Series Overview

SERIES:
Indoor Air Quality Fact Sheets

This overview introduces the series and provides important background information.

What is airborne transmission?

Strong evidence tells us that the dominant way that diseases like COVID-19 spread is through droplets and respiratory aerosols, which can float and travel, infecting people who inhale them at short and long distances from the infected person.

Indoor air quality and COVID-19:

To protect against COVID-19, schools have implemented many measures recommended by public health professionals: distancing, cohorts, masking, hand-washing, and vaccination. These are effective actions to reduce the spread of the virus, but they rely on human behavior and choice.

After studying viral transmission pathways, scientists are confident that people are less likely to get sick from COVID-19 and other respiratory pathogens when the air around them is refreshed continuously with clean air that is free from the virus. Investing in indoor air quality (IAQ) is a straightforward and non-controversial way to stop the spread of COVID-19.

Know your buildings: What systems do you have?

- **Window unit, radiator, or no space conditioning:** If a mechanical system is present, it is for temperature only and not ventilation (window unit or radiator). Where no mechanical system is present, windows and/or fans may be in use.
- **Unit ventilator or univent:** Located on an outside wall with a filter, fan, and coil capable of mixing outdoor air with recirculated air. Air is heated/cooled as it passes the coil.
- **Decentralized heating/cooling systems:** Heats or cools recirculated air and, in some but not all systems, outdoor air. Typically, it has a 1" filter rack. Includes heat pumps and fan coil units.
- **Central system (100% recirculation):** Serves multiple rooms and heats and cools recirculated air. Typically has a filter. Examples: AHU and RTU units.
- **Central system (recirculation + ventilation):** Serves multiple rooms and mixes outside air with recirculated air while heating and cooling. Typically has a filter. Examples: AHU and RTU units.

The right strategy for your classrooms?

Mechanical systems can include heating, ventilation, and/or air-conditioning, but they do not always provide all three. Strategies that can be considered will depend on the capabilities of your system.

	Building System Type				
Fact Sheet Topic	Window unit, radiator, or no space conditioning	Unit ventilator or univent	Decentralized heating/cooling systems	Central System serving one or multiple rooms/zones	
				100% recirculation	Recirculation + ventilation
Ventilation: Mechanical		✓	Depending on system		✓
Ventilation: Natural (operable windows)	✓		✓	✓	
HVAC Filtration		Depending on pressure drop might need to increase filter rack from 1" to 2"	Depending on pressure drop might need to increase filter rack from 1" to 2"	Depending on pressure drop	Depending on pressure drop
In-Room HEPA Air Cleaners	✓	✓	✓	✓	✓
Upper-room Germicidal UV	✓	✓	✓	✓	✓
In-duct Germicidal UV				✓	✓

THE CENTER FOR GREEN SCHOOLS

The IAQ Fact Sheet Series was authored in collaboration with Marwa Zaatari, with technical assistance from Sarah Gudeman.

Recommendations for schools from ASHRAE's COVID Epidemic Task Force

ASHRAE is an organization known for establishing standards for building design, including strategies that impact air quality.

- Ventilate spaces per minimum standards (ASHRAE 62.1)
- Clean recirculated air using MERV 13 filtration or equivalent
- Use only air cleaners for which evidence of safety is clear
- Use air cleaners (HEPA, UVGI) where needed to minimize exposure while considering energy impacts

Proven strategies include "subtractive" technologies like filters, sorbent media, and UVGI, which remove targeted contaminants from the air.

Unproven strategies include "additive" technologies like electronic air cleaners, ionizers, and fumigation that add things to the air to remove particles, inactivate microorganisms, or react with chemical contaminants.

Reaching your air change rate goal:

eACH is equivalent air change rate. It is calculated by adding all ventilation and air cleaning strategies. A reasonable target for air change rate in a classroom is at least 6 eACH.

