

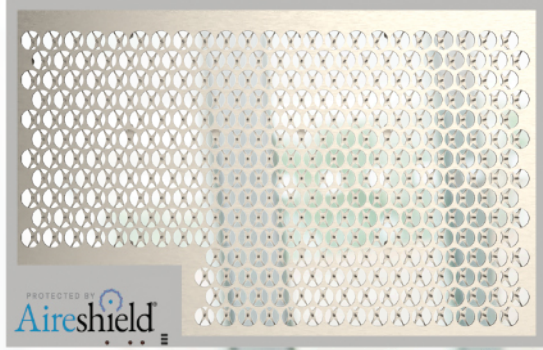


**Reviveaire**  
 Plasmic Powered Air Disinfection

**A Clean Air Solution**  
 for schools, medical, offices,  
 airports and residential



HARDI



Reviveaire LLC  
217 Market Street  
Kenilworth, NJ 07033 USA  
+1 (908) 987-7089



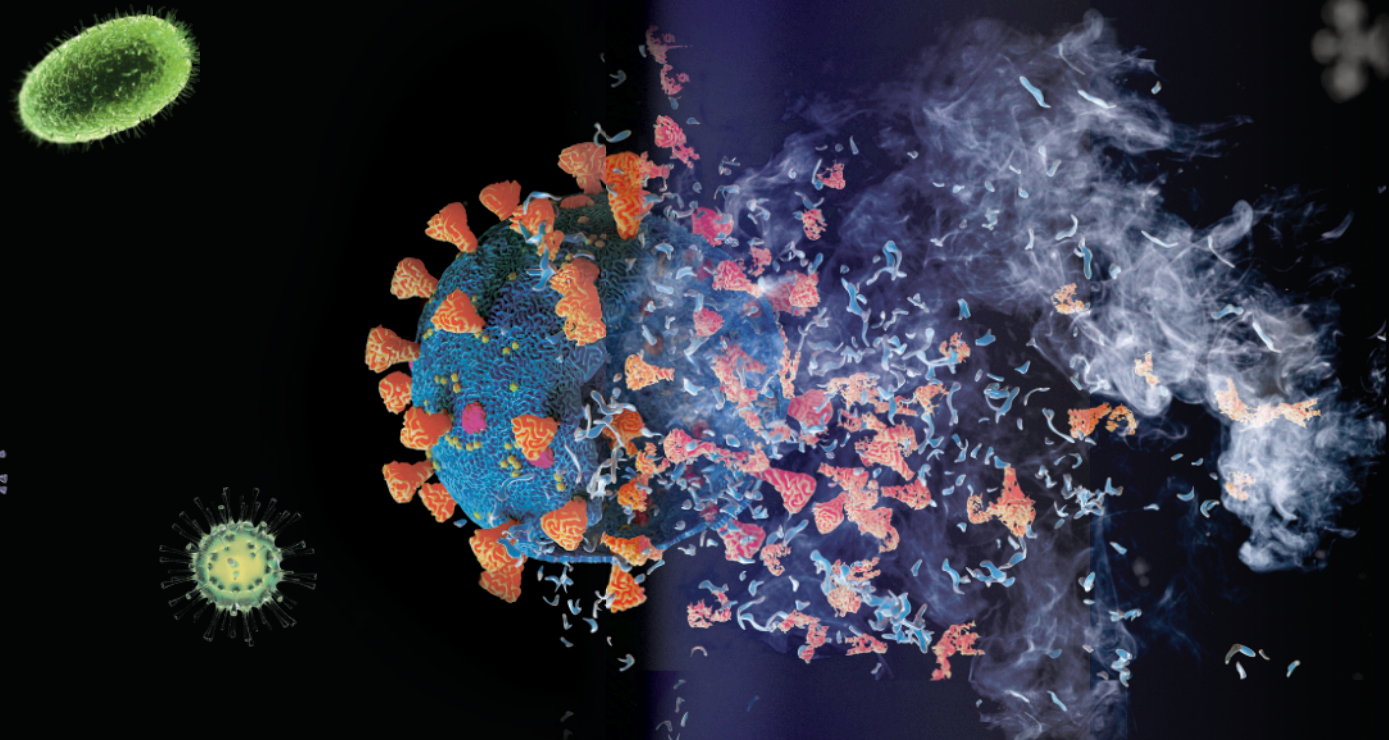
**Learn more**  
info@reviveaire.com  
www.reviveaire.com



001 12-19-23

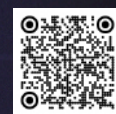
PROTECTED BY  
**Aireshield**

# Plasmic Powered Air Disinfection



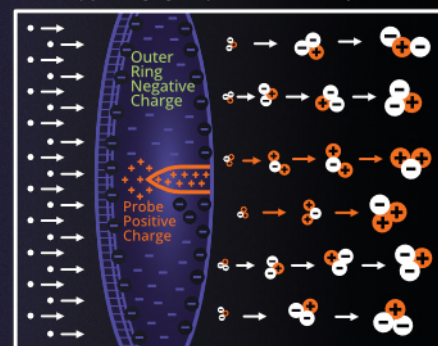
## Third Party Tested, Certified and Verified

- 97.2 %** ASHRAE 241 corrected MS-2 efficiency at 60 minutes
- 57.1 cfm** Air cleaning system equivalent clean air rate.
- 0 ppb** No ozone generation over a 24-hour period. Average chamber concentration 2.33 ppb.
- CSA 22.2** No 187-20 - Section 7.5 Avg 8Hr .000935 PPM
- 99.99 %** H1N1 aerosol kill rate Laboratory test
- 98.05 %** Natural bacteria in the air killing rate field test
- 99.98 %** Staphylococcus albus killing rate Laboratory test
- 99.97 %** Live SARs test performed by Innovation Bio-analysis



**Learn more**  
Watch our YouTube Promo Video

### PM2.5 AGGLOMERATION



Visual representation of the non-thermal plasma field created within the Airesshield chambers. The positive pin effectively charges PM2.5 particles as they traverse the field, while the outer rings carry a negative charge, attracting and agglomerating oppositely charged particles to form larger particles. These larger particles undergo sedimentation out of the air flow, unless captured by a post filter, which effectively increases the post filter's MERV rating.

