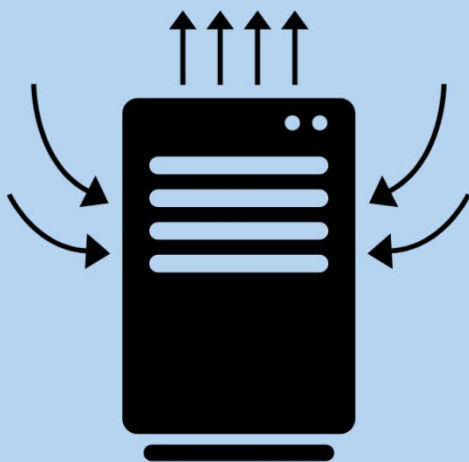
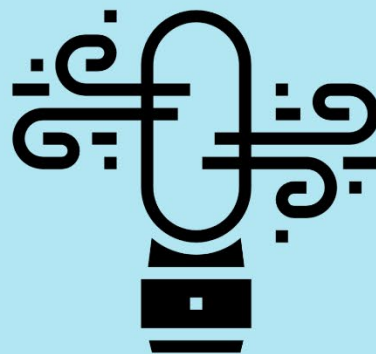
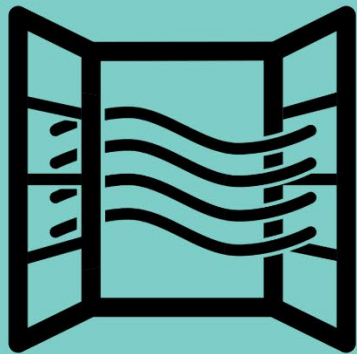


Guidance on Improving Indoor Air Quality

for individuals, building operators
and business owners



**Strategies to improve
indoor air and reduce
the risk of airborne
diseases like COVID-19
indoors**

Updated June 2023

Public Health
Seattle & King County 

INDOOR AIR QUALITY | INTRODUCTION



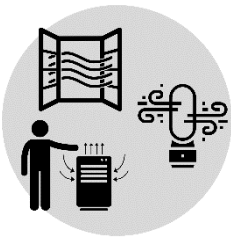
Who is this guide for?

This guide is for anyone who spends time indoors in public or residential settings and wants to ensure they have healthy indoor air. Specific sections were designed for operators of congregate settings, schools and childcare services, restaurants, and centers of faith. This guide includes strategies to improve indoor air quality and reduce the spread of airborne illnesses (like colds, flus and COVID-19) indoors.



Why does this guide matter?

Improving indoor air is a key strategy for protecting health. Good ventilation and air filtration are effective tools to reduce exposure to harmful pollutants and airborne diseases in indoor spaces, especially when used with other tools like physical distancing, wearing masks, dusting, cleaning, and disinfection. In addition to reducing the spread of diseases, clean indoor air supports healthy hearts, lungs, and brains!



What is included in this guide?

This guide outlines the three main technologies that are recommended for improving indoor air quality through ventilation, air filtration, and by killing germs:

1. Optimized Heating, Ventilation and Air Conditioning (HVAC) units
2. Portable High Efficiency Particulate Air (HEPA) air cleaners
3. Upper Room Ultraviolet Germicidal Irradiation (UVGI) disinfection

Note: Some of these options are easier to install than others. You can easily place a portable HEPA air cleaner in a space. You need to work with a specialist to install and maintain HVAC and UVGI systems. Also, UVGI works by killing germs/microbes, which means it doesn't filter the air to remove other pollutants.

How do I use this guide?

Review each of the three recommended technologies and determine what makes the most sense to implement in your facility. We recommend referencing this guide when choosing and maintaining technologies to improve the indoor air in your space.

This document also includes more specific considerations for different types of facilities: congregate settings like shelters, day centers, and other organizations that serve people experiencing homelessness; schools and childcare settings; restaurants; and faith-based organizations.

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Things to know about alternative air cleaner technologies

New technologies are being marketed to eliminate COVID-19 and other pollutants from the air. This section helps consumers evaluate which products might be effective.

TECHNOLOGIES KNOWN TO BE EFFECTIVE AT REDUCING SPREAD OF COVID-19

- Optimized Heating, Ventilation and Air Conditioning (HVAC) units with increased outdoor air intake and furnace filtration using highest MERV rated filters possible (MERV 13 or higher).
- Portable air cleaners with true HEPA filters.
- UVGI upper air disinfection (with expert recommendation and guidance).
- Opening windows and doors when options above are not available or sufficient (Refer to the HVAC section on ways to determine if your ventilation and filtration are enough.)

CAUTIONS FOR ALTERNATIVE TECHNOLOGIES

- Avoid air cleaners or HVAC systems that use ionization or oxidation, as these may generate ozone, which is harmful to health.
- Purchase technologies that have been third party verified by an independent organization such as Consumer Reports, American Home Appliance Manufacturers (AHAM), or California Air Resources Board (CARB). **Without third-party verification to confirm company claims, a new technology's effectiveness is unknown.**
- ASHRAE provides an [overview of many different air cleaner technologies and data gaps or unknowns that may exist](#).
- Never fog or spray air with disinfectant, as it can lead to harmful health effects for those exposed.

