



CHANGE IS IN THE AIR:

Charting Re-entry to an Altered Atmosphere

The end of the Sheltering in Place leaves us with a veritable cliffhanger. What happens next, particularly for building owners, employers/employees, schools, or facilities managers?

While many articles and opinion pieces have covered 'the new normal', we discovered only one common thread amongst all of them: Change is coming.

Fortunately, no one needs to go it alone.

Official Coronavirus Guidance Resources

[World Health Organization Coronavirus Guidelines](#)

[UK Coronavirus Guidelines](#)

[ECDC Coronavirus Guidelines](#)

[White House Opening America Guidelines](#)

[ASHRAE Coronavirus Guidelines](#)

[OSHA Coronavirus Guidelines](#)

Read Global, Act Local

Please follow global guidance but also pay close attention to your own national and local requirements, which may vary widely by country/region, business type, or building. Should there be a conflict between the many guidelines you encounter, follow the most stringent rules to be safe - both for occupants and for your building or business to avoid fines.

Layer Up

No single approach to indoor environmental quality (IEQ) will completely eradicate SARS-CoV-2, or any human virus. However, implementing multiple approaches, both automated and manual, can help protect your building's occupants. Additionally, some steps may help improve efficiency or add to the value of your building(s) as an unintended consequence.

Engineering | Automation

In preparation for the return of employees, students, and/or occupants, building owners and facilities managers should review their current HVAC systems. While this could include updating to more modern infrastructure, it is actually recommended to simply service your current system.

While the COVID-19 pandemic may be a catalyst to consider such maintenance, [the role of indoor air quality in 'sick building syndrome'](#) means there are multiple longer-term advantages to investing the time, including [improving worker productivity](#) and lowering overhead expenses by keeping employees healthy.

Moreover, as a result of the current pandemic, John D Macomber, senior lecturer at Harvard Business School, who co-authored [Healthy Buildings: How Indoor Spaces Drive Performance](#) and Productivity with Joseph G Allen, says:

I think awareness is heightened, and in this economy there'll be a drop in demand for space, both for apartments and offices. With those two things together, I think that the offices with the premier health story will get the premium rent and get the tenants, and the offices with a lagging health story will lag.¹

How can you augment your building's health story even via your current HVAC system?

¹ Kristen Senz. ["Why COVID-19 Raises the Stakes for Healthy Buildings."](#) HBS Working Knowledge. April 20, 2020.

Ventilate Properly

While HVAC systems provide heating or cooling mechanisms, air circulation in and of itself has increased in importance over the years, particularly within commercial buildings. HVAC systems can now be programmed to react to air quality signals other than temperature or humidity, such as oxygen, carbon dioxide, particulate matter, and other factors. Whether passive, mechanical, or a hybrid approach, vents to external air and dampers can be adjusted to help optimize airflow, critical when the [EPA reports](#), “Indoor concentrations of some pollutants have increased in recent decades due to such factors as energy-efficient building construction (when it lacks sufficient mechanical ventilation to ensure adequate air exchange).”²

There are more reasons than the COVID-19 to ensure proper ventilation. Managing air exchange rates can mitigate the negative effects of CO₂ such as:

- Drowsiness
- Headaches
- Decreased Productivity
- Difficulty with decision making

And, while we have already learned about [the high level of CO₂ in conference rooms](#), there are now many new areas to think about for adequate ventilation and/or occupant reduction in relation to the pandemic. These include lobbies, micro-kitchens, elevators, restrooms, and other spaces that may be unique to your building.

Adequate air circulation can also help mitigate [VOCs \(Volatile Organic Compounds\)](#), which can arise from any number of pre-existing building materials such as:

- Flooring
- Painting
- Adhesive
- Office Furniture

While a lot has been written on the physical causes of VOCs, it is likely air pollutants will also be on the rise from the increased cleaning to protect occupants from SARS-CoV-2. With the updated disinfection protocols, it will be important to ensure VOC levels are not too high post-cleaning for occupants, or for the facilities crews doing the incredibly difficult and thorough work.

