



YOUR ESSENTIAL GUIDE

Indoor Air Quality and Your Business

Part Two: Understanding the science of air purification





Indoor air quality (IAQ) is now a critical health and safety factor for all businesses big and small. Consumers want to know that the places where they live, work, learn, and play prioritize their safety and well-being.

In fact, in the not-so-distant future, IAQ ratings in buildings will be something we check as normally as we check the weather. Why? As humans, we spend around 90% of our time indoors, so the quality of the air in those spaces is vital to our health.

To provide a healthy environment, indoor air needs to be treated constantly to remove airborne contaminants. While upgrading ventilation systems can be costly, there are less daunting, more budget-friendly solutions that can be implemented quickly.

Take a deep breath. To help you navigate your air hygiene journey, Ambius has put together Part Two of our ***Indoor Air Quality and Your Business*** series. It's full of easy-to-understand information you can use to shape your air hygiene initiatives. And if you need assistance, our hygiene experts are standing by to help.





Turning buildings into healthy, thriving environments

PROPER AIR HYGIENE IS NOW ESSENTIAL

Indoor air can become polluted with any number of microscopic particles, which are brought in from the outside or emitted from people, fixtures, and fittings within a space. These contaminants can be particulates, such as dust, dirt, mold spores, and pollen; volatile organic compounds (VOCs); or respiratory droplets and aerosols which carry pathogens such as viruses and bacteria.

Whether your business has previously considered IAQ as part of a health and hygiene strategy or the global pandemic of 2020 elevated its importance for your business, now is the time to take action. We can turn our buildings into healthy, thriving environments through targeted mitigation strategies that address IAQ.





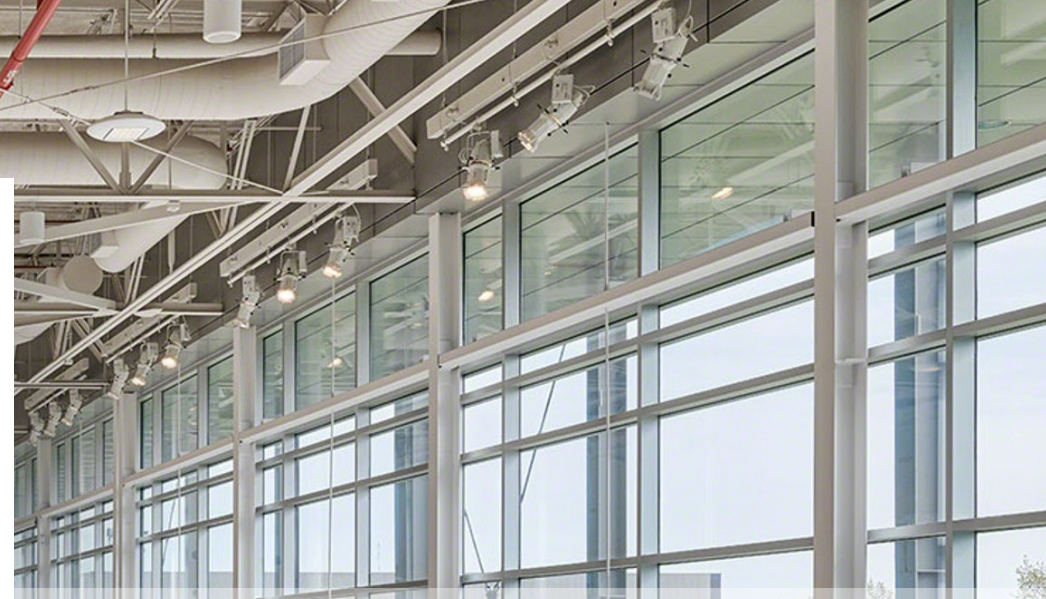
Mitigation strategies for indoor air quality in a pandemic era

In March 2020, the International WELL Building Institute (IWBI) launched a Task Force on COVID-19 and Other Respiratory Infections, a consortium of more than 550 global experts in public health, medicine, design, real estate, government, and academia.

