

Agentis Air 

**BETTER INDOOR
AIR AT WORK
2023 GUIDE**

HEALTHY INDOOR AIR

MORE THAN A PERK, IT'S A BASELINE RETURN-TO-OFFICE REQUIREMENT



Long before the pandemic, poor indoor air quality at work was associated with health and productivity issues. A large study by Harvard University in the early 1990's found a direct association between sick leave and inadequate building ventilation. In another study, volunteers working in well-ventilated conditions scored 61% higher on cognitive function tests than when they worked in typical office conditions. And sick-building syndrome is a well-documented

consequence of poor IAQ. But it took COVID-19 to show that existing HVAC systems were not up to the task of keeping office spaces safe. Awareness grew that building systems are designed for efficiency and minimum-safety standards and not to a maximum-health standard.

How to close the clean-air gap? This guide provides an overview and introduction to improving IAQ at work, from assessing and planning to investing in quick, practical solutions.

3 REASONS OFFICE IAQ MIGHT NOT BE SO GREAT

WE SPEND 90% OF OUR TIME INDOORS; INDOOR AIR QUALITY IS AT LEAST TWO TO FIVE TIMES WORSE THAN OUTDOOR AIR QUALITY; POOR IAQ IS A “TOP 5” EPA HEALTH CONCERN. AND YET:

NATIONAL IAQ STANDARDS DON'T EXIST

The U.S. Environmental Protection Agency has set standards for clean air outside and for clean drinking water. Despite the importance of our indoor air, there are no national standards for indoor air quality.

BUILDING STANDARDS DON'T PRIORITIZE HUMAN HEALTH

The focus has been on minimum acceptable ventilation standards for efficiency and safety, not the standards needed to provide the best air quality for health.

BUILDING SYSTEMS ARE OFTEN NOT UP TO THE TASK

HVAC systems typically use air filters rated at a MERV 8 efficiency level or lower, removing only 20% of particle pollutants. And HVAC systems are only run 25% of the time, compounding the problem.



WHY IT MATTERS

Air pollution is linked to life-shortening diseases—beyond known respiratory ailments—including heart disease and dementia. At work, the consequences of inadequate air filtration include absenteeism, reduced cognitive function, and productivity declines.

Top 5

85-95% OF DAILY LIFE IS INDOORS

A lot of that is at the office. The EPA identifies indoor air pollution as one of the top five environmental risks to public health.

PM0.1

ULTRAFINE PARTICLES ARE DAMAGING

COVID-19 and other viruses are a known danger. But other ultrafine particles, including smog, smoke, and copier toner can also reach respiratory and circulatory systems, contributing to long-term health complications and diseases.

53%

STUDIES SHOW THE CONNECTION

20-plus years of academic and real-world studies make clear the direct association between poor IAQ, lower productivity, and worsened cognitive function. In one large study, poor ventilation was associated with a 53% increase in sick leave.

THE CLEAN AIR IN BUILDINGS CHALLENGE

One outcome of the pandemic is a new awareness, from employees to managers to the federal government, of the role that good air quality plays, not just in reducing virus transmission and illness, but in overall health and longevity.

You might not be at that job forever, but recent studies have shown even low levels of pollution can reduce your lifespan.

In response, the EPA established the Clean Air in Buildings Challenge as an important first step to making the IAQ in buildings healthy.

- 01.** CREATE AN ACTION PLAN FOR CLEAN INDOOR AIR
- 02.** OPTIMIZE FRESH AIR VENTILATION
- 03.** ENHANCE AIR FILTRATION AND CLEANING
- 04.** ENGAGE YOUR COMMUNITY

READ THE COMPLETE CLEAN AIR IN BUILDINGS CHALLENGE

The document covers the challenge in more detail and includes a list of helpful IAQ resources.

epa.gov/indoor-air-quality-iaq/clean-air-buildings-challenge



CHALLENGE ACCEPTED

ASSESS YOUR SITUATION AND PLAN FOR MONITORING, IMPROVEMENTS, AND MAINTENANCE

- Evaluate your building IAQ, including ventilation, filtration, and air cleaning, with the help of an HVAC expert
- Determine what changes are needed
- Commit to ongoing monitoring, inspections, regular maintenance