ADDITIONAL RESOURCES

- [Washington Department of Health's ventilation and air quality for reducing transmission of airborne illnesses](#)
- [ASHRAE COVID-19 resources](#)
- [EPA Clean Air in Buildings Challenge](#)
- [CDC Ventilation in Buildings Guidance](#)
- [National Collaborating Centre for Environmental Health's overview of technologies and potential risks](#)



Heating, Ventilation, & Air Condition (HVAC) Systems

HVAC systems help increase indoor air flow by pulling in outdoor air. They also filter both inside air and outdoor air entering the building. This helps clean the air indoors, reducing the risk of spreading disease.

Consult with your building engineer or certified HVAC specialist to maintain and optimize your HVAC system. If you rent, talk to your landlord. If you don't have an HVAC system, increase air flow by opening windows and doors when the air outside is clean and it's safe to do so.

You can determine how much air flow you need in your space (and if you should also use other strategies) by considering a few factors, including the number of people in the space and the size of the space. In some situations, measuring CO₂ can help indicate when additional ventilation and/or filtration are needed. Read more about CO₂ monitoring on the next page.

OPERATION

Increase air flow and function:

- Most HVAC systems work by bringing in outdoor air and mixing it with air circulating inside. Work with your HVAC specialist to set your HVAC system to reduce the amount of air recirculated and to bring in as much outdoor air as possible.
 - Experts recommend higher ventilation rates up to 21.2 cubic feet per minute per person, and minimum 5 air changes per hour to reduce the risk of airborne infectious disease transmission. Read more in [this Lancet Commission report](#).
 - Note: the ventilation rates set by ASHRAE standard 62.1-2019 are not sufficient. ASHRAE will be updating to higher standards in the coming months.
- Work with your building engineer or HVAC specialist to adjust the airflow to prevent air with pollutants/germs moving from one area to another.
- It's generally helpful to bring in more outside air during the whole day – during normal operations, between group and work shifts, and while cleaning and disinfecting. Maximizing air flow during these periods helps quickly replace the air in

the room with fresh, clean air. (Note: this does not apply during wildfire smoke events.)

FILTERS

If you are recirculating air, make sure it is filtered. Recirculating unfiltered air can increase the spread of respiratory diseases (like COVID-19):

- If your system can handle them, use MERV 13 HVAC filters or higher or their ISO (“3M” brand) and Filter Performance Rating (FPR) equivalents (“The Home Depot” brand).
- MERV 8 filters are the most commonly-used HVAC filters, but they capture 30-40% fewer particles (like pollutants and airborne viruses) than a MERV 13 filter. MERV 10 and 12, while more effective than MERV 8, are still not as effective as MERV 13.
- Ask your HVAC specialist about upgrading to MERV 13 filters or the highest rated filters your system can handle. The all-in cost (labor, materials, energy) of upgrading from MERV 8 to MERV 13 is about \$1.50 per month for a 5,000 square foot office, according to the [Lancet Covid-19 Commission Task Force on Safe Work, Safe School, and Safe Travel](#).
- If it’s not possible to upgrade to MERV 13, consider also using portable HEPA air cleaners or DIY box fans with MERV 13 filters attached.

MAINTENANCE

Maintain your HVAC system to ensure maximum air flow, efficiency and filtration:

- Change filters as needed. Clogged filters make it harder to improve indoor air quality. Visually inspect filters monthly to ensure they are not thickly coated with dust.
- Inspect and clean the entire HVAC systems regularly. Make repairs quickly to prevent serious issues.
- Open windows and doors to increase outside air. This may add to heating costs during colder weather, but is an important precaution against airborne viruses like COVID-19.
- Ask your building engineer to share maintenance and air quality data so you can be aware of health and safety measures in place. If you are the building engineer, proactively share this information.

HOW DO I KNOW I’M ACHIEVING

- We receive many questions about ventilation and how to know if it’s enough. Ask your HVAC specialist or building manager to set the air flow in the space to achieve a minimum of 5 air changes per hour.

ENOUGH VENTILATION?

- In some situations, measuring CO₂ can indicate when additional ventilation or filtration are needed. However, results from built-in CO₂ monitors can be expensive to install and complicated to interpret. Handheld monitors can be more cost effective and should be used to monitor CO₂ levels in occupied spaces.
- The CDC recommends increasing ventilation when CO₂ levels exceed 800 ppm. If increasing ventilation isn't possible, they suggest increasing filtration.
- Building managers can use new tools, like [this CO₂ calculator](#), that incorporate CO₂ levels to determine when ventilation and filtration should be increased.

RESOURCES

- [American Society of Heating, Refrigerating and Air-Conditioning Engineers \(ASHRAE\) COVID-19 One Page Guidance Documents](#)
- [Centers for Disease Control and Prevention \(CDC\) Ventilation in Buildings Guidance](#)
- [Center for Disease Control Interactive Home Ventilation Tool](#)
- [The First Four Healthy Building Strategies Every Building Should Pursue to Reduce Risk from COVID-19 \(The Lancet COVID-19 Commission Task Force on Safe Work, Safe School, and Safe Travel\)](#)
- [Clean Air in Buildings Challenge – Guidance to Help Building Owners and Operators Improve Indoor Air Quality and Protect Public Health](#)
- [ASHRAE Position Document on Indoor Carbon Dioxide](#)
- [ASHRAE Positions on Infectious Aerosols](#)

