HVAC System Considerations for Building Infection Control
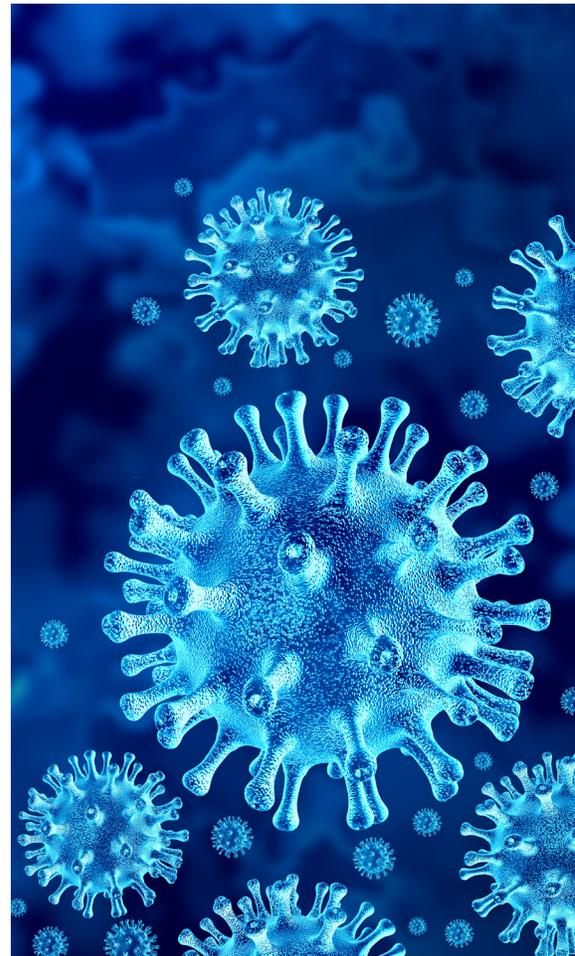

Powering your mission for safer building operation.

The power behind **your mission**

Johnson Controls

We are committed to helping facilities operate in a safe and effective way that puts employees and occupants at ease.

HVAC Recommendations for Infection Control in Buildings

Introduction

As organizations embark on a journey to their new normal, facilities need to consider how to help reduce disease transmission among employees and building occupants, provide a safe work environment, and maintain strategic facility operations.

Johnson Controls is committed to helping facilities operate safely by leveraging their heating, ventilation, and air conditioning (HVAC) infrastructure.

We can design a holistic HVAC-centered infection control strategy for your facility encompassing:

- Ventilation methods focused on increased outdoor air circulation
- Recommended air change rates to mitigate aerosols
- Filtration options for increased particle collection to improve indoor air quality (IAQ)
- Optimal temperature and humidity settings to destabilize pathogen transmission
- Ultraviolet germicidal irradiation (UVGI) methods to inactivate viral organisms

Our team of experts can also evaluate your facility's mechanical and life safety systems to determine its infection mitigation readiness – including checking for hazards associated with prolonged facility shutdown like mold growth or issues with stagnant water systems, and take appropriate remedial actions to mitigate risks.

This document is intended to provide general guidance* and a list of considerations for those who maintain and operate HVAC and lighting systems. We continue to follow recommendations from the Centers for Disease Control and Prevention (CDC), World Health Organization (WHO), and American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE).

Industry Guidance

Utilize Industry Guidance to Create a Infection Control Strategy

The ASHRAE Epidemic Task Force developed guidance[1] for HVAC systems to aid in mitigating the spread of airborne pathogens within buildings. According to ASHRAE and the CDC, infectious diseases like COVID-19 can be transmitted through aerosols. By providing increased amounts of clean air, HVAC systems can have a major effect in decreasing disease transmission from the primary host to secondary hosts, which is an important step in curtailing the spread of infectious diseases.[2]

ASHRAE recommends creating an infection control strategy to cultivate and sustain a healthy building environment. The strategy should ensure a dependable supply chain for critical items like filters, building support plans, and safety measures for occupants. ASHRAE also recommends utilizing guidance in Standard 180-2018[3] for HVAC systems that have been shut down or in setback for a continued duration.

By implementing ASHRAE's recommendations, building managers can help make an important contribution to public safety through effectively reducing the spread of airborne pathogens.

Methods to Increase Clean Air in Your Building

You can decrease the risk of pathogen spread throughout your building by increasing the amount of clean air flowing through the HVAC system. An effective, multi-faceted approach includes:

Increasing Ventilation Rates: Increasing the amount of clean outdoor air and increasing the amount of filtered recirculated air decreases pathogen exposure probability by diluting and removing aerosols.[4]

Improving Filtration Methods: Adding additional filters, including high efficiency particulate air (HEPA) filters and filters with the highest minimum efficiency reporting value (MERV) rating[5] can trap more particles and increase your building's clean air percentage.

