



**Special Communication to City of Burlington
Emergency Operations Center and Mayor
Regarding COVID-19**



To: Brian Lowe

From: Jesse Freedman

RE: Building HVAC Operational Considerations

Date: 6/12/20

Updated: 7/24/20

Key Messages:

- Building HVAC operations may have an impact on transmission rates because the coronavirus is airborne.
- To limit transmission indoors:
 - Open windows and doors to maximize outdoor air
 - Set HVAC systems to “flush” two hours before and after occupancy
 - Aim for 40 to 60% relative humidity in occupied spaces, using humidifiers in winter if necessary
 - Use MERV13+ filters and change regularly, treat used filters as potentially contaminated
 - Consider air purification methods like spot filtration with HEPA filters and upper room- or duct-mounted UVGI systems
 - Disable demand controlled ventilation for spaces such as conference rooms or auditoriums, or set the maximum concentration to 600 ppm
 - CO2 sensors could be used to measure the effectiveness of ventilation

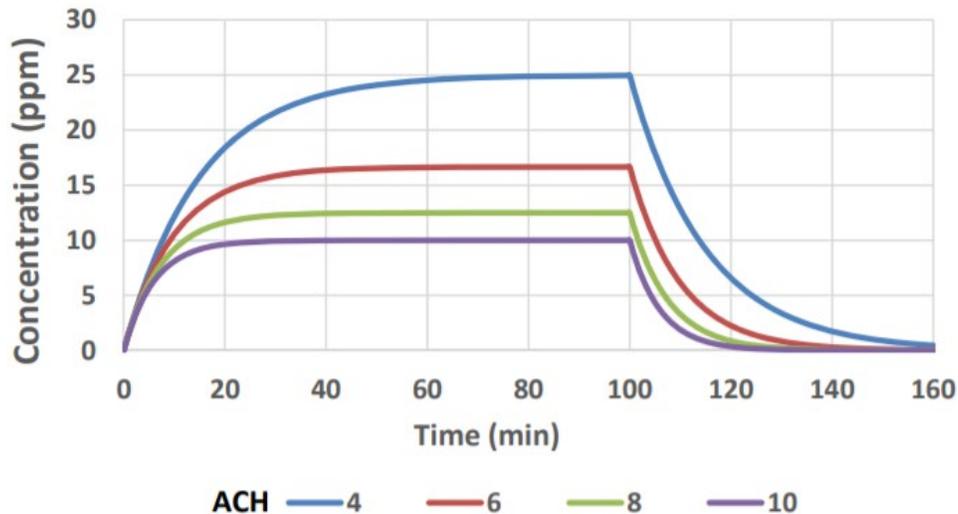
None of these guidelines should be considered a replacement for other public health guidance such as following social distancing and wearing masks.

Summary of Research

The American Society of Heating, Refrigeration, and Air-conditioning Engineers has stated that “Transmission of SARS-CoV-2 through the air is sufficiently likely that airborne exposure to the virus should be controlled. Changes to building operations, including the operation of heating, ventilating, and air-conditioning systems, can reduce airborne exposures.” Increasing the ventilation rates of occupied spaces, as well as increased filtration and better humidity control, may help reduce the transmissibility of coronavirus. At a minimum, all building operators should comply with local/state public health guidelines as well as ASHRAE ventilation standards (62.1 and 62.2).

Important Note Regarding this Document: COVID-19, and local, state and federal guidance/orders regarding this pandemic, are rapidly evolving. Information contained in this memo is presumed to be accurate and reflective of the situation as of the date and time noted above. Information in this memo is offered as review of actions, events, case studies, and data based on specific requests of the Analytics Team. The intended audience is the EOC and Mayor. Sharing of these resources to other City staff or outside partners upon approval of Brian Lowe or Luke McGowan.

Below is a graphical representation of the concentrations of a theoretical contaminant at various air change rates, highlighting the importance of ventilation rates. Concentrations decrease as the air changes per hour (ACH) increase, with each 2 ACH providing about a 25% decrease in concentration. For individual rooms or buildings without sophisticated building control systems, a portable CO₂ sensor can let the occupants and building operator know how well-ventilated a space is at a given point in time.



Air Cleaners

Portable air cleaners with HEPA filters can also play an important role in reducing risk. Harvard's Dr. Joseph Allen recommended putting one in every classroom, and aiming to achieve approximately three ACH to keep the air adequately filtered. Each unit should have a stated clean air delivery rate (CADR), and CADR x 60 divided by room volume should be equal to or greater than three. This supplemental control strategy can be used in coordination with others mentioned in this paper, at a cost of \$500-\$1000 per room. This may be a particularly useful strategy in rooms and classrooms without central ventilation.

Ultraviolet lights

Ultraviolet germicidal irradiation (UVGI) using far-UVC light is an additional strategy to reduce airborne risk. The Illuminating Engineering Society (IES) recommends upper-room UVGI over duct-mounted systems. These have been shown to inactivate coronavirus, and although studies of airborne transmission are limited UVGI has been shown to be up to 80% effective against tuberculosis. UVGI must be paired with good air mixing to be effective (6-12 ACH), which can be achieved with low velocity fans.

Assess HVAC

Because coronavirus is a novel virus, research is ongoing and subject to change. Businesses should continually check [ASHRAE's Covid-19](#) hub for updated guidance. Building operators should also consider hiring an HVAC professional assess whether their system's is performing as designed and is capable of operating in a manner consistent with ASHRAE's guidance. Due to long lead times for larger equipment, it is advisable to do this assessment in the summer months while natural ventilation is still an option.

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Monitor CO2

Once the system has been optimized, it is vital to check that it is operating correctly before each occupancy period. If the system does not have monitoring capabilities, consider purchasing an inexpensive indoor air quality monitor and regular check CO2 levels throughout occupancy. ASHRAE typically recommends CO2 levels below 1,000ppm (atmospheric CO2 levels are typically around 410ppm), but if possible consider a lower setpoint closer to 800ppm.

Sources

[AIHA Reopening Guidance for General Office Settings](#)

[How to Return the HVAC System to Normal Operation](#)

[ASHRAE Position Document on Infectious Aerosols](#)

[IES Committee Report FAQ on UVGI](#)

[CDC Recommendations for Airborne Diseases](#)

[EPA FAQs for HVAC](#)

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