FIELDCONTROLS
PORTABLES

HOW TO FOLLOW THE CDC, EPA, AND ASHRAE SCHOOL GUIDELINES

GETTING BACK TO NORMAL

BACKGROUND

Field Controls, a North Carolina based company, has been an HVAC manufacturer since 1927 and has become an innovative leader in Air Treatment. As one of the first manufacturers to introduce a smart portable air purifier over 20 years ago, we remain dedicated to further developing and implementing air treatment technologies across the HVAC industry.

The COVID-19 pandemic has furthered the need for these technologies to reduce the risks of airborne disease transmission. Studies have shown that SARS-CoV-2, the pathogen that causes COVID-19, travels as aerosol particles through the air around us. This means of transmission emphasizes the importance of improving indoor air quality in response to such pathogens.

In 2020, we launched the TRIO™ Plus portable air purifier to provide Clean, Fresh, and Pure indoor air. The TRIO Plus is innovative and comprehensive, developed on the fundamentals of proven air purification technologies, HEPA filtration, UV-C purification, and our patented PRO-Cell™ for Volatile Organic Compound reduction.

OBJECTIVE

The following report provides guidance to people and organizations who are looking to reduce COVID 19 exposure, improve indoor air quality, and get back to normal.

This document will help navigate the EPA, CDC, and ASHRAE recommendations when looking to reduce COVID-19 transmission. By providing information on indoor air quality and details on the air treatment technologies available, this will assist institutions in making the best decisions to improve indoor air quality, and effectively reduce COVID-19 transmissions in the education system.

THE FOCUS ON INDOOR AIR QUALITY TO REDUCE TRANSMISSIONS

Studies have shown that the transmission of SARS-CoV-2, the pathogen that causes COVID-19, is through aerosol particles, much like regular air pollution. This understanding is the reason that the EPA, CDC, ASHRAE, and other trusted associations are focusing on indoor air quality.

“Transmission of novel coronavirus to persons from surfaces contaminated with the virus has not been documented.” – CDC, 2020[1]

The touching of contaminated surfaces (both short and long range) has a lower risk level than breathing in contaminated air.

Aerosol inhalation is increasingly considered dominant, where large droplet spray is typically short range only, and aerosolization of the pathogen can contaminate both short and long range.

ACRONYMS:

ACH: Air Changes per Hour
AHAM: Association of Home Appliance Manufacturers
CADR: Clean Air Delivery Rate
CARB: California Air Resource Board
eACH: Equivalent Air Changes per Hour
HEPA: High-Efficency Particulate Air Filter
HVAC: Heating, Ventilation, and Air Conditioning
MERV: Minimum Efficiency Reporting Value
PCO: Photocatalytic Oxidation
SARS-CoV-2: The pathogen that causes COVID-19
UVC: Ultraviolet-C, light in the 200 - 280 nanometer wavelength range
UVGI: Ultraviolet Germicidal Irradiation
VOC: Volatile Organic Compounds

WHAT ARE THE EXPERTS RECOMMENDING?

CENTER FOR DISEASE CONTROL AND PREVENTION (CDC)

- Physical distancing
- Wearing face masks
- Hygiene etiquette (washing hands, covering face when sneezing/roughing, etc.)
- Vaccinations
- Improving Indoor Air Quality by:
  - Improving ventilation
  - Maximizing central air filtration by following ASHRAE's protocols
  - Using portable HEPA systems
  - Supplementing air purification with UVGI

www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html

ENVIRONMENTAL PROTECTION AGENCY (EPA)

- Increase natural ventilation through doors and windows
- Use HVAC ventilation systems and upgrade air filters
- Utilize portable air cleaners
- Install evaporative coolers and whole house fans