² [“Report on the Environment: Indoor Air Quality.”](#) Environmental Protection Agency. Accessed May 5, 2020.

Finally, there are studies about how building ventilation or light may help solve for bacteria or viruses. However, we are still in the very early stages of understanding building biomes. In one study published by the [National Center for Biotechnology Information](#), it's reported that more so than any type of environmental or material causes, "The activity of people and equipment within the indoor environments is thought to be the principal factor contributing to the buildup and spread of airborne microbial contamination. Particular activities like talking, sneezing, coughing, walking and washing can generate airborne biological particulate matter."³

Most importantly, air quality is dynamic and it should be monitored real-time such that adjustments can be made to ensure continued occupant safety.

Replace Filters

Particulate matter, or PM, is the name given to liquid particles or fine dust that are suspended in the air we breathe. PM is generally measured by size inclusive of PM10, PM2.5, and PM1. The numbers refer to the diameter of the particle measured in micrometers. As a comparison point, the diameter of the average human hair is 30 times larger than PM2.5.

PM2.5, specifically in outdoor air pollution, has been attributed to a [rise in the mortality of Covid-19 patients](#). It is a great time to check on filters within your HVAC system, ensure you have clean filters and possibly a high enough [MERV \(Minimum Efficiency Reporting Value\)](#) rating. ASHRAE calls out MERV 13 or higher filters as being particularly effective against human viruses, and it's suggested to use a MERV 8 filter at the minimum.

However, it is important to note that there is no filter, irrespective of MERV rating, that will completely eradicate SARS-CoV-2. You should also not select the highest MERV rated filter thinking that will work best for your building. Make sure the rating that you choose is fully compatible with your system. Too high of a MERV rating can create inefficiencies or high-pressure loads that impact the HVAC system negatively elsewhere.

There is also a fair amount of debate with SARS-CoV-2 as to whether the virus is more often transmitted via droplets or particles. However, the main differentiation between droplets or PM is the size and hang time in the air. In keeping with the theme of layering up, it is prudent to [solve for both](#). From the American Society for Microbiology:

³[Samuel Fekadu Hayleeyesus and Abayneh Melaku Manaye. "Microbiological Quality of Indoor Air in University Libraries." National Center for Biotechnology Information. May 2014.](#)

MERV 13 filters have the potential to remove microbes and other particles ranging from 0.3 to 10.0 μm . Most viruses, including CoVs, range from 0.004 to 1.0 μm . However, viruses are rarely observed as individual particles, but instead are expelled from the body already combined with water, proteins, salts, and other components as large droplets and aerosols. Thus far, SARS-CoV-2 has been observed in aerosolized particles in a spectrum of sizes, including 0.25 to 0.5 μm .⁴

Given its size, SARS-CoV-2 can still wind its way both into and potentially through the highest end MERV rated filters, which is why other steps are also necessary to keep air healthy. Relatedly, you should also establish a process or automated signal to change filters regularly and ensure HVAC technicians follow safety standards when disposing of the used ones.

Finally, in a similar manner, portable or plug-in air filters with HEPA filters may help as well, particularly for those employees that will continue working from home or even those that return to the office in open spaces. However, given the various sizes of the virus, air filters will, as above, only help mitigate it. For this reason, there are no hard and fast recommendations about portable air filter devices at this point in time.

If the virus can escape air filtration, what other other methods can you use to contain it?

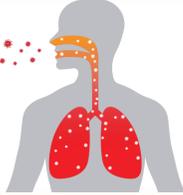
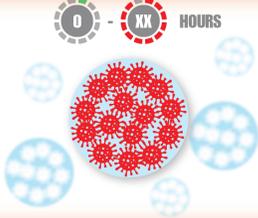
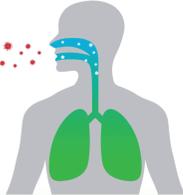
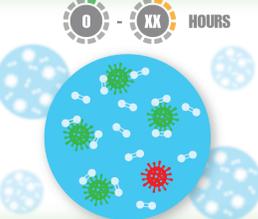
Control Temperature and Humidity

Another recommendation is to keep indoor air at a [relative humidity](#) of 40% to 60% to decrease viral infectivity.

