

Indoor Air Quality for Your Business

During and After the COVID-19 Pandemic



AN E-BOOK BY
DONNELLY MECHANICAL



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You are reading an ebook by Donnelly Mechanical
*Improving Indoor Air Quality for Your Business:
During and After the COVID-19 Pandemic*

INTRODUCTION

Now more than ever, indoor air quality (IAQ) solutions have become essential elements of large building ownership and management as the nation continues to navigate the changes brought on by the COVID-19 pandemic and its effect on commercial building operation. As commercial buildings begin to assess reopening plans post-pandemic, it is important to understand the complexities of managing IAQ solutions to most effectively regulate humidity and temperature conditions, as well as reduce the spread of illness.

The quality of air within your building, especially as it relates to the health and comfort of building occupants, is also central to the overall success of your business plan and strategy. In the United States, individuals spend nearly 90 percent of their time indoors where the quality of air is two to five times more toxic than outside air on average.¹ As many Americans begin to transition to in-person workspaces after more than a year of working from home, poor ventilation can dramatically worsen air quality as harmful pathogens and toxic chemicals are circulated via the HVAC system.



¹ “Introduction to Indoor Air Quality.” EPA, United States Environmental Protection Agency, 23 Mar. 2021, www.epa.gov/indoor-air-quality-iaq/introduction-indoor-air-quality#health.

AN OVERVIEW OF THE SARS-COV-2 VIRUS

Over the course of the pandemic, companies and agencies have gained more information on the transmission of the SARS-CoV-2 virus, having determined the sufficient likelihood of airborne exposure that can be further facilitated by poor commercial HVAC conditions.

To combat the spread of the virus in large commercial buildings, organizations such as The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the Centers for Disease Control and Prevention (CDC), and others have released guidelines and recommendations for commercial HVAC and IAQ management that will aid businesses in their efforts to protect their building occupants from sickness while also maintaining an optimal level of workplace productivity.²

Unconditioned or poorly conditioned office spaces place great stress on the respiratory system of even healthy individuals, posing an even greater threat to immunocompromised individuals who live with lower resistance to infection and airborne illness. Through a combination of appropriate HVAC management and IAQ solutions, however, including heating, cooling, ventilation, and filtration operation, commercial buildings can dramatically reduce the likelihood of COVID-19 exposure.

Risk for COVID-19 Infection, Hospitalization, and Death by Age Group									
	0-4 years old	5-17 years old	18-29 years old	30-39 years old	40-49 years old	50-64 years old	65-74 years old	75-84 years old	85+ years old
Cases	<1x	1x	Reference Group	1x	1x	1x	1x	1x	1x
Hospitalizations	<1x	<1x	Reference Group	2x	2x	4x	6x	9x	15x
Death	<1x	<1x	Reference Group	4x	10x	35x	95x	230x	600x

Source: <https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-age.html>

Rate ratios compared to 18- to 29-year-olds. All rates are relative to the 18- to 29-year-old age category. This group was selected as the reference group because it has accounted for the largest cumulative number of COVID-19 cases compared to other age groups. Sample interpretation: Compared with 18- to 29-year-olds, the rate of death is four times higher in 30- to 39-year-olds, and 600 times higher in those who are 85 years and older. (In the table, a rate of 1x indicates no difference compared to the 18- to 29-year-old age category.)

² “ASHRAE Issues Statements on Relationship Between COVID-19 and HVAC in Buildings.” ASHRAE, The American Society of Heating, Refrigerating and Air-Conditioning Engineers, 20 Apr. 2020, www.ashrae.org/about/news/2020/ashrae-issues-statements-on-relationship-between-covid-19-and-hvac-in-buildings.

FINDING THE INDOOR AIR QUALITY SOLUTION THAT'S RIGHT FOR YOUR COMMERCIAL BUILDING

As New York City's premier commercial HVAC provider, Donnelly Mechanical offers our clients the IAQ solutions that will allow businesses to operate under maximum levels of comfort and efficiency during and after pandemic times. Through our expert technical support and experience, commercial building managers and facility managers utilize industry leading HVAC remediation services to most effectively combat the spread of indoor pathogens and disease.

