# **HEALTHIER BUILDINGS** & COVID-19 DESIGN STRATEGIES

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A TETRA TECH COMPANY

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# CURRENT SITUATION

SARS-CoV2 is a contagious virus that causes the illness COVID-19 and is primarily transmitted through respiratory droplets (>5 microns). Other modes of transmission may include aerosols (<5 microns) and touching contaminated surfaces, although this is not thought to be the main way the virus spreads[1].

**We need to re-think how we design buildings moving forward with a focus on healthy buildings**

*1. https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html*

“Companies are going to come back to a different world where their workers have a heightened awareness about the risk of infectious disease transmission and how the building influences that.”

*Source: The Harvard Gazette “How Masks and Buildings can be Barriers to the Coronavirus” by Dr. Joe Allen & Colleen Walsh*

# How do we respond

**as design industry professionals** that deal with existing and new buildings

+

**to the community** that will soon be allowed to re-enter buildings?

# COVID-19 RESPONSE

Awareness of SARS-CoV2 & COVID-19

Operational Concepts

Physical Environment Design Concepts

Social Behaviors

# THE VIRUS

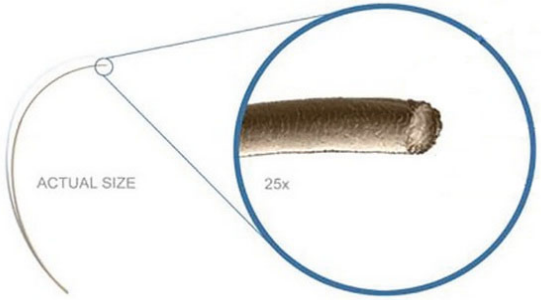
## **SARS-CoV2: S**evere **A**cute **R**espiratory **S**yndrome **C**orona **V**irus **2**

The illness caused by the virus is known as **COVID-19**

| | SARS-CoV1 | SARS-CoV2 |
|---|---|---|
| **Year of affect** | 2002-2004 | 2019-ongoing |
| **Confirmed Cases** | 8,096 | 25,500,870* |
| **Mortality Rate** | 9.50% | 3.34% |

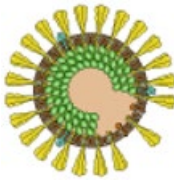
**as of 2020/09/01*

## SARS-CoV2 is 60-140 nanometers in diameter




**Human Hair**
80,000 nm

AEROSOL



**SARS-CoV2**
60-140 nm

AEROSOL

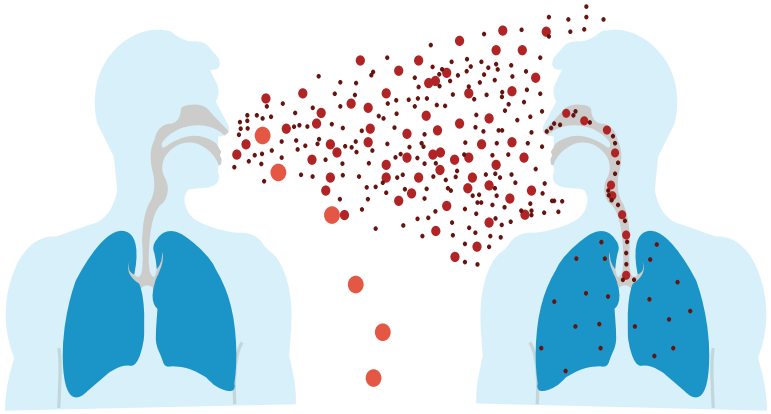
**Influenza**
100 nm

AIRBORNE

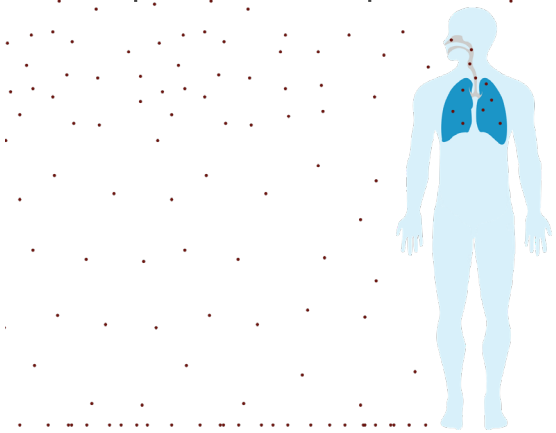
**Rhinovirus**
30 nm

# TRANSMISSION

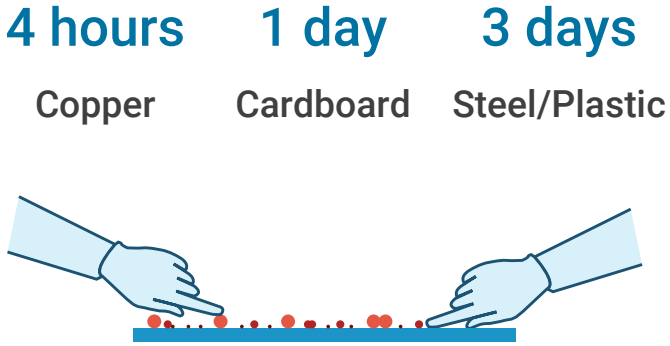
The primary transmission method is from person-to-person in close contact through respiratory droplets.



*Source: Kimberly A. Prather et al. Science 2020; DOI: 10.1126/science.abc6197*



**Virus found to live in the air for up to 3 hours**




*Source: N van Doremalen, et al. Aerosol and surface stability of HCoV-19 (SARS-CoV-2) compared to SARS-CoV-1. The New England Journal of Medicine DOI: 10.1056/NEJMc2004973*

## Respiratory droplets >5 microns

Coughs, sneezes, or exhales release droplets of infected fluid – most fall quickly. If you are standing within 6' of someone you can catch it by breathing in droplets.

## Aerosolized Droplets <5 microns

Aerosolized droplets (droplet nuclei) can travel long distances through the air stream and linger, where they can be breathed in before eventually settling on surfaces. Most small particle losses are by exchange with outdoor air.

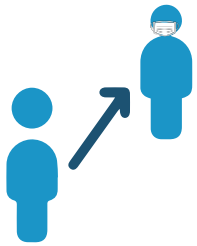
## Fomite Transmission

Touching contaminated surfaces or objects and then touching your eyes, nose or mouth.

*Sources: WHO: "Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations"*
*CDC: https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html*
*CDC: "Generation and Behavior of Airborne Particles (Aerosols)" https://www.cdc.gov/niosh/topics/aerosols/pdfs/Aerosol_101.pdf*
*CDC: "Aerosol and surface distribution of severe acute respiratory syndrome coronavirus 2 in hospital wards, Wuhan, China, 2020." https://doi.org/10.3201/eid2607.200885*

# TRANSMISSION

There are 4 main elements to consider when identifying the risk of transmission.[1]



## Distance

The closer you are to others the higher the risk. It is recommended by the CDC to stay at least 6’ apart and to wear a mask.

## Environment

A majority of infections (outside of nursing homes) occurred indoors, at home, in workplaces, on public transit, and during social gatherings. Reduce risks indoors with good ventilation.[2]

## Time

The longer amount of time spent with others increases transmission risk. It is recommended to reduce sustained contact time to less than 15 minutes, especially if you are indoors.

## Activity

Singing and yelling produce far more droplets than breathing, leading to an increased risk. Consider the activities happening around you to reduce risk.

1. *https://www.vox.com/science-and-health/2020/5/22/21265180/cdc-coronavirus-surfaces-social-distancing-guidelines-covid-19-risks*
2. *https://www.erinbromage.com/post/the-risks-know-them-avoid-them*

# TRANSMISSION

**Pre-symptomatic spread:** Those infected with the coronavirus are emitting the virus BEFORE they are symptomatic[1].

**Asymptomatic spread:** Those that are truly asymptomatic (never develop symptoms) appear to be a lower transmission risk[1].

**2.5 days**

Time an infected individual is estimated to be spreading the virus before first symptoms appear

**18 hours**

Time before developing first symptoms at which an infected person is estimated to be most contagious

**44%**

Estimation of transmissions that may occur during the pre-symptomatic period

Symptoms may appear **2-14 days after exposure to the virus**[2].


1. *He, X., Lau, E.H.Y., Wu, P. et al. Temporal dynamics in viral shedding and transmissibility of COVID-19. Nat Med 26, 672–675 (2020). https://doi.org/10.1038/s41591-020-0869-5*
2. *https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html*

# TRANSMISSION

**The infectious dose** (the amount of virus necessary to make someone sick) of SARS-CoV2 is currently unknown. Experts speculate it ranges from a few hundred to thousands of infectious particles[1].

**Lower infectivity, Needs more sustained contact time to infect** → **Higher Infectivity, Needs less sustained contact time to infect**

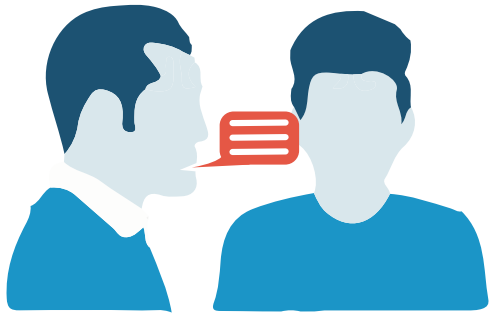
Less droplets
Average droplet size is smaller
Most droplets don't come from lower respiratory area

More Droplets
Average droplet size is larger
Many droplets come from lower respiratory area

## Breathing

50-5,000 Droplets[2]

~33 infectious particles per minute for influenza, unknown for SARS-CoV2



## Speaking

600-2,600 Droplets[2 3]

~200-1,000 infectious droplets per minute & can stay in the air for 8-14 minutes

## Coughing

3,000 Droplets[2]

~millions of infectious particles, travels at 50 mph, and can stay in the air for 30 minutes or more

## Sneezing

40,000 Droplets[2]

~millions of infectious particles, travels at 200 mph, and can stay in the air for 30 minutes or more


*1. https://www.sciencemediacentre.org/expert-reaction-to-questions-about-covid-19-and-viral-load/*
*2. https://www.erinbromage.com/post/the-risks-know-them-avoid-them*
*3. Valentyn Stadnytskyi, Christina E. Bax, Adriaan Bax, and Philip Anfinrud "The airborne lifetime of small speech droplets and their potential importance in SARS-CoV-2 transmission" PNAS first published May 13, 2020 https://doi.org/10.1073/pnas.2006874117*

# **ASHRAE'S** POSITION

"Because it is sufficiently likely that SARS-CoV-2 can be transmitted through the air, airborne exposure to the virus should be controlled. Changes to building operations, including the operation of heating, ventilating, and air-conditioning systems, can reduce airborne exposures.

Ventilation and filtration provided by heating, ventilating, and air-conditioning systems can reduce the airborne concentration of SARS-CoV-2 and thus the risk of transmission through the air."