As buildings become increasingly airtight and energy-efficient, the risk of indoor air pollution rises. Despite standard ventilation and air filtration, indoor contaminants accumulate, posing health risks to occupants due to pathogens.

In the ever-evolving landscape of indoor air quality, Reviveaire introduces Airesshield, our state-of-the-art HVAC filtration solution. It interrupts the chain of airborne transmission between individuals, promoting healthier breathing.

Airesshield's seamlessly integrates advanced pathogen filtration into both residential and commercial HVAC systems. Its efficacy has been independently certified through rigorous third-party testing.

Protect your indoor air quality today with Reviveaire's Airesshield. Experience cleaner, safer breathing in your home or workplace.

Particles: In plasma, the presence of charged particles can cause electrostatic forces



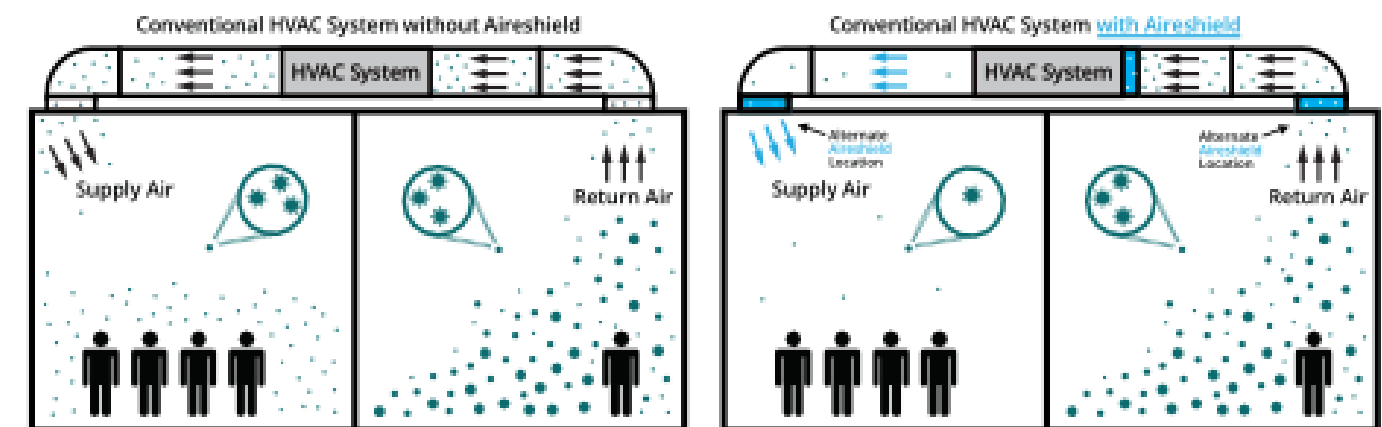
among the particles. Particles with the same charge repel each other, while those with opposite charges attract. This attraction results in the aggregation or clumping of smaller particles into larger formations, affecting the size distribution of particulate matter in the plasma.

This aggregation process can enhance the performance of your existing post-MERV-rated filter.

For instance, a MERV8 filter could effectively perform at a MERV13 level due to this effect.

**“While HVAC systems and purified air cannot solve all aspects of infection control, they can be effective against the distribution and biological burden of infectious aerosols.”**

Excerpt: ASHRAE position document on infectious aerosol - April 14, 2020



HVAC systems will increase the spread of aerosols within buildings without a pathogen mitigation strategy.

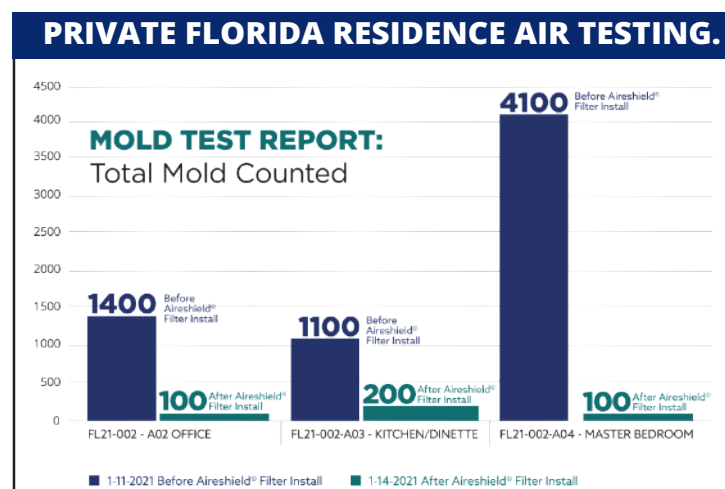
**Groundbreaking Pathogen Disinfection Technology.**



**"There are 16 kinds of bacteria, fungi and mold, in homes."**

**HOMES:**

As we spend more time at home today, discover the critical link between code minimum ventilation rates in residential HVAC systems and the potential impact on occupants when a virus strikes or general IAQ and sub-micron particle control. In a household where one person becomes infected, or code mandated minimum, inadequate ventilation allows airborne pathogens to linger. This increases the risk of transmission, putting everyone at greater vulnerability. Step into the unseen world within your home, where indoor air transforms into a bio dome of life. Teeming



Third party test ACM engineering & environmental services. An overall average reduction rate of 97% when testing for Basidiospores, Aspergillus, Penicillium, Ascospores and Bipolaris.

with complex organisms and sub-micron particles, it's a microscopic ecosystem. Unveil the mystery and take control of your indoor environment with Reviveaire. Our solutions empower you to breathe cleaner, healthier air inside your home—where every particle

matters and your well-being takes center stage.

Elevate your home environment with enhanced filtration solutions, mitigating the impact of viruses and fostering a healthier, safer living space for all.

**OFFICES:**

Embark on a journey through the hidden microcosm within your office space, where indoor air evolves into a biodome of intricate organisms and sub-micron particles. Our workplaces host a thriving ecosystem, often unnoticed.

Worker absenteeism in the United States alone caused by workplace hogen mitigation strategies costs the US economy billions of dollars.