Ventilation

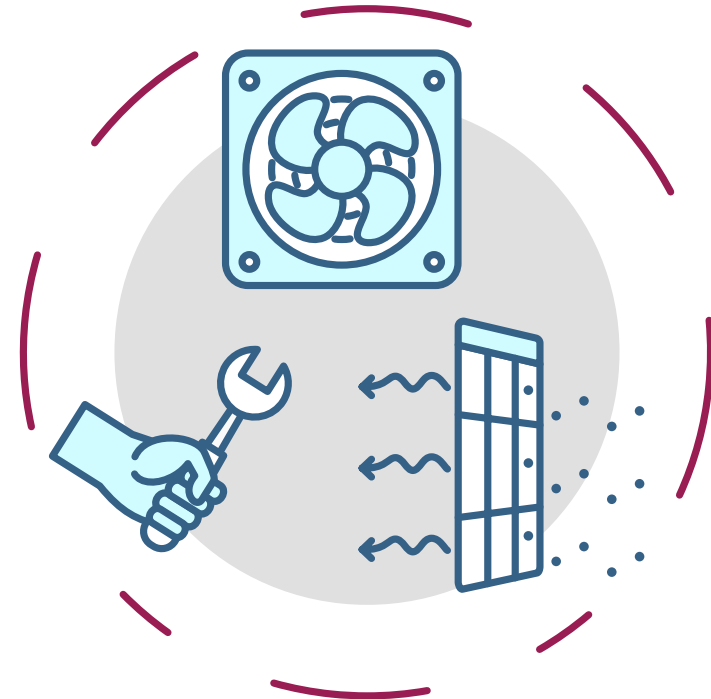
Ensure clean, breathable air is supplied to building occupants through specialized cleaning of ductwork, coils, and vents to limit the accumulation of mold, dust, debris, and odors.

Filtration

Air filters are an essential element of any IAQ strategy, necessitating the identification of the appropriate filter level for large commercial buildings.

Preventive Maintenance

Protect your employees and other building occupants year-round with preventive maintenance for your commercial HVAC system.



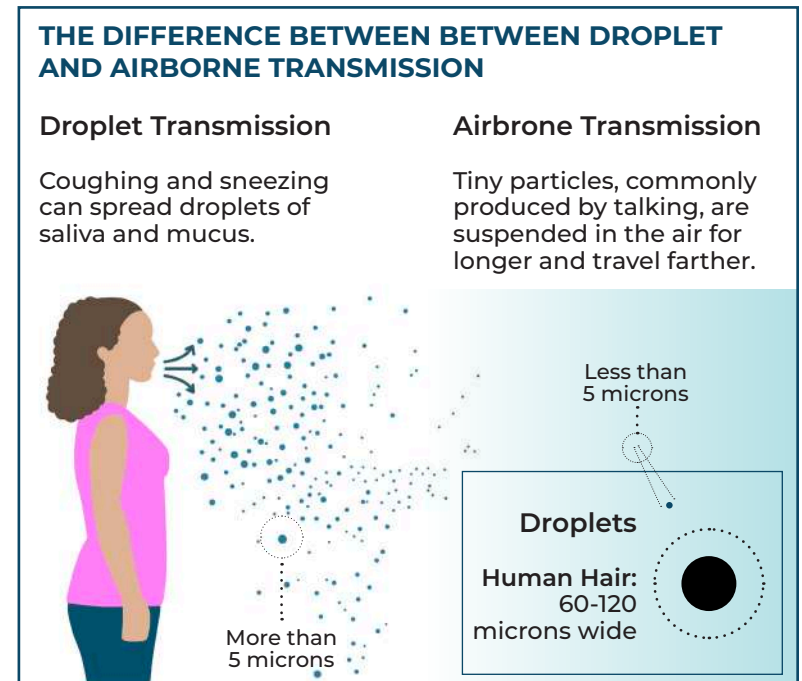
INDOOR AIR AND SARS-COV-2

Understanding the nature of the COVID-19 virus and its impact on indoor air quality is essential to combatting its spread and reducing its overall effect on the health and safety of building occupants.

HOW DOES COVID-19 SPREAD?

Exposure to the virus is a reality that millions of Americans face in daily life — whether at school, work, or home. In large commercial buildings, however, where close proximity with coworkers or customers is commonplace, appropriate HVAC conditions are important to reducing the spread of the pathogens and contaminants that enter the body through airways.