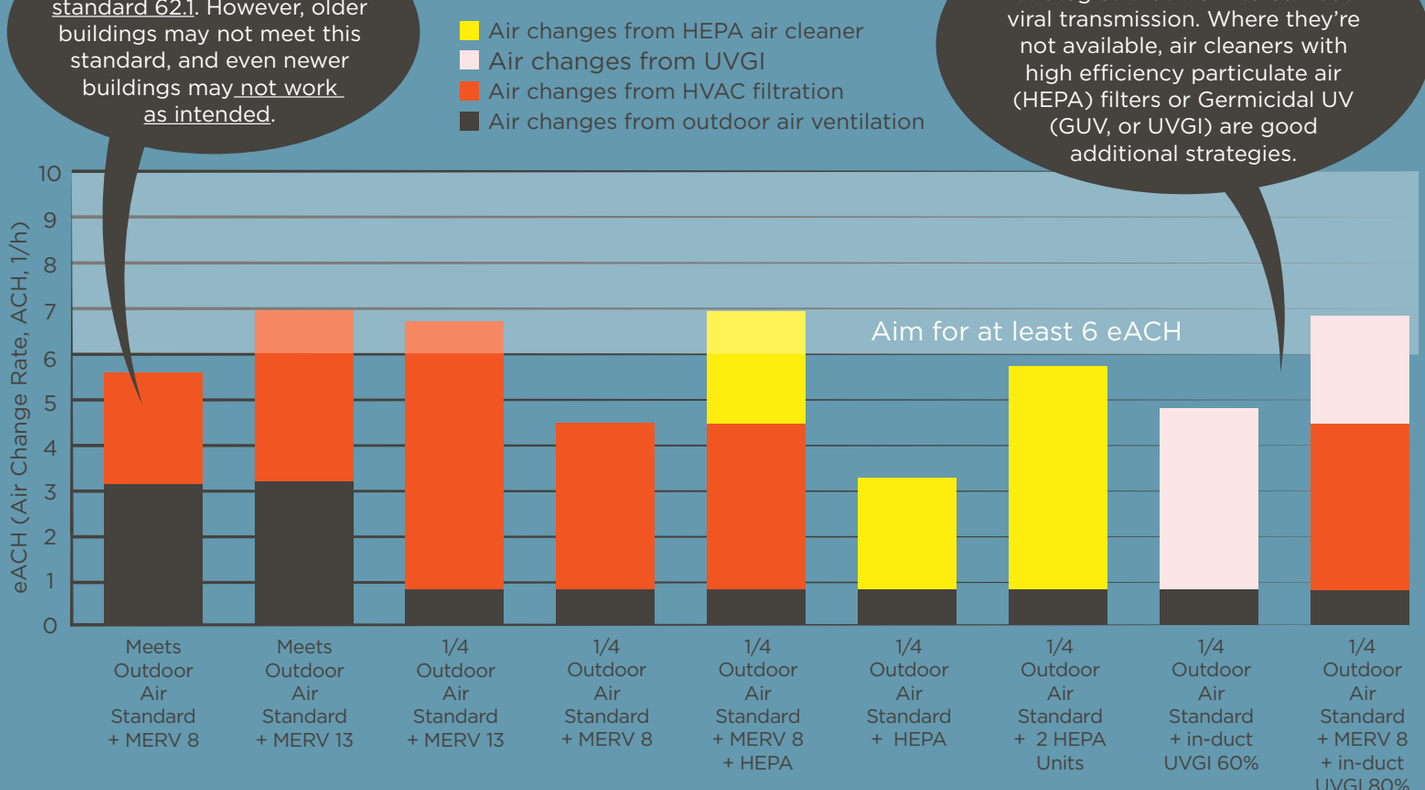
Example eACH for a typical 1,000 ft² classroom

This eACH calculation may vary based on factors such as the amount of air supplied from an HVAC system. The graph is provided as a general comparison between strategies and as an example of how strategies can be combined for infection control.

Imagine measuring contaminants in a space and then starting a stopwatch. At 6 eACH, at the end of 30 minutes, 95% of the original contaminants would have been removed. At a lower eACH, it would take longer to get the same result. At a higher eACH, it would take less time.

Minimum outdoor air is governed by ASHRAE standard 62.1. However, older buildings may not meet this standard, and even newer buildings may not work as intended.

Ventilation and filtration are long-lasting strategies that work to combat viral transmission. Where they're not available, air cleaners with high efficiency particulate air (HEPA) filters or Germicidal UV (GUV, or UVGI) are good additional strategies.



Acronyms used in the fact sheet series

CADR: clean air delivery rate
eACH: equivalent air change per hour
HEPA: high efficiency particulate air (i.e., HEPA filters, HEPA air cleaner)
HVAC: heating, ventilation, and air conditioning
MERV: minimum efficiency reporting value
OA: outdoor air
PPE: personal protective equipment
PPM: parts per million
UVGI: ultraviolet germicidal irradiation, also know as germicidal UV (GUV)