www.epa.gov/coronavirus/indoor-air-homes-and-coronavirus-covid-19

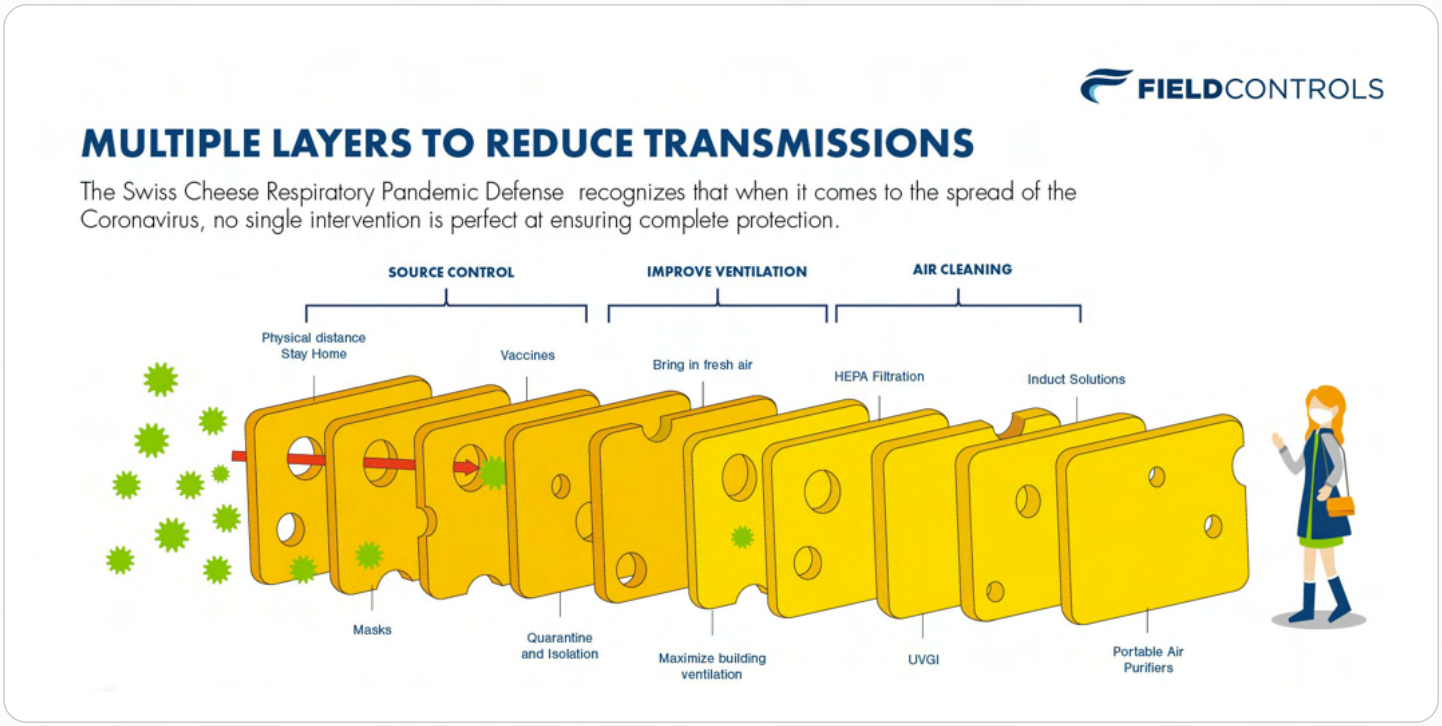
AMERICAN SOCIETY FOR HEATING REFRIGERATING AND AIR CONDITIONING ENGINEERS (ASHRAE)

- Public health guidance:
  - Follow CDC guidance on hygiene, masks, distancing, etc.
- Ventilation, Filtration, and Air Cleaning:
  - Maximize outdoor air (OA) flow rates
  - Use MERV-13 or higher filters
  - Only use air cleaners for which evidence of effectiveness is clear and energy efficient
- Air Distribution:
  - Promote mixing (when directional airflow is not required)
- HVAC System Operation:
  - Maintain temperature, humidity, and clean air supply
- System Commissioning and Monitoring:
  - Verify systems are functioning as designed

www.ashrae.org/file%20library/technical%20resources/covid-19/core-recommendations-for-reducing-airborne-infectious-aerosol-exposure.pdf

LAYERED APPROACH

The CDC, EPA, and ASHRAE's recommendations all provide a layered approach to reduce exposure - multiple strategies are combined in order to achieve the overall goal of reducing the spread of COVID-19. A helpful way to understand this methodology is through the "Swiss Cheese Metaphor." Each individual slice of Swiss cheese has holes, but the holes may be in different places. Subsequently, when multiple slices are stacked together, it can create a solid block. In terms of preventing the spread of COVID-19, no singular strategy is 100% effective. However, when we combine multiple strategies together, it leads to a much greater reduction in transmission.