In the case of COVID-19, research indicates that infection can occur via small droplets and particles that may be expelled via the mouth or nose, lingering in the air and circulating via HVAC ventilation and ductwork. According to the CDC, such viruses have great potential to spread from person to person within six feet of one another.³



Source: WHO

RISK FACTORS

Common risk factors⁴ associated with workplace illness due to poor commercial HVAC conditions include the following:

- Business and economic consequences, including commerce, supply, and delivery changes, that may be necessary as businesses continuously adapt to limited capacity guidelines and product or service shortages
- Loss of productivity due to reduced staff and emotional strain or anxiety
- Sick leave and extended absenteeism due to illness, both personal and family-related
- Legionnaires' disease,⁵ a rare but extremely dangerous form of pneumonia caused by the spread of legionella bacteria via HVAC systems

³"How Coronavirus Spreads." CDC, Centers for Disease Control and Prevention, 28 Oct. 2020, www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html. "

⁴Guidance on Preparing Workplaces for COVID-19." Occupational Safety and Health Administration, 2020.

⁵"Legionnaires Disease Cause and Spread." CDC, Centers for Disease Control and Prevention, 25 Mar. 2021, www.cdc.gov/legionella/about/causes-transmission.html.

THE DANGER OF INDOOR PATHOGENS IN COMMERCIAL SPACES

There are many factors that can affect the indoor air quality of your commercial building, most of which can be remedied by appropriate HVAC conditions and IAQ improvement measures.

To facilitate the flow of cleaner, cooler air throughout their commercial buildings, facility managers must avoid maintaining environments conducive to the accumulation of the dangerous particulates that can linger in the air and on surfaces.

DID YOU KNOW?

Damp and dark areas are prone to puddles of condensation that can facilitate the accumulation of mold and other bacteria. When these conditions are allowed to continue, the HVAC components responsible for delivering clean air throughout the building, such as coils and air filters, can quickly become inundated with dirt and dust. Not only do dirty HVAC components pose a greater risk to indoor quality, but they also cost businesses more in energy usage as their commercial HVAC systems work harder to filter air.



PROPER HVAC MEASURES CAN REDUCE DEATHS FROM ANTIBIOTIC-RESISTANT INFECTIONS BY **18%** OVERALL AND BY NEARLY **30%** IN HOSPITALS

Source: <https://www.cdc.gov/drugresistance/biggest-threats.html>

HVAC SERVICES TO COMBAT THE SPREAD OF COVID-19 AND INDOOR PATHOGENS

The most effective control method for containing and combating viral outbreaks is elimination. By containing and removing existing contaminants within a commercial building through the appropriate HVAC and IAQ solutions, companies will be better equipped to maintain healthier working conditions for building occupants both during the pandemic and onward.

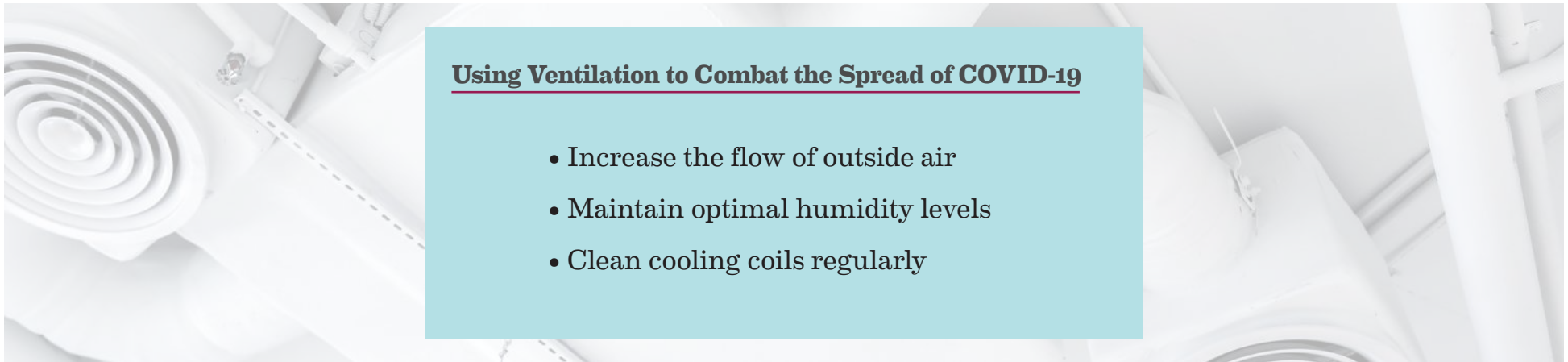
As an industry leader in commercial HVAC service and maintenance for New York City, Donnelly Mechanical offers comprehensive system analysis, maintenance, and modification to better support clients as they navigate their IAQ improvement journey.