OPTIMIZE FRESH AIR FILTRATION

- Ensure the fresh air is filtered before bringing it inside
- Run the HVAC system continuously when people are in the building
- Increase the volume of clean outdoor air when the risk level is higher

ENHANCE AIR FILTRATION AND CLEANING USING HVAC SYSTEM AND IN-ROOM CLEANING DEVICES

- Install MERV 13 air filters if possible, or the highest-rated MERV filter that your HVAC system can accommodate
- Use portable air cleaners where airflow and HVAC filtration are ineffective or inefficient, non-existent, and where there is elevated risk
- Consider an upper-room Ultraviolet Germicidal Irradiation (UVGI) system, in consultation with a professional HVAC system design consultant

ENGAGE YOUR PEOPLE, COMMUNICATING TO EMPLOYEES, CUSTOMERS, AND OTHERS IN YOUR COMMUNITY

- Tell them what you are doing and how these steps will improve air quality
- Show them with walk-throughs, signage and other communications
- Demonstrate the importance of individual actions

KEY CONSIDERATION

Once you learn that something needs to be done, you may find that your HVAC system is not designed to accommodate higher efficiency filters.

ASHRAE, the American Society of Heating and Refrigeration Engineers, [recommends](#) that “mechanical filter efficiency be at least MERV 13 and preferable MERV 14 or better to help mitigate the transmission of infectious aerosols. Many existing HVAC systems were designed and installed to operate using MERV 6 to MERV 8 filters. While MERV 13 and greater filters are better at removing particles in the 0.3 micron to 1 micron diameter size (the size of many virus particles) the higher efficiency does not come without a penalty. Higher efficiency filters may require greater air pressures to drive or force air through the filter. Care must be taken when increasing the filter efficiency in an HVAC system to verify that the capacity of the HVAC system is sufficient to accommodate the better filters without adversely affecting ability to maintain the owner’s required indoor temperature and humidity conditions and space pressure relationships.”

A RAPID, ADAPTABLE SOLUTION

While assessment can happen quickly, it may take months and years and considerable capital expenditure to implement system-level adaptations. For this reason, the EPA, ASHRAE, the NIH, the CDC, and other advisory groups of scientists and building engineers recommend the addition of in-room, portable air cleaners. They serve as a first step, a supplement, and as an adaptable long-term solution to a dynamic environmental concern.

“THE BOTTOM LINE: IF FEASIBLE, INCREASE OUTSIDE AIR AND FILTRATION IN THE BUILDING’S MECHANICAL VENTILATION SYSTEM. IF THAT IS NOT FEASIBLE, CONSIDER USING PORTABLE AIR CLEANING UNITS.”

-THE NATIONAL INSTITUTES OF HEALTH



Better indoor air: a buyers guide to portable air purifiers

GOOD TO KNOW

IAQ, AQI, AND PM ARE USED TO IDENTIFY, INDEX, AND MEASURE PARTICLE POLLUTION

IAQ

IAQ is short for Indoor Air Quality. Every home, office, and indoor space has one. And it can change dramatically based on what you are doing and where you are located. The best way to find out your IAQ at work? Hire a professional to measure it, and then invest in a high-quality IAQ monitor for ongoing, real-time information.

AQI

AQI stands for Air Quality Index and is the Environmental Protection Agency's gauge for outdoor air pollution, with a range from 0 to 500; The higher the AQI value, the greater the air pollution and related health concerns. An AQI of 50 or lower is considered good.

The important thing to know about AQI is that it affects your indoor air quality due to air exchange. Particulate matter is one of five pollutants measured in the AQI. See the current air quality in your zip code at airnow.gov.

PM

Particulate matter (PM) is measured in microns. PM_{2.5} (smaller than 2.5 microns) and PM₁₀ (smaller than 10 microns) are harmful to human health, as they can enter the upper respiratory system, the lungs, and the blood stream. Both are associated with higher levels of lung disease, heart disease, cancers, and dementia. Read more on particles and health [here](#).

TACKLE THE TERMS

CADR, CFM, ACH, AND CCM ALL RELATE TO AIR PURIFIER PERFORMANCE

CADR

If you've shopped for an air purifier, you've probably seen CADR mentioned. CADR, which is short for clean air delivery rate, is an industry standard, set by the Association of Home Appliance Manufacturers (@AHAM), to compare the cleaning power between new air purifiers. Independent testing labs conduct CADR tests following a strict protocol to meet AHAM standards.