The task force published eight new guidelines for strategies to manage buildings, which include actionable insights that can be integrated into your operations.

The second of the guidelines focuses on air quality, specifically improving the level of air filtration. It recommends the implementation of adequate air filtration and a documented maintenance protocol for installed filters. This requires businesses to carefully monitor filters and replace them regularly, and properly, based on the level of air contamination in their environment.

In addition to this standard, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) discusses key air hygiene strategies based on your facility's risk assessment.



ASHRAE AIR HYGIENE STRATEGIES



Providing enhanced filtration; using higher rated filters



Using upper-room ultraviolet germicidal irradiation (UVGI)



Reviewing local exhaust ventilation for source control



Using of personalized ventilation systems for some high-risk tasks



The addition of portable, free-standing high-efficiency particulate air (HEPA) filtering systems



Monitoring and control of temperature and humidity



Understanding air filtration

In any mechanical air or ventilation system, filters are used to capture airborne contaminants and prevent or reduce the amount of contaminants being released into the air that we breathe. Different types of contaminants may require different methods of filtration via specific filter types.

As defined by the U.S. Environmental Protection Agency (EPA), particulate matter is “the term for a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, can be seen with the naked eye. Others are so small they can only be detected using an electron microscope.”¹

TYPES OF FILTERS

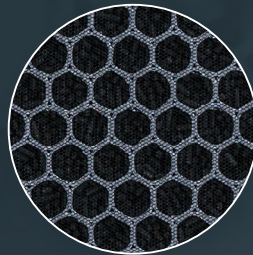
What a filter is made of matters. Different filter materials are used to capture particulate matter than are used to capture VOCs.



Prefilter – In many units, a prefilter is installed as an added layer of filtration. This filter comes first in the system and is designed to remove the largest particles. This helps lengthen the lifespan of particulate filters.



Particulate filters – A common filter used to capture particulate matter, particulate filters are a continuous sheet of material, often referred to as “medium,” which is made up of millions of overlapping fibers. Performance depends on many factors such as the fiber material and the size of the pores between the fibers.



Activated carbon filter – Used to remove VOCs, these filters work through adsorption, which allows VOCs to collect on the surface of the carbon. An activated carbon filter may be supplied as a separate filter or in a single housing with the particulate filter.

THE IMPORTANCE OF FILTER REPLACEMENT

As soon as any type of filter starts to trap material, it begins filling up and its performance will slowly decline over time. This makes maintenance and regular filter replacement critical. Filter replacement should be conducted at manufacturer’s recommended intervals, or more frequently if a space is heavily polluted.



Understanding filter designations

PARTICULATE FILTER PERFORMANCE RATINGS

The performance of particulate air filters can be designated by different ratings which indicate its effectiveness at capturing particulate matter of various sizes.

MERV (Minimum Efficiency Reporting Value)

This is a simple designation to express the size of a particle or droplet that a filter can effectively trap. The higher the MERV rating, the better the filter is at capturing particles that are below 10 microns in size. ASHRAE currently recommends using a minimum MERV 13 filter.

HEPA (High-Efficiency Particulate Air)

HEPA filters correlate to MERV 17 (and above). According to the EPA, “This type of air filter can theoretically remove at least 99.97% of airborne particles and droplets with a size of 0.3 microns.”² HEPA filters are often used in medical or other sensitive environments. Their use was standard pre-pandemic and remains so now.