Discover a new era of clean and invigorating indoor air with Reviveaire Aireshield Technology. We provide the



tools to navigate this unseen terrain, ensuring a healthier, more productive office environment—where every breath supports your well-being and performance.

**"Absenteeism and reduced productivity impact the USA economy by billions of dollars."**



**Protect the ones you love with Aireshield.**

**Increase employee productivity, reduce sick days.**

## HOSPITALS:

Amid the pursuit of healing, medical spaces host a hidden world. Step into the delicate ecosystem thriving in every corner of your hospital. Medical facilities are exposed to an extremely high impact of airborne pathogens. Uncover the power to safeguard against unseen threats with Reviveaire's Aireshield. Elevate patient care and staff well-being by creating a disinfected environment that champions health, one breath at a time.

Your hospital or medical facility is fortified against these threats with our cutting-edge solutions.

Infectious risk management strategies require the following trifecta:

- Ventilation strategy
- Consistent surface disinfection strategy
- Pathogen filtration strategy

While all three are important, pathogen control is your only line of direct defense of what gets

into the air and stays in the air. Airborne pathogen disinfection has the potential to lower airborne nosocomial (hospital-acquired) infection rates significantly. While specific statistics can vary based on factors such as the type of pathogens, the efficiency of filtration systems, and overall hospital hygiene practices, several studies support the efficacy of air quality interventions in healthcare settings.



- COVID-19
- All Strains of Influenza
- Avian Bird Flu
- Pulmonary Tuberculosis
- Bacillus Pneumonia
- Chicken/Monkey Pox
- Measles
- Rubella
- Mumps
- Hand Foot Mouth Disease
- Noru Legionella Pneumonia
- Drug Resistant Bacteria
- Mold
- Fungus



- **Reduced Airborne Pathogens:** High-efficiency designs can effectively capture and eliminate airborne pathogens, reducing the risk of transmission within hospital environments. These technologies can be designed for common area air movement, operating rooms, as well as critical applications like negative and positive pressure confinement rooms, where localized airborne disinfection is required.
- **Lower Respiratory Infections:** Air disinfection coupled with proper ventilation has been associated with decreased

respiratory infections, a common source of nosocomial infections.

- **Positive Impact on Patient Outcomes:** Improved air quality may contribute to better patient outcomes, shorter hospital stays, and decreased postoperative complications.
- **Studies on Air Disinfection:** Research studies have demonstrated a reduction in airborne microbial contamination and associated infection rates.

While exact statistics can vary, the implementation of comprehensive air quality measures aligns with the broader goal of enhancing patient and medical staff safety in healthcare

facilities. Hospitals must adopt a multi-faceted approach, combining airborne pathogen disinfection and strict hygiene protocols to create an environment that minimizes the risks of nosocomial infections.

**“As long as one person is infected in a confined space, more than half of the people or things in the room will be covered with viruses after 4 hours.”**

Research Group from Kelly Reynolds, Assistant Professor, School of Public Health, University of Arizona, USA

**The Aireshield kills 99.9% of live SARS virus.**

**Originally Developed for the Healthcare Industry.**

## PUBLIC SPACES:

Enter the dynamic microcosm thriving within public spaces:

- K-12 schools
- College universities
- Auditoriums
- Airports
- Subways / train stations
- Retail stores
- Daycare centers
- Senior living
- Elevators
- Transient spaces
- Anywhere where people move through and deposit their bio-prints.

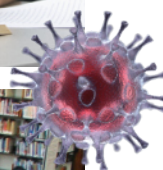
These spaces become just as complex as hospitals due to the sheer volume of people moving in and out of these spaces. In these bustling environments, the need for pathogen filtration is paramount.

Elevate the safety of these spaces with Reviveaire's Airesshield technology and align with ASHRAE Standard 241 building readiness plan to reduce infectious risks. Our cutting-edge solutions redefine clean air, ensuring every breath in these close proximity settings is a breath of safety and well-being.

### OCCUPANT DENSITY RELATIVE TO OFFICES, ASHRAE 62.1 SPECIFIES

Auditorium:	30x
Places of worship:	24x
Cafeterias/bars:	20x
Transportation:	20x

**“Higher occupant density elevates the risk of infection, as close proximity facilitates the spread of airborne pathogens.”**



## PRODUCT FEATURES: SPECIFICATIONS:

The Airesshield, a non thermal plasmic disinfection (NTPD) device, which can eliminate harmful airborne pathogens (including submicron particulates) using a multi-patented confined field plasmic disinfection technology.

The air disinfection process is highly efficient in contrast to standard air filters.

- Any building, any size unit!
- Eco-friendly and energy-efficient
- Quiet operation: With no moving parts and ultra-low static pressure drop, the Airesshield features low noise with a max of 25 decibels.
- Improves existing post filter MERV rating without static issues
- Adaptability is easy. The Airesshield is designed for new construction or retrofit applications and can be installed into any forced air HVAC system.
- Complies with the new ASHRAE 241 building readiness standard.
- Filter installation is multi-orientation: The Airesshield can be installed vertically, horizontally or angled.

### WARRANTY

- The NTPD system shall be warranted to be free from defects in material and workmanship for three (3) years.
- Operating life of the system shall be a minimum of 10 years without replacement or major service.

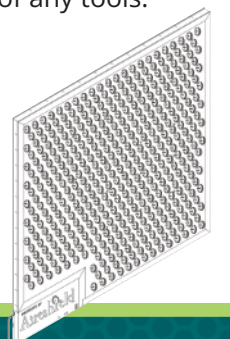
### NON-THERMAL PLASMIC DISINFECTION (NTPD)

- Provide a NTPD for the control of viruses, bacteria, and mold control inside each equipment it is installed in. The NTPD shall be designed to operate between 200 FPM and 500 FPM for a theoretical 99% air disinfection.
- Construction. The NTPD System shall be of aluminum, stainless steel, and plastic construction.
- Safety protocols are designed into the Airesshield to ensure no electrical shock potential.
- Air proving switch shall be included to ensure the NTPD disinfection device is de-energized if the airflow is shut off.
- All exterior safety signage shall be permanently applied to the device with UL warning requirements.
- Independent Testing. The device submitted shall be safety listed by UL (Underwriters Laboratories). Also conforms to UL 867, and conforms to ASHRAE standard 241 modified UL 2998.
- The NTPD device's power consumption shall be a maximum of 12 watts for the largest cross-sectional area.
- The output power to the device shall be factory set at 5500 volts, at very low amperage, with safety protocol cutouts to protect against short-circuiting ensuring a safe product for people, with a capacity to be increased to 10,000 volts if required.

