

EMCOR Group, Inc.

# HVAC System Operations

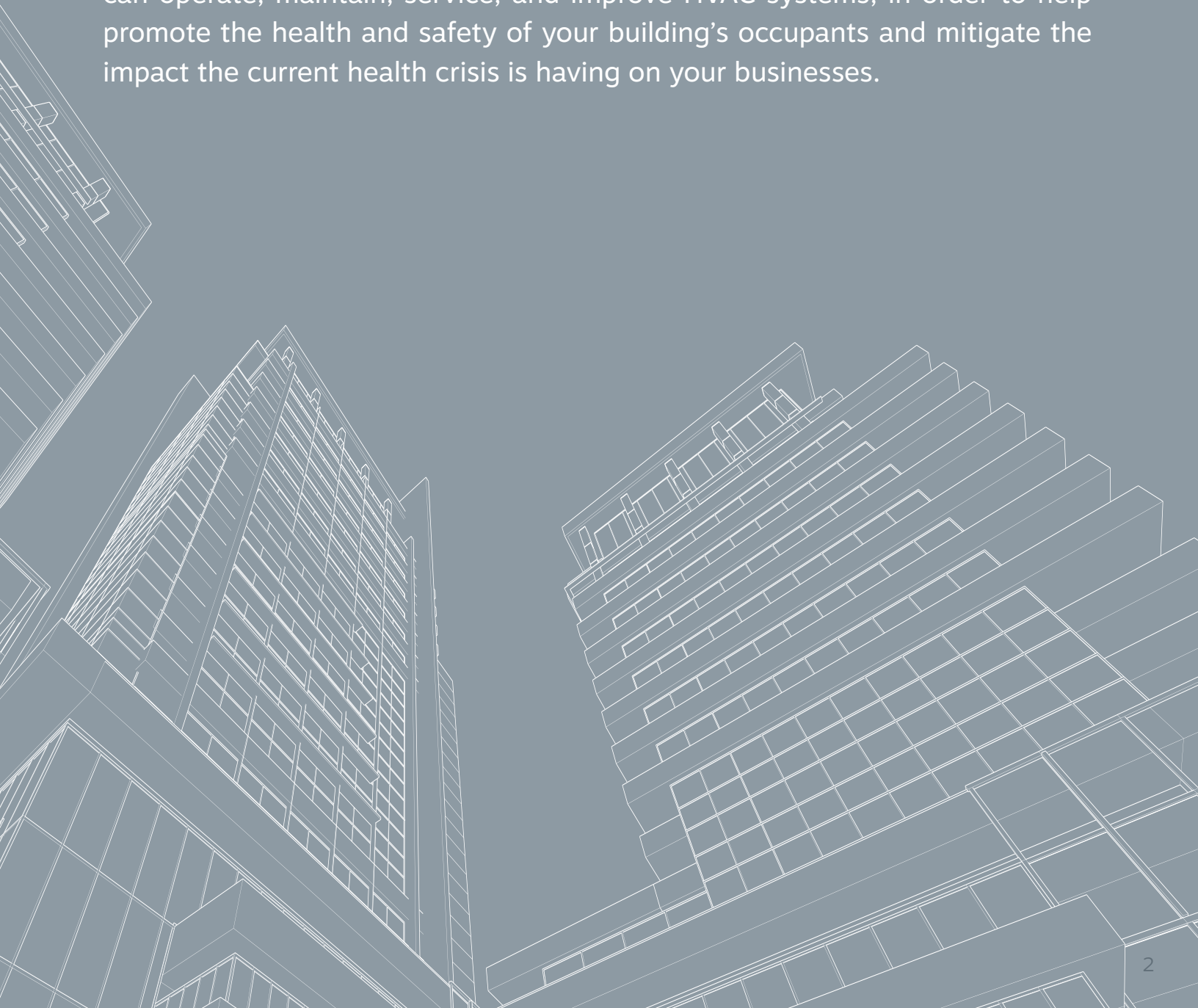
NOW AND GOING FORWARD





As one of the industry's most trusted HVAC and mechanical services providers, **EMCOR** is ready to help building owners and operators navigate changes to their HVAC system that can potentially reduce the spread of airborne pathogens, including those that carry viruses.

According to ASHRAE, when operated and maintained effectively, ventilation and filtration provided by HVAC systems can help reduce the airborne concentration of SARS-CoV-2 (the virus that causes COVID-19) and thus the risk of transmission within a building. We want to highlight various ways you can operate, maintain, service, and improve HVAC systems, in order to help promote the health and safety of your building's occupants and mitigate the impact the current health crisis is having on your businesses.



**BASIC CONSIDERATIONS:**

## Maintenance and Cleanliness

Before considering any major changes to HVAC systems, filtration, or other mitigation technology, the first thing all buildings should do is review their mechanical maintenance and cleaning procedures.