QUESTIONS TO ASK AN HVAC SPECIALIST

- | | |
|---|---|
| • What type of filters does my HVAC system currently use? | <i>Ideally your HVAC will use MERV 13 filters or higher (14, 15, etc.) or the ISO or FPR equivalent (3M or Home Depot brand).</i> |
| • Can my HVAC system handle a MERV 13 filter? | <i>If yes, discuss upgrading your filters to MERV 13.
If no, discuss upgrading your HVAC system or taking other precautions such as purchasing HEPA air cleaners to remove indoor pollutants.</i> |
| • How often do I need to change my filters? | <i>Your HVAC specialist should know how often to replace filters or describe what a dirty filter that needs replacing looks like.</i> |

- How often should I clean or inspect my HVAC system?
At a minimum your system should be inspected, serviced, and cleaned once a year. Inspection schedules will depend on type and use of the building. If a system has both heating and cooling functions, heating should be checked in the fall and air conditioning checked in the spring. Additionally, you should visually inspect your filters during wildfire smoke events to ensure they aren't thickly coated with dust.
- Does airflow in my building move in the direction of clean to less-clean air?
Your HVAC specialist or another expert, such as an industrial hygienist, can assess the air flow in a building using special tools. For example, if a facility has an isolation room for sick patients, the specialist can determine if HVAC system changes can prevent air moving from that space to other areas.
- How do I know my HVAC system is working well?
HVAC specialists assess how well the system is functioning during their regularly scheduled inspections.



Portable High Efficiency Particulate Air (HEPA) Air Cleaners

High Efficiency Particulate Air (HEPA) air cleaners trap up to 99.97% of small particles in the air, such as smog, smoke, allergens, soot, and viruses. This includes small (microscopic) airborne droplets produced when people breathe and talk. Certain activities like loud talking, singing, and aerobic exercise produce many more airborne particles. These small droplets can float and move in the air like cigarette smoke.

HEPA cleaners help reduce the amount of airborne virus in spaces where people are gathered, especially when people aren't wearing masks. They are useful to supplement an existing HVAC system, when no HVAC system exists, when outside air pollution is high (e.g., during wildfire smoke), in crowded spaces, and during respiratory disease outbreaks.

WHAT KIND OF HEPA AIR CLEANER SHOULD YOU LOOK FOR?

Select units that:

- Use HEPA or True HEPA filters, meaning they are 99% to 99.97% effective at filtering particles as small as 0.3 microns.
- [Are verified by AHAM](#) to have a clean air delivery rate (CADR) adequate for the size of the space. Higher CADRs (above 200 cfm) are more efficient and better for larger spaces (see sizing info below). The unit should have a room size and CADR indicated in its specifications.
 - Usually, the CADR listed is for the unit's highest fan speed. If you use a lower fan speed, or the "auto" setting, you likely will not get the full CADR listed, and may need multiple units to achieve the right CADR for your room.
- Do not have additional technologies or features (e.g., ionization, UV lights, and oil diffusers) because they can cause unintended health hazards, unless they are third-party verified (see last point below).
- Have a filter replacement schedule that will be easy to follow based on the manufacturer's recommendations.
- Are quiet. Look for a noise rating of 50 decibels (dB) or less (roughly the operating noise of a refrigerator).

- Have third-party verification of filter efficiency, energy star and low-ozone certification through the [Association of Home Appliance Manufacturers \(AHAM\) searchable list of portable air cleaners certification](#) and the [California Air Resources Board \(CARB\) list of low ozone emitting units](#).

HOW MANY HEPA AIR CLEANERS DO YOU NEED FOR YOUR SPACE?

Having more than one unit in a room may be necessary for adequate filtration.

To know how many units you need:

1. Estimate the CADR (filtration rate) for your room size using [EPA’s Guide to Air Cleaners in the Home](#):

Portable Air Cleaner Sizing for Particle Removal						
Room area (square feet)	100	200	300	400	500	600
Minimum CADR (cfm)	65	130	195	260	325	390

Note this chart is for estimation purposes. The CADRs are calculated based on an 8-foot ceiling. If you have higher ceilings, you may want to select a portable air cleaner with a higher CADR.

The numbers provided assume an 8-foot ceiling height. If a space has a higher ceiling, the resources provided below can help you calculate the needed CADR based on the volume of your room. The numbers above also provide 4-5 air changes per hour (ACH) in the specified room size (5 is the minimum the CDC recommends). If you have an HVAC system, or other ventilation that provides a certain number of ACH, you may not need a full 4-5 ACH from a HEPA cleaner.

2. Purchase HEPA air cleaners that, when added, create the minimum CADR listed in the chart above. Multiple units may be placed in the same space to achieve the recommended CADR.
 - For example, if your room area (length x width) is 500 square feet with an 8-foot ceiling, you can get one HEPA air cleaner that has a CADR of 325 or higher, or two HEPA air cleaners that have a CADR of 175 each, adding up to a CADR of 350.
3. Choose a unit with a higher CADR than needed for the space. This allows you to get enough filtration even on lower, quieter settings that may be used in classrooms or sleeping areas.

USING A HEPA AIR CLEANER

- Keep it on higher fan speeds to filter more air.
- Leave the HEPA air cleaner on. It is not effective when turned off.
- Place in areas where people spend the most time.
- Place the cleaner in an area that will avoid blowing air from one person onto another.
- Do not place air cleaners where walls, furniture, curtains, or other objects will block the unit's air intake and outlet.
- Most units plug into electrical outlets. Secure cords to avoid tripping hazards.
- Always follow manufacturer safety recommendations to protect children from any possible hazards posed by the air cleaner.
- Reduce indoor air pollution by, for example, establishing a no-smoking perimeter around doorways and windows of the building and installing functional cooking fume hood/exhaust fans in kitchen, bathroom, and laundry areas.
- Note: When pollution is high outdoors (such as during a wildfire episode), close windows and doors while the air cleaner is on.