The foundations of this layered approach can be broken down as follows:

1. SOURCE CONTROL - MINIMIZING EMISSIONS

"Source Control" refers to improving indoor air quality by eliminating individual sources of a contaminant to reduce their emissions. For overall air quality, source control involves removing items that emit gases or harmful particles such as fresh paint, cleaning supplies, and asbestos. In the context of COVID-19, when an individual is infected, they become a "source" of the virus. By wearing masks, following social distancing and hygiene etiquette, quarantining, and getting vaccinated, we are practicing source control by limiting the capability of the virus to spread from us to others. Generally, these layers are considered the most practical and least costly; however, on their own, cannot be 100% effective at preventing the spread of COVID-19.

LAYERED APPROACH (CONTINUED)

2. IMPROVED VENTILATION - DILUTING THE CONCENTRATION OF CONTAMINANTS

Ventilation is the introduction of fresh air into an indoor space, either naturally or mechanically. By increasing ventilation in buildings and homes, the goal is to lower the collection of indoor air pollutants inside – diluting the concentration of contaminants. In order to maximize ventilation, one must increase the amount of outdoor air it is pulling in, as well as the total airflow delivered to each occupied space in a given building.

Natural ventilation can be achieved simply through the opening of windows and doors to let fresh air inside. This method, however, may not be practical in cases where there are excessively hot or cold climates, or in rooms where doors or windows are not present. In such areas, mechanical building ventilation in HVAC systems must be used.

Many buildings already have large Heating and Cooling (HVAC) systems installed, which are already designed to ventilate the occupied space. In order to maximize ventilation, however, the additional measures that must be taken can often be costly and inefficient:

- Potential upgrade costs - Many of these HVAC systems were not designed to use the more efficeint MERV 13+ filters that the CDC, EPA, and ASHRAE are recommending, which leads to costly upgrades
- Increased energy costs - Maximizing HVAC system usage increases energy demand
- Increased consumable costs - Higher MERV rated filters are more expensive
- Increased maintenance costs - Higher MERV rated filters need more frequent replacement
- Equipment upgrade costs - Higher MERV rated filters may wear out existing equipment more quickly

https://www.ed.gov/coronavirus/improving-ventilation

3. AIR CLEANERS - CLEANING AND PURIFYING THE AIR

Air cleaners are designed to filter and purify the existing air within a given space. Generally, there are two types of air cleaners available on the market: In-duct and portable. In-duct air cleaners, also known as whole-house air cleaners, are integrated into a building or home's existing HVAC system.

Once implemented, these systems work to remove particles, such as dust and other allergens from entering a room from the HVAC vents. Some in-duct systems also utilize UVC light, which can work to neutralize and eliminate harmful particles.

Portable air cleaners work similarly, but are stand-alone units that can be placed in and moved around any space. These units draw in air from the room, clean and filter it, and replenish the space with fresher, cleaner air. Like in-duct systems, portable air cleaning units also use various types of filtration to remove particles from the air, as well as some that utilize UVC technology to purify the air of germs and other bacteria. Portable air cleaners are able to use higher performing filters, like HEPA filters, to capture higher percentage of particulate matter in the air. These portable air cleaners can provide a faster and simpler implementation process than making significant changes to an entire HVAC system, which can often be a very time-consuming and expensive endeavor.

www.epa.gov/indoor-air-quality-iaq/air-cleaners-and-air-filters-homec

HEPA & UVGI TECHNOLOGY

HEPA

HEPA filter, or High Efficiency Particulate air filters, are rated to capture at least 99.97% of 0.3-micron particles.

- A large percentage of contaminates are in the 0.2 - 0.3 micron range, which is very challenging to capture.
- SARS-CoV-2, or the COVID-19 virus, is in the 0.1-micron range; however, droplets that can carry the pathogen are in the 0.2 - 100-micron size.
- HEPA filters are shown to effectively clean air from indoor contaminants and based on their effectiveness in the 0.3-micron range, are effective in capturing COVID-19 droplets.

UVC/UVGI

UVC is a span of wavelengths in the UV spectrum, which has been widely used in cleaning and sterilizing applications. The UVC energy disrupts the DNA of the wide range of microorganisms, rendering them unable to reproduce, and therefore not infectious.

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

"UVGI is effective in reducing the transmission of airborne bacterial and viral infections in hospitals, military housing, and classrooms. UVGI solutions can provide an effective technology in the war against the SARS-CoV-2 virus" - CDC

https://www.cdc.gov/infectioncontrol/pdf/guidelines/environmental-guidelines-P.pdf

"HEPA filters (either ceiling mounted or portable) can be effective in reducing/lowering concentrations of infectious aerosols in a single space" - World Health Organization

WHY CARE ABOUT INDOOR AIR QUALITY IN SCHOOLS?

