

# Building Solutions

## HVAC and Air Filtration in Response to COVID-19

### What is a Novel Coronavirus?<sup>1</sup>

A novel coronavirus is a new coronavirus that has not been previously identified. The virus causing coronavirus disease 2019 (COVID-19), is not the same as the coronaviruses that commonly circulate among humans and cause mild illness, like the common cold. Coronaviruses are a large family of viruses that are common in people and many different species of animals, including camels, cattle, cats, and bats. Rarely, animal coronaviruses can infect people and then spread between people such as with MERS-CoV, SARS-CoV, and now with this new COVID-19 virus (named SARS-CoV-2).

There are several mechanical means of reducing exposure to a coronavirus. Each method has pros and cons that need to be determined and reviewed based on your individual and unique facility. This will not be a one system fix for air quality in your facility but an augmentation to your existing systems.

### HEPA Filtration Systems<sup>2</sup>

HEPA stands for high-efficiency particulate air. A HEPA filter is a type of mechanical air filter; it works by forcing air through a fine mesh that traps harmful particles such as pollen, pet dander, dust mites, and tobacco smoke. HEPA filters are very effective at removing particulates from the air. Many are certified to capture 99.97 percent of particles that are precisely 0.3 micron in diameter or larger. Depending on the size of the particles HEPA Filters are quite capable of filtering out viruses. The novel coronavirus itself is stated to be 0.125 microns, but information tells us the droplets it travels in—when people cough, talk, or breathe—initially are larger, around 1 micron. HEPA filters are very efficient at catching coronavirus-size air born particles, but the particles must first physically travel to the filter. That means an air purifier must be capable of consistently drawing in enough air to reduce the amount of virus particles in the air. The faster an air purifier can cycle air through the filter, the better its chances of catching virus particles.

You might even be considering a portable, but highly efficient unit to move around your facility. This is a very practical matter to consider, however, you may not want to run a portable air purifier on its highest speed setting. Air purifiers are quite noisy, especially at higher speeds, and that can disturb the rooms occupants.

An economical way of introducing HEPA Filtrations systems in some cases may be as easy as changing the filter types you are currently using or increasing the HEPA Rating. Beware however that older systems were not designed for these higher density filters and may cause lower efficiency and added energy and maintenance costs.

1 Information compiled from the Center for Disease Control: <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/summary.html>

2 Information compiled from the Center for Disease Control: DHHS (NIOSH) Publication No. 2003-136: <https://www.cdc.gov/niosh/docs/2003-136/pdfs/2003-136.pdf?id=10.26616/NIOSH-PUB2003136>

# HVAC and Air Filtration in Response to COVID-19 (cont'd)

## Air Scrubbers (similar to standard HEPA Filtration Systems).<sup>3</sup>

The difference between an air purifier and an air scrubber, is that an air purifier can only clean particles that are airborne. So – if you are seeking both clean air and clean surfaces, an air scrubber may be a better choice of equipment for your facility. An Air Scrubber is a device which is engineered to improve the indoor air quality of an occupied space. It is designed to be installed into an existing HVAC system and intended for use as a fully integrated whole unit air purification system. Forced air passes through the return air filter and then travels through a titanium oxide coated honeycomb chamber before being returned through the ductwork as supply air.

HEPA-filtered air scrubbers can remove mold spores from the air, along with other germs, bacteria, viruses, fungal spores and other particles as small as 0.3 micron. It should be noted that not all air scrubbers are able to capture particles as small as mold spores.

Portable air scrubbers are available, like those used in Asbestos abatement projects and larger-scale air quality remediation projects. These include healthcare construction projects. With portable systems, issue begin to arise with operational costs for some of the systems as some recommendations state pre-filters should be changed at least once per day, secondary filters every 3-7 days, and HEPA filters every 800 hours. While this normally applies to self-contained individual room units under high usage, units installed in the return air path of the HVAC system will have higher maintenance and material usage costs.

Is an air scrubber worth it? The answer is yes and no. It really depends on your goals and maintenance resources. Those scrubbers rated at least “very good” for indoor air quality will remove smells, pet dander, allergens, pretty much any particles in the air, An air scrubber also helps keep your AC unit clean inside while it destroys allergens, germs, viruses, and odors. Air scrubber technology generally costs in excess of \$2,000 per unit, depending on the size of your project space and HVAC system. Given the high costs of HVAC repair, replacements, and utility bills, this system could be well worth the long-term investment, if intensively maintained. Older mechanical systems and electrical distribution systems may require modifications to install effective scrubbers. Facilities operators should be aware of added maintenance and operational costs for their yearly operational budgets.

## Ultraviolet Light<sup>4</sup>

UVC light is used to disinfect objects and surfaces. Ultraviolet light is produced by the sun and by special lamps. There are three types of UV light—UVA, UVB, and UVC. UVC light has the most energy of the three types. This energy destroys the genetic material inside viruses and other microbes. Therefore, UVC light is used for disinfection. UVC lamps and robots are commonly used to sanitize water, objects such as laboratory equipment, and spaces such as buses and airplanes. In-line Ultraviolet light systems have been utilized in healthcare and commercial HVAC Systems for years and require lower maintenance priority than the previous two systems. Portable systems are available and appear to have a good record of sanitizing space. You should note that utilization of the UVC system requires more training and a systematic approach to utilize.

