MEMORANDUM

TO: Greg Smith, Assistant Vice President of Facilities & Operations

FROM: Tony Davis, Director of Facilities Maintenance

Claire Jackson, Director of Utilities & Sustainability

SUBJECT: Fall 2020 Return to Campus HVAC Operations protocol

DATE: July 17, 2020

As we prepare for faculty, staff, and students to return to campus this August, the Facilities & Operations team has developed several protocols and safety measures to reduce the risk of COVID-19 spread. This memo specifically addresses the heating, ventilation and air conditioning (HVAC) systems and operations protocol.

Throughout the pandemic, various strategies have been circulating in the media regarding HVAC system operations to promote COVID-19 risk reduction, including but not limited to:

- Increase outside air ventilation into building interiors
- Improve central air system filtration
- Continuously run the HVAC systems
- Install portable room air cleaners
- Install Ultraviolet Germicidal Irradiation (UVGI) in air handling equipment
- Provide local exhaust ventilation systems in rooms with known risk of contamination
- Install bipolar ionization type air cleaners
- Install negative air pressure systems

As UAH has numerous different types of HVAC systems on campus, a “one size fits all” HVAC modification approach will not work. To efficiently help reduce the risk of COVID-19, any response should be specifically customized based on each individual building. These actions should be implemented only where they would be most apt to help more rapidly remove the virus carrier droplets from the air within the building, thus helping make the indoor environments safer for subsequent occupants. The specific actions taken inside the campus buildings will vary based on the specific design of the building, on the type of HVAC system and equipment inside each building, and on the occupant loading within the building. UAH does have several enhanced filtration and HVAC disinfection devices already in some areas including the following:

- ✓ Business Administration: AHU4 (Chan Auditorium) has an air purifier.
- ✓ Charger Union has primary MERV 9a and Secondary MERV 14 filters
- ✓ Lowe House has air scrubbers in all HVAC Systems

301 Sparkman Drive
Physical Plant Building
Huntsville, AL 35899

t. 256-824-6480

f. 256-824-7399

- ✓ Optics - Most of the AHUs have Primary MERV 9a and Secondary MERV 15 Filters. AHU-14 has a bi-polar ionization air purifier system.
- ✓ Shelby Center - AHU - 5 & 6 have Primary MERV 9a and Secondary MERV 15 filters.
- ✓ Wilson Hall - The three main AHU's have bi-polar ionization air purifier systems.
- ✓ All other filters on campus are MERV 9a or are in the process of being changed over from the standard pleated MERV 8. F&O is also studying the feasibility of changing over to MERV-11 filters.

Given the evidence and knowledge of COVID-19 that exists today, HVAC related actions which are effectively being implemented on the UAH campus are listed below:

1. Continue to operate and maintain the HVAC systems to a high-quality level and recommend focusing campus resources on CV19 prevention measures that CDC recommends (social distancing, cleaning, etc.)
2. Ensure all HVAC system equipment are operational and in good working condition. Clean and disinfect cooling and heating coils.
3. Operate each building HVAC system with the level of outside air that is optimal based on the building design and occupant load (as opposed to “maximum” level of outside air)
4. Other recommended strategies that are currently under consideration can be found on the following pages.

Like most CV19 issues, there is no simple solution. By taking a smart, precise approach that implements only the HVAC strategies in each specific campus building that have the highest probability of reducing the risk of COVID-19 in that specific building, along with implementing the sanitation and social-distancing protocols, we will lower the overall risk of COVID-19 and thus provide a safer campus for the students, faculty, and staff.

Additional Strategies Under Consideration

Many Mechanical Engineering and HVAC design professionals are saying that increased ventilation does not help reduce COVID-19 based on CDC guidance that CV19 is mainly a person-to-person transmitted virus. Since COVID-19 is primarily spread person to person, building HVAC systems are not effective in preventing the spread of the COVID-19 virus between people who are in close proximity to each other. HVAC systems are also ineffective in dealing with virus droplets on surfaces within a room which may lead to infection via indirect contact. Thus, any operational or physical modifications to HVAC systems must be viewed as having only a very small role in any COVID-19 risk reduction plan.