Below are just a few of the IAQ solutions we offer at Donnelly to help businesses protect their employees and customers against the COVID-19 virus and prepare for a future with cleaner, more breathable air.

VENTILATION

Because the particles involved in SARS-CoV-2 infection spread more easily in indoor environments than outdoors due to the lack of natural airflow, commercial buildings must be equipped with effective ventilation mitigation strategies that will reduce the concentration and spread of the viral particles that make us sick—the lower the concentration of these particles, the less likely that contaminants will enter the lungs and do damage to the body.

Usually, total replacement of the ventilation system of a commercial building is not necessary. Instead, improvement upgrades can be applied to optimize the current system and eliminate pathogens from air passageways.



Using Ventilation to Combat the Spread of COVID-19

- Increase the flow of outside air
- Maintain optimal humidity levels
- Clean cooling coils regularly

THE IMPORTANCE OF OUTDOOR AIR FLOW

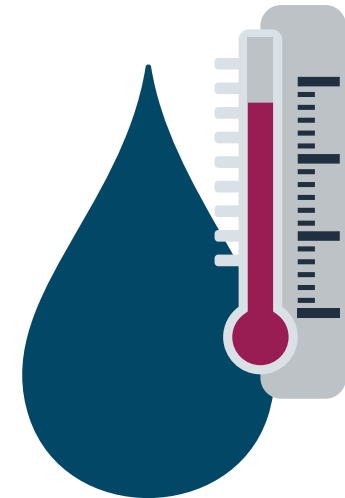
By facilitating the flow of fresh air into a commercial building, clean air can more easily displace pathogens and particles present indoors. By introducing outdoor air into the building, the recirculation of infected air may be dramatically reduced⁶. Because outdoor air is constantly moving, the chances of an individual breathing in infected air indoors are far less likely than with stagnant air alone. Ideally, ventilation of outside air should be increased to the highest level the HVAC system can properly and safely accommodate.

OPTIMIZING HUMIDITY LEVELS FOR PEAK HVAC VENTILATION PERFORMANCE

Commercial buildings should strive to maintain relative humidity levels between 45 and 55 percent in order to decrease the bio-burden of recirculated air ripe with infectious particles that spread infection and illness. Humidity control becomes even more essential in the winter months, when indoor humidity levels can drop to 20 percent and lower due to the drastic changes in temperature during the frigid months.⁷

ELIMINATING PARTICLES WITH FREQUENT CLEANING

By their very nature, commercial HVAC units are incredibly susceptible to fouling and bacterial accumulation. The dank, dark environments that ventilation systems are commonly situated in increase the probability of coil fouling, or the build-up of unwanted organic matter on HVAC heating and cooling coils.⁸ With frequent cleaning of HVAC coils, lost heat can be recaptured to ensure a more comfortable building temperature while also maintaining free air passageways within the ventilation system.



⁶ “Building Readiness.” ASHRAE, *The American Society of Heating, Refrigerating and Air-Conditioning Engineers*, 2020, www.ashrae.org/technical-resources/building-readiness.

⁷ “The Role of Dry Winter Air in Spreading COVID-19.” *University Hospitals, University Hospitals*, 20 Dec. 2020, www.uhhospitals.org/Healthy-at-UH/articles/2020/12/the-role-of-dry-winter-air-in-spreading-covid-19#:~:text=Using%20home%20humidifiers%20during%20winter,19%20and%20other%20viral%20infections.

⁸ “What Is Scale / Fouling?” *CQM, Cooling Quality Management*, 1 Aug. 2019, www.cqm-tech.com/what-is-scale-fouling/.

FILTRATION

Choosing the appropriate filter application for a given commercial building or space can mean the difference between a safe work environment and one that puts building occupants at risk by facilitating the spread of illness.

