UCM: AIR QUALITY & COVID-19 WHEN WORKING INSIDE: 7/29/20

Executive Summary: based on information below

UCM has 2 different systems in the building:

1. Sanctuary & Vestry: Air from furnaces in the basement. There is currently no outdoor (clean) air introduced to the system, and it is only operated during the heating season.
2. Addition (Offices and Meeting Rooms): a hot water baseboard system (from a boiler) is used for heating. Summer cooling is provided by window air conditioners. There is no outdoor (clean) air introduced to the system.

Suggestions based on the following information:

a. The VT Health Department's solution to open doors and windows is problematic. It cannot be used in the winter (!), and the airflow could actually distribute contaminants throughout the room. Research has shown that the location where the air is introduced is critical when considering the spread of Covid-19 in a space.
b. A combined system of filtration is possible:
   -- Air System: Air filtration (HEPA or MERV 13 rating) might be added to the existing system ductwork. This would require fan operation any time the spaces are occupied, may require upgrading the fans, and the filters must be replaced in accordance with EPA requirements.
   -- Offices and Meeting Rooms: provide portable HEPA machines or electronic air cleaners for each occupied room. Benefits: these can be controlled for use only during occupancy, and are flexible for the number of occupants in a space. Drawbacks: a cleaner would be required for each space that's occupied, and they consume electricity (varies based on types).
c. Air disinfection (see below) seems problematic for UCM.

Excerpts from Pertinent Documents Regarding Covid-19:

Vermont Health Department:
When working inside, open doors and windows to promote air flow to the greatest extent possible and limit the number of people occupying a single indoor space.

EPA Guidelines:
In general, the greater the number of people in an indoor environment, the greater the need for ventilation with outdoor air. In other words, the ventilation rate should be based on the number of people that occupy an indoor space (and a few other factors)…

In general, increasing ventilation and filtration is usually appropriate; however, due to the complexity and diversity of building types, sizes, construction styles, HVAC system components, and other building features, a professional should interpret ASHRAE guidelines for their specific building and circumstances…

The most effective ways to improve your indoor air are to reduce or remove the sources of pollutants and to ventilate with clean outdoor air. In addition, research shows that filtration can be an effective supplement to source control and ventilation. **Using a portable air cleaner and/or upgrading the air filter in your furnace or central heating, ventilation, and air-conditioning (HVAC) system can help to improve indoor air quality.** Portable air cleaners, also known as air purifiers or air sanitizers, are designed to filter the air in a single room or area. Central furnace or HVAC filters are designed to filter air throughout a home. Portable air cleaners and HVAC filters can reduce indoor air pollution; however, they cannot remove all pollutants from the air…

Types of Air Filters: (when the space is occupied)

• Mechanical Air Filters (MERV ratings > 13 recommended for Covid-19).

• HEPA (High Efficiency Particulate Air) Filters: better than MERV 16 but may not be able to be retrofitted into HVAC systems…

• HEPA filters can be located in HVAC systems or in:
  - Portable HEPA Machines
  - Pre-Assembled Systems
  - Ad Hoc Assemblies

• Electronic Air Filters: The fraction of particles removed from air passing through an electronic filter is termed "removal efficiency." For portable, self-contained electronic filters, the rate of particle removal from air is termed the Clean Air Deliver Rate (CADR). CADR = airflow rate x removal efficiency. Over effectiveness… depends on:
  - Removal efficiency
  - Airflow rate through the filter
  - Size and number of particles
  - Location of the filter in the HVAC system or room air cleaner
  - Maintenance and cleanliness of electronic filter components

To filter particles, choose a portable air cleaner that has a clean air delivery rate (CADR) that is large enough for the size of the room or area in which you will use it. The higher the CADR, the more particles the air cleaner can filter and the larger the area it can serve. Most air cleaner packaging will tell you the largest size area or room it should be used in. Portable air cleaners often achieve a high CADR by using a high-efficiency particulate air (HEPA) filter.

Portable Air Cleaner Sizing for Particle Removal						
Room area (square feet)	100	200	300	400	500	600
Minimum CADR (cfm)	65	130	195	260	325	390

Note this chart is for estimation purposes. The CADRs are calculated based on an 8-foot ceiling. If you have higher ceilings, you may want to select a portable air cleaner with a higher CADR.

Furnace and HVAC filters work to filter the air only when the system is operating. In most cases, HVAC systems run only when heating or cooling is needed (usually less than 25% of the time during heating and cooling seasons). In order to get more filtration, the system would have to run for longer periods. This may not be desirable or practical in many cases since longer run times increase electricity costs and may also result in less reliable humidity control during the cooling season.

Types of Air Disinfection: (when the space is not occupied)

- Ultraviolet Energy (UV-C)
- Photocatalytic Oxidation (PCO)
- Bipolar Ionization/ Corona Discharge
- Ozone

ASHRAE Guidelines:

ASHRAE recommends that mechanical filter efficiency be at least MERV 13 and preferable MERV 14 or better to help mitigate the transmission of infectious aerosols. Many existing HVAC systems were designed and installed to operate using MERV 6 to MERV 8 filters. While MERV 13 and greater filters are better at removing particles in the 0.3 micron to 1 micron diameter size (the size of many virus particles) the higher efficiency does not come without a penalty. Higher efficiency filters require greater air pressures to drive or force air through the filter. Care must be taken when increasing the filter efficiency in an HVAC system to verify that the capacity of the HVAC system is sufficient to accommodate the better filters without adversely affecting the system's ability to maintain the owner's required indoor temperature and humidity conditions and space pressure relationships.