



## Pathfinder Update: COVID-19 and Re-Opening Buildings

August 17, 2020

Re-opening buildings in the wake of the COVID-19 pandemic creates a never-before-seen challenge to building owners and operators; every system in each building must be considered in a new light.

Engineering, design and commissioning firms are working to find a way thru this COVID-19 pandemic-shaken environment. Getting ready for re-opening, many commissioning experts are discussing essential system checks prior to opening businesses.

At Pathfinder, we are helping clients develop guidelines for building re-opening and occupancy that are technically sound, financially feasible and effective toward the goal of improving Indoor Air Quality specific to virus control.

We have noted that:

- Many clients are seeking guidance towards HVAC strategies that can be implemented to successfully control COVID-19 and other viruses for more healthy indoor environments. This includes both new system designs and retrofits. There is a lot of misinformation in the marketplace and some vendors are promoting/selling bogus technology. ASHRAE, the CDC, NIOSH, NYSERDA and other technical professional organizations are the best guides for best practices and standard of care solutions.
- For existing systems, retro-commissioning is a good place to begin to validate existing operating conditions and functionality prior to implementing any new COVID-19 control strategies. NYSERDA's FlexTech program provides grant support to New York State building owners for retro-commissioning. See *Pathfinder Update: Retro-Commissioning and COVID-19*.
- COVID-19 control approaches will vary depending upon the HVAC system, either new or existing, and the use of the occupied space. Pathfinder believes larger spaces will need the most attention and control.

Pathfinder has focused viral (COVID-19) control strategies along four paths: filtration, sterilization, ventilation / airflow pathways and humidification.

### Filtration

Although the virus particle size is 0.1- 0.5 micron, the recent CDC and ASHRAE recommendations indicate that most COVID-19 particles tend to coagulate into larger 1.5 – 2 micron particles.

- Particles < 0.5 micron require HEPA filters to capture and remove.
- Particles 1.5-2 micron can be removed effectively (95%) with MERV-14 filters.

Due to the high first and energy cost of HEPA filters, we are adopting ASHRAE's guidelines for MERV -14 filters on recirculated (mix) air.

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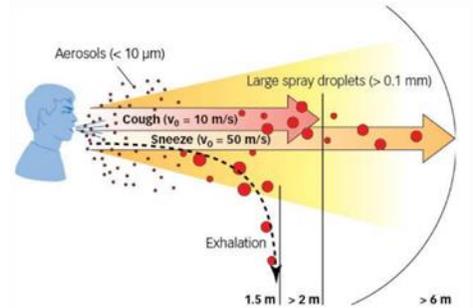
New York State has issued a document "Interim Guidance for Commercial Building Management" suggesting procedures to ready your facility for a re-opening.

[https://www.governor.ny.gov/sites/governor.ny.gov/files/ato\\_ms/files/commercial-building-management-master-guidance.pdf](https://www.governor.ny.gov/sites/governor.ny.gov/files/ato_ms/files/commercial-building-management-master-guidance.pdf)

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## Other filtration considerations:

- Protect energy recovery wheels on both sides with MERV -14 filters to protect the media and control viral carryover.
- Verify filter rack locations in existing AHUs to ensure that return / mix air is filtered through MERV -14 filters.
- Most unitary equipment manufacturers standard fan coil units, unit ventilators etc., can handle a MERV -14 filter and the associated fan static pressure loss.



<https://www.perioimplantadvisory.com/periodontics/oral-medicine-anesthetics-and-oral-systemic-connection/article/14173521/covid19-and-the-problem-with-dental-aerosols>

## Sterilization

There are currently two proven virus killing sterilization systems for HVAC applications: UV light arrays and ionization.

Previously, we typically only applied one of these to health care facility AHUs. The key is recirculation of air across the system (air change rates) for effective control. Both are intended for enclosed application within an AHU or terminal unit. Sterilization system considerations:

- UV lights are typically applied within larger AHUs and must be shielded from the public and operators.
- Ionization systems are more adaptable to smaller airflows and terminal devices.
- Both UV and specifically ionizers are only effective with prolonged contact time with the virus.