Prior to the emergence of COVID-19, allergic reactions caused by indoor air pollution have always had strong impacts on student's learning.

Cognitive Impacts

Multiple studies have shown that poor air can have a significant impact on students' ability to learn and directly link IAQ and student performace:

- Children in classrooms with greater outdoor air ventilation achieve 14-15% higher scores on standardized tests than in poorly ventilated classrooms.[28]
- Schools with lower HVAC maintenance backlog have a higher average daily attendance and lower annual drop out rate by 10-13 students per 1,000.[29]
- Just a slight increase in pollen levels during allergy season can reduce test scores up to 2.5%.[9]
- The presence of particles such as pet dander and dust worsen asthma and allergy symptoms and subsequently increase students' anxiety, causing loss of focus during class.[10]
- When students are forced to miss school due to the symptoms of asthma and allergies, it results in poor learning outcomes, especially if the students live in urban areas with high levels of pollution.[11]

Health Impacts

Many indoor air contaminants can trigger allergies and asthma - simply mold and humidity in the air can increase the likelihood of severe allergy episodes and asthma symptoms by up to 50%[7]. Indoor air pollution can cause immune system responses that make students more susceptible to bacterial and viral infections, including COVID-19. Increases in illness results in students missing school and falling behind in their courses.

- People exposed to high air pollution levels are twice as likely to die from Severe Acute Respiratory Syndrome (SARS), as those with less exposure.[16]
- Exposure to wildfire smoke can make it harder for the body to fight viral infections for up to a week after exposure.[17]
- For every 20% rise in air pollution, COVID-19 cases can be expected to rise by nearly 100%.[18]

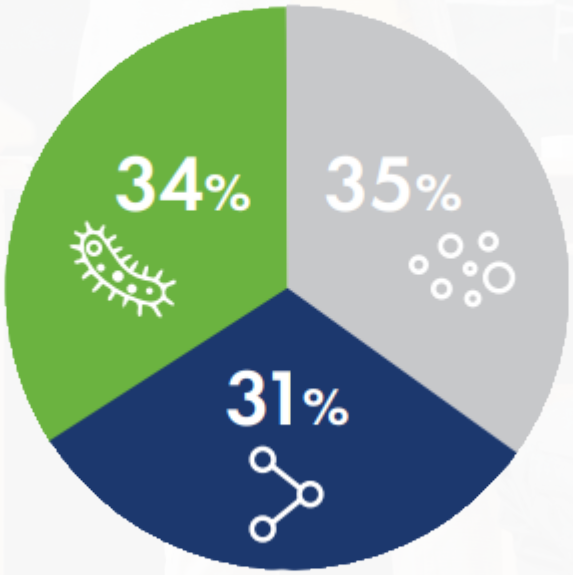
INDOOR AIR QUALITY BEYOND COVID-19

INDOOR AIR QUALITY

According to the U.S. Center for Disease Control (CDC), indoor air contains three types of pollutants: Germs, Particulates, and Gases which may result in illness, allergic reactions, breathing issues, and various other health impacts.

Alongside the spread of COVID-19, these types of pollution have always been a major source of allergens, and subsequently allergic reactions.

- 35% of allergic reactions are due to particulates
- 31% of allergic reactions are due to VOCs
- 34% of allergic reactions are due to germs



Particulates

i) Examples: pollen, dust, pet dander, smoke, and dust mites

Gases and Chemicals - or Volatile Organic Compounds (VOCs)

i) Examples: gas molecules, odors, Formaldehyde and Benzene, and carcinogens

ii) Sources: Building materials (paints, adhesives, and flooring), chemical cleaning products, and pesticides

Microbiological or Germs

i) Examples: viruses, bacteria, molds, spores, and pathogens

WHAT TO LOOK FOR IN A PORTABLE AIR PURIFIER

The portable air purifier market is extensive and becoming even more so due to rising demand for air cleaners during the COVID-19 pandemic. With so many options to choose from, it is understandably difficult to be confident that you are making the best decision in choosing a portable air purifier. When selecting a unit for widespread implementation, such as across a school system, it is especially important to be sure the chosen product is the safest and most effective for the many individuals in its occupancy.

There are many companies in the market who produce quality products which are proven to be safe and effective in purifying the air. However, it must be noted that there are also companies selling products with questionable and potentially unsafe technologies. It is important to watch out for such companies, as they often falsely advertise products which appear to have certain capabilities and effects that have not actually been proven scientifically or under industry standards.