MAINTENANCE

- Maintaining your HEPA cleaner is critical to ensure it's working and to extend its life.
- Review the user manual for maintenance needs and information on when to change the filter(s).
- Design a maintenance plan that includes:
 - Designated staff to conduct maintenance.
 - Regular cleaning of air cleaner and pre-filter(s). If the cleaner is in a space that lots of people use, you may need to clean it more frequently than what the manufacturer recommends.
 - A schedule for checking if the filters are dirty and when to change the pre-, carbon and HEPA filter(s).
 - Protocols (translated into multiple languages as needed) on how to change filters.

- A schedule to check that HEPA cleaners are plugged in and on the appropriate setting throughout the day.
- A schedule for ordering replacement filters.
- Directions to staff for how to respond if they find the unit not working.
- When changing the unit's filters:
 - Wear a high-quality face mask, such as an N-95 or KN95.
 - Unplug the cleaner.
 - Remove the dirty filters outdoors or in a well-ventilated area.
 - Place dirty filters directly in a garbage bag or outdoor bin.
 - Use a HEPA vacuum if possible to clean the unit inside and out, or use a damp cloth to wipe it clean.
 - If your unit has a reusable pre-filter, vacuum or wash as indicated by the manufacturer.
 - Carbon filters usually need to be changed more frequently than HEPA filters. If you are only changing the carbon filter, once you remove it, vacuum the HEPA filter, pre-filter, and inside and outside of the unit. If you are changing both the carbon and HEPA filters, dispose of them both.
 - Once filters are back in place, close all doors/panels and return the unit to the best-determined location.
 - Turn the unit on, make sure air is flowing, and check that any timers or filter replacement indicators are reset.
 - Note on your maintenance plan when the filters were changed/cleaned, and when the new filters should be changed/cleaned.

RESOURCES

- [Association of Home Appliance Manufacturers \(AHAM\) searchable list of portable air cleaners certification.](#)
- [California Air Resources Board \(CARB\)](#) list of devices to avoid due to harmful ozone emissions.

- Online tool: [Harvard-CU Boulder Portable Air Cleaner Calculator for Schools](#)



Upper Room Ultraviolet Germicidal Irradiation (UVGI) for Indoor Air Disinfection

Upper room ultraviolet germicidal irradiation (UVGI) systems kill viruses and other microbes in indoor air using low-wavelength ultraviolet light (UVC light). UVGI systems are UV light fixtures that kill or inactivate germs in the air in the upper part of a room. UVGI systems do not remove particles from the air, so they are ineffective at cleaning pollutants like exhaust, dust or smoke.

Upper room UVGI is not recommended for every facility. Consult a UVGI expert from a reputable UVGI vendor (contact a local HVAC company for assistance) before installing an upper room UVGI system and review the considerations below.

Direct exposure to UV light can be dangerous. Do not attempt to self-design or use a homemade upper room UVGI system. Placing and installing an upper room UVGI unit should always be done in consultation with the manufacturer and your building engineer to ensure safety.

IS UPPER ROOM UVGI RIGHT FOR YOUR FACILITY?

- Upper room UVGI systems are best for spaces where there is little to no option for ventilation or air filtration.
- Ceilings should be at least 8 feet tall, though some units may be effective at 7 feet. Depending on the size of the space, you may need more than one system.

MAINTAINING YOUR UPPER ROOM UVGI SYSTEMS

- Replace UV lights every 1-2 years. Schedule regular bulb cleanings and replacement.
- Follow the manufacturer's instructions when cleaning and replacing bulbs to avoid accidental UV exposures.
- UV bulbs contain mercury and should be handled with care. Staff should be informed of what to do if a UV light bulb breaks on site and how to safely dispose of used lamps. EPA provides [guidance on how to clean up a broken bulb](#).
- You may need to make seasonal adjustments to maintain relative humidity (RH) at 60% or less and room temperature between 68°F to 75°F (20°C to 24°C), which are the optimal conditions for low-pressure mercury lamps used in upper room UVGI systems.

**UPPER ROOM
UVGI SAFETY**

- Only use upper room UVGI systems. Other UV devices are not recommended for cleaning the air.
- Installation should be done by your building engineer and/or a certified electrician.
- As an added safety measure, building maintenance staff should use a radiometer or UV dosimeter indicator cards every few months to ensure UV light intensity in the upper and lower room spaces is correct and that the UV lamp is performing as it should.
- Consult a professional who is knowledgeable about upper room UVGI systems and system installation before procuring and installing the system. There are a limited number of people properly trained in the design of upper room UVGI systems. Companies that manufacture, supply, and install units will recommend unit placement and provide experts who can install units in your area. Be prepared to provide companies with the following information:
 - “As-builts” (diagrams) of the building.
 - Square footage per room.
 - Ceiling heights per room.
 - Number of people and activities per room (e.g., number of beds in sleeping spaces, are there bunk beds, etc.).

For more information see the CDC’s [guidance](#) on the use of upper room UVGI, which discusses its utility for limiting the spread of COVID-19.