*Source: ASHRAE's statement on airborne transmission of SARS-CoV-2/COVID-19*

# **PHYSICAL ENVIRONMENT** DESIGN CONCEPTS

Recommendations for healthier buildings

## HVAC

Improve air quality: Increase air exchange rates & High-efficiency filtration/air treatment

Ensure pressurization between spaces

Humidification

Decentralized Systems

## Architectural

Space planning for distancing

Frictionless entryways

Lighting Controls & Automated Shading

Distance Indicator on Floors

Larger workstations

## Material

Low-VOC materials

Easy to clean surfaces

Entryway mats

## Technology

High-tech connectivity

App-based touch-free systems

Smart Concierge

Thermal Scanning

# **ENHANCED HVAC** SYSTEMS

## Air Quality
(Dilution)

Increase outdoor air ventilation

Disable demand-controlled ventilation

Extend hours of operation and consider pre/post occupancy purge ventilation

Provide CO2 sensors in densely occupied spaces

## Air Treatment
(Removal/Disabling)

Enhanced Filtration (MERV 14+)

Air Ionization (Bi-Polar Ionization / Photo-Hydro Ionization)

UV Light Sanitizers (Ultraviolet Germicidal Irradiation & Photo Catalytic Oxidation)

## Air Exchange
(Containment)

Reduce air recirculation with smaller HVAC zones

Increase bathroom exhaust and elevator ventilation

Control pressurization relationships

## Humidification
(Optimization)

Control humidification within optimal bandwidth

# **INCREASING AIR** QUANTITY (ACH)

Increase outdoor air change to dilute contaminants in the air.

## Air Changes Per Hour (ACH)

| Assuming 9’ ceiling and 1 CFM/sf | Typical Modern Building | | | Typical 1970’s Induction Building | | |
|---|---|---|---|---|---|---|
| | | Outside ACH | Filtered Recirculation ACH | | Outside ACH | Filtered Recirculation ACH |
| Outside air | .15 CFM/sf | | | .25 CFM/sf | | |
| Time for 100% outside air change | 60 minutes | 1 | 6 | 36 minutes | 1.7 | 6 |
| If % outside air is doubled | 30 minutes | 2 | 6 | 18 minutes | 3.3 | 6 |
| **Assuming 12’ ceiling and 1 CFM/sf** | **Typical Modern Building** | | | **Typical 1970’s Induction Building** | | |
| Time for 100% outside air change | 80 minutes | .75 | 4.5 | 48 minutes | 1.25 | 4.5 |
| If % outside air is doubled | 40 minutes | 1.5 | 4.5 | 24 minutes | 2.5 | 4.5 |

## Implications of HVAC Energy Usage

Code outside air without demand controlled ventilation **+5% energy usage**

Doubling the ventilation without demand controlled ventilation **+20% energy usage**

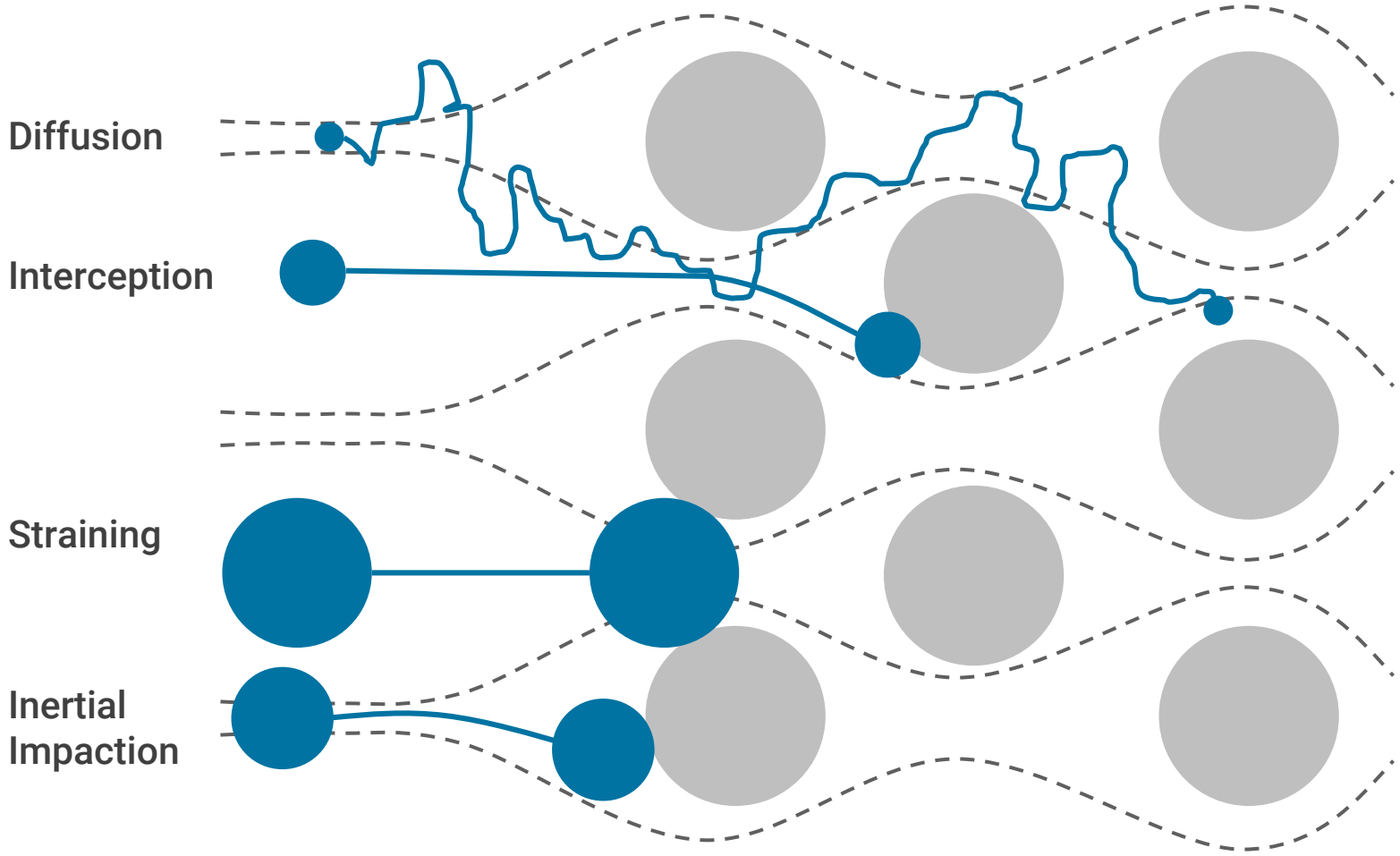
**These numbers are for a floor by floor VAV system.*

# **AIR TREATMENT** – High Efficiency/HEPA FILTERS

HEPA filters consist of interlaced glass fibers that create a fibrous maze that takes particles out of circulation through diffusion, interception, straining, and inertial impaction.

## HEPA Filters*

When selecting a filter, careful consideration must be given due to the pressure drop from a high filter




**In large central stations consider electronic filter (performs at MERV 15 level)*

# **AIR TREATMENT** – FILTRATION

**MERV** - Minimum Efficiency Reporting Value

**HEPA** - High Efficiency Particulate Air filter

## SARS-CoV2 is 0.06 microns to 0.14 microns

| Ratings | 0.3-1 microns* | 1-3 microns | 3-10 microns | Filter Type | Controlled Particles |
|---|---|---|---|---|---|
| MERV 8 | - | - | 70-85% | Low Quality MERV Filter | Mold spores, pollen, dust |
| MERV 9 | - | <50% | 85-90% | Standard MERV Filter | Fine dust |
| MERV 11 | - | 65-79% | 85-90% | | |
| MERV 13 | **<75%** | <90% | <90% | Superior MERV Filter | Bacteria, viruses, smoke |
| MERV 14 | **75-84%** | <90% | <90% | | |
| MERV 15 | **85-94%** | <90% | <90% | | |
| MERV 16 | **<95%** | <95% | <95% | | |
| MERV 17 | **99.97%** | <99% | <99% | HEPA / ULPA Filter | Small bacteria and viruses, fumes |
| MERV 18 | **99.997%** | <99% | <99% | | |
| MERV 19 | **99.9997%** | <99% | <99% | | |
| MERV 20 | **99.99997%** | <99% | <99% | | |

Filters must be changed regularly. Consider monitoring air quality as well.

# AIR TREATMENT – FILTRATION

How filters perform for influenza virus and cost of filtration versus MERV

## Infections Versus Filtration Rate

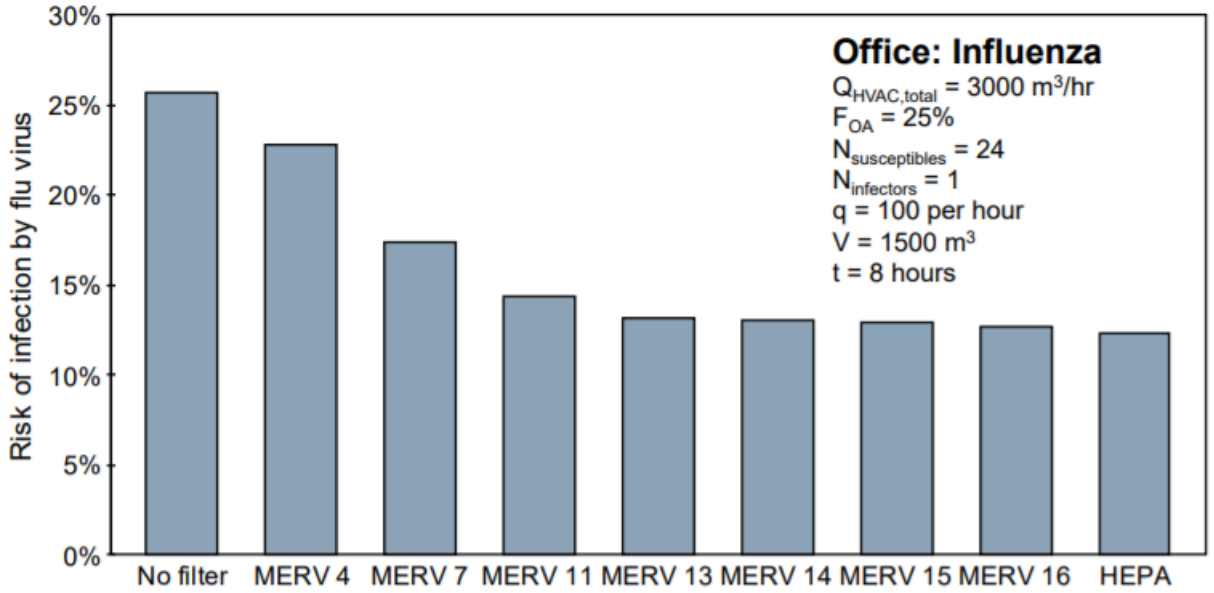



**Figure 6. Projected risk of infection by influenza virus during an 8-hour workday in a hypothetical office building with 25 occupants and 25% outdoor air supply using a range of HVAC filters installed in a system with a recirculation rate of 1.5 per hour**