Organizations have concluded the relative size of the SARS-CoV-2 particles that travel out from the human respiratory system, through HVAC air passageways, and into the lungs of others, which is about 0.1 micrometer (μm).⁹ With this information, businesses will be able to make more informed decisions about their commercial HVAC strategies as they decide which filter type and grade will provide the most protection to their employees and customers.

Understanding how your filtration system works is essential to crafting an effective commercial HVAC strategy for your building. Air filter efficiency is measured as MERV, or Minimum Efficiency Reporting Value, which is used as a standard metric for evaluating the efficiency and performance of HVAC filtration systems.



Photo: Side by side clean vs dirty MERV-13 filter

UNDERSTANDING HVAC FILTERS

MERV filter rates range from (1) to (16); the higher the rating, the more efficient the filter will be at removing harmful particulates in the air and within the air passageways of the HVAC system. In general, sanitation critical buildings—such as hospitals and medical centers that must combat the spread of the virus amongst staff and patients—should use filters with MERV ratings of no less than 13.

CONSIDERING BUILDING PRESSURE FOR OPTIMAL HVAC FILTRATION

Building pressure is an important element to consider when planning for an HVAC filter system upgrade. In order to ensure the lowest level of contaminated air infiltration, facility managers should strive to achieve an airtight seal that unfiltered air will not be able to penetrate. According to the National Air Filtration Association (NAFA), unfiltered air has the same potential to enter a building without proper air filtration measures as through a filtered HVAC system.¹⁰ To establish the most effective filtration for their building, facility managers should consult a trusted commercial HVAC contractor to identify the specifications best suited for the space.

⁹ “Ventilation in Buildings.” CDC, Centers for Disease Control and Prevention, 23 Mar. 2021, www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html#:~:text=HEPA%20filters%20are%20even%20more,with%20SARS%2DCoV%2D2.

¹⁰ IEC Connections; January 2007 Author(s): Stephen W. Nicholas. “Selecting Proper Air Filter Efficiencies for Commercial Buildings.” NAFA, National Air Filtration Association, 8 Aug. 2011, www.nafahq.org/selecting-proper-air-filter-efficiencies-for-commercial-buildings/.

COMMERCIAL HVAC PREVENTIVE MAINTENANCE

HVAC preventive maintenance plans that have been customized by a commercial HVAC contractor for a specific building or space is an essential component of maintaining a safe and healthy working environment for occupants. Without regular inspections and services, problems and hazards with the HVAC system may not be identified in time to avoid costly repairs and replacements. To avoid unexpected issues and costs associated with commercial HVAC upkeep, establish a preventive maintenance plan early on for maximum protection throughout the year, time and again.

WHAT IS INVOLVED WITH COMMERCIAL HVAC PREVENTIVE MAINTENANCE?

Because HVAC equipment and conditions can easily fluctuate with the changing seasons, arranging for preventive maintenance inspections multiple times a year is important to ensuring properly functioning equipment that is capable of preventing the spread of COVID-19 in large buildings. Failure to do so may result in system deterioration as your HVAC equipment strains harder to filter and deliver clean air while also regulating the temperature throughout the building. Below are just a few of the HVAC components that should be inspected as part of regular preventive maintenance:

- Boilers
- Chillers
- Cooling Towers
- Steam and water distribution systems
- Roof top units
- Water source heat pumps
- Air handling units



THE IMPORTANCE OF RETRO-COMMISSIONING

The primary goal of HVAC retro-commissioning is to ensure that each component of an existing HVAC system is functioning as it should be. Donnelly Mechanical's specialized Systems Analysis & Commissioning Group leverages decades of experience to uncover key performance and air quality issues. Performing a full system inspection and analysis can identify problems that are causing ongoing issues such as discomfort, airflow, sound, and performance.

With regards to COVID-19, a system analysis of your HVAC system serves as a seal of approval that the building or space is capable of combating the spread of airborne particles in order to protect building occupants.

While the implementation of any of the IAQ measures discussed will help reduce the spread of the air droplets responsible for SARS-CoV-2 infection, risks to indoor air quality and the health of building occupants are not eliminated. Instead, commercial building and facility managers should consider a layered approach that utilizes a combination of solutions, upgrades, and improvements to achieve the highest possible level of air safety during and after the pandemic.



