

ASHRAE 2023 UPDATE: A new and better way to ventilate classrooms

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A high wall-mounted HEPA/UV-C Air Purifier, one of three in a smart classroom system.

A new norm is coming for ventilating classrooms, and it should be welcomed by everyone.

This new norm is in response to new pathogenic viruses and now wildfire smoke that are causing an unprecedented assault on the safety of our indoor air. And there is no reason to think this won't keep happening.

Multiple health science and engineering expert bodies have convened since the beginning of the COVID-19 pandemic and come to a common conclusion. Ventilation rates of our indoor spaces need to go up very substantially!

Ventilation is the way polluted air gets diluted down to levels low enough to minimize the risk of infection. This has been known for over a century. The American Society of Heating and Ventilating Engineers (the predecessor of today's ASHRAE) published ventilation recommendations in 1895 intended to reduce disease transmission. While these recommendations found their way into laws in North America from the 1920s, over subsequent decades ventilation standards have been set at values generally much lower than the original ASHVE values. This occurred especially following the energy crisis of the 1970s. Having to heat and cool outside air for it to be comfortable indoors became much more expensive as energy prices soared.

Fast forward to this decade's health crisis. The COVID-19 pandemic has caused enormous personal, societal, and economic damage, much of which resulted from the closure of public buildings due to widespread perception (supported by considerable evidence) that they were high-risk environments for infection transmission. ASHRAE was encouraged by the US White House COVID-19 Response Team to take the lead in developing a new standard for the control of airborne pathogens.

In July this year, ASHRAE published its new Standard 241-2023 Control of Infectious Aerosols. While the standard will need to be adopted into local codes for it to become law in B.C., the 'new norm' it calls for is very apparent. This is especially true in two ways:

1. Ventilation systems need to have the capacity to supply much higher rates during times when the risk of the transmission of infectious disease is elevated, so for example during the regular respiratory illness season or during particular outbreak waves. For classrooms, the proposed rate is 40 CFM per person.
2. These ventilation rate values are specified in terms of equivalent clean air, whereas the regular ventilation standard rate for classrooms of 15 CFM per person was the amount of clean outside air. The 40 CFM per person rate can therefore be made up of clean outside air plus recirculated room air that has been filtered or treated to be as clean as outside air.

It is this second point that reflects the large paradigm shift of the new norm. It means that indoor

air quality (IAQ) objectives can be achieved without the penalty of increased energy costs. IAQ and reduced energy need no longer be conflicting objectives as they have been since the 1970s. This is the good news of the new norm and why it should be welcomed by everyone.

What does this all mean in practice for classroom ventilation systems?

In particular, it will normalise the use of in-room high-efficiency air purification systems. Earlier in 2023, ASHRAE published a document Design Guidance for Education Facilities: Prioritization for Advanced Indoor Air Quality. This provides practical steps that can be taken to upgrade schools' ventilation systems. For classroom level air cleaning it recommends "HEPA/UV machines" capable of 400 CFM on the fan speed setting with maximum acceptable noise (about 40 dBA).

This is one way that classrooms can easily be upgraded to help meet the requirements of the ASHRAE 241-2023 Standard. Two aspects of this method highlight the benefits of doing this:

1. It can result in large energy savings that rapidly pay for the costs.


Schools in B.C. have had to implement COVID-19 ventilation protocols that had them double ventilation rates of outside air (if this was possible and practical) and to run the ventilation systems for one to two hours before and after class - what was called 'pre-flush and post-flush'. These measures have resulted in very high additional energy costs which have had to be accommodated in

operational budgets. If, instead, the in-classroom 'equivalent clean air' systems are used for these functions, these energy costs can be saved, along with the associated greenhouse gas emissions.

2. The HEPA air filters are highly effective for removing wildfire smoke that finds its way indoors into classrooms.

This helps solve the dilemma faced if a wildfire smoke event coincides with a respiratory illness event, and the intake of outside air otherwise needs to be reduced to prevent the build-up indoors of wildfire smoke.

This winter, school districts can avoid paying the high additional energy costs and instead invest in high-efficiency in-classroom air purification systems. ■



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