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Indoor Air Quality in K-12 Schools

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Goal: Explain the components of IAQ and the goal metrics for all areas of all schools, including the nurse office and isolation space.

The specifics of what each school needs to do is going to be based on the assessment of what you currently have, what mechanical infrastructure you have in place to build off of, and a collaboration between the facilities manager, controls contractor, and HVAC contractor.

I believe that with what we know, and the institutional knowledge of the facilities staff, we can make improvements for **ALL** schools, both in classrooms and nurse stations.

Priority of Controls To Reduce Transmission Indoors

Exposure =
Intensity + Duration + Frequency

Ventilation

- Decreases the intensity by diluting the indoor air with outdoor air.
- Minimum requirement is 10cfm/person + .12 cfm/ft²

Filtration

- Decreases duration by removing particles through a physical air filter.
- Effectiveness is a function of air flow, air changes per hour, and filter MERV rating

Spot Purifiers

- Add air changes (ACH) to supplement the building system
- Use high MERV filters, typically > 16

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The whole point of focusing on IAQ anywhere in a school or building is that we want to use the mechanical systems to reduce the risk of transmission. Transmission is a function of intensity, duration, and frequency. We can use the HVAC system to address the Intensity and Duration....frequency is a function of the scheduling.

And the HVAC Elephant in the room that we need to do this while maintaining our space at a comfortable temperature, and ideally a relative humidity that is not less than 40%. The reason any of this is tricky is because we live in Vermont, we heat our buildings for 7 + months of the year. There comes a point with ventilation where you are trading OA for human comfort. And we know that if we drive the temperature and RH down, that is also considered poor IAQ.

A Strong and Healthy Start: Guidance for Vermont Schools (June 17, 2020)

"Where feasible, the school nurse's office/isolation room should have:

- Dedicated HVAC system
- Dedicated restroom (ideal)
- Exhaust directly outdoors
- Maintain negative pressure to adjoining spaces
- Nurse office suite design should follow health care facilities design practices as described in standards such as ASHRAE Standard 170 and other applicable guidelines and design information."

ASHRAE Epidemic Task Force: Schools & Universities (7-17-2020) Nurse Office General Requirements

- Treat as Isolation rooms – 1 bed per building
- Dedicated bathrooms.
- Include Anteroom/Protective Equipment Room.
- Normal non-isolation nursing office.
- The HVAC operation will be "Isolation mode" **OR** "Normal Mode".
- Follow CDC guidelines, do not mix isolation room air with any other spaces.
- Recommend locations of nurse's office HVAC on an exterior wall.
- Maintain pressure relationship for room, ante room and corridor.

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Here is the exact guidance for Vermont along with more detailed information from ASHRAE. I know we all want an easy button with a widget to buy and put in a room to make it safe, but that unfortunately isn't an option here. The guidance out there is not an if-then guide to perfection. I think of this the same way I am approaching the IAQ in schools comprehensively. Every school building is starting from a different point and we want to use the guidance to inform the scale and scope of improvements. I appreciate that Vermont has distilled the information into Vermont specific guidance, with our buildings and population in mind. The ASHRAE guidance is for all schools across the country and is heavily weighted for the large super schools with large central systems of heating and cooling and ventilation. This is also the guidance that an engineer would use to build a brand new school. Not necessarily helpful or applicable here.

The CDC has indicated that the primary mechanism for transmission of the virus is through person-to-person spread. Ventilation and filtration can minimize the close contact and long range transmission. Long range is the potential of the virus to spread via aerosols. There have been no confirmed cases that have been traced back to transmission from one HVAC zone to another. Transmission is happening in one space. This points back to the priority one of Ventilation.

What are schools doing?

- **Assessment and quantification of existing ventilation and ACH**
 - Facilities manager and HVAC contractor, establish the baseline so you know what you need.
 - Proposal for an isolation mode
 - Ventilation Controls to Increase ACH, Increase OA
- **Using a Remote Isolation Room:**
 - Small classroom or office near the exit
 - Dedicated air system, typically an existing unit ventilator
 - Upgrade the filter in the unit ventilator to MERV 13
 - Controlling the existing exhaust fan to operate all day.
- **Stand alone Isolation Unit added**
 - 15+ ACH
 - Exhaust direct to outside
 - For buildings with no central system (ie. Radiant heat and windows only)

Next Steps

- **Figure out what you have now**
 - Work with your facilities manager and the HVAC contractor that your school has an existing relationship with to measure what you have now:
 - The volume of OA being supplied to the space (cfm)
 - Number of ACH currently in the space
 - Current filtration level
 - Be able to answer the question – “Is the space served by a central or unitary system?”
- **Define your goals for the space based on your specific system, budget, timeline**
 - Ability to increase ventilation
 - Control to two modes of operation: normal and isolation
 - Increase filtration on recirculated air
 - Increase ACH
- **Get a proposal and submit it as part of your K12 IAQ Grant application!**

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