## Cost of Filtration Versus MERV

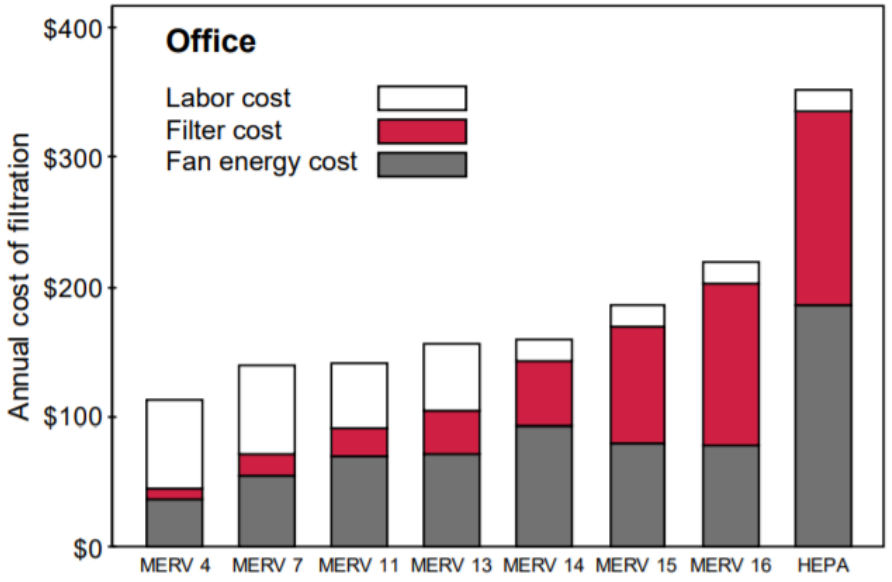


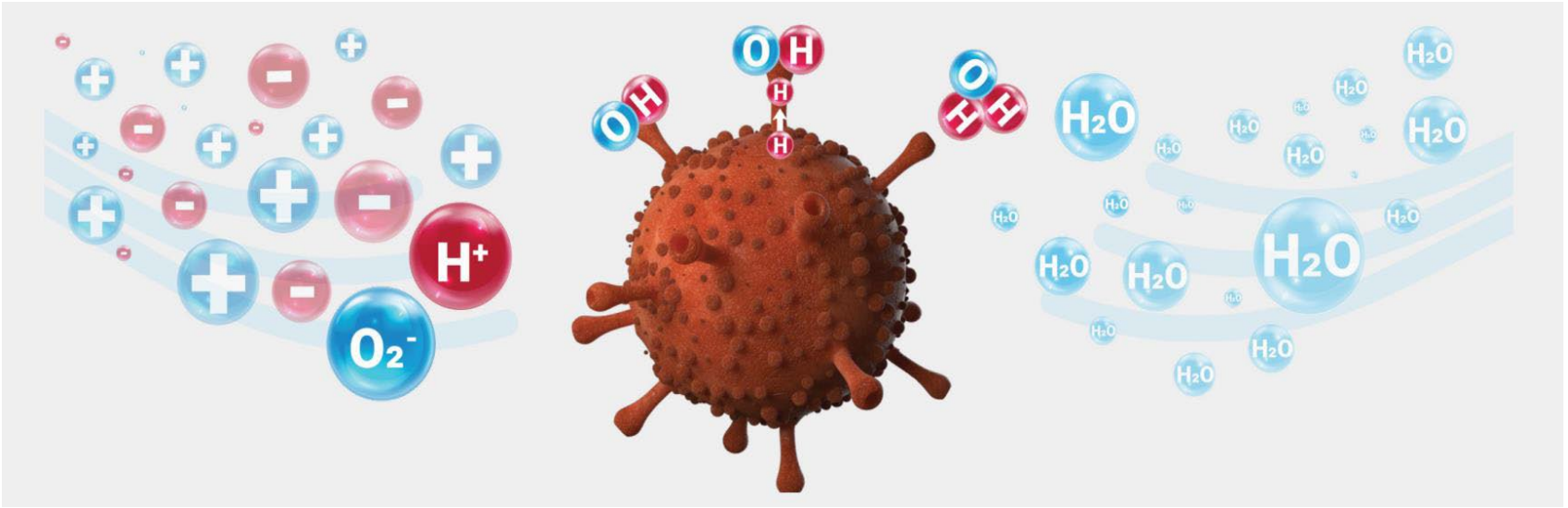

**Figure 17. Estimated annual cost of filtration in the hypothetical office environment**

Source: Stephens, B. HVAC Filtration & Wells Riley Approach. *Built Environment.* 3/1/12.

# **AIR TREATMENT** – BI-POLAR IONIZATION

Bi-Polar Ionization works by introducing positive and negative ions into the air via the supply side of ducts. The ionization causes production of clusters of hydroxyl (OH) radicals which are formed on the surface of microbes, removing hydrogen from the microbes cell wall, thereby inactivating the virus.

## Bi-Polar Ionization



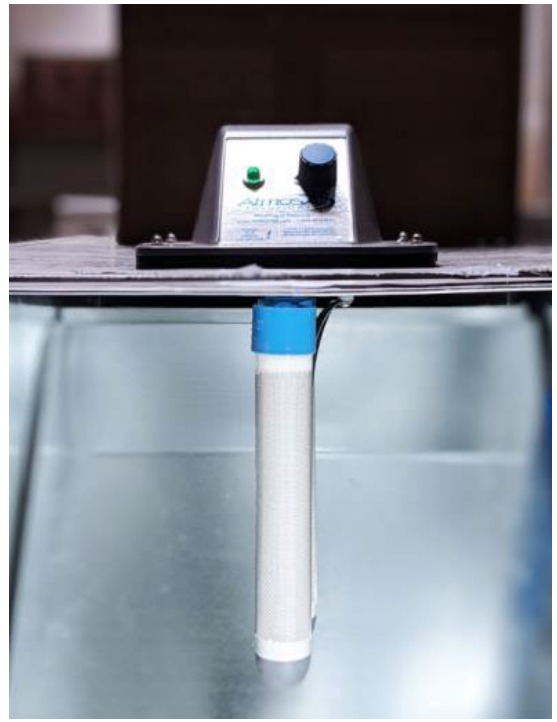

**ASHRAE Position:** Systems are reported to range from ineffective to very effective in reducing airborne particulates and acute health symptoms. Convincing scientifically-rigorous, peer-reviewed studies do not currently exist on this emerging technology; manufacturer data should be carefully considered.

# **AIR TREATMENT** – BI-POLAR IONIZATION

Installation is most often in supply ducts, but can also be rack-mounted in plenums, in air handling units, or smaller units can be installed within fan coil unit plenums.

## Bi-Polar Ionization

The unit has negligible air pressure drop, and can be easily retrofitted to an existing HVAC system.

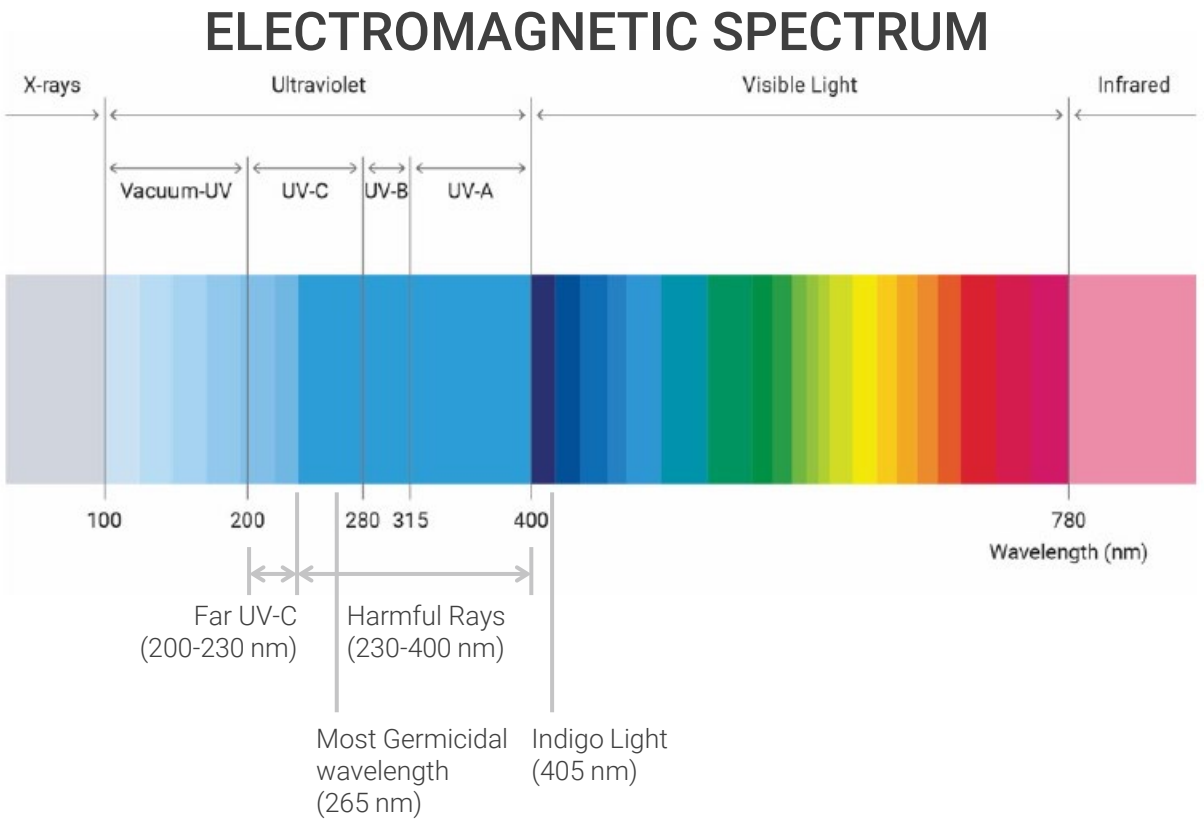


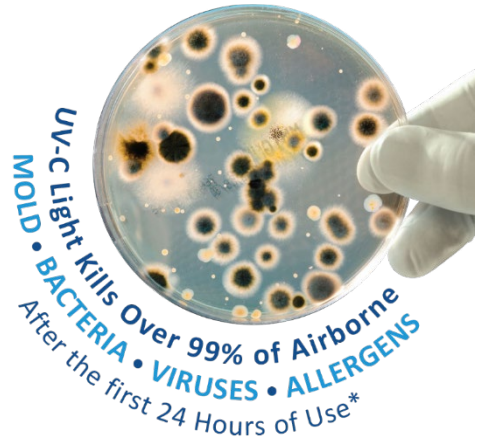
# **AIR TREATMENT** – UV LIGHT SANITIZERS

Ultraviolet light kills bacteria and viruses by destroying bonds that hold their DNA together as particles pass under the UV light they are destroyed. UV-C energy in the wavelengths from 200 to 280 nm provides the most germicidal effect, with 265 nm being the optimum wavelength. Exposure to UV-C rays is harmful to occupants.

## UV Light Sanitizers

Effectiveness is based on how long air is exposed to UV (resonance time)



# **AIR TREATMENT** – UV LIGHT SANITIZERS

Installation can be in-duct or on AHUs. Lamps installed inside HVAC can also clean cooling coils & drain pans.

The majority of modern UVGI lamps create UV-C energy at a near optimum 254 nm wavelength

Works by installing banks of UV-Lamps inside HVAC systems or associated ductwork. Consider adding to return air plenums or downstream of cooling coils.