MERV Rating	Average Particle Filtering	Particle Size Range	Typical Use (Pre-COVID)
1-4	60-80%	>10.0 microns	<ul style="list-style-type: none">Residential buildingsLight duty commercial buildingsEquipment protectionWindow air conditioners
5-8	80-95%	3.0-10.0 microns	<ul style="list-style-type: none">Industrial workplacesTypical commercial buildingsBetter residential buildings
9-12	>90-98%	1.0-3.0 microns	<ul style="list-style-type: none">Superior residential buildingsBetter industrial workplacesBetter commercial buildingsHospital laboratories
13-16	>95-99%	0.30-1.0 microns	<ul style="list-style-type: none">Smoke removalHospital patient careSuperior commercial buildings
17-20 (HEPA range)	99.97%	0.30 microns	<ul style="list-style-type: none">Clean roomsHospital surgery and isolationPharmaceutical manufacturing

FILTERS AND AIRBORNE PATHOGENS

One of the most common questions to arise during the pandemic, was “How do filters trap or catch the viruses?” The answer isn’t quite as simple as many would like.

Many viruses, such as influenza and SARS-CoV-2 (which causes COVID-19), can be transmitted via large and small respiratory droplets. These droplets are typically spread by people in close contact – 6 feet or less – from one another. However, smaller, lighter droplets and aerosols can linger in the air for minutes to hours and have the ability to ride air currents well beyond 6 feet.

Filters don’t trap viruses on their own, but rather viruses contained in these droplets and aerosols (or particulate matter). And that’s where filter rating comes into play.

HOW PERFORMANCE RATINGS CAN AFFECT VENTILATION SYSTEMS

To achieve a higher level of filtration efficiency, the filter medium needs to be packed more densely within the filter housing which is normally achieved by folding or pleating. This increased density creates a higher resistance to the flow of air passing through the filter, which reduces its velocity and the rate of airflow.

For this reason, it is not always possible to simply replace lower rated filters with higher-rated filters within existing ventilation systems as it can adversely affect the volume of air passing through the unit. Instead, a complete system upgrade may be needed. However, the use of portable HEPA air filtration units can be an effective way to supplement the work being done by an existing ventilation system.

The higher the filter rating, the more effective it is at stopping smaller particulates. While no filter will be able to stop all particulate matter, higher-rated MERV and HEPA filters will catch particles that are 0.3 microns or larger.



6 qualities to evaluate in an air purifier

Air purification systems are proven to be useful tools in eliminating contaminants, including respiratory droplets and aerosols. However, as with all tools, you must evaluate a few key functions to ensure you select the air purifier that is right for the job. Here are six criteria worth considering before selecting an air purifier.



HEPA filters

HEPA filters can remove at least 99.97% of particles and droplets that are as small as 0.3 microns.



Clean air delivery rate (CADR)

CADR is a performance measurement of how quickly a unit lowers the concentration of particles of a given size, i.e. how fast it cleans the air of a particular size of room. The higher the CADR value, the faster it will filter air. Sometimes CADR values are expressed as cubic feet per minute (cfm) and separate values are given for dust, smoke, pollen, or VOCs based on formaldehyde.



Serviced solutions

Air purifiers need to be serviced regularly by experts for filter replacement and safe disposal. According to the International WELL Building Institute, filter maintenance is critical for ensuring proper air filtration.



Indoor Air Quality (IAQ) sensors and displays

Visual cues, real-time Indoor Air Quality (IAQ) sensors and displays offer reassurance to building occupants that a business prioritizes health and safety. Some devices will just show a reading for particulate materials and others display VOC readings. Other air purifiers calculate an overall Air Quality Index (AQI) based on these readings.



Noise levels

To effectively clean the air in a room, air purifiers should be run continuously and have a range of fan speeds. As the fan speed increases, it will create more noise. Most units will run at a quiet level (between 30 - 40 decibels) on their lowest level, but this can rise to over 50 - 60 decibels at higher speeds. Some air purifiers are equipped with an auto-speed function that uses the unit data to control fan speed, ensuring that the device only runs at audible levels when needed.



Cost-effectiveness

There are many air purifiers available for purchase online. But before making this type of purchase, consider the overall expense, not only the upfront purchase price. Filter costs, safe filter replacement, unit service, and repair are additional expenses to consider. In fact, leased models may offer better overall cost efficiency. With a reduced initial outlay and filter servicing costs included, a serviced rental contract can cost as little as the price of a cappuccino per day – with the added benefit of the expertise of the service company for placement, cleaning, and care.



