ILLINOIS
FACILITIES & SERVICES

F&S Health and Safety Response Team

HVAC Considerations for COVID-19

Executive Summary

It is important to note that the disabling of HVAC systems is not recommended due to the potential for causing thermal stress and lowering resistance to infection. As of May 2020, research has not demonstrated that contaminated air taken from one space and recirculated through an HVAC system into another space has been found to cause infections. The ventilation and filtration provided by HVAC systems can reduce the airborne concentration of COVID-19 and thus the risk of transmission through the air. The primary means to prevent the spread of infection are considered to be social distancing, wearing of masks, and proper hygiene. Each HVAC system and each building is unique; there is not a one-size-fits-all strategy for every HVAC system across campus. It is essential to continue providing proper operation of the HVAC systems through proactive and preventive maintenance strategies. Modifying systems that have been designed and commissioned to operate under carefully constructed parameters can cause unintended harmful consequences, especially in areas such as research laboratories, where space pressurization and air changes are critical for continued safe operations.

Introduction

The safety and well-being of our faculty, staff, and students is central to our efforts to prepare the campus to return to on-site-work. As we work together to create an environment that minimizes the spread of COVID-19, it will allow the university community to return to campus feeling safe and confident in their learning and work environment. To assist in this effort, the Facilities & Services Health and Safety Response Team has been established to deliver solutions to units through in-person and virtual consultations that address immediate and ongoing social distancing and space concerns. The team is made up of experts in operations and maintenance, safety, engineering, and building code compliance. Members will monitor suggested guidance on the virus and be available to assist campus leadership as we develop safety protocols and prepare to return to our mission-critical work through teaching, research, public engagement, and economic development.

Heating Ventilation and Air Conditioning (HVAC)

There is ongoing research and discussion regarding the operation of HVAC systems related to COVID-19. Transmission of the virus is believed to occur primarily through respiratory droplets produced by talking, coughing, and sneezing. These droplets can settle on surfaces or objects and these contaminated surfaces may also be a factor in spreading the virus. Most campus HVAC systems are central systems with long runs of ductwork between the supply (air outlet) and return (air inlet). If you would like to find out more information about the specific HVAC system serving your space, please send an email to covid19fsconsulting@illinois.edu.

The Centers for Disease Control and Prevention (CDC) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) have released guidance to consider for the operation of HVAC systems. On May 6, 2020 the CDC provided strategies to consider for improving the building ventilation system as part of their *Interim Guidance for Businesses and Employers Responding to Coronavirus Disease 2019 (COVID-19), May 2020* https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html.

Below are the CDC recommendations for engineering controls, with commentary from F&S Mechanical Engineering staff for considerations regarding the HVAC system within your building:

Increase ventilation rates. [CDC]

- Urbana campus standard HVAC systems have ventilation rates that are typically higher than required by codes and recommended by standards. F&S advises caution when considering opening windows. Opening windows brings in unfiltered air and can allow unwanted pollutants, allergens, weather, insects, and

animals to enter the building. Opening windows may be appropriate in certain spaces, depending on the outdoor air conditions, when fresh air is not supplied to a space via mechanical ventilation means. Please consult with F&S Health and Safety Response Team at covid19fsconsulting@illinois.edu to determine whether or not opening windows in your space is advisable.

Ensure ventilation systems operate properly and provide acceptable indoor air quality for the current occupancy level for each space. [CDC]

- Urbana campus standard HVAC systems have digital controls that have been set to meet and, in most cases, exceed ASHRAE's standard 62.1 for indoor air quality. HVAC systems are continuously monitored by the F&S Energy Management Control Center and are routinely checked by technicians to ensure proper operation. Systems are periodically revisited to ensure they are providing acceptable indoor air quality and are improved as necessary.

Disable demand-controlled ventilation (DCV). [CDC]

- Urbana campus standard HVAC systems utilize DCV for several purposes. DCV is in the process of being reviewed by F&S programmers and engineers to enhance safety by disabling or modifying some control sequences.

Further open minimum outside air dampers (as high as 100%) to reduce or eliminate recirculation. In mild weather, this will not affect thermal comfort or humidity. However, this may be difficult to do in cold or hot weather. [CDC]

- Urbana campus standard HVAC units have outside air dampers that utilize economizer operations. Economizer operations generally introduce as much outdoor air as possible without negatively affecting temperatures or humidity, which aligns with the CDC recommendation. This economizer function will be reviewed campus wide to ensure proper operation and ensure as much dilution as possible is occurring.

