EPA

Clean Air in Buildings Challenge

U.S. ENVIRONMENTAL PROTECTION AGENCY MARCH 2022

This document provides basic principles and general actions recommended to improve indoor air quality (IAQ) in buildings and reduce the risk of airborne spread of viruses and other contaminants. These actions, as well as technical assistance and tools provided through the links, are intended to support building owners and operators, as well as organizational leaders and decision makers, to make ventilation and other IAQ improvements.

Infectious diseases like COVID-19 can spread through the inhalation of airborne particles and aerosols. In addition to other layered prevention strategies, taking actions to improve IAQ can reduce the risk of exposure to particles, aerosols, and other contaminants, and improve the health of building occupants. None of these actions will eliminate risk completely, and building owners and operators may not need or be able to take all actions listed below. The best combination of actions for a building will vary by space and location. When determining which actions to take to help protect occupants, building owners and operators should consider, for example, public health guidance, who and how many people are in the building, the activities that occur in the building, outdoor air quality, climate, weather conditions, and the installed heating, ventilation, and air conditioning (HVAC) equipment. Some actions may increase energy consumption and may be more appropriate as temporary measures when disease transmission is higher. Building owners and operators should engage experts, facilities managers, and others who are skilled, trained, and/or certified in HVAC work to develop and implement plans to improve IAQ and manage air flows. Individual actions and layered prevention strategies remain important measures for reducing the spread of viruses.

American Rescue Plan and Bipartisan Infrastructure Law funds can be used to supplement investments in ventilation and IAQ improvements in public settings.

1. CREATE AN ACTION PLAN FOR CLEAN INDOOR AIR IN YOUR BUILDING(S) that assesses IAQ, plans for upgrades and improvements, and includes HVAC inspections and maintenance.

- Determine how clean outdoor air is brought into the building and distributed to all occupied spaces. Understand and document how HVAC systems work for your building.
- Work with an HVAC expert to assess and inspect systems for ventilation, filtration, and air cleaning. Verify through commissioning, testing, and balancing that building systems are functioning as designed.
- Implement other IAQ assessment approaches such as room carbon dioxide (CO2) monitors as needed.
- Determine how much clean air (outdoor air + filtered HVAC recirculation air) is needed and verify or measure air delivery for each room or space.
- Assess if you need to manage the direction of air flows in higher risk areas of your building (e.g., in a school nurse's office).
- Create an IAQ action plan that includes regular inspections and maintenance, including filter replacements, and HVAC system upgrades or improvements, as needed.
- Support the people who operate or help with building and air distribution systems by providing continuing education and training.

2. **OPTIMIZE FRESH AIR VENTILATION** by bringing in and circulating clean outdoor air indoors.

- Ensure outdoor air is acceptably clean or is adequately filtered as it is brought into the building.
- Properly use economizers, which are devices that supplement mechanical cooling with fresh air, to efficiently and cost effectively increase fresh air ventilation.
- Run HVAC systems during all occupied hours to ensure clean air enters and is distributed throughout the building.
- Ensure that exhaust fans in bathrooms are functioning, and set fans to run during occupied hours.
- Increase volume of clean, outdoor air at times of higher risk (e.g., at times of elevated risk of COVID-19):
    - Adjust HVAC settings while considering thermal comfort, humidity, outdoor air quality, and energy use.
    - Consider running the HVAC system to refresh air before arrival and/or remove remaining particles at the end of the day (e.g., 1-2 hours before/after the building is occupied), as needed.
    - Check with an HVAC expert to understand the maximum outdoor air your system can support.
- Open operable windows, as weather, outdoor air quality, occupant safety, and HVAC systems permit. To the extent possible, enable cross ventilation by opening windows and doors at opposite sides of the room or building. (Note: Opening windows while running HVAC systems may increase energy costs or introduce other air contaminants.)

3. **ENHANCE AIR FILTRATION AND CLEANING** using the central HVAC system and in-room air cleaning devices.