Box Fan Filters

A box fan with a furnace filter attached is a low-cost way to clean your air at home. These “filter fans” can filter out viruses, mold, dust and small particles common in wildfire smoke, improving indoor air quality. Filter fans suck air through the furnace filter, which traps dust, pollen and other particles, sending clean air out the other side.

[Read our blog post](#) for instructions on putting a filter fan together. Use a thicker, 2” or 4” filter for better protection. The best option for filtering airborne viruses like COVID-19 is [to make a Corsi-Rosenthal cube using multiple filters](#) and a box fan.

USING A BOX FAN FILTER

- Use the fan in the room you spend the most time in.
- Position the fan toward the middle of the room, away from walls and big objects. Don’t position the fan near a dusty or dirty area or the fan will blow dust into the air.
- Close all windows and doors when outdoor pollution is high, such as during wildfire smoke events. The filter fan can’t clean the air if outside pollution is re-entering the room. Refer to the [Puget Sound Clean Air Agency air quality sensor map](#) for air quality near you.
- Filters should have a “MERV-rating” of 13.

MAINTENANCE

- Replace filters every 3 months, when they look dirty, and after every smoke event.

SAFETY

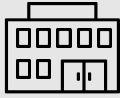
- Keep small children away from the box fan filter.
- Do not use when not at home.
- For electrical safety, do not use the fan in the bathroom or near water.
- Only use fans with UL or ETL safety markings (2012 models or newer).
- Use box fans and MERV 13 filters that are 20 inches by 20 inches. ([DIY guide](#))
- Follow manufactures instructions for use.
- Ensure your home has functioning smoke detectors.

RESOURCES

- [Indoor air quality is important](#): Public Health – Seattle & King County and the Puget Sound Clean Air Agency

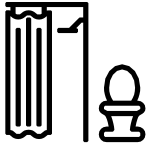
- [Research on DIY air cleaners to reduce wildfire smoke indoors](#): EPA
- [Instructions for making a DIY air cleaner to reduce wildfire smoke indoors](#): EPA

Indoor Air Considerations for **SHARED OR CONGREGATE HOUSING**



FACILITY

- Work with your building engineer to ensure ventilation and/or air filtration are adjusted to the number of people in your space (21 cfm per person of fresh air in the space or a minimum of 5 air changes per hour).
- If ventilation and air filtration are limited and can't be improved, work with a reputable UVGI vendor (contact a local HVAC company for assistance) to determine if that technology will work in your space.
- Refer to King County's guidance on [HVAC systems](#) and [HEPA air cleaners](#) for information on selecting and maintaining air ventilation/filtration systems.
- If you're using HEPA air cleaners in your facility, see our [HEPA Air Cleaner guidance](#) for more information on creating a plan to clean and change filters on a regular schedule, and to keep the units on at all times. (If noise and energy use are a concern, you can use the auto setting, but be sure to keep the units on.)
- Create and maintain a no-smoking perimeter around doors and windows, and check that exhaust fans in the kitchen, bathrooms, and laundry are on to prevent and remove air pollutants before they spread.
- If you can't improve ventilation and air filtration, consider if outside air quality and site safety allow for opening doors and windows during certain times of the day. Research has shown that opening a window up to 6 inches can achieve significant ventilation. (Note: this does not apply during wildfire smoke events. Refer to the [Puget Sound Clean Air Agency air quality sensor map](#) for air quality near you.)
- To help control temperatures, run fans in the normal direction in winter to push warm air down. In summer, run fans in reverse to pull warm air up.



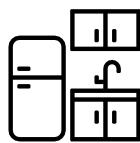
RESTROOMS

- Leave bathroom fans running at all times when the building is occupied to remove moist, dirty air.
- Keep bathroom doors closed.
- Ensure all toilets have lids. Post signs to encourage people to shut toilet lids before flushing. Studies have suggested that pathogens found in feces may become airborne when flushed.
- Add a trap primer to your drain, which will drain water into the trap to prevent sewer gases, pathogens (like COVID-19), and odors escaping from sewer pipes.
- Consult with your building engineer to ensure that air flow is not moving from the bathroom to the rest of the facility.



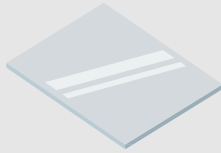
SLEEPING AREAS

- Clean shared sleeping areas on a regular schedule.
 - If people sleep on floor mats, floors should be cleaned daily if possible.
 - If a facility is carpeted, use a HEPA vacuum cleaner to reduce the amount of particles (such as viruses and dust) that may re-enter the air while vacuuming.
 - Cleaning and disinfection protocols for sleeping areas can be found on the [CDC](#), [HUD](#), [PHSKC](#), and [EPA](#) websites.



KITCHEN & DINING AREAS

- Run kitchen exhaust fans as much as possible, particularly 2 hours prior to, during and 2 hours after kitchen is in use. Exhaust fans eliminate cooking fumes that contribute to poor air quality. They can also increase ventilation by pulling in outdoor air through doors, windows, and small cracks in the building.
- Install screens on windows and backdoors near the kitchen. Leave windows and backdoors open when it's safe to do so and screens are installed.
- If eating indoors, and the facility doesn't have an HVAC system, open doors and windows if possible, even if only a few inches.
- Place HEPA air cleaners or [DIY box fans with filters](#) where people are congregating and eating.



