

Ventilation and Air Quality for Reducing Transmission of Airborne Illnesses

Recommendations for Schools, Homes, and Other Non-Healthcare Facilities with or without Mechanical Ventilation

Good ventilation and indoor air quality are important in reducing airborne illness. It can limit exposures to viruses, other pathogens, chemicals, and odors. The ability to provide good ventilation and air filtration varies with a building's design and age. It also depends on the heating, ventilation, and air conditioning (HVAC) system.

Because each building is different, consult a professional engineer or HVAC specialist. They can help determine the best way to maximize the system's ventilation and air filtration for each room. For more guidance, see the [Clean Air in Buildings Challenge, EPA \(PDF\)](#).

General Considerations

- Upgrade building HVAC filters to MERV 13 if the system can handle the air resistance, or the highest rated filter that the system can handle.
- Change HVAC filters every season and more often if needed. Consider replacing the filter after poor air quality events (following wildfire smoke events or when the air quality is in the Unhealthy for Sensitive Groups or Unhealthy AQI range). Clogged filters decrease HVAC operation, stress the fan motors, and decrease their ability to improve indoor air quality. Visually inspect filter condition and fit (no gaps) monthly.
- Reduce recirculation of indoor air and maximize outside air. Ensure outside air dampers function appropriately as part of scheduled maintenance. Remove or avoid sources of air pollution near outside air dampers, such as dumpsters or idling vehicles.
- Meet the required flow rate of outdoor air, following your state or local mechanical code. Where possible, aim for 5-6 total air changes per hour.
- Monitor carbon dioxide (CO₂) levels with the goal of keeping levels below 800 ppm. If levels are frequently above 1000 ppm, considering increasing outdoor air ventilation.
- Maintain humidity between 40 and 60 percent.
- Ventilate the building 1 hour before occupancy and 2 hours after custodial activities.
- Inspect and maintain local exhaust ventilation in restrooms, kitchens, cooking areas, labs, art rooms, and shops. Increase exhaust ventilation from restrooms above the required flow rate if possible. Follow your state or local mechanical code.
- Work with a building engineer or HVAC specialist to generate air movement that goes from clean to less clean air (create negative pressure), especially in areas with high transmission risk such as healthcare spaces. Air from negatively pressurized rooms should be either directly exhausted outside or filtered before recirculation within the HVAC system. Use a MERV 13 or more effective filter.

Buildings that Do Not Have an Existing HVAC System

- Open windows and doors to create a cross draft. Even opening a few inches will help with ventilation.
- Reduce occupancy in areas with limited or no outdoor ventilation.
- Use fans to increase the effectiveness of open windows. Position fans securely in or near open windows. This draws in fresh air for the room in addition to cooling.
- Position fans to avoid blowing respiratory aerosols from one person to another.

Portable Air Cleaners

- Portable air cleaners with HEPA (High Efficiency Particulate Air) filters remove particles, including respiratory aerosol particles. Use a portable air cleaner in addition to providing fresh outside air. They are most critical in rooms with poorer ventilation or medical isolation rooms.
- Use a simple mechanical filter device with no other technologies, such as ionizers or UV lights. Air cleaners with other technologies can produce harmful byproducts like ozone, hydroxyl radicals, formaldehyde, and ultrafine particles.
- Not all filters are HEPA filters. Choose a HEPA filter to effectively remove small particles. In addition, a carbon filter may remove some gases like volatile organic compounds (VOCs).
- Find a portable air cleaner sized to clean your room. Look for a device that lists a “tobacco smoke” or “smoke” Clean Air Delivery Rate (CADR) in cubic feet per minute (CFM). It should be at least 2/3 the area of the room where you’ll use the portable air cleaner (width × length, in square feet).
- Pick a quiet device. Loud devices could be harmful or may be more likely to be turned off. The U.S. EPA recommends keeping indoor noise levels below 45 dB. To reduce noise, consider finding a device with a CADR for a larger room or using multiple devices, and running at a lower fan speed. Use the “auto” setting if your device has a sensor and can automatically adjust the fan speed.
- Replace HEPA and carbon filters regularly. Follow the device indicator or manufacturer’s recommendations. Portable air cleaners should be vacuumed and cleaned after heavy use or every few weeks.
- For more information, see [Portable Air Cleaners](#).

Additional Considerations

Restrooms:

- Install paper towels to dry hands and disconnect hand dryers (blowers).
- Ensure drain traps are not dry. Periodically turn on faucets and shower heads and flush toilets in low use areas.

Wildfire Smoke:

For ventilation guidance during wildfire smoke see: [Improving Ventilation and Indoor Air Quality during Wildfire Smoke Events \(PDF\)](#)

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