Make sure that your air filters are being replaced on a consistent basis. Routine maintenance should be more frequent and should regularly include an inspection of the cleanliness of the system's entire air path. If your building has been at low- or no-occupancy for the past few months, include an indoor air quality (IAQ) analysis in your transition plans. Transition periods are also ideal times to thoroughly clean air ducts and vents.

### Fundamental Best-Practices:

**In general, operational changes should be focused on performance confirmation and increased maintenance of existing systems:**

1. Change filters regularly, as recommended by your specific system operating requirements.
2. Ensure that components related to outdoor/ventilation air are working properly. Consider supplemental duct/ system cleaning.
3. Where present, verify proper operation of other IAQ-related components (humidification or UV light systems, for example) to confirm they are functioning at peak performance.
4. Consider supplemental air cleaning measures. These could include: higher MERV ratings for filters, UVGI, or Ionization systems, to name a few.



## Improving Ventilation and Circulating Outside Air

After settling your maintenance routine, improvements to ventilation and outside air intake should be considered next.

**Maximizing the use of outside air to displace contaminated air is one of the most fundamental ways to minimize the transmission of airborne viruses and pathogens through a building's HVAC system.** When coupled with one or more other suggested technologies, improving ventilation and increasing intake levels can result in significantly cleaner air and eliminate the re-circulation of particulates.

While the amount of increased outside air required to achieve your ventilation needs will be application specific and require consultation from a professional, there are a few general considerations to take into account. As you assess these changes, keep in mind that mixed-air HVAC systems looking to maximize occupant health and safety should be operated with a focus on increased outside air ventilation, rather than energy conservation.

### Key Takeaways:

1. More outdoor/ventilation air is better for IAQ.
2. Ensure that outdoor air dampers/economizers (and return or relief air components) are functioning properly and appear properly set.
3. For buildings with controlled pressurization levels (often used in laboratories, healthcare, or pharmaceutical environments) consult your mechanical contractor prior to making any changes.

### Relative Humidity

While changes to ventilation and circulation may help improve IAQ, they may also affect relative humidity in unexpected ways. An ASHRAE report on infectious disease has shown that lower relative humidity can result in microbes and pathogens staying airborne longer.

To mitigate this phenomenon, make sure your systems are capable of keeping relative humidity below reasonable levels in warmer climates or during summer months. If practical, consider adding humidification to maintain at least 30% relative humidity in colder climates or during the winter months. Above all, if you have a humidification system, make sure it's being properly maintained.



## Air Filtration Options

Alongside ventilation and circulation, filtration is another fundamental way HVAC systems can help improve IAQ and promote occupant health and comfort.

**Poor filtration is a key culprit in the spread of airborne viruses, and indoor air pollutants can also cause serious health problems for occupants who have respiratory conditions, autoimmune disorders, or environmental allergies.**

Upgrading a filter's MERV rating to the highest level compatible with the existing system, can also help boost IAQ. If your system already has high efficiency filters above MERV 13 or uses HEPA filters, confirm their level of effectiveness and make sure they are well sealed within the frames that hold them.

Depending on the climate, building type, and facility location, special air filtration or treatment technology may be needed to remove contaminants like dust, dirt, smog, salt, pollen, etc. Urban and suburban locations will likely require solutions for volatile organic compounds (VOCs), while rural areas tend to demand more frequent filter changes and pre-filtration.

While these are useful basic guidelines, no two HVAC systems are exactly the same. The measures outlined below should also be taken into account when assessing the needs of your system, and your trusted mechanical contractor should always be consulted before upgrading filters.

## Upgrading Existing Filters

Depending on system type and application, the efficiency and effectiveness of a filter—regardless of its rating—can vary widely.

According to the National Air Filtration Association, filters below MERV 15 have a minimal ability to trap virus microbes. The filters that are located upstream of your coils typically do not have more than a MERV 13 rating, and the performance of even the highest rated filter will deteriorate over time.

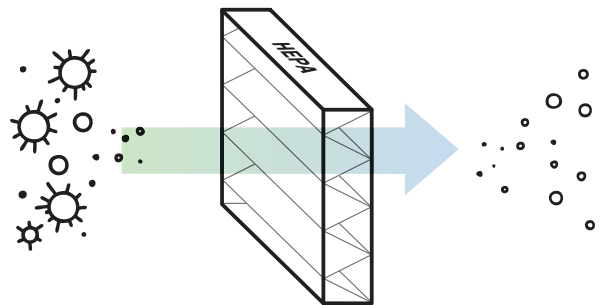
However, increasing the MERV rating too much—without also increasing filter surface area—will require a fan speed adjustment and additional energy or the system will suffer a decrease in airflow. Furthermore, most commercial equipment will also run into practical limitations and even excessive filter loading. Increasing filtration while decreasing airflow and circulation, may not have any positive impact on IAQ or occupant health.

This is why we always recommend consulting a professional HVAC representative, who can assess your system's performance capabilities and building needs, before making major filtration upgrades.