Disinfecting Air with UV-C Lighting: Ultraviolet germicidal irradiation (UVGI) is a disinfection method that uses ultraviolet-C (UV-C) light to inactivate viral and bacterial microorganisms in the air so they are unable to replicate.[6]

UVGI can be utilized to disinfect air passing through air handling units and by circulating room air through UV-C troffers in the ceiling.

Room Control: Temperature, room pressurization, and relative humidity also aid in destabilizing airborne viral transmission by reducing cross contamination and creating protective environments for occupants.[4]

Air Change Rates and Disease Mitigation

Critical environments like operating suites have high air change rates to help prevent airborne-transmitted healthcare-acquired infections.[4] Applying the same technique to non-critical spaces can produce a similar effect throughout your facility.

The graph[7] below illustrates how the probability of airborne infection declines for rhinovirus, tuberculosis (TB), influenza (common flu), SARS (SARS-CoV), and COVID-19 (SARS-CoV-2) as the clean air change rates per hour increase.
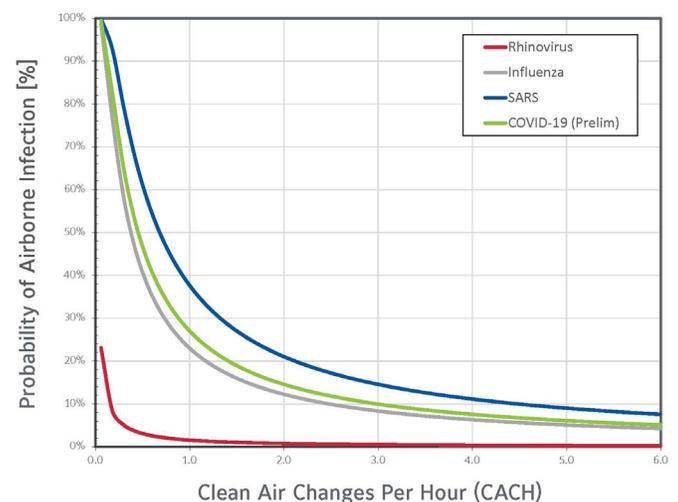
Probability of airborne infection calculated using the Wells-Riley equation.[7] Assumes one infected individual in a 5,400 sq. ft. space.

1. https://www.ashrae.org/about/news/2020/ashrae-offers-covid-19-building-readiness-reopening-guidance | https://www.cdc.gov/coronavirus/2019-ncov/community/office-buildings.html
2. https://www.ashrae.org/file%20library/about/position%20documents/pd_infectiousaerosols_2020.pdf
3. ASHRAE Standard 180-2018, Standard Practice for the Inspection and Maintenance of Commercial Building HVAC Systems
4. ASHRAE 170-2017 Standard Ventilation for Health Care Facilities
5. ASHRAE Test Standard 52.2-2012 | https://www.ashrae.org/file%20library/technical%20resources/covid-19/i-p_s16_ch17.pdf
6. https://www.ashrae.org/File%20Library/Technical%20Resources/COVID-19/ASHRAE-Filtration_Disinfection-C19-Guidance.pdf | https://www.ashrae.org/file%20library/about/position%20documents/filtration-and-air-cleaning-pd.pdf
7. https://www.sciencedirect.com/science/article/pii/S0160412020312800?via%3Dihub | https://www.nafahq.org/wp-content/uploads/WellsRileyReport.pdf

An Approachable Infection Control Strategy

To help you balance your strategy with your budget, the below recommendations start by utilizing your operational budget and progress to how you can utilize your capital expenditure budget for simple upgrades, planned upgrades, and renovations to implement infection control methods in your building.

1 Operations

- Optimize current maintenance practices
- Increase outdoor air ventilation to the extent the equipment/budget can handle
- Update control system setpoints
- Maximize filtration methods by installing filters with the highest MERV rating the equipment can support

2 Simple Upgrades

- Upgrades implemented by current building staff
- Install deeper filter racks to accommodate higher efficiency filters, potentially requiring a fan motor upgrade, to overcome a higher static pressure drop
- Install UV-C light troffers to sanitize room air

3 Planned Upgrades

- Changes made during equipment replacement or a planned upgrade program
- HEPA filter banks
- Lower cost outdoor air supply (indirect energy recovery ventilators, dedicated outdoor air systems)
- UV-C components in air handling units

4 Renovations

- Changes made during renovation
- Increase outdoor air supply system capacity with larger duct system
- New air handling units with HEPA filters and UV-C components
- Install Venturi valves and room pressure controls to limit cross contamination

HVAC Infection Control Product Solutions

York Air Handling Units

To reduce airborne pathogens within a building, mixed-air HVAC systems should focus on increasing outdoor air ventilation. York air handling units allow you to maximize outside air to displace contaminated air and increase ventilation and air change rates. UV-C disinfecting light components are also available to sanitize the air as it leaves the air handing unit. Factory-installed humidifiers and wrap-around heat exchangers can help support effective humidity control.