IAQ SOLUTIONS BY DONNELLY MECHANICAL

At Donnelly Mechanical, we understand that effective IAQ solutions are a growing need amongst owners and managers of large commercial buildings, and we strive to provide these individuals with the tools, services, and expertise they need to achieve healthier work environments for their employees.

Because poor air quality can have a monumental impact on the health and comfort of building occupants, it's important, now more than ever, to implement the appropriate measures to protect individuals from the debilitating effects of COVID-19 and other airborne illnesses in the workplace. Luckily, healthier building environments and reductions in illness can be achieved through a combination of controlled temperature and humidity levels, as well as optimal indoor air quality.

**“Remember, excellent indoor air quality is not only good for employees
—it also benefits the overall business.”**

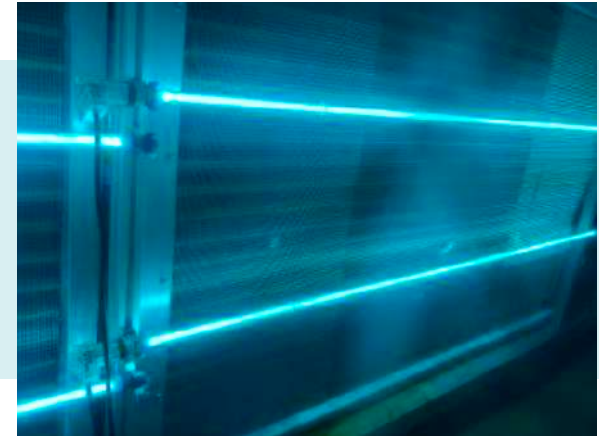


ULTRAVIOLET GERMICIDAL IRRADIATION

Ultraviolet germicidal irradiation (UVGI) is an incredibly effective IAQ solution that utilizes short-wavelength ultraviolet light (UVC) to inactivate and/or kill the harmful microorganisms responsible for infecting workplace environments. Additionally, this solution is a versatile option, offering the added benefit of dual application for in-duct airstream disinfection and air handler component surface disinfection.

Benefits of UVGI

- Elimination of airborne contaminants and particulates
- Increase in operational efficiency
- Reduction in maintenance costs
- Reduction in energy consumption
- Dual application disinfection



HOW DOES UVGI WORK?

The process of air sanitization through UVC technology involves the use of special light bulbs capable of emitting high-intensity short wavelengths that penetrate the inner workings of microorganisms between 100 to 290 nm¹⁸ capable of reducing the accumulation of mold and bacteria by nearly 99 percent.¹¹



UVGI is 99% effective at eliminating bacteria

¹¹ "UV Light." *Stanford Solar Center, Stanford University, 2020, solar-center.stanford.edu/about/uvlight.html.*