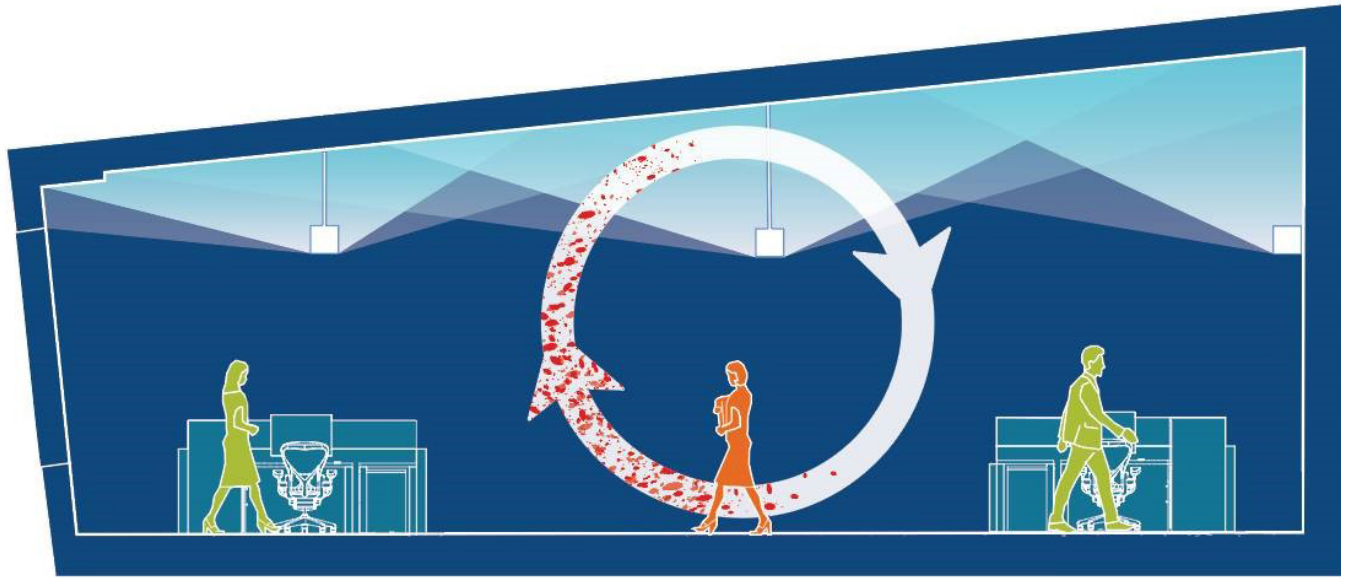
Requires high UV doses to inactivate microorganisms on-the-fly as they pass through the irradiated zone due to limited exposure time.

- 99.9% Coronavirus deactivation in 0.25 seconds (first pass) is commercially available.
- Systems typically designed for 500 fpm (at AHU) moving airstream.
- Installation in ductwork at higher velocities is possible, with exponentially higher lamp power

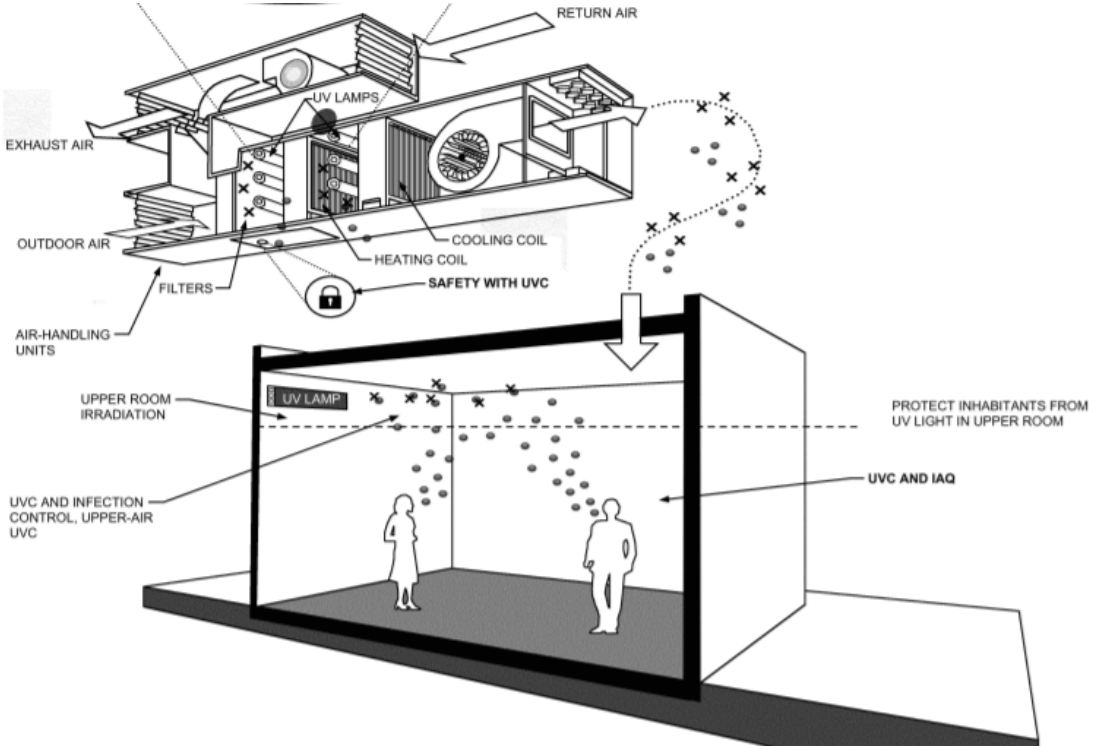
Should always be coupled with mechanical filtration.

# **AIR TREATMENT** – UV LIGHT SANITIZERS

Upper room UV disinfection involves mounting lights from the ceilings or on the walls and pointing them upwards to disinfect the upper room air. It can be used in combination with in-duct UV for maximum effect.  The UV-C lamps must be mounted 7’ in the air to protect inhabitants from the harmful UV rays. Requires low UV-reflectivity of walls and ceilings and ventilation should maximize air mixing (supplemental fans needed where ventilation is insufficient).



Upper Room Air UV Light Disinfection



# **AIR TREATMENT** – UV LIGHT SANITIZERS

Portable, fully automated units that can be controlled remotely. Effective on air and surfaces where the light can penetrate (not in shadowed areas).

Units have settings for specific pathogens such as MRSA, C. difficile, both of which are harder to inactivate than coronaviruses.

- >99.9% reduction of vegetative bacteria within 15 minutes[1]
- 99.8% for C. difficile spores within 50 minutes[1]

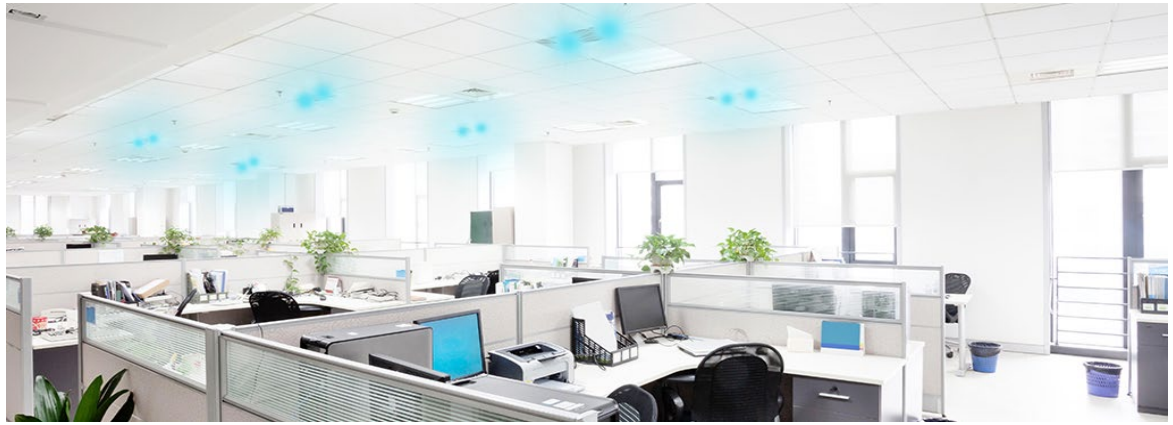


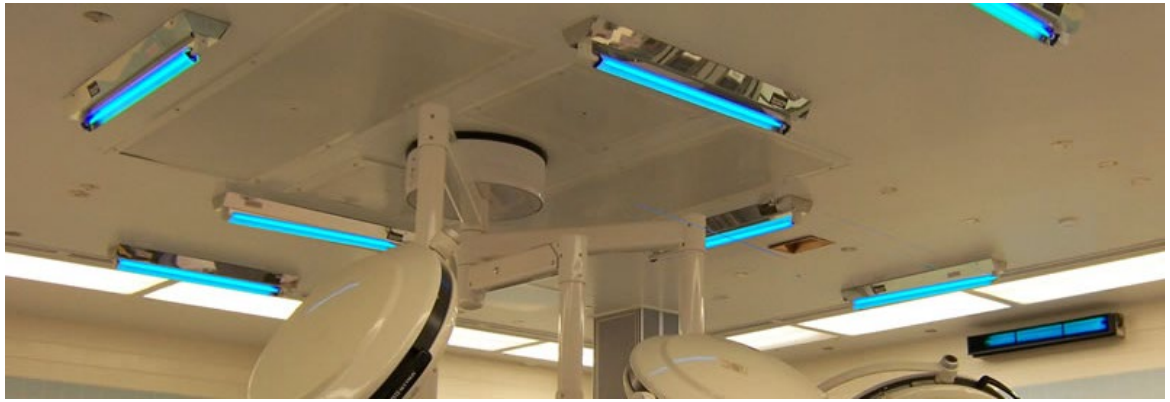
Pulsed Xenon lamps: High-powered UV lamps (generally containing xenon gas) used in rapid pulses of intense energy. Emits a broad brand of visible and ultraviolet wavelengths, with a significant fraction in the UV-C band. Uses significantly higher power outputs than usual UV-C techniques.

*1. Weber DJ1, Rutala WA, Miller MB, Huslage K, Sickbert-Bennett E. Role of hospital surfaces in the transmission of emerging health care-associated pathogens: norovirus, Clostridium difficile, and Acinetobacter species. American Journal of Infection Control 2010..*

# **AIR TREATMENT** – UV LIGHT SANITIZERS

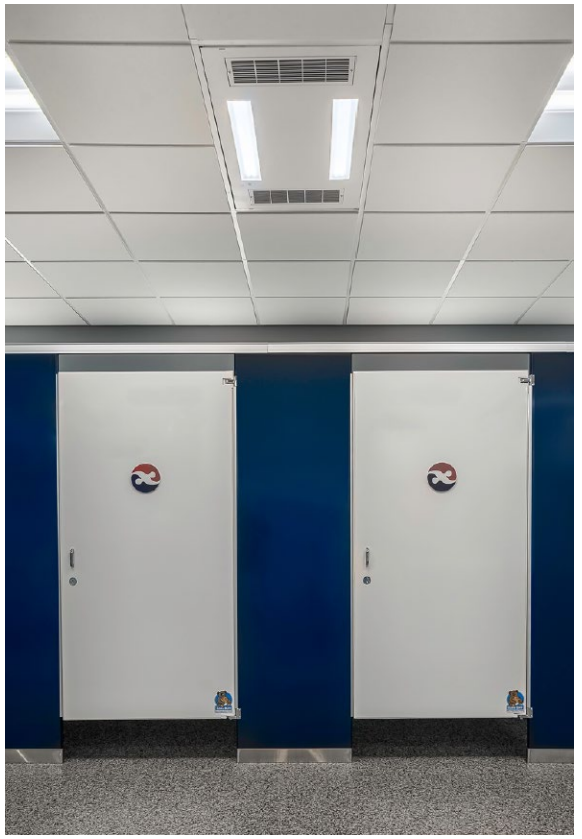
UV-C lights on occupancy sensors so they can sanitize spaces when unoccupied.



