

## Q1: OUR AIR QUALITY IS VERY POOR CURRENTLY DUE TO WILDFIRE SMOKE BUT I'M STILL WORRIED ABOUT COVID-19. WHAT SHOULD I DO?

**A:** In general, you should follow [the guidance of local public health officials](#) when wildfire smoke threatens your location. It is anticipated that persons who are either susceptible to or affected by COVID-19 may have health conditions that also make them vulnerable to wildfire smoke exposure and while social distancing guidelines are in place, finding cleaner air shelters might be challenging. If you need to reduce your exposure at home, you should stay indoors and set up a clean room. While increasing ventilation rates is good for reducing COVID19 risk, this is not recommended during wildfire smoke events. However, the same filtration options, such as portable air cleaners or MERV 13 filters in HVAC systems, that will reduce risk of COVID19 will also reduce indoor particle concentrations from wildfires. Information on clean rooms can be found from the [US EPA](#) and the [Indoor Environment Group of Lawrence Berkley National Lab](#). The [US CDC](#) has provided additional advice on protecting yourself from wildfire smoke during the COVID-19 pandemic.

If there are known or suspected COVID-19 infected persons in your home, you should create a separate clean room for them. Follow the [residential building guidance](#) on creating an isolation space but take the additional step of operating a portable air cleaner in the space (for more information on air cleaners see [here](#).)

## Q2: WILL USING A SPACE HEATER INCREASE RISKS OF COVID-19 TRANSMISSION?

**A:** There is neither evidence of, nor any reason to believe that portable space heaters directly create any increased risk of COVID19. ASHRAE recommends that you continue to keep occupied spaces heated to normal levels, because spending time under thermal stress such as excessively cold spaces can lower resistance to infection.



There are, however, other issues to consider when selecting and operating a space heater. Be aware that *unvented combustion* space heaters (e.g. using kerosene, propane, natural gas, etc.) release products of combustion into the indoor air. Without adequate ventilation, these contaminants can build up to unacceptable or even hazardous levels. Unvented combustion emits NO<sub>2</sub> which is a reactive oxygen species (i.e. a known breathing irritant,) and could increase susceptibility to respiratory infections, such as COVID-19. Unvented combustion-based heaters are banned in some jurisdictions. Electric space heaters do not pose those risks, but the placement of any portable heater requires some thought and care, to avoid overheating any nearby materials.

## Q3: WHAT CAN I DO IN MY HOME TO REDUCE THE RISK OF COVID-19 SPREAD?

**A:** ASHRAE recommends following guidance from the CDC which includes minimizing contact, having a [household plan](#) which includes basic information on how to [protect yourself](#) and how to keep your [home sanitary](#).

Additionally, follow the guidance in the Task Force's [Technical Guidance for Residences](#) presentation which is intended to supplement CDC recommendations with options related to controlling virus transmission through the air using the home's heating, ventilating and air-conditioning (HVAC) equipment and related factors.

This [Technical Guidance for Residences](#) includes guidance for all homes, homes with forced-air systems, multi-family homes and guidance for homes with COVID-19 positive or high-risk individuals.

### General Guidance Applicable to All Homes

Because of the variation of home construction, HVAC system and climate, some of the recommendations below may not be meaningful or practical in a given specific situation:

- **Maintain normal thermal comfort conditions:** The HVAC system should be operated and maintained consistent with its instructions, and to provide acceptable indoor thermal conditions, which is normally in the range of 68-78°F (20-25°C) and 40-60% relative humidity (RH).
- **Increase ventilation rate:** The home's ventilation system should be operated at least to provide the flow rate intended at all times. If mechanical ventilation systems are not available in single-family homes, opening multiple windows is an acceptable alternative, provided the open windows do not cause excessive draft. Whole-house "Summer Cooling" fans may also be used when weather permits. Ventilation should only be increased above required minimums if normal indoor temperature and humidity conditions are maintained.



## Q4: SHOULD I OPERATE MY HEATING/COOLING SYSTEM IN MY HOME?

### Additional Guidance for Homes with Forced-Air Systems

Many homes have forced-air HVAC systems that recirculate air throughout the home through ducts. The recommendations below are specific to those systems.

- **Install High Efficiency Media Filters:** Most air handlers have a slot for replaceable media/paper filters. Such filters should be upgraded to high-efficiency filters (such as MERV 14) or higher, when the system allows it. Personal Protective Equipment (PPE) is advised when [changing filters](#) that may contain virus-laden particles.
- **Operate System Continuously.** Forced air systems should be run as much as possible, such as by using a "FAN ON" setting. More complex control devices, such as smart thermostats, may allow programmable operation. Continuous operation at low speed should provide substantial filtration without undue draft.
- **Operate UltraViolet Germicidal Irradiation:** If present, UVGI systems should be maximally operated according to manufacturer instructions.
- **Operate Economizers:** If present and weather permits, economizers should be operated consistent with maintenance of normal indoor temperature and humidity conditions.