## Ventilation and Airflow Pathways

For new designs we are considering low wall returns with overhead or horizontal supplies to keep the fresh air in the breathing zone and any contaminants low and out of the breathing zone. The return air grille should be low and the path of travel should not be in the breathing zone of occupants. This is similar to our typical cleanroom and surgical suite airflow management strategies. To be effective, the return registers need to be placed in a grid pattern on 12' centers to keep the return air low, and out of the breathing zone for a seated person. Ventilation considerations:

- DOAS systems provide reliable quantities of ventilation to occupied spaces. For COVID-19 control we recommend disabling or modifying the demand control ventilation CO2 control schemes to allow longer fresh air purge during and post occupancy. This should be maintained at least until it's determined safe to resume energy control priority.
- Where possible, increase the outside air ventilation volumes into the occupied zones to allow longer fresh air purge during and post occupancy. This should also be at least until it's determined safe to resume energy control priority.

## Humidification

During the Winter in Upstate New York, indoor humidity levels can be very low. It has been widely known that humidity control (humidification) during the cold months helps our nasal passages stay moist which helps us resist viruses. However, due to first and operating costs, humidification is typically limited to healthcare, greenhouses and animal handling facilities. Due to COVID-19 we may need to change our approach and widen the application of humidification to larger spaces. Humidification considerations:

- New "cold" humidification approaches, such as infrared humidification and electric adiabatic humidification, are readily adaptable to terminal equipment and specific zones. These are more energy efficient.
- A new adiabatic technology, Ultrasonic (piezoelectric transducer) humidification, shows promise for improved energy efficiency, long term maintenance, unitary application and humidity control.

## Re-opening Fully Closed Buildings

Before occupancy of a building that has been fully closed owners must complete a variety of pre-return assessments and tasks to ensure a healthy and safe environment for building occupants. Systems requiring review include and are not limited to mechanical, water, HVAC and elevators. The requirements vary, depending upon how long a building has been fully closed. Systems should be run, while being observed, to ensure they are operating correctly.

- The building should be flushed with fresh air for at least 24 hours. After this, air filters should be replaced as needed.
- Owners must make sure that maintenance and monitoring in cooling towers are in accordance with State regulations. Additionally, any closed water system must be checked to confirm that chemical and microbial levels are in accordance with State guidelines. Any system with stagnant water should be drained.

A Commissioning Authority can guide you through the performance dynamics to get your building back into operation using standard New York State and ASHRAE guidance and standards intended to mitigate the risk of infectious disease transmission in the built environment.

ASHRAE has information available, by building type – healthcare, residential, commercial, schools and universities – to establish how buildings should be operating and how to check operations. Key considerations:

- Are existing HVAC systems able to meet the pandemic operating strategies?
- Is there enough monitoring in place to know *how* they are operating? Is this monitoring ongoing?
- Have proper system operation strategies and evaluation plans been established?

## Ongoing Commissioning

Pathfinder recommends:

- Monitoring system performance for Indoor Air Quality (ex. filter differential pressure, system outside air flow, RH control) on an ongoing basis.
- Notify and report on performance Key Performance Indices.
- Implement repair plan for prioritization and process for addressing impacts to re-opening plan.
- Update control and monitoring strategies based on research findings and jurisdiction updates.

## Seasonal Changes (Cold Weather Strategies)

As Fall and Winter approach, building owners need to:

- Modify outside air control based on system design and risk of coil freezing
- Monitor indoor RH with humidity levels typically lower during Fall/Winter seasons
- Prepare for potential facility shutdown(s) in response to increased regional infection trends

## Emergency Response

Non-healthcare buildings should have a plan for an emergency response. The following modifications to building HVAC system operation should be considered:

- Increase outdoor air ventilation (disable demand-controlled ventilation and open outdoor air dampers to 100% as indoor and outdoor conditions permit).
- Improve central air and other HVAC filtration to MERV-13 (13 or 14?) (ASHRAE 2017b) or the highest level achievable. (Caution should be exercised to minimize the amount of pressure drop in your existing system.)

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Engineers & Architects

- Keep systems running longer hours (24/7 if possible).
- Add portable room air cleaners with HEPA or high-MERV filters with due consideration to the clean air delivery rate (AHAM 2015).
- Add duct- or air-handling-unit-mounted, and/or portable UVGI devices in connection to in-room fans in high-density spaces such as waiting rooms, prisons, and shelters.
- Maintain temperature and humidity as applicable to the infectious aerosol of concern.
- Bypass energy recovery ventilation systems that leak potentially contaminated exhaust air back into the outdoor air supply.

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