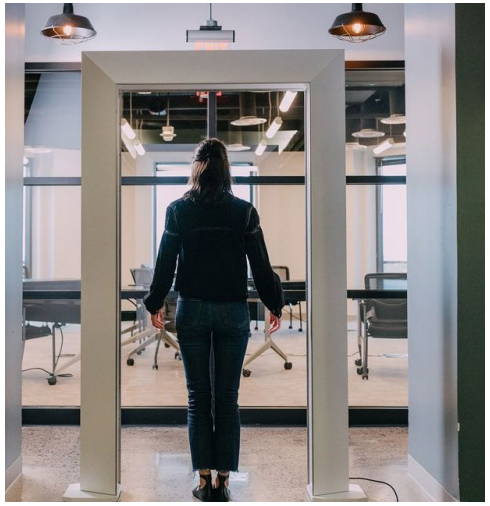


More UV-C lights in various shapes and styles are currently in development, including UV-C LED's which are emerging for use.

Far UV-C lights (200-230 nm spectrum) can sanitize without harming occupants[1]. Awaiting more testing.



One cleanse per 800ft3 achieves 4 air exchanges per hour (50cfm) and also includes a HEPA & Carbon filter



Individual downlights and doorway disinfection technology currently in development

*1. Rich M. Simons, Far UV-C in the 200 – 225 nm range, and its potential for disinfection applications. IUVA July 2020. https://bit.ly/2B5rYaa*

# **EMERGING TECHNOLOGIES** – DFS SYSTEM

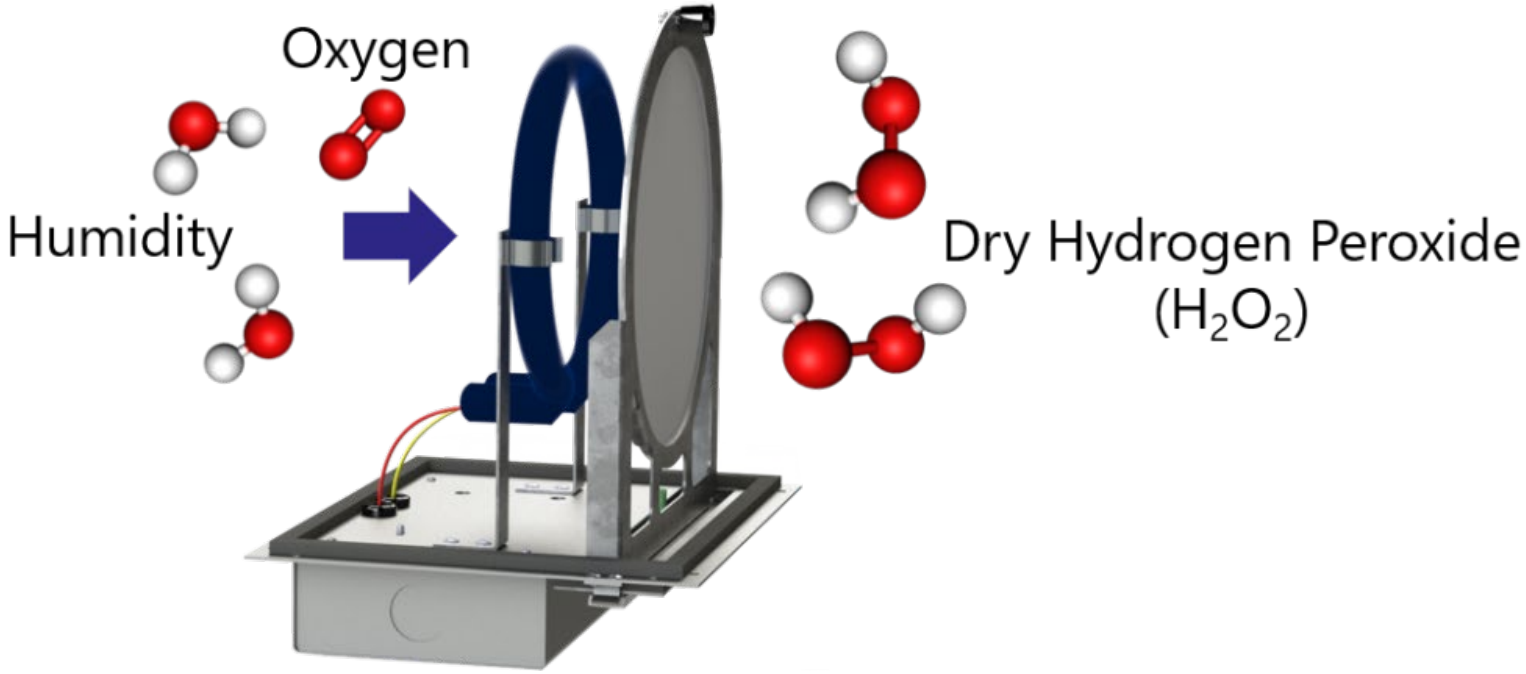
A Disinfecting Filtration System (DFS) traps microorganisms such as bacteria, mold and viruses, reduces bioburden and inhibits microorganism's growth through Microbiostatic condition. The system captures 99.99% of all particles down to .0007 micron in size. System consists of a constant energy field, particle agglomeration and a MERV 15 filter. The filters estimated life expectancy is 1 year.

Self contained independent blower that can be retrofitted to HVAC system or installed as a standalone unit above ceiling space to treat targeted areas.  Has zero pressure drop.

Portable Unit

# **EMERGING TECHNOLOGIES** – DHP System

The Dry Hydrogen Peroxide (DHP) system uses ambient oxygen and humidity to create a safe amount of $H_2O_2$ (5-25 parts per billion) in the air.  The molecules attach itself to a microbe's access points and naturally breaks down the microbe. The technology works on odors and insects as well. Works on both air and surfaces. Non-Ozone producing system and regulated by the EPA.




Device fits in-line with existing HVAC ductwork

Portable Systems, duct mounted, and unitary systems


Fogging System

# **AIR TREATMENT OPTIONS** SUMMARY

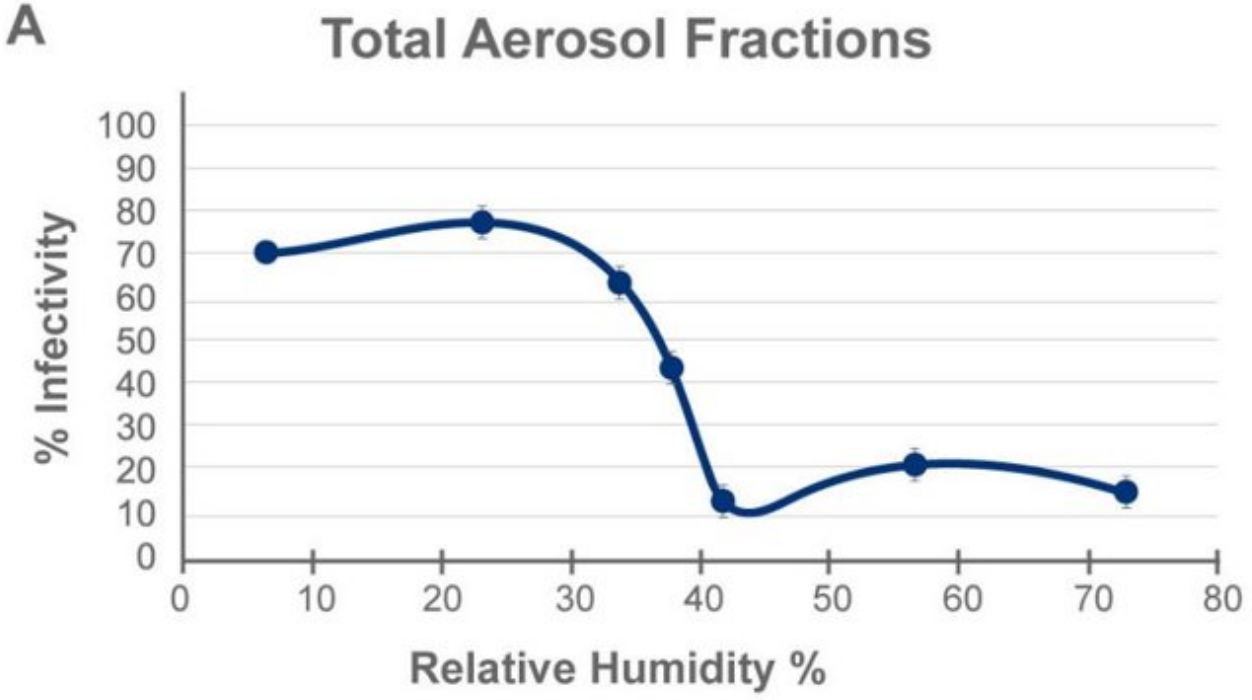
Due to the nature of the SARS-CoV2 virus, **HVAC solutions are not effective in preventing the spread of contamination person to person or eliminating airborne transmission risk**, however the following technologies are presented because they provide benefit in bacterial and virus reduction within their path of effect.