CFM

CFM stands for cubic feet per minute and is the airflow created by an air purifier fan, without a filter. Are CADR and CFM the same thing? It can be confusing because CADR is measured in CFM (cubic feet per minute). But they aren't the same. The CFM in a product's specifications refers to the airflow of the fan itself, without filter media inserted. CADR measures airflow with a filter or cartridge in place. Because you wouldn't run an air purifier without a filter, it's important to look at CADR, not CFM, when evaluating air purifier cleaning power.

ACH

The number of air changes per hours is as important as CADR, and they work together. For air purifiers, ACH refers to the number of times the air in a room circulates through the purifier in a one-hour period. The more air changes per hour, the faster an air purifier will clean the room—assuming it is also filtering efficiently. More on that later.

CLEAN AIR DELIVERY RATE FAQs



WHAT DOES CADR MEASURE?

CADR measures the air purifier's contribution of clean air to the room. Three distinct particle sizes are measured in CADR tests, from smallest to largest: smoke, dust, and pollen. Results for each range from 0 to 450.



IS A HIGHER CADR ALWAYS THE BEST CHOICE?

An air purifier with a higher CADR can remove particles faster than an air purifier with a lower CADR. That said, a lower CADR may be appropriate based on the room size and desired air changes per hour. There's no reason to oversize your air purifiers. Choose them to fit the room.



WHY DOES CADR MATTER?

If the CADR is too low for the square footage of the space, the air purifier will not be powerful enough to keep up with new air pollution entering the room. If the CADR is too high, it's essentially overkill, often at a higher price, and with added energy use and cost.



IS ANYTHING BETTER THAN CADR FOR EVALUATING AN AIR PURIFIER?

Yes. CADR measures the initial performance of a new cartridge or filter. CCM is a better measure of effectiveness over time. Unfortunately, few air purifier brands sold in the US conduct CCM testing. CCM provides an indicator of the filter performance decline that occurs with HEPA filters.

WHAT'S THE RIGHT CADR?

THE EASIEST WAY TO DETERMINE THE RIGHT CADR FOR THE SIZE OF YOUR ROOM IS THE TWO-THIRDS RULE. THIS RULE, FROM AHAM, SAYS THE CADR SHOULD BE 2/3 THE ROOM SIZE.

To find the CADR when you know the ROOM SIZE:

$$\text{ROOM SIZE} \times .66 = \text{CADR}$$

Find the ROOM SIZE when you know the CADR:

$$\text{CADR} \times 1.55 = \text{ROOM SIZE}$$

WHAT ABOUT THE ACH?

It depends on your specific conditions. If your air quality is generally good, an ACH of 2 may be fine. For more polluted indoor air, or for acute health issues, a higher ACH is better. A higher ACH increases the number of times the air circulates through the air purifier in an hour. The table below provides an example of maximum room size, using an air purifier with 143 CADR for PM2.5 and different ACH values. For example: using an ACH of 2, air will circulate every 30 minutes and can clean a space that is 535 square feet in that time frame (assuming the ceiling height is 8').

ACH	One Full Circulation	Room Size
2	30 minutes	535 square feet
3	20 minutes	355 square feet
4	15 minutes	270 square feet
5	12 minutes	215 square feet

The best ACH for your office or room depends on your air quality and specific conditions. If your air quality is generally good, an ACH of 2 may be fine. For more polluted indoor air, or for acute health issues, a higher ACH is better.

WAIT! THERE'S ONE MORE TERM YOU NEED TO KNOW: CCM

CADR PROVIDES A SNAPSHOT OF BRAND-NEW FILTER PERFORMANCE. TO MEASURE EFFECTIVENESS OVER TIME, YOU NEED TO SEE THE MOVIE. THIS IS WHERE CCM IS HELPFUL.

CADR measures the air cleaning capability for new, unused particle collection media (filter or cartridge), over a 20-minute period. It is a standardized comparison between new air purifiers. Unfortunately, CADR doesn't tell you anything about effectiveness over time. It's not unlike reviewing the performance of brand-new cars. What's not to like?

CCM or Cumulate Clean Mass testing is a method commonly used in countries with extreme pollution and it provides a picture of the clean air delivery rate over a longer period of time. CCM measures the volume, in grams, of particulate matter that a tested air purifier captures before the CADR drops to 50% of the unit's

original CADR. The higher the particle capture (CCM) before this drop, the longer a filter remains effective and the less often it will need to be replaced.