- The NTPD device shall be designed to slide into a standard filter track without the need for modifications.
- Service of the NTPD device shall be done with a factory supplied tool, not requiring any chemicals. Alternatively, the device can be washed down with water once the power supply control box is removed.
- Warranty. NTPD Air Disinfection System, shall be warranted to be free of defects in workmanship and material for a period of three years from the date of shipment.

### MAINTENANCE

- Each NTPD device is provided with a fiber cleaning tool bit to match the diameter of the plasma pin and chamber.
- The NTPD device shall be designed to be easily removable requiring no tools. The device shall be designed to offer a quick release of the power supply control box for servicing or cleaning.
- No chemicals shall be required or used to clean the NTPD device.
- Pre-filter mesh protective screen shall be designed in such a way to be removable, cleanable with water, and reinstalled without the need of any tools.



**Higher density equals higher Infection potential.**

**Easy to specify, install and maintain.**

# THE SUSTAINABLE SOLUTION FOR AIRBORNE PATHOGENS:

## SUSTAINABILITY

The Airesshield low static pressure design offers a lower electrical power draw, saving electricity costs.

The Airesshield does not require consumables, which means lower operating costs and no land fill. No handling of contaminated filters.

The disposal of particulate air filters in landfill sites results in various environmental and health consequences:

- Landfills emit pollutants such as dust and gases that further contaminate our precious outdoor air.
- Health risks to residents near landfills lead to respiratory problems, but more urgently, will contaminate groundwater with toxins.
- Toxicity potential from particulate matter (PM2.5) emitted from these landfills is twice as harmful as other waste sites.
- Non-biodegradable pollutants will cause environmental and health impacts.



## INSTALLATION AND MAINTENANCE

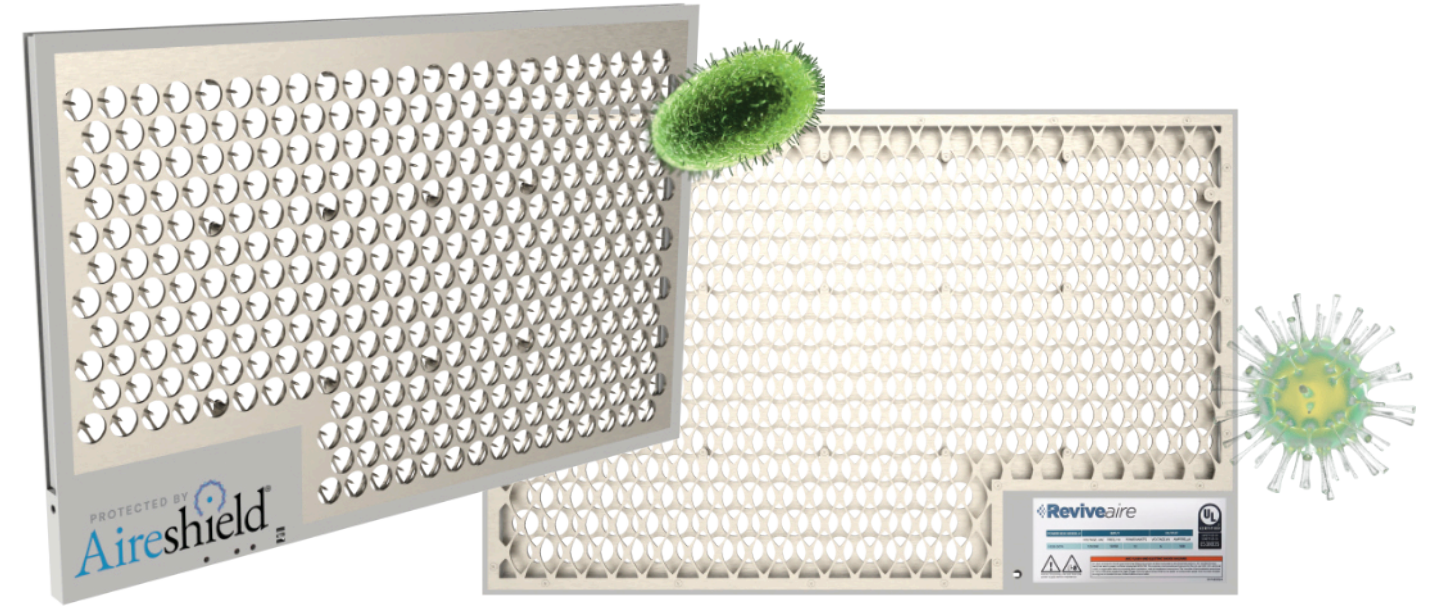
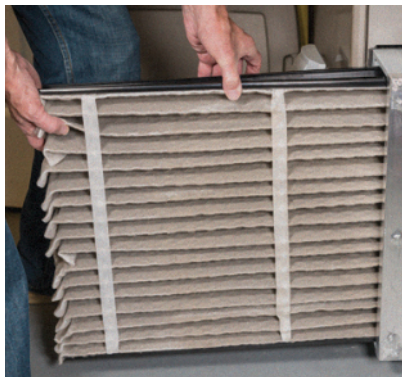
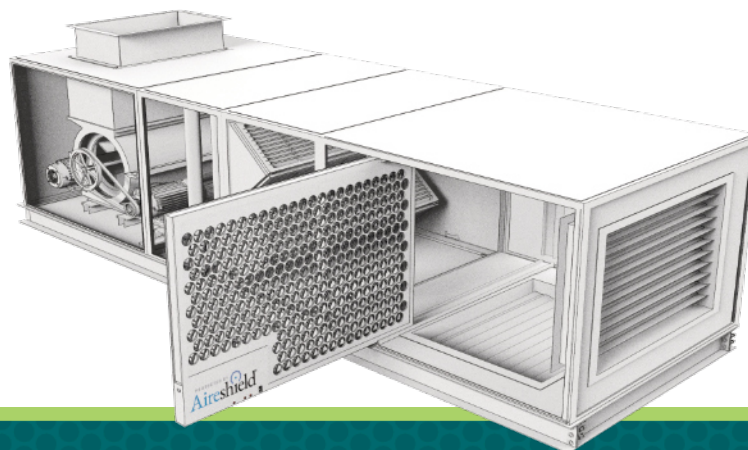
The Airesshield disinfection device does not require any consumables or replacement parts. It offers service technicians the peace of mind of not handling contaminated materials.

