ROCKY POINT ENGINEERING LTD.

Updated March 1st, 2021

HVAC Upgrade Recommendations For Occupancy of Schools - Covid-19

The following is a Summary of the ASHRAE Epidemic Task Force Bulletin "Re-opening of Schools - After Shutdown"

Kyle Hasenkox in our Victoria office is a member of the ASHRAE Epidemic Task force that helped write these new guidelines and we are sharing this with School Districts across B.C., for their information and consideration in maintaining a safe environment.

COVID-19 is caused by the SARS-CoV-2 virus which is believed to be spread by several methods; direct contact on surfaces, person to person physical contact, and aerosol transmission. It is not known as to which method is the most significant contributor to the spread of the virus. Aerosol (water droplet) transmission occurs when an infected person sneezes, coughs or even breaths in close proximity of another person and the aerosol becomes airborne. It has also been determined that the virus can survive on an airborne aerosol for up to 1 -1/2 hours.

For this reason, it is believed that the risk of infection increases in crowded indoor spaces which are poorly ventilated. The ASHRAE (American Society for Heating Refrigeration and Air-Conditioning Engineers) set up an Epidemic Task Force to publish a series of recommendations as a guideline to significantly reduce the spread of the viruses in an indoor environment through the following measures related to ventilation systems and building mechanical system operation.

In addition to cleaning and sanitization procedures within the school facilities the following recommendations to the operation, filtration and maintenance of ventilation systems, which can reduce airborne exposure to SARS-COV-2 (The Virus that Causes Covid-19), is recommended.

These are only recommendations for consideration and are arranged in a series of steps from simple to complex. The implementation of these measures is not a replacement of masks or other PPE, but are in addition to further reduce the risk of transmission.

A: System Operational Changes - Enhanced Ventilation

Changes to the operation of existing air-handling systems to both verify and deliver recommended or increased levels of outside air, is believed to provide a safer environment. Turning off air-handling systems is not recommended.

1. Use existing ventilation systems to provide a morning flush for 2 hours M-F prior to, or 2 hours after, building occupancy. Example: If a school has classes beginning at 8:30 and ending at 3:00 the period would be 6:30 to 5:00. The post flush is primarily to remove potential concentrations of aerosols and the pre-flush helps ensure that the air is clean and any VoCs generated in the cleaning process are removed.
2. Increase minimum outside air damper position of all existing air-handling systems during occupancy to increase the current minimum outdoor air. Depending on system capacity and climate conditions, there may be limitations on the system heating capacity of outdoor air.
3. On VAV systems, adjust the VAV box minimum air flow settings to 75% of maximum (Most VAV systems have a 30% to 50% minimum air volume setting).
4. On all air-handling systems equipped with CO_2 sensors, lower the set point to 800ppm during occupancy.
5. On systems with occupancy sensors, increase the duration of minimum run times (or disable occupancy sensors) to run systems for a minimum of 2 hours. Consider keeping high traffic areas in occupied mode during entire occupancy period (gyms, corridors, libraries and washrooms).
6. On variable speed single zone air-handling systems such as the gymnasia, and other large single zones, run systems at 100% fan speed during occupancy.
7. If adequate air exchange rates or outdoor air ventilation cannot be provided, consider other methods of ventilation to reduce risk such as filtered recirculation systems, disinfection systems, or fan assisted natural ventilation in combination with opening windows.

B: Air Changes and Outside Air

The ventilation rate of a typical classroom to current best practices is to provide an air flow rate of 1,000 to 1,200 CFM (cubic feet/minute) or 8 air changes/hour. This air change rate is recommended to remove odors, humidity and air borne contaminates in a classroom space. The minimum outside air portion of this air flow, to keep CO_2 levels below 1000ppm as per ASHRAE 62.1 is 15CFM/Student X 30 students = 450CFM.

1. The above air change rates are the minimum requirements, and other provisions such as increased filtration or natural ventilation can be used to supplement the lack of ventilation air.
2. If the existing system cannot provide sufficient ventilation air exchange or outside air, then supplemental recirculated air with higher filtration or disinfection is recommended on a temporary basis until the ventilation system can be upgraded.