The April 14, 2020 "ASHRAE Position Document on Infectious Aerosols" https://www.ashrae.org/file%20library/about/position%20documents/pd_infectiousaerosols_2020.pdf provides guidance on HVAC strategies that have documented success against airborne pathogens such as COVID-19. Of the many options circulating only three are noted as "strongly recommended" based on the level of scientific certainty that the strategy has been successful in reducing viruses similar to COVID-19. These are:

1. Higher efficiency filters (MERV rating increase) are available and can control contaminants in the size range of the smallest COVID-19 virus droplets. Although typically used in hospital inpatient care and general surgery applications, MERV-11 and MERV-13 filters can be retrofitted into some of the existing HVAC systems on UAH campus. The drawback with an enhanced filtration strategy is increased filter changeout frequency and material cost. MERV-13 filters must be changed more often than the MERV 8 filter currently used in most areas of campus. If installed in all campus buildings, MERV-13 filters will significantly increase maintenance costs as well as increase utility costs to due to the added load on the HVAC systems. Other alternatives such as MERV-11 filters and bi-polar ionization air purifier systems are currently under consideration and can be more cost effective while providing enhanced filtration over the MERV-8 filter.

2. Ultraviolet Germicidal Irradiation (UVGI) lighting has been shown to be the most effective for disinfection. There are several types of applications that utilize the UV-C disinfectant lighting such as:
    a. Upper Room GUV – a system that is utilized in rooms with taller ceiling heights and mixes with the air in the upper room through forced fan or natural draft in order to disinfect large volumes of room air above the occupant's heads. However, they only disinfect the upper part of the room air and not the lower room.
    b. GUV Lamps - wall mounted fixtures, lay in ceiling fixtures, and portable devices, that require the room to be unoccupied while the devices are in use due to the harmful UV-C lights; these lights would need to be set on a timing system that will allow them to run after the building shuts down for the night.
    c. Duct System UV Lighting – units installed in duct work to disinfect recirculated air; however, these systems do very little to prevent person to person transmission in a room.

3. Increased Outside Air / Exhaust ventilation is probably the most recommended strategy provided by the many different groups offering their opinions and recommendations on COVID-19 risk reduction. While increasing outdoor air ventilation is recommended by ASHRAE, this strategy was only given an evidence level of "fair scientific certainty" in the April 14, 2020 "ASHRAE Position Document on Infectious Aerosols". Thus, the incremental benefit of maximizing outside air ventilation, anything short of 100% outside air, is unknown at this time. The HVAC systems in most of UAH's older buildings have the capability to bring in only 10-25% outside air. While the HVAC systems in many of the newer, larger campus buildings may have the capability to bring in 50% or more outside air, many lack the ability to do so and still properly maintain humidity inside the building during most of July, August, and early September. Attempting to increase outside air beyond the HVAC design parameters can lead to other issues such as mold and increased levels of dust, pollen, and other allergens. This is especially true if windows and doors are left open.

4. The feasibility of negative Air Pressure Operations within the Faculty, Staff & Student Clinic is being examined as another potential strategy. Facilities & Operations has engaged the services of a professional mechanical engineer to determine the feasibility of accommodating single pass, negative pressure operation within the Faculty, Staff & Student Clinic in Wilson Hall. Due to the design of the existing mechanical system, both options presented would be highly disruptive to the function of the Clinic and to Wilson Hall as a whole. In order for this work to be completed, the areas under consideration would need to be vacated during construction. Also, the work will require extended periods of down-time for air-handling units 2 & 3 serving Wilson Hall. Because of the location of the Clinic on the third floor, both options will NOT prevent the spread of contaminated air to other areas of the building by Clinic visitors entering and navigating through other parts of the building while moving towards the Clinic. Both options only prevent the spread of contaminated air once the patient is confined within the Clinic or the Exam Rooms. Due to the estimated construction costs, we would be remiss if we did not recommend considering other possible locations for the Clinic on campus (i.e. locations that could accommodate complete isolation of the clinic from adjacent functions, and also accommodate dedicated ingress/egress for the Clinic).

In short, major HVAC system operational changes are not feasible (and sometimes impossible) without major reconfigurations, additions, disruption, and cost. Upgrading to higher efficiency filters and/or air purifiers where possible and practicable as discussed in bullet #1 may be a better strategy. Furthermore, operating the HVAC systems beyond the design parameters could cause other problems including mold, insufficient cooling, static pressure issues, and high humidity, along with excessive system wear and/ or damage. Most buildings are not designed and built to accommodate high outside air intake, single pass air, negative pressure and/or hospital grade ventilation.

301 Sparkman Drive
Physical Plant Building
Huntsville, AL 35899

t. 256-824-6480

f. 256-824-7399