Maintenance is easy; simply brush pins (with supplied tool) twice a year!

To wash a cleanable NTPD device with water, begin by removing the device from its housing, disconnecting the power box, and inspecting it for any visible dirt or debris. Position the NTPD device on a stable surface outdoors or in a large sink and gently spray it with water, starting from the clean side and working our way to the dirty side to push contaminants out.

Take care to avoid tearing or damaging the prefilter mesh or device material. Once thoroughly rinsed, allow the NTPD device to air dry completely, typically taking about an hour under moderate conditions.

Once dry, reassemble the device into its housing and reinstall it back in its location. Regular maintenance like this ensures optimal air quality and efficient performance of your NTPD device system.



## POWER REQUIREMENTS

The Airesshield is designed with universal inlet power: adaptable between 120 – 220 volts, 50/60 Hz.

The Airesshield can be powered by the new or existing air handler power supply. Alternatively, the Airesshield can be connected to any 120v service outlet, and uses a maximum of 12 watts.

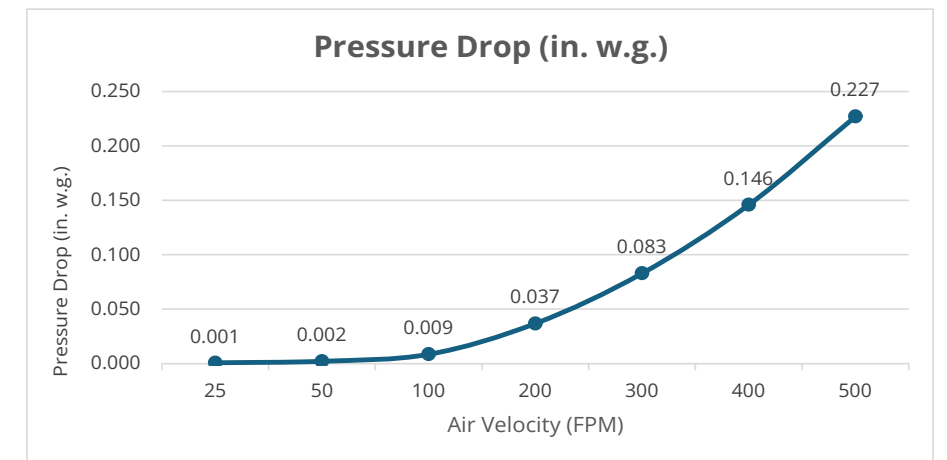
MODEL #	NOMINAL SIZES*
AS-1224-1	12" x 24" x 1"
AS-1625-1	16" x 25" x 1"
AS-2020-1	20" x 20" x 1"
AS-2025-1	20" x 25" x 1"
AS-2424-1	24" x 24" x 1"

← The Airesshield is available in both standard and custom filter sizes.

\* Nominal sizes in inches, actual dimensions are 1/8" smaller than nominal dimensions

## TYPICAL STATIC PRESSURE DROP

- 100 FPM - 0.009" w.g.
- 200 FPM - 0.037" w.g.
- 300 FPM - 0.083" w.g.
- 400 FPM - 0.146" w.g.
- 500 FPM - 0.227" w.g.



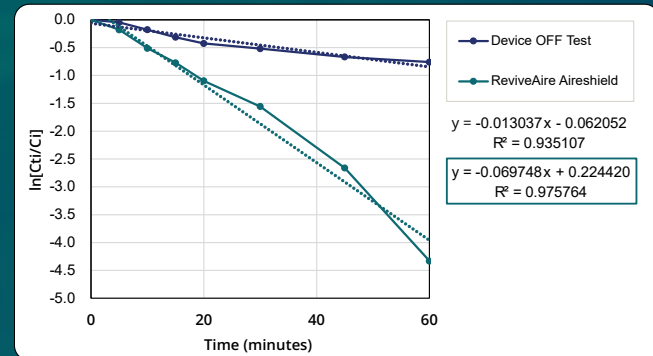
← A simple new clean air solution. Slides into existing air filter rack(s) with a two wire connection. The Airesshield has multiple installation configurations.

**Eco-friendly and Energy Efficient.**

**Airesshield: The sustainable solution.**

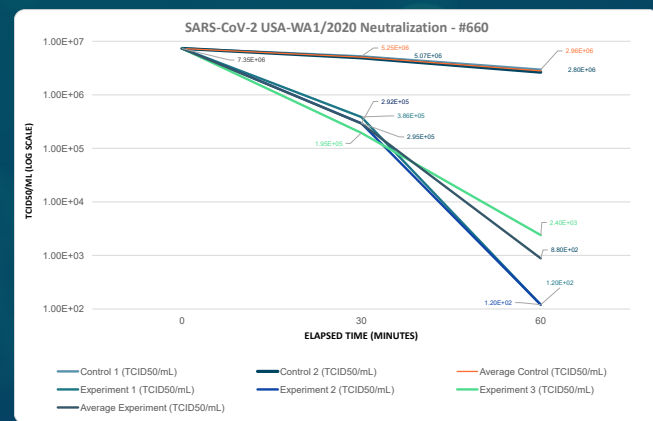
# PATHOGEN REMOVAL EFFECTIVENESS:

## LMS TECHNOLOGIES MS2 BACTERIOPHAGE (ASHRAE 241)



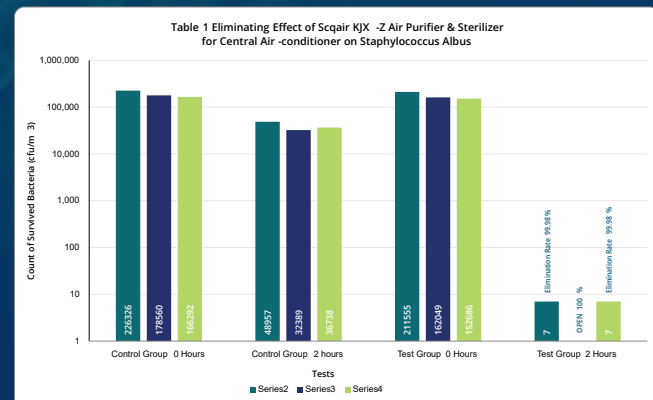
Standard 241 corrected MS2 eff: 97.2%,  $V_{acs}$  (CFM) = 57.1, tested by LMS Technologies.

