

COVID-19 UPDATE: November, 2020

CONTROLLING THE SPREAD OF COVID-19 THROUGH ENGINEERING MEASURES

While there are many important steps building owners and occupants can take to minimize the risk of spreading COVID-19 in their facilities, we can't completely eliminate the risk of viral transmission in the built environment. Any steps to adjust the HVAC system should be part of an overall strategy that includes wearing masks in shared spaces, configuring operations to allow for distancing, allowing flexible or distance arrangements when possible, and hand washing.

The most common and easiest HVAC measures include **disabling any demand-controlled ventilation strategies, increasing outdoor air quantities, installing MERV-13 filters, and providing humidification control**. Each facility is unique, and any changes made to systems must be reviewed as to how any of these changes affect the overall performance and operation.

Beyond these steps for dilution and filtration, there is increasing interest in disinfection technologies particularly **Bi-Polar Ionization and Germicidal UV Light (UVGI)**.

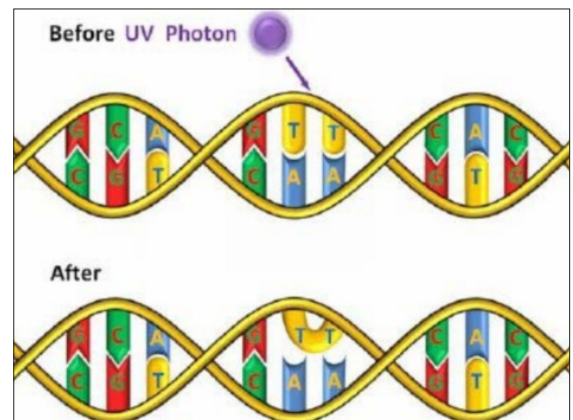
GERMICIDAL UV LIGHT (UVGI):

Germicidal UV Light (UVGI) technology can be installed in ductwork, air handling equipment, directly in the high elevations of space, or using a standalone portable unit on the floor. It works by **applying optical radiation to the air and contents of the air**, which damages the DNA/RNA of microorganisms (including viruses, bacteria, and fungi) which prevents them from being able to reproduce. Since this radiation is harmful to humans when directly exposed, applications in a space are either enclosed and draw air through a unit or situated above the occupied zone of a space.

UVGI has been studied and implemented for decades and has a high level of proven efficacy to inactivate viruses if there is enough intensity and duration of exposure. For in-duct or air handler applications, the short duration of exposure for airflow means a high level of intensity is required. Although there is not currently testing on COVID-19 specifically, similar viruses have been tested and documented to be inactivated by UVGI.

There are numerous practical challenges to implementing this system, including annual bulb replacement, efficacy reduction over time, lower efficiency at low temperatures, and mercury containing bulb disposal. With care, these issues can be overcome, and a UVGI system can improve the air quality in your facility and reduce the risks associated with COVID-19 transmission.

UV DAMAGING DNA / RNA



The UV light "attacks" and changes the DNA/RNA of the microorganisms. This causes viruses/bacteria/fungi to be inactive and prevents them from reproducing. (Image: Martin Hessline, Hochschule Ulm)