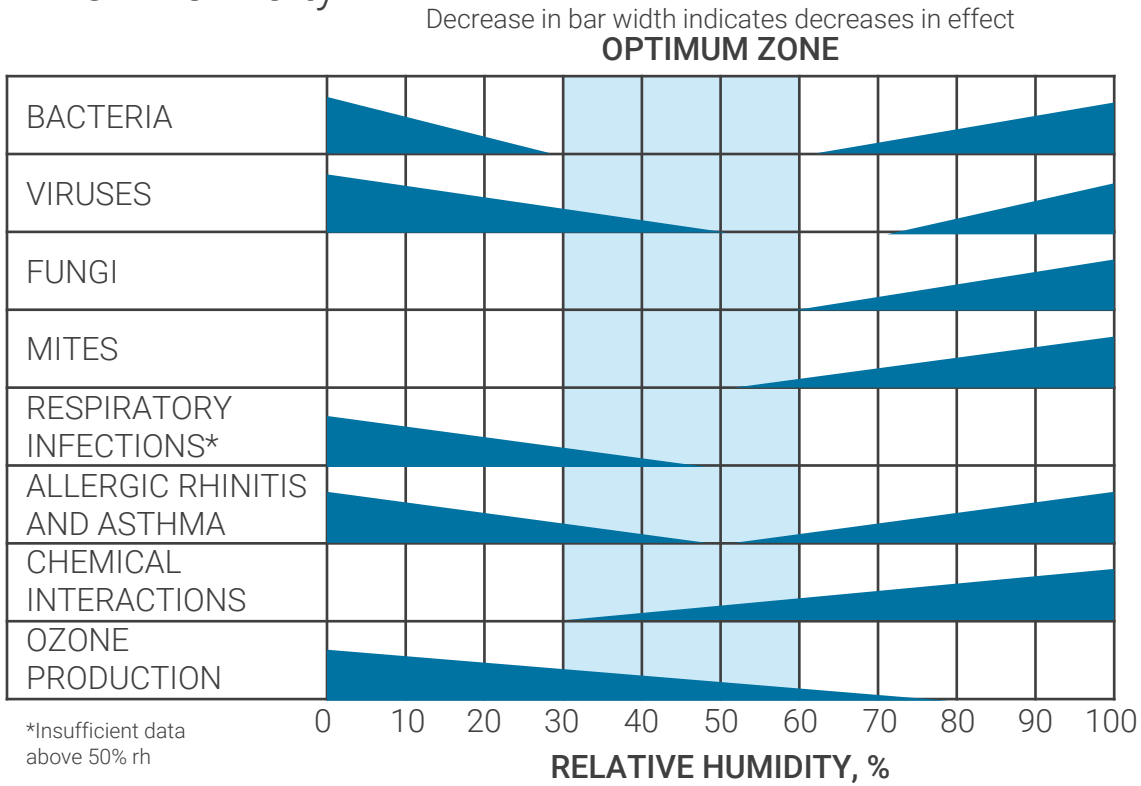
| | High Efficiency/ HEPA Filters | Ionization | UV Light | Activated Carbon |
|---|---|---|---|---|
| **Effectiveness against Viruses** | **Very Good** | **Not Effective** (Good on surfaces) | **Good** (Depending on contact time) | **Poor** |
| **Effectiveness against Bacteria** | **Excellent** | **Not Effective** (Good on surfaces) | **Good** (Depending on contact time) | **Poor** |
| Removes Gasses (Radon, Formaldehyde, etc.) | Not Effective | Not Effective | Not Effective | Excellent |
| Eliminates Odors | Not Effective | Good | Not Effective | Excellent |
| Effectiveness against pet dander/pollen | Excellent | Excellent | Not Effective | Not Effective |
| Effectiveness against mold spores | Excellent | Excellent | Good | Not Effective |
| Effectiveness against dust mite excreta | Excellent | Excellent | Poor | Poor |
| Cost per cartridge | Moderate | Moderate | Moderate | Inexpensive |
| Cartridge life expectancy | 1 Year | 2 years | 1 year | 3-12 Months |

# HUMIDIFICATION

"maintaining a RH between 40% and 60% indoors may help to limit the spread and survival of SARS-CoV-2"[1]

- Higher humidity reduces infectivity of influenza[1]
- Membranes in the respiratory track/nose dry out quicker in low humidity[2]
- Low humidity results in breathing smaller particles[3]



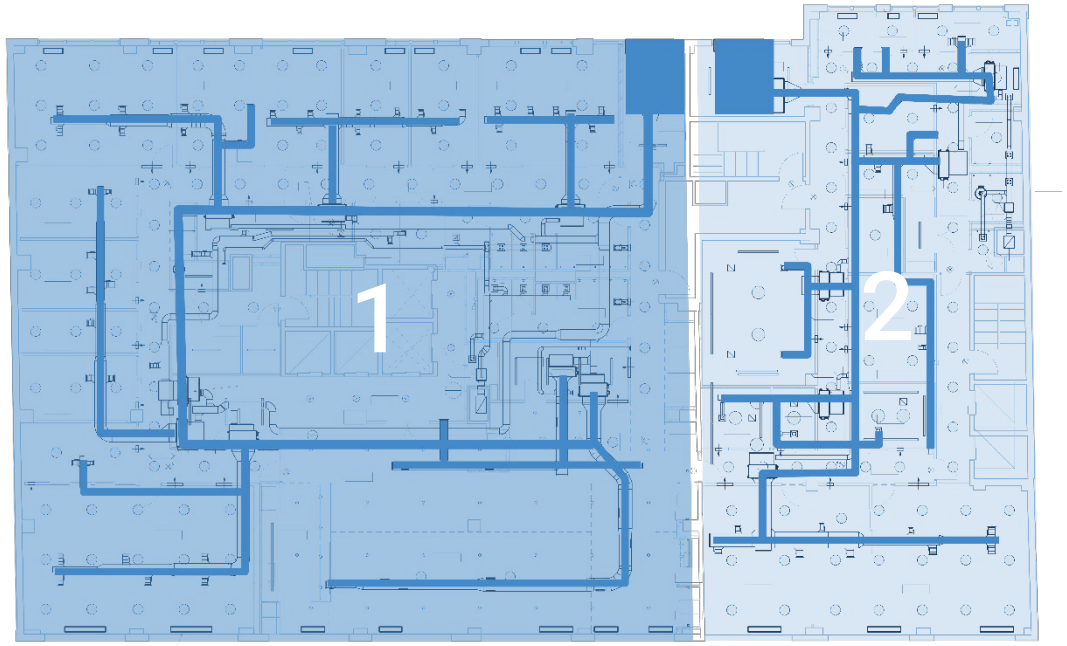





1. *John Noti, et al, Humidity Leads to Loss of Infectious Influenza Virus from Simulated Coughs (February 27, 2013)*
2. *J.P. Guggenbichler, R. Huster and S. Geiger, Luftfeuchtigkeit und Immunabwehr Die Rolle der Schleimhaut und Auswirkungen auf die Klimatechnik (2007) Tab Technik AM, Vol. 38 No. 9*
3. *ASHRAE Guidelline 10-2016, Interactions Affecting the Achievement of Acceptable Indoor Environments*

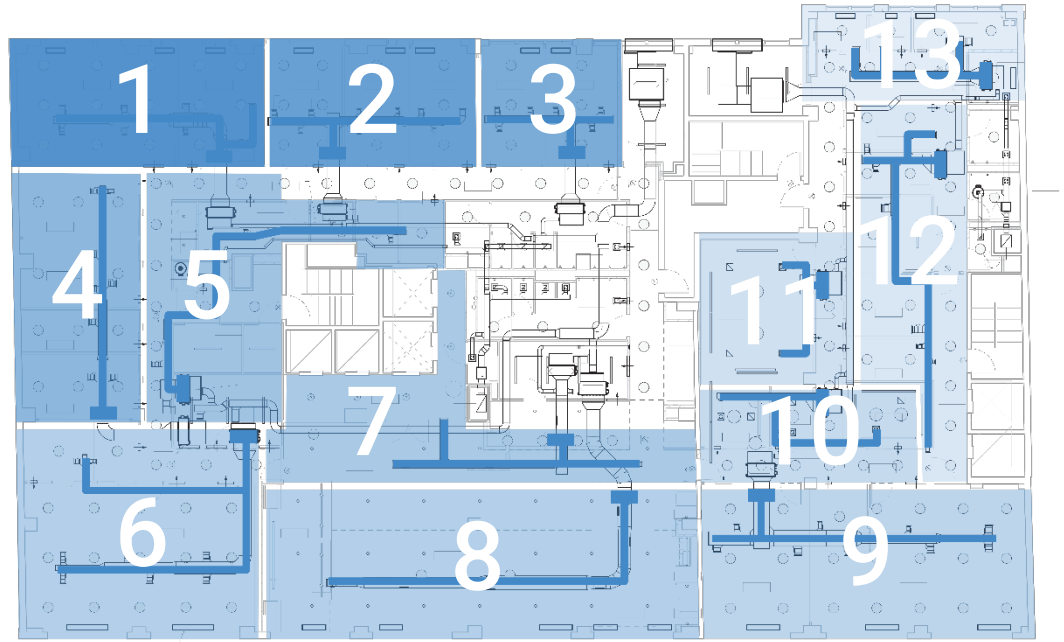
# **HVAC** ZONES

Using smaller zones (500 sf) will lower recirculation of air.  Consider use of VRF or DOAS systems.




**Typical zoning with Floor-by-Floor AHU**

Floor by floor AHU's have a higher efficiency filter (typically MERV 8-13) but the mix of outside air percentage can vary and contamination zones are larger.



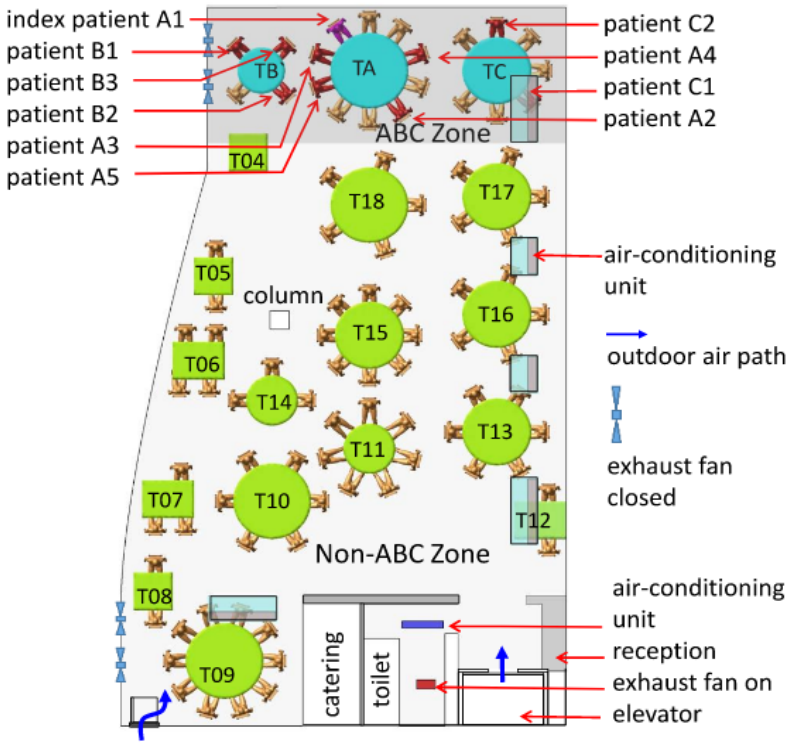

**Multiple small zones from use of VRF system**

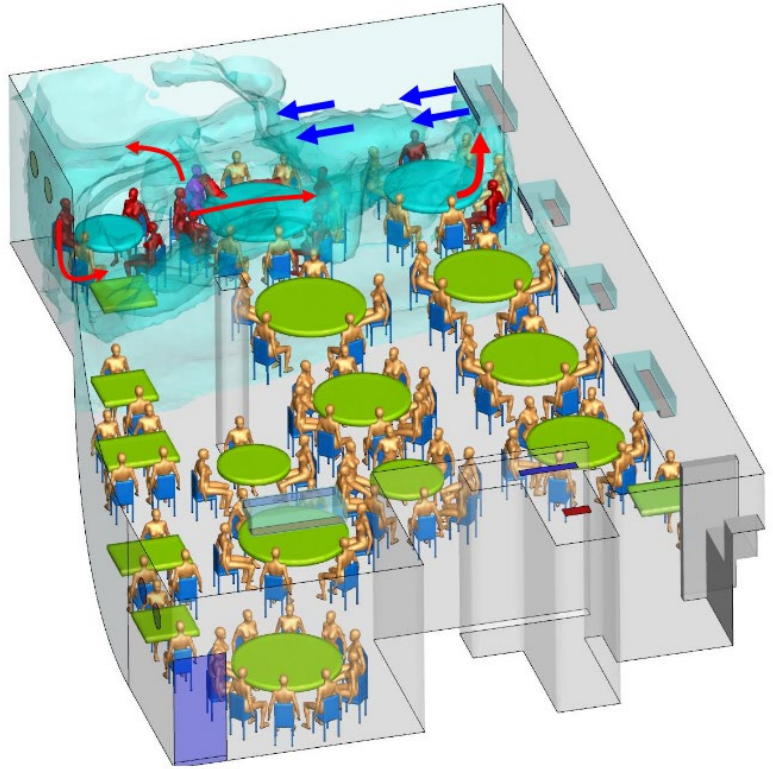
VRFs have a lower efficiency filter but can be retrofitted to accept a MERV 8 or potentially higher efficiency filter.  Percentage of outside air is assured.

