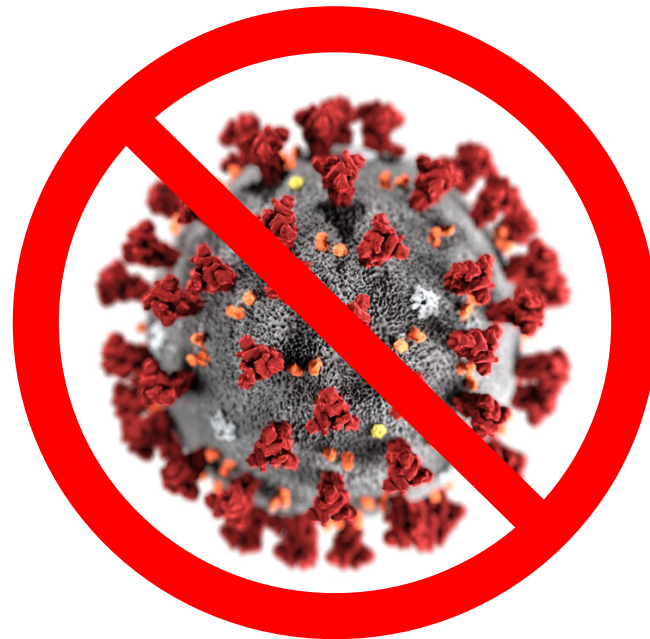
- Refrigeration/  
Air Conditioning
- Desiccant  
Dehumidification



**Psychrometric Chart**



# PREVENTION





## Health Screenings





**WEAR YOUR MASK!**

[Enhanced HVAC Control Infection White Paper Series:](https://schnackel.com/insights/whitepapers/)

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