BARRIERS

- Avoid placing fans and air cleaners in places that can blow air from one person onto another.
- Given that each setting is unique, Public Health does not recommend the installation of barriers without first consulting an expert (such as a facilities manager, HVAC specialist, or industrial hygienist) who can assess airflow in the space to:
 - Avoid creating “air pockets” that cause virus particles to build up over time.
 - Determine the impacts and/or placement of barriers in the space.
 - Identify specific cases where they may be useful (e.g., front desk staff/client counter).
- Some facilities may install barriers in sleeping spaces for reasons other than COVID-19. For example, they may be used to promote privacy and dignity among clients. In such cases, Public Health recommends installing:
 - Low barriers that are less likely to impede air flow.
 - Easily-wipeable surfaces that become part of the daily cleaning protocol.

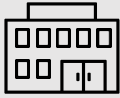
COVID-19 CONSIDERATIONS

- Refer to the [CDC’s COVID-19 Guidance for Shared and Congregate Housing](#). It’s important that you follow masking, isolation and ventilation guidelines for possible COVID-19 cases.
- Severe weather and disaster shelter capacity should provide physical distance in congregate areas where possible. See [CDC’s Environmental Health Assessment for Disaster Shelters during COVID-19](#) for more information.
- Read the CDC’s [Guidance on Management of COVID-19 in Homeless Service Sites and in Correctional and Detention Facilities](#) for more information.

RESOURCES

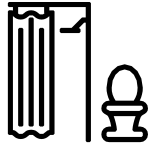
- King County [Sanitation and Hygiene Guide for Homeless Service Providers](#)

Indoor Air Considerations for **SCHOOLS & CHILD CARE SETTINGS**



FACILITY

- Work with your building engineer to ensure ventilation and/or air filtration are adjusted to the number of people in your space (21 cfm per person of fresh air in the space or a minimum of 5 air changes per hour).
- Refer to King County's guidance on [HVAC systems](#) and [HEPA air cleaners](#) for information on selecting and maintaining air ventilation/filtration systems.
- If you're using HEPA air cleaners in your facility, see our [HEPA Air Cleaner guidance](#) for more information on creating a plan to clean and change filters on a regular schedule, and to keep the units on at all times. (If noise and energy use are a concern, you can use the auto setting, but be sure to keep the units on.)
- Create and maintain a no-smoking perimeter around doors and windows, and check that exhaust fans in the kitchen, bathrooms, and laundry are on to prevent and remove air pollutants before they spread.
- If you can't improve ventilation and air filtration, and you're able to open windows and doors, consider if it's safe to do so during certain times of the day. Research has shown that opening a window up to 6 inches can achieve significant ventilation. (Note: this does not apply during wildfire smoke events, or if the outside air is polluted. Refer to the [Puget Sound Clean Air Agency air quality sensor map](#) for air quality near you.)
- To help control temperatures, run fans in the normal direction in winter to push warm air down. In summer, run fans in reverse to pull warm air up.
- Utilize the tools and resources provided by the EPA on the [Creating Healthy Indoor Air Quality in Schools](#) website.



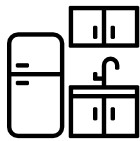
RESTROOMS & LOCKER ROOMS

- Leave bathroom fans running at all times when the building is occupied to remove moist, dirty air.
- Keep bathroom doors closed.
- Ensure all toilets have lids. Post signs to remind students to shut toilet lids before flushing. Studies have suggested that pathogens found in feces may become airborne when flushed.
- Limit the number of people using bathrooms, locker rooms, and showers to help reduce spread of airborne diseases.
- Add a trap primer to your drain, which will drain water into the trap and prevent the escape of sewer gases, pathogens (like COVID-19), and odors from sewer pipes.
- Consult with your building engineer to ensure that air flow is not moving from the bathroom to the rest of the facility.



NAPPING AREAS

- All floors should be cleaned daily.
- If a facility is carpeted, use a HEPA vacuum cleaner to reduce the amount of virus and other particles that may re-enter the air while vacuuming.
- If there is space, increase the distance between nap mats (six feet, if possible); if spacing is tight, remember to place children head-to-toe or toe-to-toe.
- Cleaning and disinfection protocols for sleeping areas can be found on the [CDC](#), [HUD](#), [PHSKC](#), and [EPA](#) websites.



KITCHEN & CAFETERIAS

- Run kitchen exhaust fans when the kitchen is in use. Exhaust fans eliminate cooking fumes that contribute to poor air quality. They can also help pull in outdoor air through doors, windows, and small cracks in the building for increased ventilation.
- Consider keeping kitchen exhaust hood/fans always on to help remove dirty air in the space.
- Install screens on windows and backdoors near the kitchen. Leave windows and backdoors always open when it's safe to do so.
- If eating indoors, and the facility doesn't have an HVAC system, open doors and windows if possible.



SCHOOL BUSES & OTHER TRANSPORTATION VEHICLES

- Place HEPA air cleaners or [DIY box fans with filters](#) where students are eating.
- Avoid placing fans and air cleaners in places that can blow air from one person onto another.
- When occupied, keep windows open a few inches (at a minimum two front and two rear windows) to provide adequate ventilation (as long as it does not create a safety or health hazard).
- Opening windows is beneficial for daily bus commutes as well as during transportation of school groups to different events (sports, field trips, etc.).
- Do not fog/mist the bus with disinfectant, as this can lead to poor air quality.
- Leave windows open to air out the bus after use and clean when visibly dirty.