Additional air purifier functionalities

There are air purifiers on the market that claim added functionalities and benefits. It's important to consider the pros and cons of these functionalities before making a purchase.



Electrostatic air purifiers contain positively and negatively charged plates. As particulates enter, they pass through and collect on the plates. Although these units are sometimes referred to as filterless, the plates must be carefully cleaned regularly to maintain efficiency.



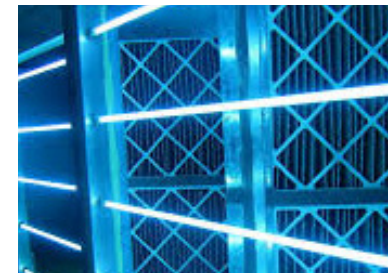
Ionizers add electrons to the oxygen molecules passing through the device, giving them a negative electrical charge. These negative ions attract airborne contaminants, which are normally positively charged.

As these particles collect, their size and mass increases so they settle out of the air quickly.



Ozone-generating air purifiers generate ozone, which may be created from oxygen in the ambient air by a number of mechanisms, such as corona discharge (an electrical discharge, not related to coronavirus) and some wavelengths of UV light.

Ozone is a highly unstable molecule that readily forms free radicals, which in turn react with organic materials (including VOCs and airborne pathogens) causing them to chemically break down.



UV light air purifiers use ultraviolet light to deactivate the genetic material (DNA or RNA) that is present in a microbe or virus. However, the effectiveness of this technology depends on numerous factors such as the light wavelength, the intensity of the light, and exposure time.

Photocatalytic oxidation (PCO) purifiers also fall into this category. A coating or plates containing titanium dioxide are added to the inside of a UV light purifier, which creates free radicals (or plasma). These free radicals react with organic molecules in a similar way to ozone.



Don't go it alone

There are many advantages to working with hygiene experts that businesses need to consider. Businesses may feel that they can manage air purifier maintenance, but replacing filters is a task best carried out by trained hygiene professionals.

Inexperienced personnel are ill-equipped to handle air purifier maintenance safely and effectively, which increases risk of exposure to pathogens and contaminants, and can negatively impact unit care and air filtration.

It's important to leave this to the experts you've partnered with to take care of your air hygiene needs. By doing so, you can realize the benefits listed on the right.



Trained specialists

Air purifiers must be positioned where they will be most effective and not be disrupted by surroundings. Advice on the correct positioning is best provided by hygiene specialists who have the technical support and experience to position units for maximum impact.



Customer protection

A hygiene partner can provide safe handling and disposal of filters following all safety, public health, and local regulations. These experts should wear appropriate personal protective equipment (PPE) to protect both the occupants of your building and themselves.



Safe servicing practices

Experts can devise the best service program that considers the needed unit maintenance, cleaning and disinfection, and filter replacement frequency to ensure maximum efficiency for your space.



Peace of mind

Look for a partner that can provide you with service reports of what's been done during each visit so that you have documentation to support and illustrate that you are adhering to your maintenance plan.

Hygiene360™

A healthy business begins with a healthy building. Ambius is leading the way in designing smarter, healthier spaces. As a trusted partner, we've been proud to help organizations positively benefit people in commercial spaces for more than 50 years.

Now, as businesses face their biggest health challenge in 100 years, we have assembled a global coalition of expertise from our family of companies, including a century-old hygiene leader and a 30-year pioneer in the operational and customer experience assessment industry.

The culmination is Hygiene360, a layered approach focused on healthy building strategies to minimize risk and improve long-term health and well-being. Discover the Ambius difference:

- Highly trained, in-house design and service experts across North America with an average tenure of 10.5 years
- Full-service, consultative approach
- Tailored solutions specific to your business goals and brand standards
- Part of the world's leading hygiene services company in over 45 countries worldwide
- Your single-source solution for savings, consistency, convenience, and peace of mind



800.581.9946 • ambius.com