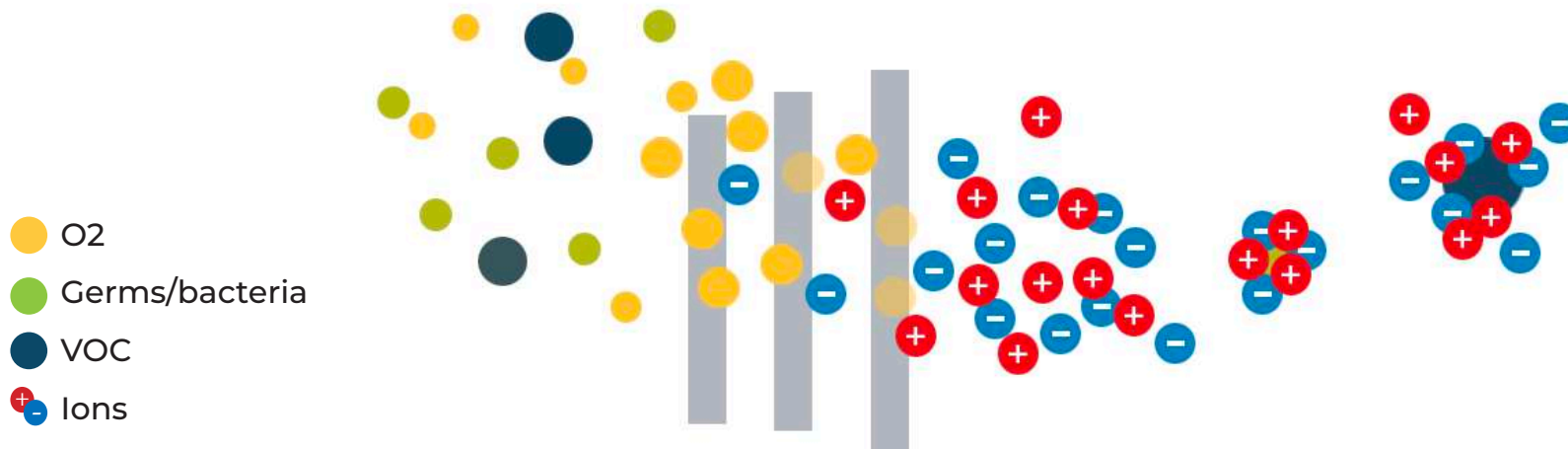
BIPOLAR IONIZATION AIR PURIFICATION

The process of bipolar ionization for air purification utilizes tubing technology that is compatible with existing HVAC systems or portable air cleaners to generate and release positively and negatively charged particles that attract harmful air particles to combat the spread of airborne illness.

HOW DOES BIPOLAR IONIZATION WORK?

When airborne particulates are attracted to the positively and negatively charged particles produced through the process of bipolar ionization, agglomeration or clustering is allowed to occur. When this phenomenon happens, buildings are better equipped to control the flow of air via system filtration.

While it is a relatively new IAQ solution that has been less researched than the more established process of filtration, air purification by bipolar ionization may assist current HVAC equipment in the removal of viruses, potentially including SARS-2-CoV. To ensure the maximum benefit of this solution, the EPA recommends the incorporation of devices that satisfy UL 2998 standard certifications to ensure safe and environmentally conscious air purification.¹²



¹² "Can Air Cleaning Devices That Use Bipolar Ionization, Including Portable Air Cleaners and in-Duct Air Cleaners Used in HVAC Systems, Protect Me from COVID-19?" EPA, Environmental Protection Agency, 17 Mar. 2021, www.epa.gov/coronavirus/can-air-cleaning-devices-use-bipolar-ionization-including-porta-

IAQ TESTING AND MONITORING

One of the simplest yet effective solutions for achieving great indoor air quality is long-term air monitoring. There are several automation devices, such as thermometers and humidity trackers, that offer facility managers the oversight they need to more effectively manipulate air quality throughout their commercial building.

By working with a trusted commercial HVAC contractor, buildings can utilize monitoring meters and sensors that will actively track levels of carbon dioxide, temperature, humidity, volatile organic compounds (VOCs), and particulate matter, both remotely and on-site. At Donnelly Mechanical, we provide our clients with comprehensive reports that present findings clearly to recommend the best course of action for achieving better indoor air quality, all based on the unique specifications of the building.



Donnelly testing equipment

THE DONNELLY DIFFERENCE

Donnelly Mechanical is proud to serve as the premier provider of IAQ solutions for larger commercial buildings and spaces across New York City. If you have any questions about the above solutions or other ways to achieve better indoor air quality by upgrading your current HVAC system, our project managers have the expertise and tools you need to be successful. That's the **Donnelly Difference**.

As a company, you have a vested interest in protecting the health, safety, and well-being of employees and other building occupants, because great indoor air quality also has a direct impact on the productivity and overall success of the business. That's why Donnelly Mechanical is dedicated to informing building and facility managers of the importance of custom-made IAQ solutions that will make a quantifiable difference to the quality of life within large commercial spaces.

COVID-19 AND THE FUTURE OF HVAC FOR COMMERCIAL BUILDINGS

The pandemic has forced owners and managers of large commercial buildings to completely rethink their HVAC strategies, necessitating close consideration of the IAQ solutions that will work best for any given building. These changes are unprecedented in nature, which means the COVID-19 virus and its successors will have lasting impacts on the nation's buildings and their operation. For this reason, building owners and facilities managers must think ahead and strive for better indoor air quality and greener building practices in the long-term, even after the nation emerges from the pandemic.

From filter changes to system cleanings, from equipment optimization to HVAC condition testing and monitoring, Donnelly Mechanical offers the service and know-how necessary to ensure happiness, comfort, and plentiful health building occupants year-round.

A BRIGHTER, HEALTHIER FUTURE.

Everything you need to transform your commercial space for the better, millions of air particles at a time.

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718.865.2294

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