BARRIERS

- Given that each setting is unique, Public Health does not recommend the installation of barriers without first consulting an expert (such as a facilities manager, HVAC specialist, or industrial hygienist) who can assess airflow in the space to:
 - Avoid creating “air pockets” that cause virus particles to build up over time.
 - Determine the impacts and/or placement of barriers in their space.
 - Identify specific cases where they may be useful (e.g., front desk staff/client counter).

OTHER CONSIDERATIONS

- If your facility uses portable HEPA air cleaners, always keep them on and well maintained. The auto setting is a good way to maximize energy efficiency and minimize noise.
- Air fresheners are not effective at removing airborne pathogens from the air and should not be used in learning environments as they can contribute to allergies, respiratory irritation, and poor indoor air quality.
- Offer more outside time for students.

COVID-19 CONSIDERATIONS

- Refer to [Washington State Department of Health's K-12 Schools and Child Care Guidance](#) for current requirements and guidance to mitigate COVID-19 transmission in schools and child care settings. It's

important that you follow masking and ventilation guidelines for possible COVID-19 cases.

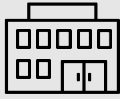
- When community transmission levels are high or outbreaks are occurring in a school, eat meals outdoors when feasible. Consider providing distance between each person in dining and snacking areas. Staggering mealtimes may help accommodate physical distancing.
- *Note:* strategies recommended for reducing COVID-19 will also reduce the spread of other airborne illnesses and thus student and staff absences.
- Washington State Department of Health [COVID-19- College and University Toolkit](#).

RESOURCES

- [Operational Guidance for K-12 Schools and Early Care and Education Programs to Support Safe In-Person Learning](#).
- EPA's Clean Air in Buildings Challenge: [Clean Air in Buildings Challenge](#).
- Washington State Department of Health: [Ventilation and Air Quality for Reducing Transmission of Airborne Illnesses](#).

Indoor Air Considerations for **RESTAURANTS**

Restaurants should aim for all recommendations listed in above sections of this guide.



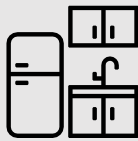
FACILITY

- Work with your building engineer to ensure ventilation and/or air filtration are adjusted to the number of people in your space (21 cfm per person of fresh air in the space or a minimum of 5 air changes per hour).
- Refer to King County's guidance on [HVAC systems](#) and [HEPA air cleaners](#) for information on selecting and maintaining air ventilation/filtration systems.
- Provide and maintain a proper hood system per local building and fire codes.
- If you're using HEPA air cleaners in your facility, see our [HEPA Air Cleaner guidance](#) for more information on creating a plan to clean and change filters on a regular schedule, and to keep the units on at all times. (If noise and energy use are a concern, you can use the auto setting, but be sure to keep the units on.)
- Create and maintain a no-smoking perimeter around doors and windows, and check that exhaust fans in the kitchen, bathrooms, and laundry are on to prevent and remove air pollutants before they spread.
- If you can't improve ventilation and air filtration, consider if it's safe to open doors and windows during certain times of the day. Research has shown that opening a window up to 6 inches can achieve significant ventilation. (Note: this does not apply during wildfire smoke events or when the air outside is polluted. Refer to the [Puget Sound Clean Air Agency air quality sensor map](#) for air quality near you.). Ensure HEPA air cleaners are dispersed within the space, prioritizing crowded spaces where people are talking loudly (e.g., bars, waiting areas, etc).
- To help control temperatures, run fans in the normal direction in winter to push warm air down. In summer, run fans in reverse to pull warm air up.



RESTROOMS

- Leave bathroom fans running at all times when the building is occupied to remove moist, dirty air.
- Keep bathroom doors closed.
- Ensure all toilets have lids. Post signs to remind customers to shut toilet lids before flushing. Studies have suggested that pathogens found in feces may become airborne when flushed.
- Add a trap primer to your drain, which will drain water into the trap to prevent sewer gases, pathogens (like COVID-19), and odors escaping from sewer pipes.
- Consult with your building engineer to ensure that air flow is not moving from the bathroom to the rest of the facility, especially when commercial kitchen hood is on.



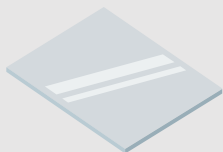
KITCHENS

- Run kitchen exhaust hoods/fans when the kitchen is in use, as well as two hours before and after use. Exhaust fans eliminate cooking fumes that contribute to poor air quality. They can also help pull in outdoor air through doors, windows, and small cracks in the building.
- Install screens on windows and backdoors near the kitchen. Leave windows and backdoors open when it's safe to do so (and screens are installed).



DINING AREAS

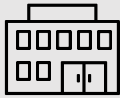
- Keep windows and doors open to increase the amount of fresh air flowing into dining areas (research has shown that opening a window up to 6 inches can achieve significant ventilation, even if just during busy periods).
- Place HEPA air cleaners throughout indoor dining areas.
- Avoid placing HEPA air cleaners so that air blows from one person onto another. If you use a ceiling fan, run it in reverse to draw air up.



BARRIERS

- Given that each setting is unique, Public Health does not recommend the installation of barriers without first consulting an expert who can assess airflow in the space to:
 - Avoid creating “air pockets” that cause virus particles to build up over time.
 - Determine the impacts and/or placement of barriers in the space.
 - Identify specific cases where they may be useful (e.g., front desk staff/client counter).