CCM is a better measure of effectiveness over time than CADR. Unfortunately, few air purifier brands sold in the US conduct CCM testing.

Agentis Air conducted CCM performance tests measuring the effectiveness of Brio—an electronic air cleaner using patented APART™ (Advanced Particle Removal Technology)—and comparable mechanical HEPA (High Efficiency Particulate Air) air purifiers.

See the results [here](#).



LET'S TALK TECHNOLOGY

Portable air purifiers aren't one-size-fits-all solutions, and the right one depends on your specific issues. Two major areas of concern indoors are VOCs (volatile organic chemicals), and particles, sometimes referred to as PM 2.5 (invisible, ultrafine particulate matter that smaller than 2.5 microns is considered the most damaging to health.)

To determine which type you need (and maybe both), you need to find out what your specific IAQ problems are, by using an air quality monitor or an outside testing service.

If IAQ testing has detected VOCs and gases in your spaces, the first action to take is eliminate the sources, if possible, and to add ventilation from clean outside air. If the VOCs are still present, a dedicated air purifier using activated carbon-filtration should be used. Keep in mind that effective solutions require many pounds of activated carbon and frequent filter replacement. VOCs and gases are too small to be captured by electronic or mechanical filtration. The add-on carbon filters included with most HEPA portable air purifiers are too small to effectively remove gases and VOCs.

OPTIONS FOR REMOVING ULTRAFINE PM 2.5

A more common problem indoors is particle pollution, and specifically PM 2.5, including dust, copier toner and 3D printer inks, smoke, viruses, germs, bacteria, mold, as well as outdoor pollutants that make their way inside, such as pollen, smog, and wildfire smoke.

In comparing air purifiers it is important to look not just at efficiency but also at effectiveness. Two air purifier technologies - Electronic APART™ and mechanical HEPA - remove particles, although they have differing levels of effectiveness based on how they work and how they are maintained.

Efficiency measures whether an air purifier does a good job of blocking and removing particles. Effectiveness measures whether it cleans the air well. For your health, effectiveness is what matters most.

MECHANICAL ELECTRONIC

HEPA

Mechanical air purifiers use HEPA or HEPA-style filters to physically block and trap particles as they pass through the filter.

HEPA filters can be very efficient in particle collection, however as the filter traps particles, it also clogs, airflow drops, and effectiveness declines.

This block-and-clog technology means HEPA air purifiers need very frequent filter changes to stay effective.

Frequent filter changes add to maintenance and increase the cost-to-own and operate HEPA air purifiers. With multiple units in an office, filter replacement can become a major investment.



APART™

The Brio portable electronic air cleaner, with APART technology, takes a different approach. Particles are charged as they pass by internal ionizing wires. The charged particles are drawn out of the airflow and captured in a disposable cartridge for later removal. This allows clean air to flow freely into the room.



Developed by research scientists and air quality experts at the University of Washington, APART technology traps fine and ultrafine particles, delivering constant, clean air flow and effectiveness over time, with less maintenance and a lower cost-to-own than comparable HEPA/mechanical filter-based portable air purifiers.

Find out more about the APART technology used in Brio air purifiers [here](#).



MEET BRIO, THE INNOVATIVE AIR PURIFIER



Compact, contemporary style
Durable design and materials
Simple controls, easy maintenance



Patented APART air cleaning technology
Peak performance with no clogging
High-capacity, low replacement costs

ABOUT AGENTIS AIR

PROVIDING CLEAN AIR IN HOMES, OFFICES, AND INSTITUTIONS IS ESSENTIAL FOR HEALTH, LONGEVITY, AND PRODUCTIVITY. OUR GOAL IS TO MAKE IT MORE EFFECTIVE.



Agentis Air is a collaboration of research scientists, engineers, and air quality experts on a mission to improve human health and longevity through better indoor air purification technology. With decades of university research and development experience, our innovation team is led by a scientist with over 100 patents including many for advanced indoor air purification technologies.

Developed over five years at the University of Washington's Sensors, Energy, and Automation Laboratory, our patented Advanced Particle Removal Technology (APART™) is designed for the next generation of indoor air quality solutions. Find out more about our patents [here](#).



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