**A:** Yes, guidance on how to run your residential Heating Ventilating and Air-conditioning (HVAC) system can be found in the Task Force's [Technical Guidance for Residences](#). This document includes guidance for all homes, homes with forced-air systems, multi-family homes and guidance for homes with COVID-19 positive or high-risk individuals.

## Q5: CAN MY HOME HEATING/COOLING SYSTEM SPREAD COVID-19?

**A:** In general, a well-designed, maintained and operated heating, ventilating and air-conditioning (HVAC) system that meets applicable standards for ventilation and filtration will reduce the risk of transmission in your home. If, however, there is an infected individual, care should be taken to isolate them from the rest of the household which may include isolating parts of the HVAC system. [See guidance for creating an isolation space](#).

Note also that it is ASHRAE's position that:

*Ventilation and filtration provided by heating, ventilating and air-conditioning systems can reduce the*

airborne concentration of SARS-CoV-2 and thus the risk of transmission through the air. Unconditioned spaces can cause thermal stress to people that may be directly life threatening and that may also lower resistance to infection. In general, disabling of heating, ventilating and air-conditioning systems is not a recommended measure to reduce the transmission of the virus.

Guidance on how to run your residential heating, ventilating and air conditioning system can be found in the Task Force's [Technical Guidance for Residences](#).

### Additional Guidance for Creating an Isolation Space

When a household member is known to be infected, additional precautions are required in order to reduce the risk to other household members. The CDC has provided general [guidance for this situation](#). A key aspect is to use a separate room essentially as an isolation space. The following additional actions should be considered when creating such an isolation space:

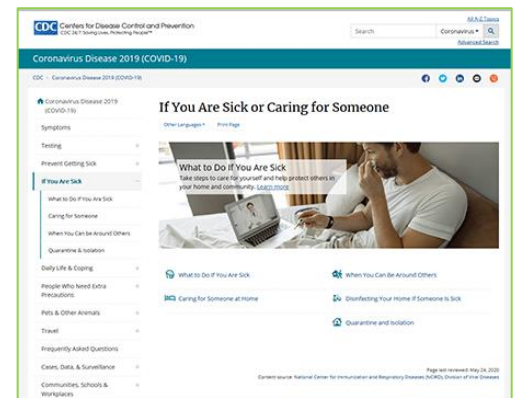
- **Select Isolation Space:** It is preferred that the space be on a high floor in the home during the heating season, but on a low floor during the cooling season. When possible, the isolation space should have its own restroom facilities. The isolation space should not be in the space that has the only return for a forced-air system.
- **Separate HVAC Systems:** A separate HVAC system is recommended for the isolation zone. If necessary, portable room heaters or room air conditioners should be used in the isolation space. If there is a forced-air system that would mix the air between the household and the isolation space, all registers, return grills or supply grills should be sealed, unless it is not possible to provide ventilation or maintain thermal comfort conditions any other way.



## Q6: WHAT CAN I DO IF SOMEONE IN MY HOME HAS COVID-19?

**A:** When a household member is known to be infected, additional precautions are required in order to reduce the risk to other household members. The CDC has provided general [guidance for this situation](#). A key aspect is to use a separate room essentially as an isolation space. The following additional actions should be considered when creating such an isolation space:

- Select isolation space
- Separate HVAC systems
- Install air barriers
- Operate exhaust ventilation

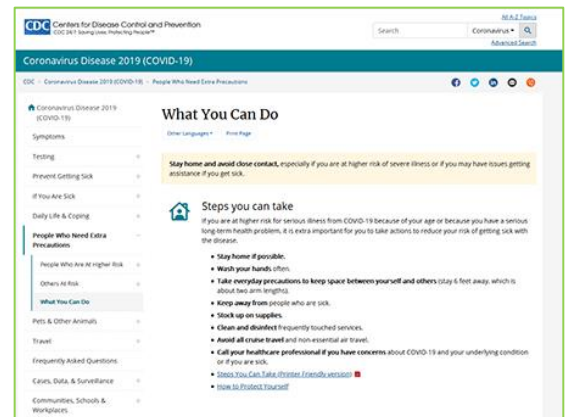


Please see the [Technical Guidance for Residences for more details](#).