Indoor Air Considerations for **FAITH-BASED ORGANIZATIONS**



FACILITY

- Work with your building engineer to ensure ventilation and/or air filtration are adjusted to the number of people in your space (21 cfm per person of fresh air in the space or a minimum of 5 air changes per hour).
- Refer to King County’s guidance on [HVAC systems](#) and [HEPA air cleaners](#) for information on selecting and maintaining air ventilation/filtration systems.
- Before, during and after each prayer/worship service, flush out the air from occupied rooms by opening windows and doors (if it is safe to do so and outdoor air quality is good), or through the HVAC system.
- If you’re using HEPA air cleaners in your facility, see our [HEPA Air Cleaner guidance](#) for more information on creating a plan to clean and change filters on a regular schedule. Keep the units on at all times – if noise and energy use are a concern, you can use the auto setting to lower both.
- Create and maintain a no-smoking perimeter around doors and windows, and check that exhaust fans in the kitchen, bathrooms, and laundry are on to prevent and remove air pollutants before they spread.
- If you can’t improve ventilation and air filtration, consider if it’s safe to open doors and windows during certain times of the day. Research has shown that opening a window up to 6 inches can achieve significant ventilation. (Note: this does not apply during wildfire smoke events and when the air outside is polluted. Refer to the [Puget Sound Clean Air Agency air quality sensor](#) [maphttp://map.pscleanair.gov/](http://map.pscleanair.gov/) for air quality near you.)
- To help control temperatures, run fans in the normal direction in winter to push warm air down. In summer, run fans in reverse to pull warm air up.
- Ensure other organizations who use your facility also follow these practices.



RESTROOMS

- Leave bathroom exhaust fans running at all times when the building is occupied to remove moist, dirty air.
- Keep bathroom doors closed.
- Ensure all toilets have lids. Post signs to remind users to shut toilet lids before flushing. Studies have suggested that pathogens found in feces may become airborne when flushed.
- Limit the number of people using bathrooms or shower rooms to help reduce spread of airborne diseases.
- Add a trap primer to your drain, which will drain water into the trap to prevent sewer gases, pathogens (like COVID-19), and odors escaping from sewer pipes.
- Consult with your building engineer or maintenance manager to ensure air flow is not moving from the bathroom to the rest of the facility.

SCHOOLS, CHILDCARES AND NURSERIES

- If the facility is also used as a school or childcare, please see our [guidance for schools and childcares](#).

CONGREGATE SHELTERS

- If the facility is also used as a congregate shelter, please see our [guidance for shared or congregate housing](#).



KITCHEN

- Run kitchen exhaust fans when the kitchen is in use, as well as at least two hours before and after use. Exhaust fans eliminate cooking fumes that contribute to poor air quality. They can also help pull in outdoor air through doors, windows, and small cracks in the building for increased ventilation.
- Install screens on windows and backdoors near the kitchen. Leave windows and backdoors open when it's safe to do so.
- When community transmission levels are high or outbreaks are occurring that are associated with the facility, eat meals outdoors when feasible. Consider providing distance between each person in dining and snacking areas. Staggering mealtimes may help accommodate physical distancing.

COVID-19 CONSIDERATIONS FOR FAITH LEADERS

- If eating indoors, and the facility doesn't have an HVAC system, open doors and windows if possible.
 - Place HEPA air cleaners or [DIY box fans with filters](#) where people are congregating and eating.
 - Avoid placing fans and air cleaners in places that can blow air from one person onto another.
- Ask staff and visitors to stay home if they are sick or have symptoms of sickness. Also ask them to wear a mask if they have had close contact with someone who tested positive for COVID-19.
 - Make masks available to visitors and staff.
 - Encourage the use of high-quality, well-fitting masks among staff, volunteers, and members. See: [Your Guide to Masks | CDC](#)
 - Centers of faith may be used for many different activities. Consider increasing ventilation, filtration, and masking during higher risk activities (e.g., singing) and when occupancy is high. Alternatively, activities could be shortened or moved outdoors when possible.
 - Encourage staff and congregation to stay up to date with vaccination and boosters.
 - If you use confessional, consider wearing masks and using a larger space with better air flow. Alternative options include tele-confession, holding confessions outdoors or via drive-through, adding a small HEPA filter to the area (if there is space and the electrical cord does not pose a trip hazard), staggering confession times, and opening the room up to allow for air exchange before the next person enters.
 - Encourage congregation to wear masks while singing, especially those [at high risk of getting very sick from COVID-19](#). Monitor transmission rates in your communities and be ready to increase filtration, ventilation and masking as community rates increase.
 - Refer to [ASHRAE's Communities of Faith Buildings guidance](#) for more recommendations.

RESOURCES

- Washington State Department of Health: [Ventilation and Air Quality for Reducing Transmission of Airborne Illnesses](#)

Additional resources

- [ASHRAE's Business Readiness Resources](#) - more information about indoor air considerations for other sectors
- [Centers for Disease Control and Prevention \(CDC\) Ventilation in Buildings Guidance](#)
- [The First Four Healthy Building Strategies Every Building Should Pursue to Reduce Risk from COVID-19 \(The *Lancet* COVID-19 Commission Task Force on Safe Work, Safe School, and Safe Travel\)](#)
- [Clean Air in Buildings Challenge – Guidance to Help Building Owners and Operators Improve Indoor Air Quality and Protect Public Health](#)