Based on the EPA, CDC, and ASHRAE guidelines and recommendations, there are certain aspects to look for when evaluating portable air cleaners.

1. Ensure that the product contains features which address all three types of air contaminants: particulates, gases, and microbiological substances.
   i) Particulates - HEPA Filtration
   ii) Gases - Carbon Filters and PCO Technology
   iii) Microbiological - UVC/UVGI Technology

2. Confirm the product has verified performance through testing by industry standards and independent third-party labs, which demonstrate its proven effectiveness.
   i) HEPA Verification: filters must be verified in lab testing to be classified as “HEPA”
   ii) AHAM Verification: AHAM, the Association for Home Appliance Manufacturers, provides a comprehensive test for measuring an air cleaner’s efficacy. Be sure that the product has gone through and passed this testing, by looking for an AHAM Verified marking, or by looking up the product on the AHAM website.
   iii) Energy Star Certification - Products that earn Energy Star Certification meet strict energy-efficient specifications set by the EPA, designed to lower costs in addition to protecting the environment. Due to schools requiring large quantities of units to occupy each classroom, confirmation of energy efficiency should be considered in order to keep energy costs down.

3. Verified safety of the product

   a. Ensure the product is certified by an accredited safety organization, tested by UL or ETL standards.
   b. Check the product is non-Ozone producing - look for CARB certifications or UL 2998.
   c. Confirm that it does not use non-proven and potentially dangerous technologies, as determined by the EPA, ASHRAE, and CDC. Examples: Plasma, Ionization, and Dry Hydrogen Peroxide.

AHAM VERIFIDE

ENERGY STAR

CALIFORNIA AIR RESOURCES BOARD

FIELD CONTROLS' SOLUTION: TRIO PLUS

Overview

Our TRIO Plus portable air purifier aligns with the CDC, EPA, WHO, and ASHRAE guidance for addressing indoor air quality by utilizing HEPA filtration and UV-C Air Treatment to create a safe and effective system for improving air quality and reducing COVID-19 transmissions.

Field Controls is one of the few air treatment companies which integrates three key purification technology solutions: HEPA filtration, PRO-Cell technology, and UVGI treatment.

In November of 2020, Field Controls launched TRIO Plus as a solution for schools, businesses, and homeowners to combat indoor air quality issues and COVID-19 transmissions. Due to its advanced technologies and proven effectiveness, TRIO Plus has shown itself to be top of its class in the air cleaning and purification industry. Since its launch, TRIO Plus has been utilized by numerous schools across the country to assist in returning to in-person education by ensuring the safety of students and teachers in the classroom.

Why Choose TRIO Plus as your School's Indoor Air Quality Solution?

As mentioned in section two, portable air purifiers are often the most cost-effective and timely method of improving indoor air quality. Although in-duct air cleaners can embody the same technology and produce similar effects as portable air cleaners, high costs alongside the complexity and lengthiness of implementation makes them a much less feasible option in many circumstances, including school buildings.

Once the decision is made to implement portable air cleaners, it then becomes a question of how to decide what product to choose out of thousands available on the market. After laying out the detailed criteria based on experts' recommendations of what to look for in a portable air purifier and how to make sure its technology is safe and legitimate, we aim to show that Field Controls' TRIO Plus is a suitable and high-quality choice based on these standards. TRIO Plus addresses all three types of air contaminants, has been verified to meet (and exceed) industry standards through extensive testing, and is proven to be a safe and effective option for improving indoor air quality. We also highlight TRIO's additional features, beyond the standard criteria, which makes the unit particularly beneficial to the school environment.

How Trio Plus Meets Recommended Criteria

1. Addresses all three types of air contaminants: Particulates, Gases, and Microbiological Substances
   - i) Uses true HEPA and Carbon Filtration
     - HEPA traps particulates such as smoke, dust, pollen, and harmful PM2.5 particles
   - ii) Patented PRO-Cell™ Technology
     - When VOCs, gaseous contaminants, and odors encounter the PRO-Cell™ surface, they are converted to harmless water vapor and Carbon Dioxide
   - iii) Advanced UVC technology
     - UV light reduces biological contaminants, with tests against bacteria[1], and viruses[2]

1. 99.63% reduction of Bacillus Subtilis spores in 120 minutes following GB 21551.3-2010 Testing Methods.
2. 99.99% reduction of active COVID-19 virus, SARS-CoV-2, in 30 minutes. Third-party testing in a BSL3 lab, Innovative Bioanalysis, conducted live aerosolized SARS-CoV-2 pathogen testing