Improve central air filtration to the MERV-13 or the highest compatible with the filter rack, and seal edges of the filter to limit bypass. [CDC]

- Urbana campus construction standards for ventilation systems include filtration. Standard building environments are supplied with clean air that has passed through at least two (2) filtration stages. The first stage is a pleated filter rated at a Minimum Efficiency Reporting Value (MERV) of 8; the second stage is rated a MERV-11. Higher-efficiency filtration is provided for special applications such as LEED certified building, labs, and clean rooms. Those spaces can get second stage MERV-14 filtration (LEED buildings) and in certain situations High Efficiency Particulate Arrestance (HEPA) filters. For more information on filtration, see the following FAQ from the National Air Filtration Association (NAFA): https://www.nafahq.org/covid-19-corona-virus-and-air-filtration-frequently-asked-questions-faqs/.
- Filters vary across campus due to the age and variety of HVAC systems in use. Systems should be reviewed before higher-efficiency filters are installed. At times a higher-efficiency filter can be counterproductive to the operation of HVAC systems due to a high pressure drop that exceeds the system design and leads to diminished air supply. Higher-efficiency filters may also become quickly loaded, which can cause air to bypass the filter. If you have specific questions on the MERV rating of the filters serving a space, contact the F&S Health and Safety Response Team at covid19fsconsulting@illinois.edu

Check filters to ensure they are within service life and appropriately installed. [CDC]

- F&S maintenance staff changes filters on a scheduled, routine basis to ensure they are within service life and appropriately installed. Checking filters across campus will be a priority for F&S staff as the university returns to on-campus operations.

Keep systems running longer hours, 24/7 if possible, to enhance air exchanges in the building space. [CDC]

- University HVAC systems are typically scheduled to run continuously during occupied times. Systems start before the building is scheduled to open and remain on past the scheduled building closing time (or when the space becomes unoccupied). Please be aware of when your systems are scheduled to run. Modifications to system run times may be appropriate if working hours are being staggered or extended as part of the effort to maintain social distancing. If you have questions on the scheduled run time for the HVAC system serving your space, or to make adjustments to run times, please have your Facility Manager work with the F&S Energy Management Control Center at fandsenergycomm@illinois.edu.

Along with the considerations published by the CDC, ASHRAE has provided a resource page for COVID-19 (www.ashrae.org/covid19) and their Position Document on Infectious Aerosols (published 4/14/2020) recommended the following additional considerations for non-healthcare buildings that warrant discussion and review:

Add duct- or air-handling-unit-mounted, upper room, and/or portable UVGI devices in connection to in-room fans in high-density spaces such as waiting rooms, prisons, and shelters. [ASHRAE]

- Duct-or-air-handling-unit UVGI (ultraviolet germicidal irradiation) has been proven to inactivate viruses in an air stream. The more prevalent use of UVGI in air handling systems is to sanitize coils. Neither application of UVGI is installed in a standard campus HVAC system. The primary strategy for continuing to provide sufficient indoor air quality is to ensure HVAC systems continue to operate properly. There is no evidence to date that contaminated air taken from one space and recirculated through an HVAC system into another space has been found to cause infections; if there are future studies to prove that COVID-19 aerosol transmission is possible in this manner, then UVGI could be considered as a supplemental strategy. One of the downsides to UVGI is that it can be hazardous to human skin and eyes. For this reason, UVGI needs safety measures in place and is typically limited to unoccupied areas (air handling units, duct work and upper portions of rooms that have high ceilings). Additionally, the bulbs used to generate UVGI typically contain mercury, which will need to be disposed of properly when bulbs are changed. Each air handling system is unique and would require proper study and design before implementation could be considered. Any system where UVGI is considered will need funding for the first cost, additional utility consumption, periodic maintenance, and end-of-life replacement/disposal. This is in addition to the engineering, product submittal review/approval, inspection, and as- built documentation that will be required.

Maintain temperature and humidity as applicable to the infectious aerosol of concern. [ASHRAE]

- Standard campus HVAC systems are configured to maintain temperature set points. The HVAC industry recommends 40-60% relative humidity as the ideal range to minimize the likelihood of virus and bacteria transmission. Most campus HVAC systems can maintain the relative humidity in buildings below the recommended 60% level. However, during the cold and dry winter months, the indoor relative humidity

falls well below the 40% level in most campus buildings. Central system humidifiers are only provided in special circumstances on campus for spaces with a specific need (such as for rare book collections, musical instruments, art displays, or other specific research requirements). Humidifiers can present many challenges and unwanted side effects. When not carefully monitored or controlled, there could be an increased likelihood of condensation forming on outside windows or walls, which could lead to mold or mildew growth. The existing building vapor barrier and duct work also need to be carefully reviewed to ensure other potential sources of moisture, mold, and mildew are not created. There are not currently plans to begin installation of humidifiers in AHU or duct systems.

- The use of portable humidifiers and electronic air cleaning devices utilizing ion generators are not recommended due to the unknown quality of water used in these devices, possibly causing excess humidity, and the potential for producing ozone.

Bypass energy recovery ventilation systems that leak potentially contaminated exhaust air back into the outdoor air supply. [ASHRAE]

- Energy recovery ventilation systems will be evaluated on a system-by-system basis to verify that they can continue to operate properly if bypassed.

These considerations are intended to guide and inform the decisions we make as we continue to navigate the best practices that allow the university community to return to campus. If you have questions or require an in-person consultation to address your concerns, please send an email to covid19fsconsulting@illinois.edu.