When RH is under 40%, airborne droplets tend to dry out more quickly and remain in the air for longer. Dry air, considered to be 0-40% RH can also lead to respiratory issues because it impairs our natural ability to remove or capture and fight airborne viruses and germs on our own. An RH over 60% may support the growth of mold, so this is not recommended either.

⁴[“2019 Novel Coronavirus \(COVID-19\) Pandemic: Built Environment Considerations to Reduce Transmission.”](#) American Society for Microbiology. Accessed May 5, 2020.

The below graph is taken from a [petition by Harvard researchers to the World Health Organization](#) to start including Indoor Air Quality in its requirements for health. The graph illustrates the above principles in action:

	 Respiratory immune system efficiency	 Virus "float" time	 Virus survival time
Dry indoor air 0-40%RH			
	Respiratory immune system's defenses are impaired, allowing viruses to infect us more easily	Airborne droplets containing viruses shrink by evaporation, are lighter and float for longer	Airborne droplets containing viruses dry, allowing the virus to survive for longer
Ideal indoor air 40-60%RH			
	Respiratory immune system's defenses function effectively, capturing, removing or fighting germs	Airborne droplets containing viruses retain moisture, are heavier and fall out of the air	Airborne droplets containing viruses retain moisture, allowing physicochemical reactions to deactivate the virus
Studies:	Kudo E. 2019 Salah B. 1988	Noti JD. 2013 Yang W. 2011	Noti JD. 2013 Yang W. 2012

In addition to relative humidity, if your building has been shut down for quite some time, it is also prudent to check for [water quality safety and ensure there are no mold issues within pipes or the HVAC system](#).

The above steps, including proper ventilation, filter replacement, mold checks, and temperature and humidity control can help keep occupants safe. There are also studies about other measures, such as the impact of UV-C (Germicidal Ultraviolet) light on the virus. However, the benefit of the steps outlined above is that they should not require major investment, simply careful maintenance of your existing HVAC system.

However you choose to proceed, keeping an eye on the invisible (your building's air) will not only help with aspects of the virus's behavior - it may also reduce dangerous factors such as PM2.5, VOCs, CO2, and more. Awair Omni and the Awair software dashboard and/or API can help provide insights and enable you to more effectively control your air. Please feel free to [reach out](#) to learn more.

Environmental | Manual Steps

Keeping building occupants safe cannot be based on air circulation alone, nor can the process be fully automated or covered by technology.

There are more tactical steps you can begin to implement as well, even in the midst of uncertainty. These controls, so to speak, are manual. But that may make them easier to manage and change moving ahead as we learn new information about the virus.

Security

To return to buildings, occupants and employees will need to feel safe, which may entail far more than any previous steps you may have taken for security, such as fire drills, security guards, and/or limited access to buildings. Security now also means ensuring that your buildings and businesses are optimized to prevent the spread of SARS-CoV-2 or future viruses. In addition, your business or building should be prepared in case there is an onsite case of COVID-19. As such, security for a building's occupants will now take on a second and more figurative meaning: Reassurance.

Safety Steps

First and foremost, please always follow the [most recent guidance](#) for your particular region. The below is a recommended, if partial, list to start with:

- **Create Building and/or Corporate Policies for COVID-19**
 - Each building, school, and business will need to create policies unique to their situation and in alignment with local ordinances.
 - Work closely with your building managers, facilities team, and/or bring on professional guidance to ensure all policies are realistic and attainable with current staff and budgets.
 - Regularly review the [OSHA Guidance on Preparing Buildings](#), or the equivalent
- **Communicate New Policies Clearly and Often**
 - You may have already received emails from other businesses, such as restaurants or rideshares, about how their business is instituting updated safety policies. These notes serve to help people feel safe about continuing to use the business, but in addition can include new rules and expectations of a business's customers so that their employees stay safe. Your building, school, or business should do the same. Health will be a collective effort more so than ever before.
 - Publish your policies via email, post them external to the building for those that missed it, and again in the lobby or entry areas, as well as elsewhere on site.
 - Educate your occupants, students, or employees about new COVID-19 learnings and policies as they arise.
- **Provide Required Health Items On-Premises**
 - If you now require masks, gloves, and an hourly splash of hand sanitizer, please have these items readily on hand for your occupants, employees, students, or visitors.
 - Provide reminders about hand-washing and social distancing.
 - When possible, add tools or new methods to help make doors easier to open and close without hands.
- **Provide Guidance for WFH**
 - Outline the importance of proper ventilation even at home, especially when there are potentially more people in the home than usual, closed door rooms, and increased cooking and cleaning routines happening.
 - Ensure those that are feeling sick or may have been exposed to others with COVID-19 stay home.
 - Give information on proper ergonomics and lighting to prevent injury.
 - Offer occupants, students, or employees discount purchase programs for certain health items, such as air filters, humidifiers, desk setup guides, and indoor air monitors. If you are interested in discount codes for certain Awair products for such a program, please reach out to us at business@getawair.com.

- **Ensure Your Policies Work for the Immunosuppressed and those with Disabilities**
 - This may include additional WFH time, non-peak travel time, or a safe area onsite.
 - Check in with individual employees to ensure options work for them (and their physician) as applicable.
 - Be certain to comply with the [Family and Medical Leave Act \(FMLA\)](#) and the [Americans with Disabilities Act \(ADA\)](#), or adhere to the local labor laws in your region.

- **Review Workspace Layouts**
 - [Open work environments will pose a challenge for virus control.](#)
 - Pay close attention to occupancy levels and space people six feet apart.
 - Consider staggering the amount of the workforce in the office on any given day.
 - Consider having different start times during the day.

- **Create a Stringent Cleaning Schedule**
 - Common areas in buildings will need increased attention for cleaning and wipedowns.
 - Review the [CDC's guidelines on disinfecting buildings.](#)
 - Ensure VOCs are not too high from the extra cleaning materials and activities.

- **Have a Containment Plan for Onsite Outbreaks**
 - Have a plan should a COVID-19 case happen within your building, school, or company.
 - Consult with your local health department for further guidance should a case arise.
 - Inform those potentially affected about any possible exposure to COVID-19 but also ensure you follow [HIPAA guidelines](#) or privacy laws within your region as you do so.
 - Ensure employees are well-versed and follow [CDC guidelines for individuals](#) on a normal basis and that they know what to do if they [suspect they are sick.](#)

- **Be Transparent**
 - Communicate your current plans and indicate that they will change as official guidance does.
 - Work with your employees and occupants - this is new for everyone and an evolving process.
 - Continue real-time monitoring of the air, particularly in the lobby, conference rooms, elevators, and restrooms.
 - Keeping an air score visible may help people feel more comfortable in your space.

Of course, there are many other ideas about ensuring occupant safety - anywhere from mapping phone devices within the building without an opt-in to thermal cameras. However, privacy concerns may make some approaches more off-putting than comforting to workers or occupants, even if the data is aggregated, so proceed thoughtfully if you can.

In Closing about Re-opening

The key to all above is that safety for this or future pandemics is not a checklist that you complete and move on. Nor will recovery be linear. Guidelines will adapt and change - and so will your air quality as people re-enter and leave the building.

For that reason, real-time indoor air monitoring can be one tool amidst the many prevention steps to help you better understand your building's air quality and take the necessary steps, whether automated or manual, to help keep occupants healthy and safe.

How is your building's air right now?

Awarair Omni features enterprise-grade sensors that track temperature, humidity, CO2, VOCs, PM2.5, Lux, and Db. A software dashboard and/or API provide air data as well as actionable insights so you can take control of the air in your environment no matter where you are. Omni is already used by leading organizations like WeWork, AirBnB, Harvard, Stanford University, and Google to keep their facilities optimized for employee and tenant health.

If you would like to learn more, please reach out to us at business@getawair.com.

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