

UV Effectiveness on airborne contaminants such as avian flu virus and bio-hazards

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Controlling airborne contamination using ultraviolet light has been used for over 70 years. In recent years there have been incidents where contamination could potentially have dire effects on occupants' health. The ability for ultraviolet air purification systems to destroy biological and chemical contaminants makes it the ideal Indoor Air Quality technology. Ultraviolet Air Purification can be used as a proactive measure to protect the HVAC system and destroy bio-chemical contaminants that would otherwise be circulated throughout the building's envelope.

In 2001, The United States was faced with the possibility of anthrax spores delivered through the US postal service in everyday unassuming packaging, and the possibility of bio-terror agents introduced into the building ventilation system. Two years later, Asia and parts of Canada were faced with a short lived SARS epidemic; the people of Toronto were wearing face masks while going about their everyday tasks. Over the last few years mold has been receiving increased media attention, only now is the public becoming aware of the health risks associated with certain types of mold. Over the last year, concerns have been growing over the possibility of the avian flu (bird flu) virus reaching North America. Business and government have been preparing contingency plans should the influenza virus become a pandemic.

According to the CDC (Centers for Disease Control and Prevention) "there are many different subtypes of type A influenza viruses. When we talk about "bird flu" viruses, we are referring to influenza A subtypes chiefly found in birds. They do not usually infect humans, even though we know they can. When we talk about "human flu viruses" we are referring to those subtypes that occur widely in humans. It is likely that some genetic parts of current human influenza A viruses originated from birds. Influenza A viruses are constantly changing, and they might adapt over time to infect and spread among humans." For more information on Avian Influenza please visit the CDC at <http://www.cdc.gov/flu/avian/gen-info/facts.htm>

The Environmental Protection Agency (EPA) & The National Homeland Security Research Center (NHSRC) released their findings on "Biological Inactivation Efficiency by HVAC In-Duct Ultraviolet Light Systems". Although the study was to validate technologies and methods for addressing risks posed by chemical, biological, and radiological terrorist attacks, the results also show how effective ultraviolet light can be for contaminants such as the avian flu virus.

According to the EPA "The National Homeland Security Research Center (NHSRC) created the Technology Testing and Evaluation Program (TTEP) in an effort to provide reliable information regarding the performance of homeland security related technologies."

The EPA goes on to explain "The Sanuvox Technologies Inc. UV Bio-Wall 50" was tested using a test plan approved by EPA Test/QA Plan for Biological Inactivation Efficiency by HVAC In-Duct Ultraviolet Light Air Cleaners. The tests were conducted using three organisms: one bacterial spore *Bacillus atrophaeus* (surrogate for the anthrax spore), one bacteria, *Serratia marcescens* and one bacterial virus (MS2). These organisms were selected because their sizes, shapes and susceptibility to UV inactivation make them reasonable surrogates for biological warfare agents (BWAs). Generally, vegetative bacteria are readily killed and bacterial spores are more difficult."

Because the Sanuvox UV Bio-Wall 50" is installed parallel in the duct and the UV Lamps are mounted to Aluminum Parabolic Reflectors one UV Bio-Wall 50" achieved a 93% kill rate on one pass for *B. atrophaeus* (surrogate for the anthrax spore), >99.97% on one pass for *S. marcescens* (bacteria) and 99% on one pass for MS2 (bacterial virus). It is important to note that only one UV Bio-Wall 50" was used in the testing. A UV Bio-Wall 60" kill rate for *B. atrophaeus* would be greater than 93%

To read the Report in its entirety visit <http://www.epa.gov/nhsrc/pubs/erUVSanuvox062606.pdf>

In order for a Single UV System to be effective in destroying contaminants such as the anthrax spore or the avian flu virus, the UV purifier must be strategically oriented to maximize exposure and use reflection to direct the UV intensity. When Ultraviolet Lamps (which can be as long as 60") are installed parallel with the airflow, the biological contaminants traveling through the air-stream are subjected to much longer 'Dwell Time' with the UVC energy. Biological contaminants passing parallel over a 60" long UV-C Lamp will receive much higher UV exposure than contaminants passing perpendicular to a 19 millimeter Lamp (19mm vs. 1,525mm). Increased exposure or 'Dwell Time' translates to more UV Energy delivered to the contaminants, which results in a much higher kill. Although UVC energy is very effective in destroying biological contaminants, the intensity of the UVC Light decreases very quickly the farther away from the Lamp you move. At 2" away from the surface of the Lamp, the UV efficiency drops 80% and the decline is exponential. To combat this decrease in efficiency, it is imperative that the contaminants traveling more than a few inches away from the Lamp surface make up for the loss in UV efficiency by spending more time in contact with the UV Lamp. A parallel installation accomplishes this task.

Where parallel installations of UV Lamps increases exposure time, Aluminum Reflectors increase UV efficiency. The same way a flashlight or car's headlight uses a reflector, UV light is no different; reflection is needed to direct the UV energy to where it is needed most.

Parallel Lamp orientation and Aluminum Parabolic Reflectors allow more UV energy to be delivered to the moving air-stream over a longer period of time can guarantee a higher Kill Rate.

Ultraviolet Air Purifiers have been tested and used in thousands of applications, from residential systems to commercial / industrial Indoor Air Quality applications. UV systems produce two distinct UV wavelengths for two very different tasks. UV-C (254nm) light attacks the DNA of a cell. This wavelength's primary uses are for the destruction of viruses, bacteria, mold and other microorganisms that pass through the UV system. The Centers for Disease Control and Prevention (CDC) recommends this method for destroying viruses such as tuberculosis. UV-V (187nm) is primarily used for oxidization; this is the portion of the Lamp that will destroy chemicals and odors such as cigarette smoke, VOCs, diesel fumes, odors and formaldehyde.

By outfitting buildings and facilities with UV systems we can control the spread of a possible pandemic. We can control or limit the spread of a bio-terror agent throughout the HVAC system and we can treat the air destroying everyday contaminants that continually circulate throughout the HVAC system.