FIELD CONTROLS' SOLUTION: TRIO PLUS

2. Proven Effectiveness

   i. TRIO Plus has been tested against SARS-CoV-2 and shown to produce 99.99% reduction of the virus in its given space within 30 minutes
   ii. Proven True HEPA Filtration
   - Standard: traps 99.97% of 0.3-µm particles, down to 0.1-µm
   iii. AHAM Verified - performance tested and verifies by the Home Appliance Manufacturers (AHAM) for Clean Air Delivery Rate (CADR) against PM2.5, Smoke, Dust, and Pollen
   iv. Energy Star Certified - Rated as an energy-efficient air purifier by the EPA's ENERGY STAR® rating program
   - Even at maximum fan speed, TRIO Plus meets strict energy efficiency standards

3. Safety Verification

   - ETL Certified - Conforms to UL STD.507 and certified to CSA STD.C22.2 No. 187 2020 Ed.5
   - Non-Ozone producing - Ozone tested to UL 867 by Intertek
   - CARB Certified - Certified by the California Air Resources Board for meeting the ozone emissions limit.

Beyond Standard Criteria: Further Benefits of TRIO Plus for Schools

1. Smart Mode Setting
   - TRIO Plus automatically detects changes in air quality and increases fan speed when quality is low, allowing the classroom to receive consistent and efficient air cleaning throughout the day without any additional action required.

2. 8-Hour Timer
   - TRIO can be programmed to run for the duration of the school day, shutting off after-hours to ensure energy and power are being used efficiently.

3. Cleaning Speed: Up to 3,300 Sq. Ft. in just 1 Hour
   - Covering approximately the space of 3 classrooms, TRIO's fast and efficient cleaning time ensures that air is being efficiently processed and distributed.

4. Child-Lock Function
   - In classrooms with young children, TRIO's child lock function makes sure that students cannot easily adjust settings and interrupt the units' cleaning process.

5. Quiet Processing: Sound level only 24 to 52 decibels
   - Low decibel noise minimizes the potential for sound distraction in the classroom and allows students to maintain attention during lectures, exams, and other educational activities.

TRIO Plus™

INNOVATIVE BIOANALYSIS
creating solutions | getting results

Innovative Bioanalysis confirmed the TRIO Plus achieved a **99.99% efficacy against coronavirus**, specifically SARS-CoV-2, the virus that causes COVID-19 **within 30 minutes**.

1 True HEPA and Carbon Filtration

- Pre-Filter captures hair and dander
- True HEPA traps 99.97% of 0.3-micron particles such as mold, bacteria, dust, dander, pollen, and harmful PM2.5 particles
- Activated carbon absorbs toxic gases from smoke, household products, and cleaners

2 PRO-Cell VOC Reduction Technology

- Photo-Reactive Oxidation process breaks down toxic VOCs (Volatile Organic Compounds) into safe CO_2 and H_2O vapors

3 UVC Germicidal Protection

- Two powerful UVC lamps to reduce fungi[1], viruses[2], and bacteria[3]

1. >99.99% reduction of Influenza H3N2 in 60 mins following GB21551.3-2010
2. >99.99% reduction of Staphyloccocus aureus in 60 mins following GB21551.3-2010
3. >99.99% reduction of Aspergillus Brasiliensis in 60 mins following GB21551.3-2010

Intertek

AHAM VERIFIDE

ENERGY STAR

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OZONE

Does Not Produce Ozone

The TRIO Plus is ozone free, meeting CA and NY state non-ozone requirements for added peace of mind.

CONCLUSION

When choosing which portable air cleaner to buy, trusted authorities provide specific recommendations and criteria on the use of proven and effective air cleaning technologies. Field Controls is trusted and proven to meet these standards and beyond with our advanced air treatment technology.

Field Controls provides a listed, certified, and proven portable solution for air cleaning. As schools, restaurants, and businesses attempt to get back to normal and re-open safely, Field Controls is dedicated to being a trusted partner in these efforts. The Trio Plus is scientifically proven to be effective in reducing SARS-CoV-2, providing the ultimate combination of technologies to best protect indoor environments.

This document supports the following conclusion:

With TRIO Plus in the classroom, students and teachers will enjoy improved air quality, proven protection against the transmission of COVID-19, and a healthier environment for education.

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