## Q7: WHAT CAN I DO IF SOMEONE IN MY HOME IS A HIGH-RISK INDIVIDUAL?

**A:** The CDC recognizes various categories of [high-risk individuals](#) and has general [guidance for high-risk individuals](#). If there is not a known infected individual but there is a high-risk household member, additional protection can be afforded by creating a protected space for the high-risk individual. The following actions should be considered:

- Select protected space
- Separate HVAC systems
- Install air barriers
- Operate supply ventilation
- Operate stand-alone [air cleaner](#)

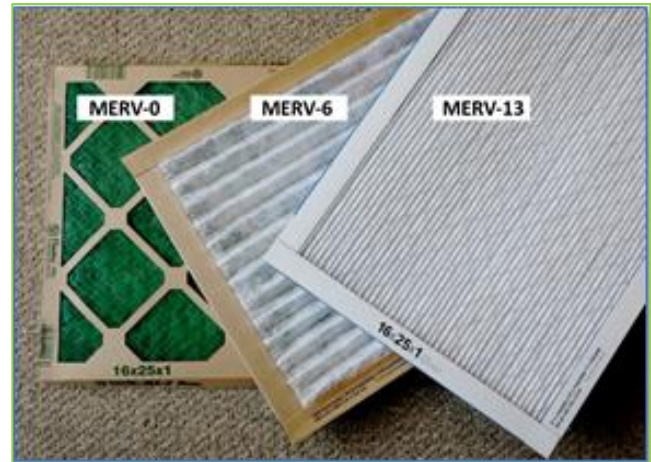


Please see the [Technical Guidance for Residences for more details](#).

## Q8: I WANT TO UPGRADE THE FILTER IN MY CENTRAL HEATING AND COOLING SYSTEM TO A HIGHER EFFECTIVENESS ONE. IS THIS SAFE AND DO I NEED TO ADJUST MY FAN SETTING?

**A:** Generally, this is safe and some minor adjustments are in order.

The typical 1-inch (thick) filter in most systems can be replaced with a filter up to MERV 13. Above this MERV rating the additional airflow resistance of high-performance filters may impact the performance of the HVAC system. If you have a 2-inch or greater filter then you can upgrade it safely with filters up to MERV 16. A 4-inch or greater filter will need to be changed far less frequently. If installing a new filter grille or holder, consider one that can take a 4-inch filter.



You will need to adjust the fan setting to make the fan run even if there is no heating or cooling. Many thermostats have a “fan only” setting that can be used or you may have a smart thermostat or fan controller that can be used to provide a minimum operating time of at least 15 minutes per hour. In hot humid climates, be aware that continuous fan operation may reduce the ability of your system to control humidity. Please refer to the user’s manual of your system or consult an HVAC contractor for more information, and consider asking your contractor to upgrade your filters. Care must be taken when [replacing filters](#) because of exposure from surface contaminants.

## Q9: I AM CONSIDERING USING A GERMICIDAL ULTRAVIOLET SYSTEM IN MY HOME, BUT I WANT TO KNOW IF THESE SYSTEMS PRODUCE OZONE. IS THERE EQUIPMENT I CAN BUY THAT DOES NOT PRODUCE OZONE?

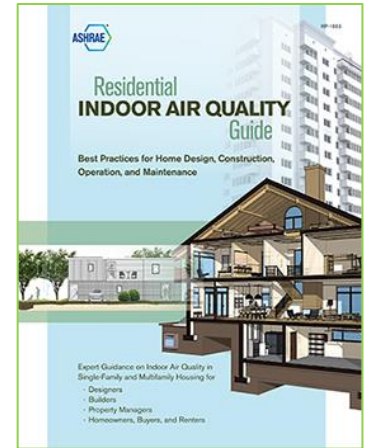
**A:** Yes, but it is important to avoid ozone production because it is a contaminant of concern. Look for equipment meeting UL Standard 2998 Environmental Claim Validation Procedure (ECVP) for Zero Ozone Emissions from Air Cleaners.

This kind of germicidal equipment uses mercury vapor lamps that produce ultraviolet light at 254nm, which is effective at inactivating many pathogens including SARS-CoV-2. Light at this wavelength does not produce ozone, but the mercury vapor lamps also produce ultraviolet light at shorter wavelengths that do produce ozone. Manufacturers have overcome this problem by using titanium-doped quartz in the lamps, which block the ozone-producing wavelengths. These products require careful design, installation and maintenance to be most effective.



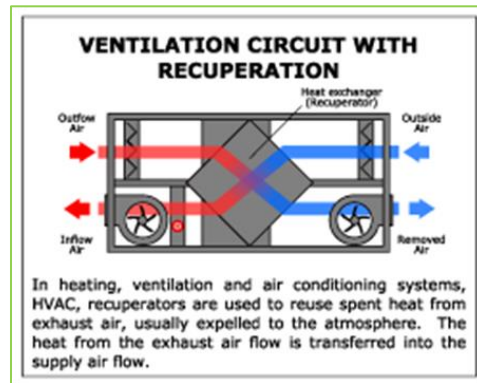
## Q10: WILL LETTING DAYLIGHT INTO MY HOME REDUCE COVID-19 RISKS?