UVC light probably destroys the novel coronavirus, but more information and testing data is needed before a positive statement can be presented. UVC light has been found to destroy viruses and other microbes on surfaces in hospitals. But it is not widely used in hospitals

<sup>3</sup> Information compiled from Occupational Safety and Health Administration (OSHA) website: <https://www.osha.gov/SLTC/covid-19/>

<sup>4</sup> Information compiled from: <https://www.fda.gov/radiation-emitting-products/tanning/ultraviolet-uv-radiation>

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or other health care settings. Reasons noted included time, experienced cleaning staff, and overall costs of operation. The U.S. government and the UV technology industry are working to define standards for UV disinfection technologies in healthcare settings. Most UV sanitizers have not been tested against the novel coronavirus, SARS-CoV-2. But UVC light has been shown to destroy related coronaviruses, including the one that causes the disease MERS.

It is not safe to use UV sanitizers on your body.

- Exposure to UVC light is dangerous for people.
- UVC sanitizers can damage your eyes and skin.
- UV light may cause cancer.

Scientists are exploring ways to use a specific type of UVC light for devices that could be safe for humans. However, existing products are not safe to use on your body.

UVC wands, pouches, and lamps are also sold for home use—for example, disinfecting your cell phone. However, the safety and effectiveness of these products is not known.

Depending on your needs and the system you choose, you may install the UV lights directly in the air handler. In addition to the air handler, you may choose to install them in the air return or in strategic areas throughout the ductwork. This system does not replace deep cleaning, it is in conjunction with and part over you overall sanitization process. This system enhances your standard process and gives you an added layer of sanitation. Modifications to your existing HVAC system and ductwork are required for installation and older electrical systems may require modifications for added UVC lighting system.

### Other Technology (Far-UVC)<sup>5</sup>

Far-UVC is still in the review phase; these are techniques that zaps airborne viruses with a narrow-wavelength band of UV light and is showing promise for curtailing the person-to-person spread of COVID-19 in indoor public places, but not enough data has been gathered to determine the costs or specific benefits of the system. “Far-UVC light has the potential to be a ‘game changer,’” according to David Brenner, Director of the Center for Radiological Research at Columbus University’s Irving Medical Center.<sup>6</sup> “It can be safely used in occupied public spaces and it kills pathogens in the air before we can breathe them in.” The research team’s experiments have shown far-UVC effective in eradicating two types of airborne seasonal coronaviruses (the ones that cause coughs and colds). The researchers are now testing the light against the SARS-CoV-2 virus in collaboration with Thomas Briesse and W. Ian Lipkin of the Center for Infection and Immunity, a biosafety laboratory at Columbia University Medical Center in New York City. Results have been stated as encouraging. These teams previously found a method effective in inactivating the airborne H1N1 influenza virus, as well as drug-resistant bacteria. Multiple, long-term studies on animals and humans have confirmed that exposure to far-UVC does not cause damage to the skin or eyes. It has been stated that this is a low-cost, safe solution to eradicating airborne viruses’ minutes after they’ve been breathed, coughed or sneezed into the air.” If widely used in occupied public places, far-UVC technology has the potential to provide a powerful check on future epidemics and pandemics, Brenner said. He added that even when researchers develop a vaccine against the virus that causes COVID, it will not protect against the next novel virus. This system may have the potential for a low-cost, safe solution

<sup>5</sup> Information and excerpts compiled from Newsday.com: <https://www.newsday.com/news/health/coronavirus/coronavirus-ultraviolet-airborne-1.44287805>

<sup>6</sup> David J. Brenner Center for Radiological Research: [www.columbia.edu/~djb3/Far%20UVC.html](http://www.columbia.edu/~djb3/Far%20UVC.html)

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to eradicating airborne viruses minutes after they have been breathed, coughed or sneezed into the air.

Far-UVC lamps are now in production by several companies, although ramping up to large-scale production, as well as approval by the Food and Drug Administration and Environmental Protection Agency, will take longer. These lamps are anticipated to cost from \$500 to a \$1000 per lamp. This is still unapproved technology and while indicating potential promise, agency approvals must be acquired before this system can be recommended further.

### Conclusion:

The internet is full of companies that will tell you that their system is the one you should install. But your facility is unique and a solution that will work for your campus may not work for another. No matter what system you determine is the right one for your facility it will be an added benefit on the road to better air quality. Will it be effective, that depends on how well the facility does with its manual deep cleaning processes? If your crews are doing a good job cleaning and you activate the system of choice, you are going to see a measurable increase in air quality, however on the flip side, if they are lacking in deep cleaning procedures you may exacerbate the problems causing additional maintenance and material costs.

### Recommended Reading:

- Covid 19 Fact Sheet: <https://www.cdc.gov/coronavirus/2019-ncov/downloads/2019-ncov-factsheet.pdf>
- Filtration and Air Cleaning Systems: <https://www.cdc.gov/niosh/docs/2003-136/pdfs/2003-136.pdf?id=10.26616/NIOSH PUB2003136>
- Air Purifiers and the Cost of Clean Air: <https://www.consumerreports.org/air-purifiers/air-purifiers-and-the-cost-of-clean-air/>
- U.S. Food and Drug Administration: Ultraviolet (UV) Radiation: <https://www.fda.gov/radiation-emitting-products/tanning/ultraviolet-uv-radiation>

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