

Additional HVAC Information Related to JMU Buildings

HVAC Systems and the Spread of COVID-19

According to current research findings, the only identified HVAC systems that appear to have been related to viral spread are systems that recirculate the air in a room. There have been no cases tied to a central ventilation system that is working as it should. HVACs pull air into duct work, move it through a filter, mix it with some outside air, then redistribute it through duct work.

JMU primarily uses a central ventilation system with a minimum of MERV 8 filters and air exchanges at 7 CFM/person, resulting in most droplets being filtered and any potential remaining viral particles being diluted as the air is mixed with fresh outside air. This is more than sufficient to provide clean air related to the virus.

The only air-handling system of concern is the mini-split system that is only recirculating air within a space, like some room air conditioners. In some of these window units, air is pulled into the system, heated or cooled, then expelled with little to no filtration. This type of system will spread any respiratory virus.

However, JMU does not use this type of window units. Facilities Management services the window units in all buildings twice a semester. All units have cleanable screen filters with built-in ventilation. See specific building details below.

Roop Hall

Roop Hall has two large air handlers and a make-up air unit, along with exhaust for restrooms and general use. All the units use MERV 8 filters, and all have outside air that is compliant with the building code at the time they were installed. The amount of outside air introduced into the systems is maximized via our automation system. The system is well maintained and in good working order, according to the recent consultant review. Almost all classrooms on exterior walls are heated and cooled by unit ventilators that provide outdoor air, while offices and a few modified classrooms are heated and cooled by fan coils, which get fresh air from the make-up air unit ducted in through a ceiling vent. Interior classrooms and offices are heated and cooled by air from the air handler in the third floor mechanical room, which has outdoor air inducted through a controlled damper. These spaces have induction boxes in the ceiling to modulate and temper the air. A computer lab has both a Liebert unit and an induction box that help to supply fresh air to the space.

Moody Hall

Moody Hall has dedicated HVAC units in Blackwell Auditorium, the conference room and computer lab. The rest of the building has radiators and window AC units. The window units have ventilation controls that bring in outside air and built-in filters, which are serviced twice per semester. Classrooms will be disinfected once per 24-hour period, and high touch surfaces are disinfected on a continuous basis.

Alumnae and Sheldon Halls

Alumnae Hall and Sheldon Hall are conditioned by fan coil units in the rooms, with ducted fresh air from air handling units (AHU) to meet building code requirements. The AHUs are served by MERV 8 filters, and the fan coil units are filtered as well.

Explanation of Filter Size

Filters are rated based on their Minimum Efficiency Reporting Value (MERV). Higher numbers mean higher level filtration; the key factor here is the size of particles that the filter will remove. Hospitals use MERV 13 filters, which are a very high level filtration, as fits a health care setting with the potential for a significantly higher viral load due to a concentration of sick individuals. In addition, there are multiple other pathogens that hospitals want to eliminate.

MERV 5 to MERV 8 are effective at controlling mold spores, hair spray and dust. They are appropriate in most commercial buildings, residences and industrial workplaces. MERV 8 filters have 90 percent efficiency on particles that are 3 to 10 micrometers in size. MERV 9 to MERV 12 filters are the best option for residential use as these filters can remove pollutants as small as 1–3 microns.

JMU uses MERV 8 and MERV 12 filters in its ventilation systems.

Droplets vs. Aerosols

Expert consensus continues to be that COVID-19 is primarily spread by droplets rather than aerosols. People generate some aerosols (resulting in smaller particles) by coughing, sneezing, laughing, singing and maybe talking. However, the amount of aerosol is limited, and its role in viral spread is unclear. Even if aerosol plays a bit of a role, that will occur as primary exposure and not due to aerosolized particles going through a central HVAC system. In order to understand the rationale behind this there are many factors to understand.

First, there is the consideration of viral inoculum. In order for the typical person to become ill from COVID-19 due to an exposure, that exposure needs to have enough viral particles that overwhelms the body's ability to get rid of these live viruses. Any viral particles that do get pulled into a central HVAC system will go through either a MERV 8 or MERV 12 filter so some of the particles will be filtered out. Next, the air is mixed with outside air so if there are viruses still present, the concentration will be diminished. Finally, the air is redistributed to the multiple areas served by that air handler. If any live viral particles are left in the air being redistributed, there will not be a significant viral inoculum to give someone COVID-19.

In conclusion, COVID-19 can spread into a room via both droplet and aerosols from an infected individual (minimized by face mask use). However, this does not translate to infections that are obtained through a well-designed and correctly working HVAC system with a minimum of MERV 8 filtration. The factors that would need to occur for viral spread through a JMU HVAC system are so improbable that concern for COVID 19 transmission through a normally working HVAC system with standard filtration is unfounded.

Some studies report finding viral particles in air ducts. This does not correlate with the live virus being in air ducts. These studies are finding viral RNA which does not equal live virus.

Even more important is that if droplets and aerosols can be prevented or minimized, there would be minimal if any live virus making it into the HVAC system. Face mask use has been shown to do just this. Furthermore, facemask use has also been shown to provide the wearer with protection.

Why Masks Work

COVID-19 is primarily spread through respiratory droplets that escape into the air and are then inhaled by an individual nearby (typically less than 6 feet if no masks are being worn) or they fall to a surface and are touched by an individual who then touches their mouth, nose, or eyes. The vast majority of respiratory droplets are heavy enough that they fall out of the air onto surfaces within a few feet of the person: Three feet is the WHO working distance.

If an individual is wearing a mask, the respiratory droplets are confined to the mask and to areas in close proximity to that person. There is minimal droplet spread when masks are worn. This virus may be aerosolized, meaning large droplets become small aerosols and can then linger in the air, but this is limited and can be minimized by mask use. Also, these aerosols disperse and as they disperse, viral load diminishes.

Research Shows

[This article](#), published 6/22/2020 by the European Centre for Disease Prevention and Control, lead to the following conclusions:

- Transmission of COVID-19 commonly occurs in closed indoor spaces.
- There is currently no evidence of human infection with COVID-19 caused by infectious aerosols distributed through the ventilation system ducts of HVACs. The risk is rated as very low.
- Well-maintained HVAC systems, including air-conditioning units, securely filter large droplets containing SARS-CoV-2. It is possible for COVID-19 aerosols (small droplets and droplet nuclei) to spread through HVAC systems within a building or vehicle and stand-alone air-conditioning units if air is recirculated.
- Air flow generated by air-conditioning units may facilitate the spread of droplets excreted by infected people longer distances within indoor spaces (recirculating the air).
- HVAC systems may have a complementary role in decreasing transmission in indoor spaces by increasing the rate of air change, decreasing recirculation of air and increasing the use of outdoor air.