## INNOVATIVE BIOANALYSIS SARS-COV-2



Innovative Bioanalysis, third party tested SARS-CoV-2, resulting in 99.97% after 60 minutes as well as Omicron.

## CHINESE CENTER FOR DISEASE CONTROL & PREVENTION TEST REPORT



Staphylococcus Albus Disinfection: 99.99% reduction by Chinese Center for Disease Control & Prevention

## SARS SURROGATE INTERTEK REPORT

TEST PARAMETER (W FILTER)	TEST RESULT	NATURAL DECAY RESULT	UNITS
ORGANISM	SPECIES	COLIPHAGE $\phi$ X174	---
	ATCC N.	13706-B1	---
	CHALLENGE CONCENTRATION	$5.0 \times 10^9$	PFU/mL
SAMPLES	0	TNTC (2628)	TNTC (2628) PFU
	15	TNTC (2628)	TNTC (2628) PFU
	30	TNTC (2628)	TNTC (2628) PFU
	45	234	TNTC (2628) PFU
	60	156	TNTC (2628) PFU
	75	66	TNTC (2628) PFU
	90	21	TNTC (2628) PFU
	105	10	TNTC (2628) PFU
	120	10	TNTC (2628) PFU
RESULTS	---	99.6%	---

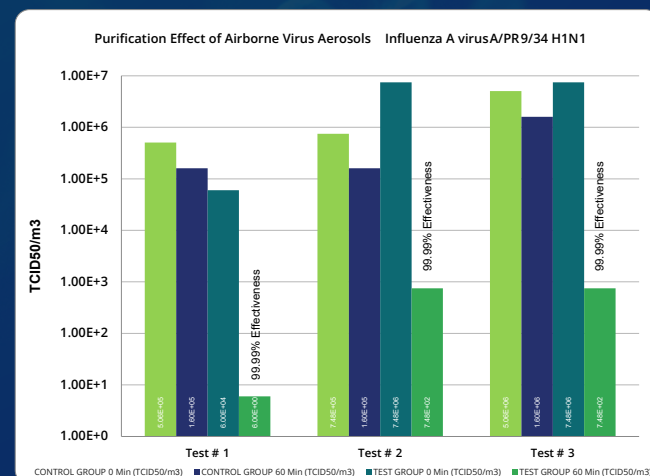
Phi-X174, a surrogate for SARS-CoV-2, achieved an inactivity rate of 99.6% after 60 minutes in the test chamber.

## S. EPIDERMIDIS BACTERIA INTERTEK

TEST PARAMETER (W FILTER)	TEST RESULT	NATURAL DECAY RESULT	UNITS
ORGANISM	SPECIES	S. Epidermidis	---
	ATCC N.	1228	---
	CHALLENGE CONCENTRATION	$8.8 \times 10^8$	CFU/mL
SAMPLE	50	TNTC 2628)	TNTC (2628) CFU
	15	TNTC 2628)	TNTC (2628) CFU
	30	TNTC 2628)	TNTC (2628) CFU
	45	218	TNTC (2628) CFU
	60	177	TNTC (2628) CFU
	75	111	TNTC (2628) CFU
	90	108	TNTC (2628) CFU
	105	76	TNTC (2628) CFU
	120	59	TNTC (2628) CFU
RESULTS	---	97.7%	---

BACTERIA TESTED - S. Epidermidis kill rate of 97.7% after only 2 hours in the test chamber.

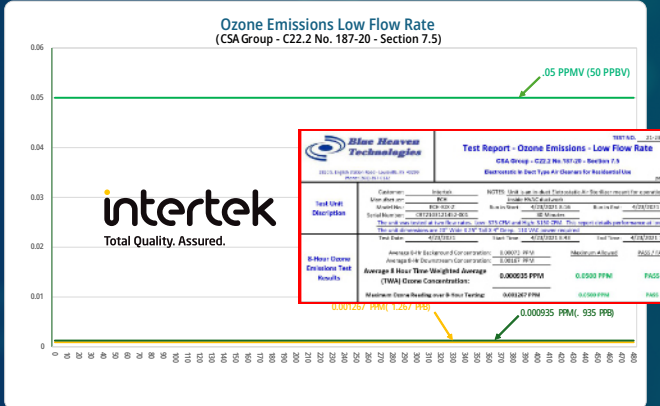
## GUANGZHOU INSTITUTE OF MICROBIOLOGY H1N1 TEST



H1N1 Disinfection: 99.99% reduction by Guangzhou Institute of Microbiology using a 1 hour chamber test.