ROCKY POINT ENGINEERING LTD.

Updated March 1st, 2021

C: Enhanced Air Filtration

In general, if increased or enhanced outside air ventilation cannot be provided, then it is recommended to increase efficiency of air-handling system filtration to MERV (Minimum Efficiency Reporting Value) 13 where possible. The MERV 13 filter will catch 90% of particles in the 1.0 to 3.0 micron size of an airborne aerosol which may carry the SARS-COV2 Virus. Recent studies have shown that the particles in 2-5 micron ranges are likely to present the greatest potential for spread of infection and a minimum Merv 8 filter is recommended if Merv 13 cannot be installed due to equipment limitations.

1. Install new filters in all air-handling systems prior to full building occupancy and ensure that a stock of filters are available for a future filter change.
2. Monitor filter status and change out filters when required, to ensure maximum filter efficiency. Frequency of filter change will depend on several conditions such as the location of the air intakes and the location of the building relative to airborne pollutants. Seasonal changes can also impact the frequency of required filter changes.
3. Upgrade existing filters in all air-handling systems, roof top units, fan coils and unit ventilators to a minimum of MERV 8 and only to MERV 13 where outside air ventilation cannot be increased. Consult an HVAC expert on whether the existing systems can accommodate the increased air resistance of a Merv 13 filter as some systems cannot operate effectively with the higher efficiency filters.
4. Make Up Air systems or any systems which can provide much higher levels of outside air or 100% outside air need not have their filter efficiency increased.

D: Safe Maintenance Procedures

In general, maintenance of mechanical systems should continue to ensure a high level of comfort and air-quality. Studies have shown that poor comfort and air-quality can cause stress on our immune system.

1. Establish work safe procedures and additional PPE for all filter change and maintenance personnel.
2. Review building room temperatures and address comfort issues where possible.
3. Ensure all air-handling systems are operational and achieving operating conditions, morning or post flush and outside air volumes as per section 'A'.
4. Set up trend logs, if not already in place, with the building automation system to monitor air-handling systems.

E: Temporary Isolation Area

It may be advantageous to isolate a student that is not feeling well or showing symptoms of Covid-19. In hospitals, these are known as Isolation or Negative Pressure Rooms in which the entire area is held under negative pressure relative to adjacent spaces protecting other occupants.

1. Designate an area/room in the building which can be used as an isolation room which has an exhaust air system.
2. Walls above the ceiling space should be full height and sealed air tight if possible. Doors should be weather-stripped.
3. Install an exhaust system, if none exists, which can maintain negative pressure and vented directly to the outdoors.

F: System Monitoring

A building automation system is extremely valuable in setting up and continually monitoring ventilation systems in the building. Critical alarms should be set up on system operation related to these measures.

1. Create a log of all system operational changes made to each of the ventilation systems so they can be set back to original parameters.
2. Set up critical alarms for all systems where ventilation rates and set points are not being achieved.
3. If possible, create global variables that can be used to switch from normal to "enhanced ventilation" mode and add to system graphics.

G: Supplemental HEPA Filtration and Disinfection of Air

Disinfection of re-circulated air in addition to high efficiency filtration, may be considered as an option and temporary solution to limit exposure, where adequate outside air ventilation cannot be provided through either fan powered or natural means. While there are a number of products currently being marketed with claims of disinfection, some are still emerging technology and should be reviewed carefully before being applied.

1. Portable commercial sized HEPA and other disinfection units are available on the market but should be selected based on the room area rating that they can serve and the sound performance, in order to be effective within a classroom space. Some portable units are specifically sized for a classroom environment. Residential quality and sized units should be avoided.
2. Ultraviolet is a well proven technology but requires special attention in its installation and maintenance to ensure it is effective and operational. There are many types and frequencies of UV available and the most effective and safe is in the Far-UVC wavelength range of 207nm to 222nm.