If you believe higher filter efficiency is warranted, most systems can upgrade to MERV-11 without changing fan-speed. However, professional consultation is almost always needed when considering an upgrade to MERV-13 or higher or if you have larger equipment, like built-up air handling units (AHUs).



HEPA filters offer an outstanding level of filtration, which can be critical and even required in certain environments (hospitals, healthcare facilities, etc.). Just remember, they are a site-specific solution designed for equipment with specific available fan power, filter rack construction, and ventilation needs. Again, consult an expert when considering any filter upgrade.



## Supplemental Air Cleaning Technologies

No single technology can guarantee that viruses and pathogens will be 100-percent eliminated. As it is so new, information on SARS-CoV-2's survivability in air and on surfaces is being updated regularly. We recommend a balanced approach that utilizes multiple techniques in order to maximize your protection from the virus and promote optimal IAQ.

Along with more standard maintenance, circulation, and filtration improvements, there are a number of additional air cleaning technologies we recommend to clients depending on their specific requirements of their facility environments.

### Ultraviolet Germicidal Irradiation



Ultraviolet C (UV-C) technology has been a popular method for preventing the accumulation of airborne pathogens on HVAC equipment for many years now. UV-C bulbs are typically placed on the backside of cooling coils or in

ductwork, where they offer continuous 24/7 protection from pathogen buildup.

**Keep In Mind:** *The “typical” lifespan of a UV bulb is one year, and the efficiency of the bulbs can be up to 50% less after one year in use, so contact your contractor to verify their performance and determine when a replacement is necessary.*

Fighting the accumulation of airborne contaminants not only promotes IAQ but can also help minimize maintenance costs and restore cooling capacity. Without contaminant buildup, cooling coils preserve their original heat transfer and pressure drop levels, often resulting in significant energy savings.

#### **We recommend two primary UV-C options:**

- **Surface Decontamination:** To help ensure equipment receives continuous exposure, lamps are placed downstream of cooling coil and drain pan on mounting brackets installed in the coil segment.
- **Airstream Decontamination:** Designed to fight pathogens in the airstream, lamps are placed end-to-end in ductwork, increasing the total time that air particles are exposed to light. This is typically reserved for certain environments such as hospitals and healthcare facilities.



## **Air Ionization**

Air ionization is gaining popularity as a viable active air treatment option, and, in recent years, we have seen multiple successful applications of the technology for our customers.

The solution we recommend utilizes needlepoint bi-polar ionization (NPBI) technology to purify air inside industrial, commercial, and residential buildings. The patented technology uses an electronic charge to create ions that can kill pathogens, breakdown harmful compounds, and accumulate micro-particles into larger filterable particles.

After passing through the HVAC system, the ions enter a building's air stream, cleaning air throughout the entirety of a facility. Make sure any ionization product you use is UL and CE approved, producing neither ozone nor other harmful by-products, so they are considered safe for continuous operation and can be deployed anywhere throughout a building.

## **Other Solutions: Independent Systems**

Heavily populated areas—such as waiting rooms, small patient rooms, lobbies in commercial buildings, conference rooms, convention centers, etc.—can also consider independent filtration devices and equipment, in order to further increase air filtration in these targeted zones.

There are a variety of independent cleaning devices on the market, including upper air UVGI fixtures, small HEPA filter recirculating/portable air systems, and larger cleaning systems. These machines help eliminate viruses and bacteria that have not yet cycled through filtration in central systems.





## HVAC Precautions if Occupants are Infected

If a regular building occupant, visitor, or someone working on mechanical equipment tests positive for COVID-19, there are some precautions that can be taken to ensure that your HVAC system is not promoting further transmission of the virus.

First, shutting down an HVAC system entirely, is not always necessary. An HVAC system will have very little effect on surface contamination, so the focus should be on its impact to airborne spread. As stated above, systems with MERV 14 filters or greater should already be adequately prepared to remove aerosol particles.

Additionally, unless your system has particularly high air velocity or humidity, viruses typically won't be re-entrained from HVAC equipment because there is not a mechanism for the creation of aerosols to carry them.

Regardless, mechanical cleaning and UV sterilization should be performed, as maintaining adequate filtration and clean filters is paramount. Sanitation of AHUs and a UV retrofit may also be a viable option. Do not utilize aqueous cleaning because the process may create aerosols that re-entrain the virus.

While the survivability of the virus on different surfaces is still being studied, filters that are removed should be immediately bagged and sealed. For extra precaution, special handling may be required by persons trained to perform this work.

*This document was developed for general guidance and a list of considerations for those who operate and maintain commercial HVAC systems. Information is not intended to specify solutions as these would be application specific and would require the design guidance of a qualified HVAC professional.*

By following these best-practices, applying these technologies, and consulting your trusted HVAC provider, you can help ensure your facility is ideally equipped to fight the spread of COVID-19 and promote the health and safety of occupants.



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