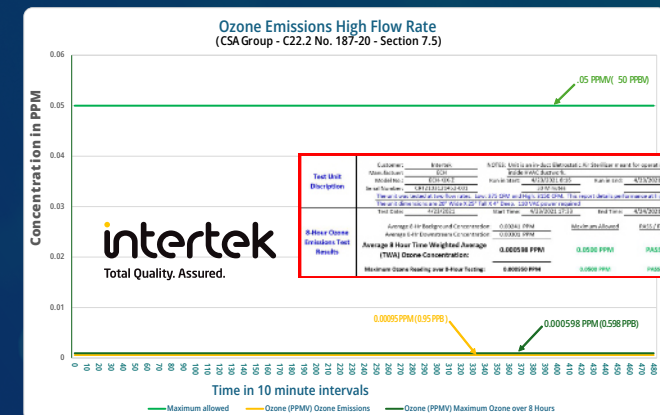
# OZONE TEST RESULTS:

## CSA TEST: OZONE EMISSIONS AT LOW FLOW RATE



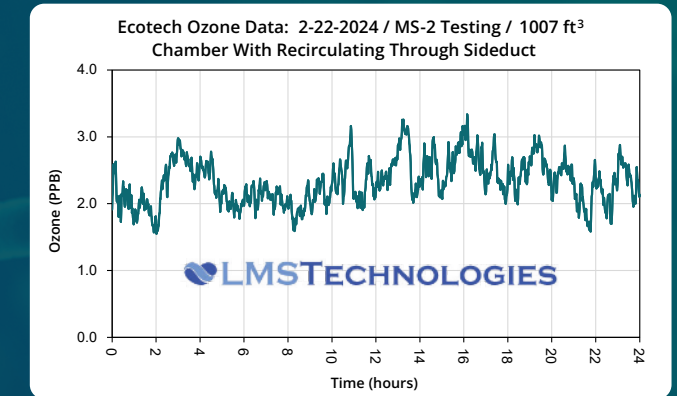
Eight hour time weighted average, 0.935 PPB.

## CSA TEST: OZONE EMISSIONS AT HIGH FLOW RATE



Eight hour time weighted average, 0.598 PPB.

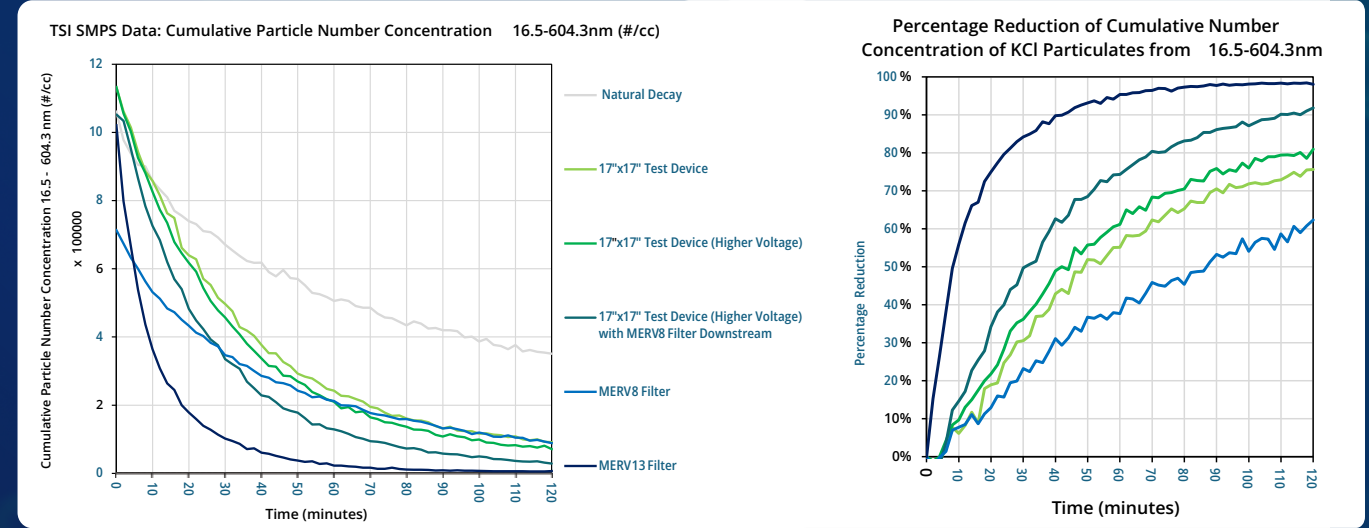
## ASHRAE STANDARD 241 OZONE TEST



The Aiareshield was energized in an ASHRAE 52.2 test duct, connected to a 1007 ft<sup>3</sup> test chamber recirculating the airflow at 200 CFM for a 24-hour period.

There was no ozone generation observed during this test period. The average ozone concentration over this 24-hour period was 2.33 ppb.

# PARTICULATE REDUCTION USING NON THERMAL PLASMA:



The Aiareshield when used in concert with a MERV 8 post filter will achieve similar performance as a MERV13 after 120 minutes in an environmental chamber.

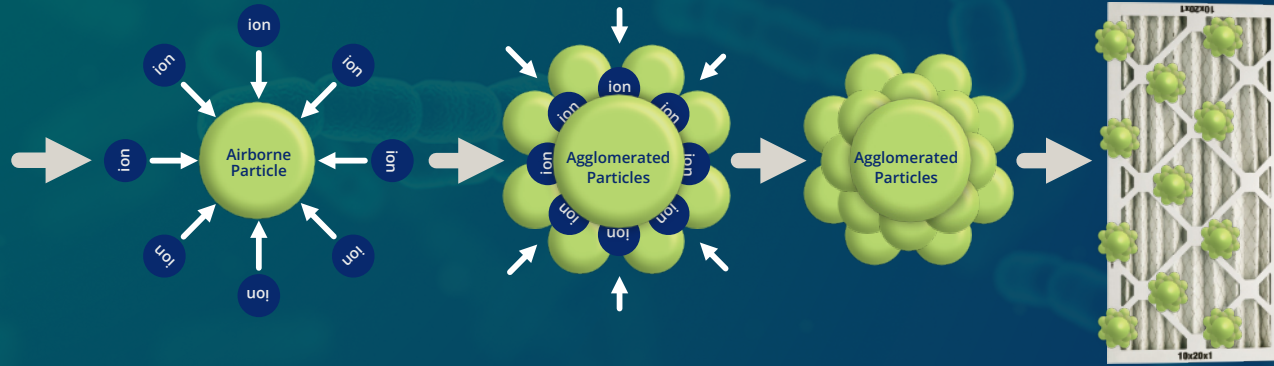
**Third Party Tested Airborne Pathogen Disinfection.**