# **HVAC** ZONES

COVID-19 Outbreak Study within a Restaurant in Guangzhou, China

Air circulation and Ventilation



January 24, 2020, 12:00 PM, Chinese New Years Eve luncheon
5-story restaurant, 3rd floor of the restaurant
Exposure time: 53 minutes for TA & TB, 75 min for TA & TC

*Source: Lu J, Gu J, Li K, Xu C, Su W, Lai Z, et al. COVID-19 outbreak associated with air conditioning in restaurant, Guangzhou, China, 2020. Emerg Infect Dis. 2020*

# **TOUCHLESS** TECHNOLOGY

## Doors & Entryways

Destination Dispatch Elevators

Automatic Doors (motion sensor, facial recognition, optical foot sensor)

## Pantries

App-based coffee and water machines

Motion sensor faucet with 20 second timer and soap dispensers

Touchless cabinets or open shelves for frequently used items

Use bottle fillers instead of drinking fountains

## Bathrooms

Motion sensor flushometer, faucet with 20 second timer, and soap dispenser

Paper towels instead of automatic hand dryers

UV disinfecting on seats

UV lamps in bathrooms for after-hours disinfection

## Lighting

Lighting Controls

Automated Shading

BMS & app-based controls for lighting controls & automated shading

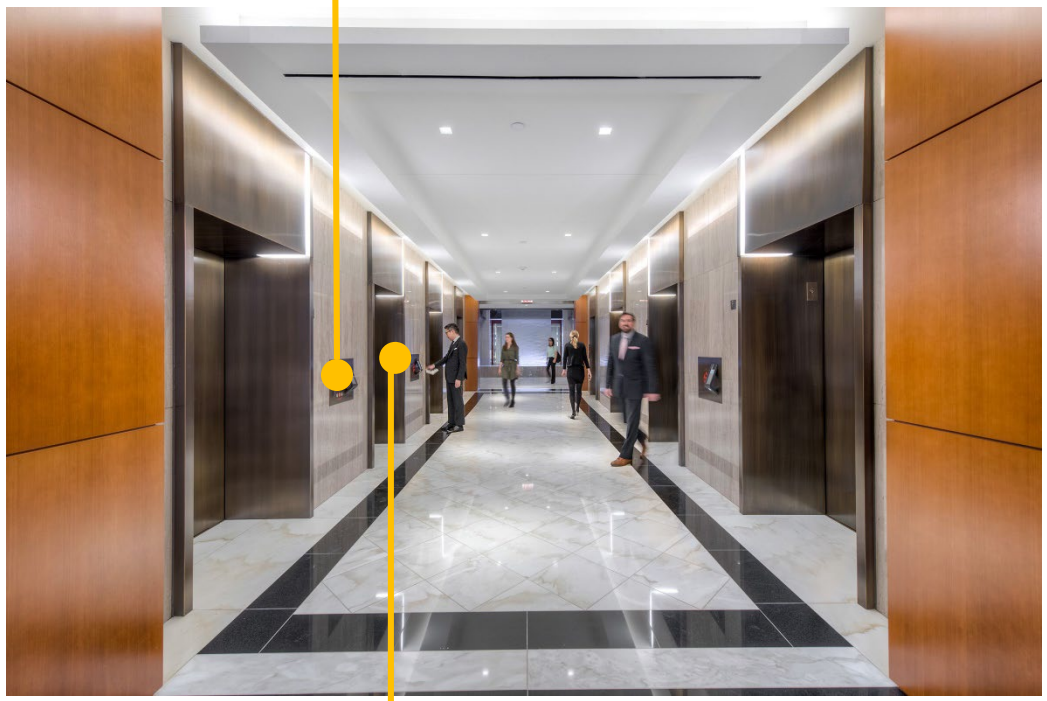
# **BUILDING** LOBBY

Automatic doors

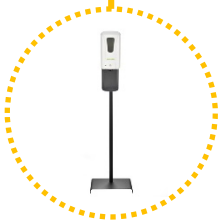
Plexi barrier for security/ reception desks

Increase outside air, enhanced filtration, and air treatment systems

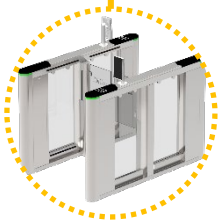
**Touchless destination dispatch system via card or mobile app. Keep elevator doors open at lobby/floors** (note stack effect concern in winter).



Entryway mats



Sanitization station at entry



Facial recognition/mask scanning, thermal scanning, and touch-free security

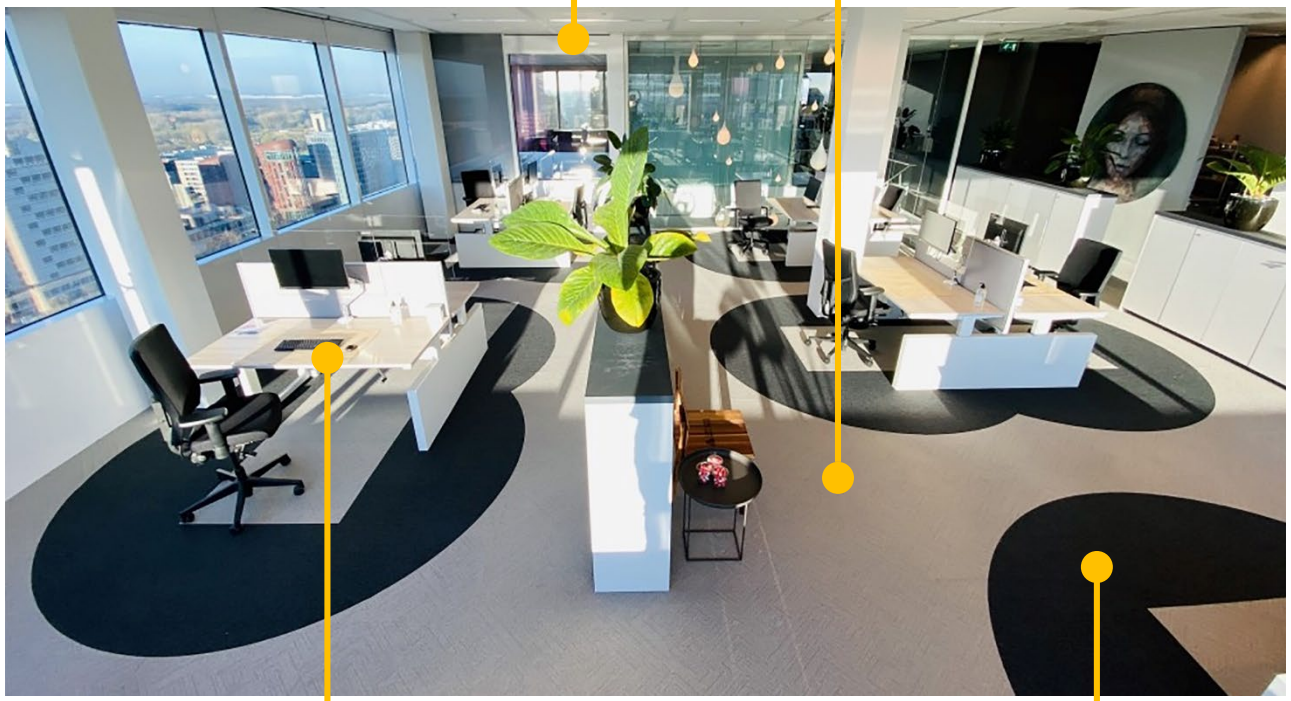
Minimize elevator occupancy and use floor stickers. Consider UV & HEPA filters in elevator cabs.

# **OPEN** OFFICE

Increase outside air, enhanced filtration, and air treatment systems

For conference rooms space out seating, add CO2 sensors, consider portable air filtration. Reduce open collab/touchdown spaces.

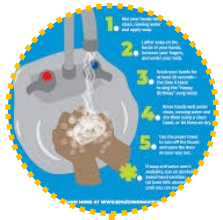
Desk dividers for existing desks



Larger or separated workstations, stagger work hours and occupancy (occupy every other desk) for social distancing


Floor markings for circulation and 6’ separations

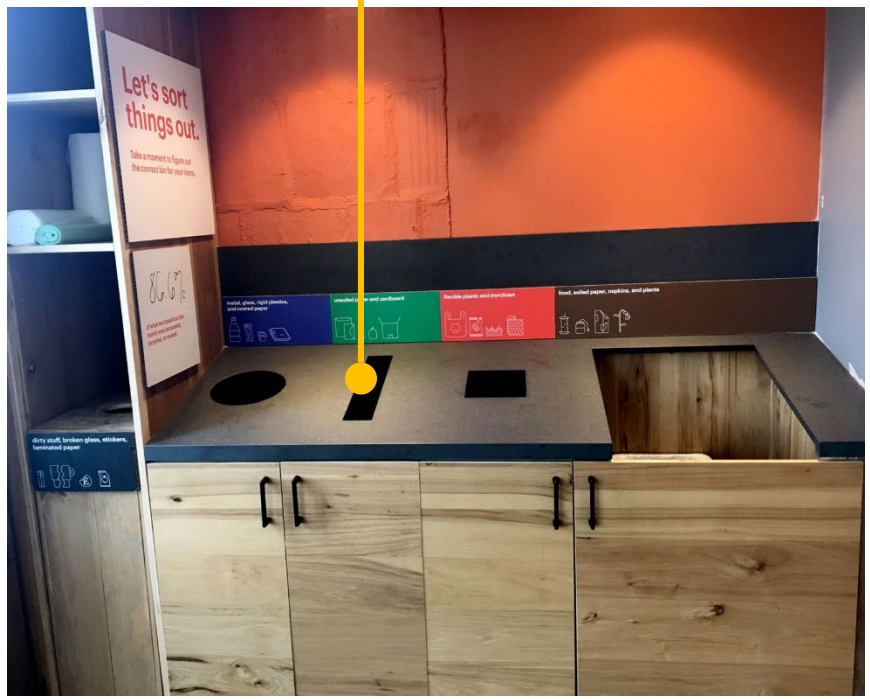
# PANTRIES



Handwashing education posters

App-based coffee machine and automatic water bottle filler

Countertop cut-outs for touchless waste and recycling system




Motion-activated faucet with 20 second timer

Touchless cabinets

# BATHROOMS

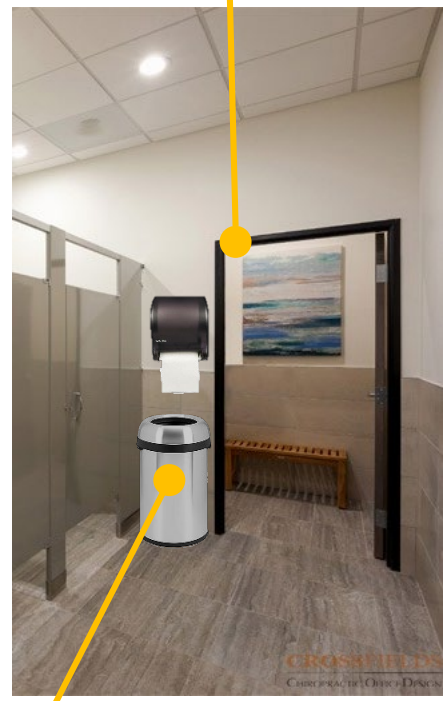
Increased Bathroom Exhaust

Automatic Flushometers

After-hours UV disinfection

Motion-sensor 20 second faucet and automatic soap dispenser


Automatic bathroom doors or foot pulls



Full-height water closet partitions ($7,500/unit)