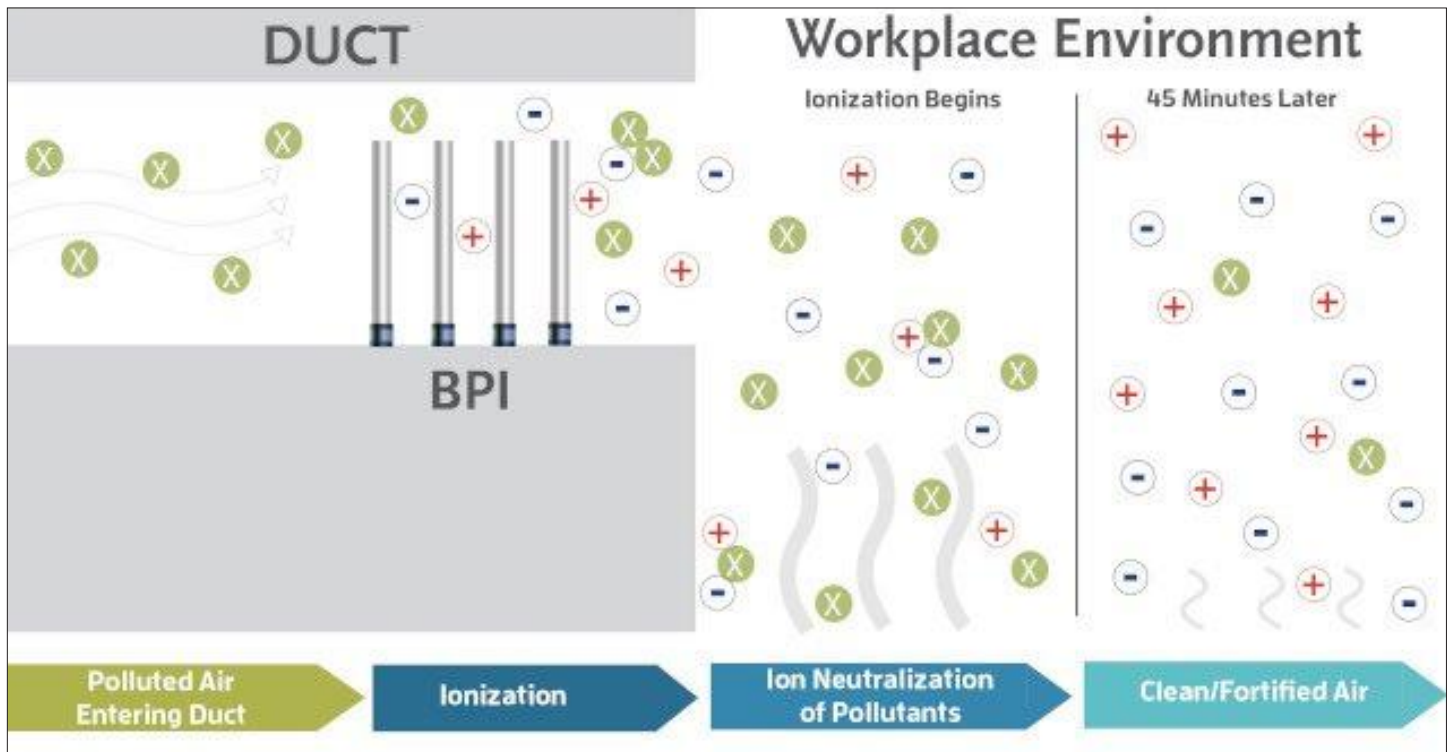
UV INSTALLATION IN AN AIR HANDLER



This application is intended to disinfect the air in one pass through the Air Handler. Due to the short duration of exposure to UV, there are nine bulbs. (Image: William P. Bahnfleth, ASHRAE UVGI Short Course)

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CONCEPTUAL DIAGRAM OF BIPOLAR IONIZATION IN ACTION: The X's represent contaminants in the air, and the + and - represent the polarized ions that are created by the bi-polar ionization system. After the BPI has run for an extended period of time, the ions will find and inactivate the contaminants: odor, volatile organic compounds, viruses, bacteria, and mold spores. (Image: AtmosAir Solutions, Continuous Disinfection Layer Presentation)

BI-POLAR IONIZATION

This is a technology that creates ionized particles that act as a magnet to other particles in the air such as odors, volatile organic compounds, pathogens, and mold spores. When the ionized particles interact with these odors and volatile organic compounds, the chemical compounds are broken down into common safe gases such as oxygen, water vapor and hydrogen. When the ionized particles interact with mold, viruses, and bacteria, they "attack" DNA/RNA making these organisms unable to reproduce. The ionized particles can also cause grouping of particles, which may cause them to fall out of the air or make them more likely to be captured by filters.

This technology can be installed in ductwork, air handling equipment, or in a stand-alone portable unit directly in a space. Since this technology is newer, there is less scientific evidence on the efficacy of bipolar ionization than UVGI systems, and ASHRAE has not endorsed the technology, but there are numerous studies by independent labs and universities demonstrating effectiveness.

Ions are only active for 60 seconds, but the ions can be delivered directly into a space if the duct run is short enough, so viral particles do not need to travel through the air handling unit to be neutralized. There has been independent, third-party testing of two major Bi-Polar Ionization manufacturers, and in a laboratory setting with 30 minutes of operation, at least 99.4% of the COVID-19 virus was inactivated. Depending on the specific technology, there may be potential for the creation of ozone, which can be harmful to air quality. Devices rated by UL 2998 have been demonstrated to be virtually ozone-free. Additionally,

devices may or may not require cleaning, some as often as monthly, and they may or may not require canister replacement, as often as every two years. To ensure the system is working, there are sensors with Building Automation System integration potential including ion meters, particle meters, and sense of smell.

VERDICT

Depending on your application, there may be reasons to employ UVGI over bipolar ionizations, especially when there are long duct runs. However, due to the ability to measure impacts more easily, the potential for very little maintenance using the right technology, and the ability to eliminate other air quality concerns (particulates, odors, and volatile organic compounds), bi-polar ionization is the technology Emanuelson Podas is recommending most often to owners who want to take additional steps in combatting COVID-19.

Knowledge of the virus, and more information on these and other technologies are rapidly evolving and Emanuelson-Podas is keeping up with the science as it develops. We are available as a resource to help you and your clients make decisions about your facilities.

ABOUT EMANUELSON-PODAS

Emanuelson-Podas helps make amazing spaces happen. We're an MEP (mechanical, electrical and plumbing) engineering firm that works side-by-side with architects and other building professionals to develop design solutions that get air, power, light and water to the places that matter. A values-driven firm, our services include the full suite of MEP services as well as energy modeling and building commissioning.