- Install properly sized MERV-13 air filters or the highest rated MERV filters that the HVAC system can accommodate.
- Close off any gaps around air filters to minimize air moving around them instead of through them.
- Use portable air cleaners to increase air cleaning rates in areas where air flow and central filtration are insufficient:
    - Select devices that are appropriately sized for the space in which they will be used. Consider ENERGY STAR certified products. If noise is a consideration, look for a product with lowest perceived sound levels.
    - As a temporary measure, do-it-yourself air cleaners can also be built from HVAC filters and box fans.
- Increase ventilation and/or filtration in areas with higher emission of airborne particles and aerosols (e.g., gyms, cafeterias, or choir/music rooms at schools). You can make adjustments for these areas by:
    - Increasing the volume of clean, outdoor air delivery.
    - Using portable air cleaners.
    - Setting up extra exhaust ventilation to move air directly to the outside.
- Consider an upper-room Ultraviolet Germicidal Irradiation (UVGI) system to clean the air. (UVGI systems require professional design and installation, in consultation with experts.)

4. **GET YOUR COMMUNITY ENGAGED IN YOUR ACTION PLAN** by communicating with building occupants to increase awareness, commitment, and participation in improving indoor air quality and health outcomes.

- Communicate to affected people (e.g., building occupants, workers, students, teachers, and parents) about how the action steps you are taking will improve indoor air quality and reduce disease transmission in your building.
- Show your work by hosting building walkthroughs, posting descriptive signage, or communicating on social media. Demonstrate the importance of individual actions to ensure facility operations are optimal (e.g., keeping ventilation systems clear of clutter).
- Provide feedback mechanisms such as maintenance requests to identify repair issues and surveys to gather perspectives from your community.
- Remember individual actions and layered prevention strategies remain important measures for reducing the spread of viruses like COVID-19.

ADDITIONAL RESOURCES

Clean Indoor Air Resources

Indoor Air Quality
https://www.epa.gov/indoor-air-quality-iaq

Indoor Air and Coronavirus (COVID-19)
https://www.epa.gov/coronavirus/indoor-air-and-coronavirus-covid-19

Ventilation and Coronavirus (COVID-19)
https://www.epa.gov/coronavirus/ventilation-and-coronavirus-covid-19

Air Cleaners, HVAC Filters, and Coronavirus (COVID-19)
https://www.epa.gov/coronavirus/air-cleaners-hvac-filters-and-coronavirus-covid-19

Interactive Ventilation Tool
https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/interactive-ventilation-tool.html

Indoor Air Quality Scientific Findings Resources Bank
https://iaqscience.lbl.gov/

Ventilation in Buildings
Ventilation in Buildings | CDC

Ventilation in the Workplace
https://www.osha.gov/ventilation

Improving Indoor Ventilation During Cold Weather
https://www.osha.gov/sites/default/files/publications/OSHA4172.pdf

COVID-19 Guidance on Ventilation in the Workplace
https://www.osha.gov/sites/default/files/publications/OSHA4103.pdf

American Society for Heating, Refrigerating, and Air-Conditioning Engineers Pandemic Task Force, Core Recommendations
https://www.ashrae.org/file%20library/technical%20resources/covid-19/core-recommendations-for-reducing-airborne-infectious-aerosol-exposure.pdf

Resources for Schools

Creating Healthy Indoor Air Quality in Schools
https://www.epa.gov/iaq-schools

Efficient and Healthy Schools Campaign
https://efficienthealthyschools.lbl.gov/

Efficient and Healthy Schools Website
https://www.energy.gov/eere/buildings/efficient-and-healthy-schools

ASHRAE Pandemic Task Force Guidance for Schools and Universities
https://www.ashrae.org/file%20library/technical%20resources/covid-19/ashrae-reopening-schools-and-universities-c19-guidance.pdf

Resources for Building Professionals

Indoor Air Quality Master Class Professional Training Webinar Series
https://www.epa.gov/iaq-schools/indoor-air-quality-master-class-professional-training-webinar-series

Indoor Air Quality in Offices and Other Large Buildings
https://www.epa.gov/indoor-air-quality-iaq/indoor-air-quality-offices-and-other-large-buildings

Better Buildings Resource Center: Building Operations during COVID-19
https://betterbuildingssolutioncenter.energy.gov/covid19

ASHRAE Indoor Air Quality Guide
https://ashrae.org/iaq

ASHRAE Pandemic Task Force Guidance for Commercial Buildings
https://www.ashrae.org/file%20library/technical%20resources/covid-19/ashrae-commercial-c19-guidance.pdf