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COVID-19 Public Health Recommendations: Indoor air considerations for smaller spaces

Improved indoor air quality is associated with improved productivity and better health outcomes, regardless of COVID-19. Improvements on those conditions, where needed, will be an investment that can provide benefits extending beyond mitigating infectious disease transmission.

Indoor air spaces need special consideration because of COVID-19 transmission potential from the buildup in air of aerosols that we generate from breathing, talking, laughing, shouting, singing, coughing, and sneezing. Maintaining a distance of at least 6 feet between people will help prevent exposure to droplets that we emit, but smaller particles or aerosols can be airborne for minutes to hours depending on ventilation, humidity, and other indoor space factors. Poor ventilation of indoor settings, with larger numbers of people, significantly increases the risk of viral transmission.

Below are steps that building managers and property owners can take to improve the indoor air quality in the settings they manage. In general, these steps aim to 1) increase the amount of fresh outside air that is introduced into the system, 2) exhaust air from indoors to the outdoors, and 3) clean the air that is recirculated indoors by using various filtration methods (e.g., HEPA filters) to remove virus-containing particles from the air.

Ventilation public health recommendations for indoor spaces

- Increase outdoor ventilation of clean air into indoor spaces.
- Aim for fewer people in larger rooms. This will allow more distance between people and more space for air movement and dilution.
- Always operate restroom exhaust fans when the building is occupied.
- Operate and maintain local exhaust ventilation systems in kitchens or cooking areas when these spaces are occupied. Consider operating local exhaust ventilation even when these spaces are not occupied to supplement ventilation for the building when other areas are occupied.
- Open windows and doors when weather allows unless it creates a health or safety risk.
- Use fans to help move air through open windows. Do not place fans so that air is moved directly across the face of one person toward others.
 - Consider placing a fan securely in a window so that it moves air from indoors to the outdoors.

- Air movement from clean-to-less-clean areas is recommended
- If a window air conditioner is installed, operate it to increase outdoor air intake. Ensure the vent is open if outdoor air quality is good.
- If there will be changes in occupancy throughout the day, allow for breaks in between groups when possible so that the space can be “flushed” to remove pathogens in the air. Flushing can be best achieved by providing outdoor air (or equivalent outdoor air) by mechanical means, such as the fan in the HVAC system or a fan in an open window. Providing equivalent outdoor air can be done with a HEPA air cleaner. Opening doors and windows, when possible, can help as well.

Public health recommendations for air purifiers to improve indoor air quality

One or more air filtering devices equipped with a HEPA filter can be used indoors. These would trap most particles they encounter. This would reduce the amount of virus that people can be exposed to.

- Use portable HEPA filtering devices to supplement HVAC systems and when there is no HVAC system. This is especially valuable for higher risk areas such as a nurse’s office or areas frequently inhabited by persons with higher likelihood of COVID-19 and/or increased risk of getting COVID-19. Carefully locate air cleaning devices so the intake is unobstructed and the exhaust can move air far away as possible before it is drawn into an HVAC system exhaust grill in the space.
 - The American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) has issued the following resource: [In-Room Air Cleaner Guidance for Reducing Covid-19 In Air In Your Space/Room](#)
 - The Association of Home Appliance Manufacturers (AHAM) provides a list of [Certified Room Air Cleaners](#). Check the clean air delivery rate (CADR) to see if it suitable for the area of the room you are trying to clean.
 - Avoid air cleaners that generate ozone, or use devices that have been certified by the California Air Resources Board (CARB): [List of CARB-Certified Air Cleaning Devices](#).
 - Unless air mixing patterns have been determined in an indoor space, place the cleaner in the center of the room/space or close to a person who might be talking rather than listening (e.g., a teacher in a classroom).
 - Scientists from the University of Colorado Boulder and Harvard University developed a tool¹ to combine air cleaner and ventilation rate specifications to achieve a desired 3-6 air changes per hour for classrooms. Facility owners and operators can consult an HVAC professional to determine if they have these conditions and how to achieve them. If an HVAC system is not available or the amount of air exchange from opening windows and doors is unknown, it is

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<https://docs.google.com/spreadsheets/d/1Gv0OhTntK0esso883z1i03XjmgOojbDTSeRzr25Uvdw/edit#gid=1836861232>

possible to achieve equivalent air exchanges by adding the appropriate number of HEPA air cleaners that have the needed capacity.

Public health recommendations for heating, ventilation, and air conditioning (HVAC) systems

- Ensure HVAC systems operate properly and provide acceptable indoor air quality for the current occupancy level for each space. [ASHRAE Standard 62.1](#) “specifies both minimum and recommended outdoor airflow rates to obtain acceptable indoor air quality for a variety of indoor spaces.” Use the services of HVAC professionals to achieve the best performance from the existing HVAC system.
- Increase air filtration in HVAC systems to MERV 13 or better. Otherwise, aim for the highest possible rating that the system allows. HVAC professionals can help evaluate the potential to increase filtering efficiency. Additional steps include
 - Inspecting filter housing and racks to ensure good fit of filters.
 - Ensuring air cannot flow around the filter and sealing gaps between filters and housing.
 - Replacing filters as recommended by manufacturer.
- Turn off any demand-controlled ventilation (DCV) that reduces air supply based on occupancy or temperature during occupied hours. Set the fan to the “on” position instead of “auto,” which will operate the fan continuously, even when heating or air-conditioning is not required.

Humidity

An indoor percent relative humidity (%RH) of 40%-60% is desirable to reduce viral transmission indoors by

- Providing air conditions that do not favor virus and other microbial survival².
- Maintaining conditions that do not foster drying people’s mucous membranes that are essential to innate immune defenses.
- Decreasing the concentration of virus-laden particles in the air

It is recommended that you prevent very dry conditions but are careful not to create an environment that is too humid. We recommend that you consult an HVAC or service professional to determine how to achieve these conditions. Monitoring can be done with %RH monitors that are available from many outlets.

Resources

1. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

² <https://www.ashrae.org/file%20library/technical%20resources/covid-19/ashrae-d-co-rp3.pdf>

- ANSI/ASHRAE Standard 62.1-2019 - Ventilation for Acceptable Indoor Air Quality <https://www.ashrae.org/technical-resources/ashrae-standards-and-guidelines>
 - Commercial buildings <https://www.ashrae.org/technical-resources/commercial>
 - This webpage includes one page guidance documents for common scenarios <https://www.ashrae.org/technical-resources/covid-19-one-page-guidance-documents>
 - Laboratory
 - Small Temporary Dining Structures
 - Re-Opening Buildings
 - Residential Buildings
 - Polling Place HVAC Systems
2. Centers for Disease Control and Prevention (CDC)
- Schools and Childcare facilities: <https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/ventilation.html>
 - Office buildings: <https://www.cdc.gov/coronavirus/2019-ncov/community/office-buildings.html>
 - Ventilation in buildings <https://www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html>
3. The Environmental Protection Agency (EPA)
- [Air Cleaners, HVAC Filters, and Coronavirus \(COVID-19\)](#)
4. The American Industrial Hygiene Association
- [Reducing the Risk of COVID-19 Using Engineering Controls](#)
5. New York times illustration of the importance of adequate ventilation
- <https://www.nytimes.com/interactive/2021/02/26/science/reopen-schools-safety-ventilation.html>
6. Harvard/University of Colorado Boulder Air cleaner and ventilation rate calculator
- <https://docs.google.com/spreadsheets/d/1Gv0OhTntK0esso883z1i03XjmgOojobDTSeRzr25Uvdw/edit#gid=1836861232>

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