Koch Filter

Effective air filters are intrinsic to any successful infection control plan. Koch Filter's clean air solutions include high efficiency air filters, HEPA filters, and portable HEPA solutions for increased building flexibility. Air filters with MERV 13-16 ratings are recommended and provide increased infection control while also earning LEED® certification points. These products provide superior indoor air quality for applications from hospitals to commercial office buildings.

Critical Environment Controls

Room pressurization, air change rates, humidity, and temperature are essential components in mitigating airborne contaminants and preventing cross contamination within healthcare and laboratory facilities. Our line of Critical Environment Controls includes the broadest suite of products in the industry from touchscreen monitors to Venturi air valves, and our engineers can help you select the solution to best fit your specific needs.

These connected products allow you to remotely prepare rooms for occupancy and program energy-efficient setbacks during non-use hours. Retrofit options are also available, enabling you to create a flexible, resilient facility.

## Air Sanitizing UV-C Lighting Troffers

Disinfectant lighting solutions are an integral part of a building strategy designed to reduce airborne pathogens. We offer a comprehensive suite of disinfecting lighting products, including retrofit options to keep facility disruptions and installation costs to a minimum. Our lighting experts can assist you in selecting the best solution to fit your needs from our ecosystem of lighting partners.

Metasys Building Automation System

Metasys seamlessly integrates HVAC, lighting, and security systems on a single platform to deliver the critical information you need. Its intuitive design helps you reduce time on task, easily troubleshoot issues, and quickly implement necessary system changes.

Clean, simple dashboards identify devices that are out-of-date or offline. Continuous platform innovation enables features that allow you to quickly respond to evolving working conditions – like the ability to help achieve negative pressurization during a pandemic with a control sequence.
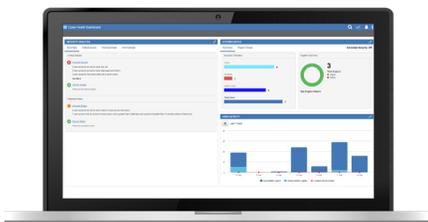
Johnson Controls Expertise and Service

Building Expertise

Johnson Controls can help power your mission to create a safe, comfortable, and energy-efficient environment by turning your building automation system data into actionable insights. Our talented team of experts can inspect your HVAC system and perform an IAQ analysis. We put our deep expertise, leading technology, and world-class products to work to address inefficiencies, explore energy cost control measures, and help you create a baseline plan with an approachable strategy to address your needs.

Our team can also rapidly mobilize planning and design engineers, project managers, installers, service technicians, and more to help you stay ahead of a crisis.

Flexible, Resilient Infrastructures

Preparing a building for the unexpected – from pandemics to natural disasters – is part of our new normal. Johnson Controls is prepared to help you optimize your building infrastructure to support flexible, resilient spaces ready to withstand different demands.

We can provide an assessment of your building and help you explore different options including expanding equipment settings to increase ventilation, implement diverse building automation operating modes, and create urgent space re-allocation plans – including converting non-critical spaces into infection control rooms to ensure your facility is safe for your occupants tomorrow and beyond.

Preventative Maintenance and Remote Monitoring Programs

Our service teams provide continuous customer support through our preventative maintenance and remote monitoring programs to ensure equipment uptime and reliability. Services include:

· Verification of HVAC system performance to provide proper airflow, temperature, and humidity
· Air distribution equipment refurbishment and cleaning
· Confirm disinfecting lighting is working and replace components as required
· Review and update of control sequences based on increased occupancy/production of new activities
· Service and support to ensure critical infrastructure equipment and systems are operating as designed
· Maintenance support to augment existing staff, including HVAC mechanics and building automation technicians
· Ability to respond to service requests 24/7/365 plus remote service options to diagnose and resolve many issues quickly over the phone, minimizing the number of people/visitors on site

- 120 branch locations in North America

- 13,600 field technicians and mechanics in North America

- World-class vendor partners with expertise in air cleaning technologies

- Recognized by federal, state, and local governments as a provider of essential products, services, and personnel

For over 130 years Johnson Controls has been helping customers prepare for and recover from natural disasters and other unexpected high-impact events. We transform the environments where people live, work, learn and play. From optimizing building performance to improving safety and enhancing comfort, we drive the outcomes that matter most.

Dedicated to protecting the environment, we deliver our promise in industries such as healthcare, education, data centers, and manufacturing. When you partner with Johnson Controls, we treat your mission as our own. We put our deep expertise, leading technology, and world-class products to work for you, never resting until you achieve your goals.

Whether your mission is to heal, teach, create or connect, Johnson Controls can help you achieve it.

For more information, contact us at (877) 913-3123

www.johnsoncontrols.com or follow us @johnsoncontrols on Twitter

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