**Automatic closing lids, optional UV disinfection**
(not yet readily available)

Automatic paper towel dispensers and open trash can located by door. Disable air dryers

# **OPERATIONAL** CONCEPTS

Proactive things building owners can do

## Cleaning

New cleaning protocols

More regular deep cleaning

Frequent cleaning of common touchpoints

Increase supply of sanitizing products

Ductwork and unit cleaning

## Air Quality

Changing filters

Monitoring air quality

Extending ventilation hours and after-hour purge with outside air

## Screening Protocols

Thermal Camera Scanning/Elevated Body Temperature (EBT) checks

Staggered Arrivals and Departures

Packages Sanitization

## Commissioning

Commissioning of systems with periodic validation

Creating operations and maintenance manuals for staff

Create a best practices manual for tenants

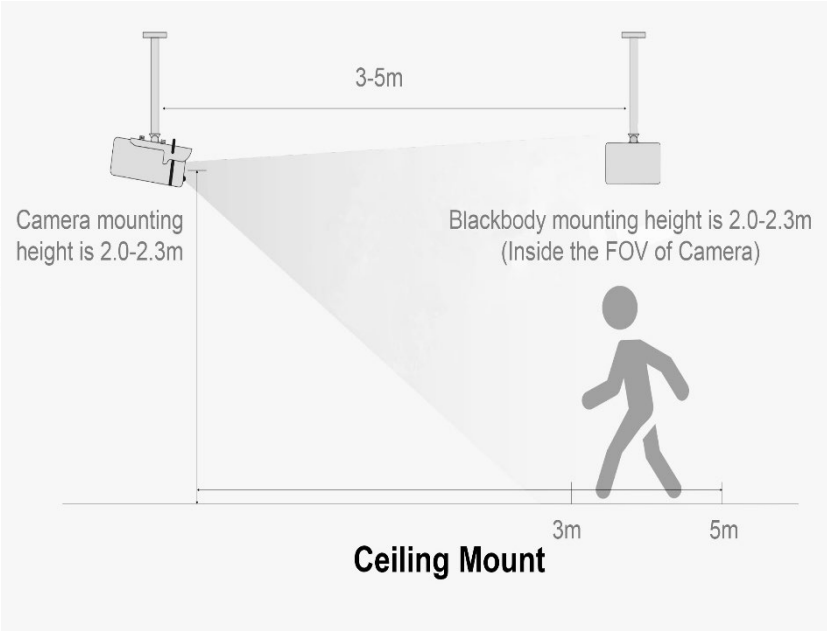
# **THERMAL** SCANNING

This thermal scanning system works at the turnstile and has facial recognition, mask recognition, and thermal scanning. Facial recognition can be turned off to protect privacy.


https://www.youtube.com/watch?v=PLqdXJLo5Uc

# **THERMAL** SCANNING

This solution is for large volume scanning without turnstiles and can scan from 20 feet away.



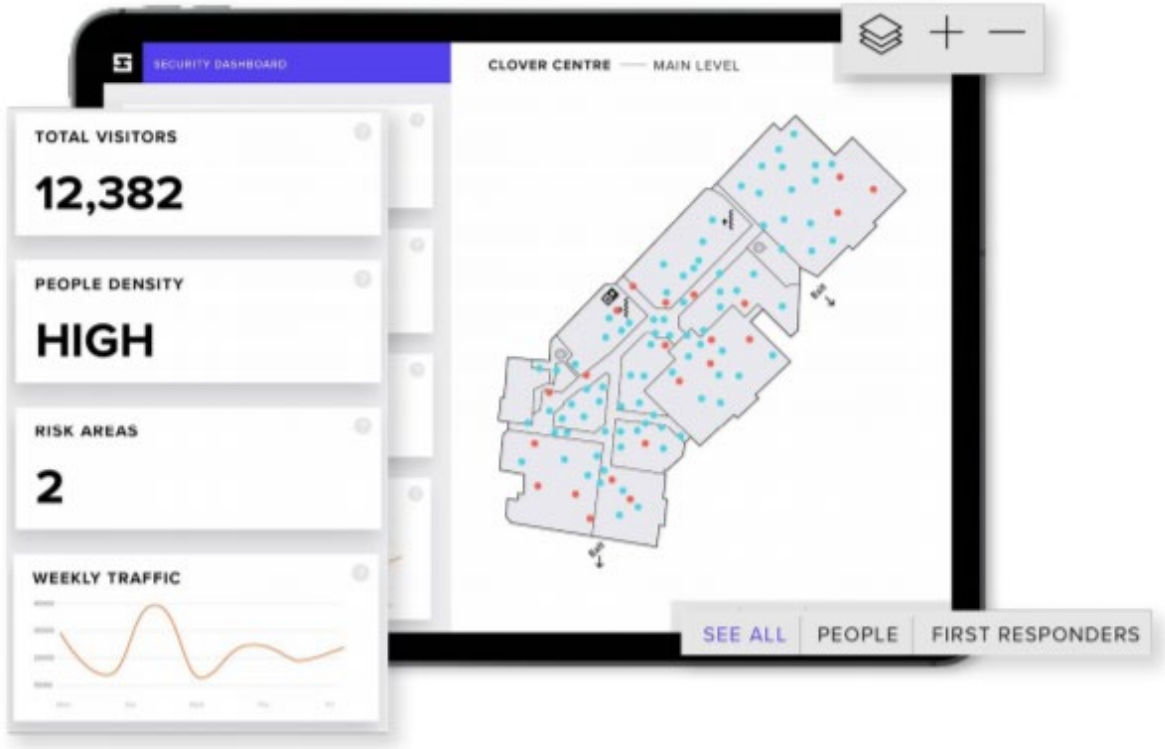

# **SMART BUILDING** WORKPLACE MANAGEMENT



Help maintain social distancing requirements

Contact tracing identification and reporting

Instant communication




## Smart Building Digital Platform

- Ultra high-speed connectivity (DAS/5G)
- Artificial Intelligence (AI)
- Analytics - IoT
- Big Data
- CBRS, mmWave
- WIFI 6

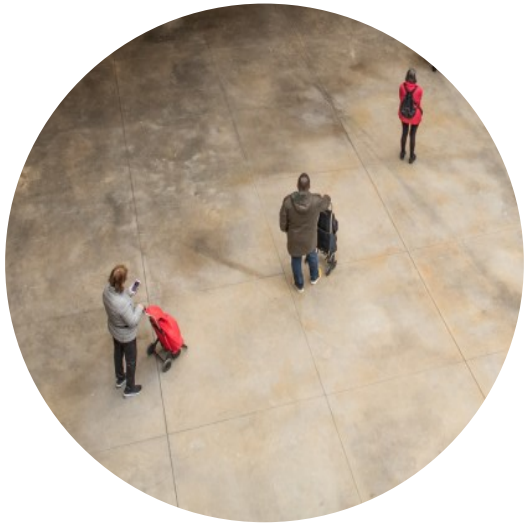
## Touchless Environment

- Biometrics (Face ID, Iris, Palm)
- Destination dispatch – touchless lobby turnstiles
- Virtual Assistants/Help Desk
- Voice/Gesture Control – AV and Conference Sys
- Real Time Occupancy Monitoring
- Social distancing density control
- Dynamic Indoor Wayfinding
- Workspace Management Flexible Seating

# **SOCIAL** BEHAVIORS

What the building occupants can do

## Social Distancing



Always stay 6’ apart

Shifted work schedules (Different days, different hours)

Staggered reoccupancy

One-way office circulation where possible

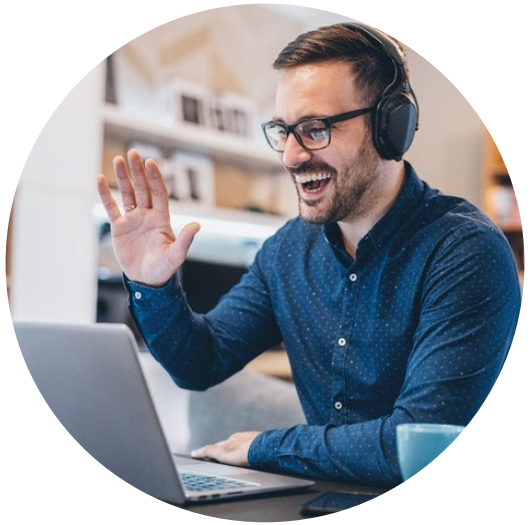
## Education


Educational posters about hand washing, wearing masks, touching your face, and other best practices

Periodic hand washing reminders

20 second timers at faucets

## Go Digital



Flexible work from home policy

Use videoconferencing for meetings when possible

Postpone large gatherings

Assess risk of travel

## New Protocols

Wearing face masks

Keeping your desk clean

Minimize elevator occupancy

Communication with staff

# **RECOMMENDATIONS** AND CONSIDERATIONS

| | Short Term | Long Term |
|---|---|---|
| Outside Air | Increase outside air to maximize dilution. Purge before and after occupancy. | Increase ventilation rates 30% above ASHRAE minimum recommendations |
| Filtration | Upgrade to MERV 13 or better filtration | Minimum MERV 13 |
| Humidity Control | Consider humidification to maintain 40% minimum relative humidity in the winter if possible (difficult in cold climates) | Difficult to humidify buildings in winter in cold climates |
| Restrooms | Increase exhaust in toilet rooms. Check trap primers. Consider UV sterilization lighting. | ASHRAE may recommend increased exhaust. UV technology still being developed. |
| Local Filtration | Provide local HEPA filtration in dense locations like conference rooms and elevators. | Rebalancing of systems and assured outside air supply may preclude need for local filtration. |
| Touchless | Frictionless entry, automatic doors, motion-activated faucets, soap dispensers, & flushometers. | Smart building and app-based technologies |

Cosentini

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