**Near Zero Ozone Emission Levels.**

## AGGLOMERATED BY CHARGED ATTRACTION:

AIRESHIELD PLASMA FIELD

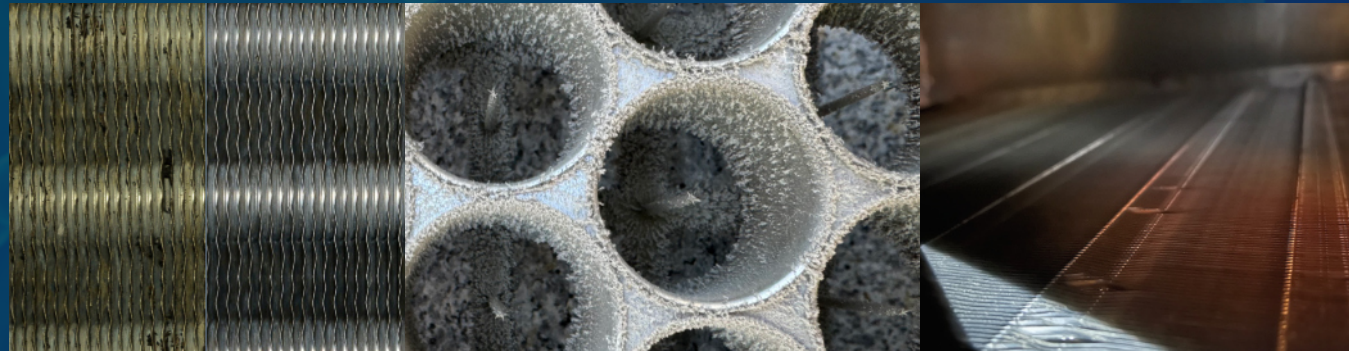
**CHARGED ATOMS OR MOLECULES** ONCE THE IONS ATTACH TO THE PARTICLE, THE PARTICLE GROWS LARGER BY ATTRACTING NEARBY PARTICLES OF THE OPPOSITE POLARITY, THEREBY INCREASING THE FILTRATION EFFECTIVENESS. CHARGED ATOMS OR MOLECULES



When particulate matter travels through a non-thermal Airesshield plasma field, it encounters the unique effects of plasma, commonly referred to as the fourth state of matter. Plasma consists of an equal number of positively and negatively charged particles—ions and electrons respectively—which grant it distinctive characteristics. These characteristics significantly modify the behavior of airborne particulate matter as it passes through the non-thermal Airesshield plasma field.

Particulate accumulates charged ions that facilitate the bonding or adherence of particles, contributing to the conglomeration process. Moreover, the presence of charged particles within the plasma exerts electrostatic forces on the particulate matter. Particles with the same charge repel each other, while those with opposite charges attract. This dynamic leads to the aggregation or conglomeration of particles, where smaller particles combine to form larger ones.

## BIOFILM EFFECTS ON COOLING COILS:



↑ FIG 1 The presence of biofilms on the cooling coils of commercial air conditioning (AC) units can significantly reduce the heat transfer efficiency of the coils and may lead to the aerosolization of microbes into occupied spaces of a building.

© 2019 John Wiley & Sons A/S. Published by John Wiley & Sons Ltd.  
SOURCE: HVAC Insider Jan 2020. <https://hvacinsider.com/new-cooling-coil-restoration-process-delivers-measurable-savings/>

↪ Pictured FIG 2 & 3. above and to the right is a residential test install. The Airesshield filter was left (neglected) for two years without filter service. Notice the extreme amount of buildup on the center photo. What was observed was, the coils preceding this filter where extremely clean, without a post filter.

PHOTO SOURCE: Ellison Rd., Watchung NJ test install.

## APPLICATION & LARGE SCALE USAGE:

### MEDICAL APPLICATION:



**N**on-thermal plasma disinfection devices ensure hygiene and safety for people indoors. In medical buildings, where sterilization is paramount, these devices are integrated into HVAC eliminating harmful pathogens. With stringent health standards, Airesshield provides an added layer of protection, safeguarding patients, staff, and visitors from potential infections.

### UNIVERSITY, BEFORE AND AFTER INSTALL:



**Educational institutions**, spanning K-12 school and universities, benefit immensely from the deployment of Airesshield technology. With large numbers of students, faculty, and staff congregating daily, maintaining a hygienic environment is crucial for minimizing illness-related absences. By integrating the Airesshield into HVAC systems, schools can create an optimal learning environment that prioritizes the health and well-being of everyone on campus.

### COMMERCIAL:



In **commercial spaces**, Reviveaire's disinfection devices offer peace of mind by continuously sanitizing the air. This proactive approach not only enhances the overall cleanliness of the environment but also fosters a healthier atmosphere for productivity and customer satisfaction.

### TRAIN STATION:



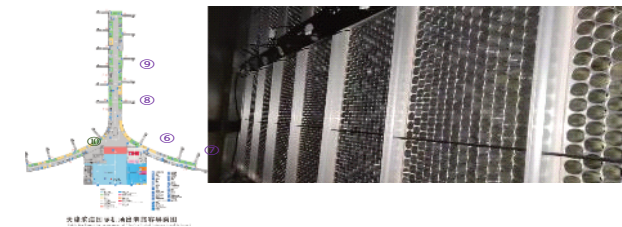
**Gathering areas**, including event venues and recreational facilities, rely on Reviveaire's Airesshield technologies to uphold standards like ASHRAE 241 during gatherings and activities. Whether hosting concerts, conferences, or sporting events, organizers can instill confidence in attendees by ensuring that the air they breathe is free from harmful pathogens.

### SUBWAY / BUS CABINS:



**Buses and train cabins** present unique challenges in maintaining cleanliness and preventing the spread of germs among passengers. By installing Airesshield technologies within these confined spaces, public transit operators create a healthier environment for commuters, reducing the risk of travel related illness transmission. Whether traversing short distances or embarking on long journeys, passengers can travel with peace of mind, knowing that measures are in place to safeguard their health and well-being.

### AIRPORTS & BUS TERMINALS:



**Airports, bus and train stations** serve as bustling hubs of transit, making them susceptible to the spread of infectious agents. Incorporating Airesshield technologies, these transportation facilities can mitigate the risk of airborne transmission, ensuring the safety of travelers and staff alike. From waiting areas to boarding gates, every corner becomes a zone of protection against contagions.

**Enhanced Filtration and Biofilm Prevention.**

**Any Building, Any Application, Any Size!**