**A:** Perhaps. Direct sunlight has disinfectant properties in addition to having other benefits for people. Research has not yet determined exactly how strong that effect is for the SARS-CoV-2 virus. Window glass absorbs a lot of the ultraviolet frequencies where the disinfectant benefit comes from so, it is best to let sunlight in through open windows. However, this practice should only be used in addition to and not as a substitute for following all the recommendations from the CDC and the [ventilation and air cleaning guidance found here](#). One must also take care to balance open windows with other concerns including thermal stress and pressure balancing.



## Q11: IS IT SAFE TO CONTINUE USE MY ERV OR HRV TO PROVIDE VENTILATION IN MY SINGLE-FAMILY HOME?

**A:** Generally, yes. While there can be a potential to recirculate a small amount of contaminated air if someone is infected, the ERV/HRV will still be an overall benefit in single-family homes.



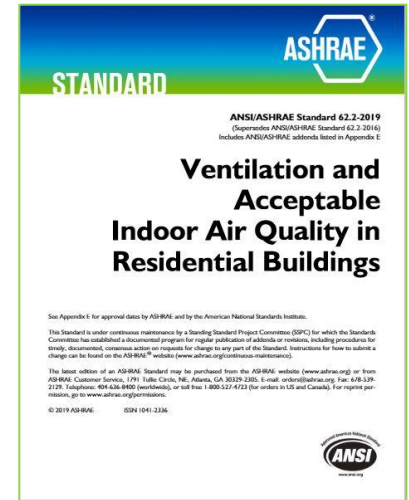
## Q12: SHOULD I UPGRADE THE OUTDOOR AIR FILTER OF MY VENTILATION SYSTEM TO PREVENT THE VIRUS FROM ENTERING MY HOUSE?

**A:** In general, it is not necessary to upgrade the filter treating the supply of outdoor air. According to current knowledge, there is a very low probability that the virus will enter from outdoors into the house through the mechanical ventilation system. In addition, a higher effectiveness filter may be more prone to clogging and will reduce air flow. One factor that might change this recommendation is if the outdoor air intake is near another building's exhaust vent or near a location where people congregate.



## Q13: MY SPOUSE AND I ARE TELEWORKING FROM HOME FULL TIME. ARE THE VENTILATION RATES IN ASHRAE STANDARD 62.2 ENOUGH FOR OUR DWELLING?

**A:** Generally, yes. If your work involves typical use of a computer and normal accessories and other routine office work, the ventilation requirements in [ASHRAE Standard 62.2](#) should be enough. However, if your office work is more intense (e.g., heavy duty use of laser printers, use of a 3d printer, soldering or other activities not typically performed at home), you may wish to look to [ASHRAE Standard 62.1](#) for guidance on adequate ventilation.



## Q14: I RUN A STAND-ALONE DEHUMIDIFIER TO MINIMIZE MOLD PROBLEMS. DO I HAVE TO TAKE PRECAUTIONS WHEN EMPTYING THE CONDENSATE RESERVOIR?

**A:** Yes. Care should always be taken when disposing of condensate water as it can contain virus and other harmful contaminants. If possible, the condensate should be emptied outdoors or into a toilet. To avoid aerosolizing any potential virus, care should be taken not to splash when emptying the container and wearing a face mask is recommended. The container should be washed as should your hands after the operation is complete. If extra care is needed, such as if the dehumidifier is in an isolation space, consider using full PPE.



## Q15: IS IT OK TO FIX OR REPLACE MY HVAC SYSTEM, OR DO I NEED TO WAIT UNTIL THE PANDEMIC IS OVER?

**A:** You should go ahead and fix or replace your system. As noted in Task Force's [Technical Guidance for Residences](#), it is important to maintain normal thermal comfort conditions. When replacing your system, consider



including upgrades such as providing better filtration as discussed in the Residential Guidance.

Some precautions you can take are to ask the contractor to use facemasks when they are working in your home. You might also ask the contractor to only enter as few rooms in your home as possible, that you can clean after the work is done (or the contractor themselves may do this). Other additional precautions to consider if you are in a higher risk group are possibly to leave the home or use portable filtration in occupied rooms during the day while the work is being done. You should definitely discuss these options with your contractor to make a plan that you are both comfortable with. Contractors may also have their own plans to protect you and their workers that should be part of any conversation before work starts in your home. The U.S. Occupational Safety and Health Administration provides guidance for “In-Home Repair” at the following links:

- [COVID-19 Guidance for In-Home Repair Services](#)
- [In-home repair services](#)

## Q16: DO I HAVE TO WORRY ABOUT INFECTION FROM PEOPLE STANDING AROUND MY OUTDOOR AIR CONDITIONING UNIT?

**A:** Generally, not. The outdoor part of your AC unit is typically only connected to the indoors through refrigerant lines—not air ducts—and there is no transmission path for air.



However, there are a few types of systems that do have outdoor air connections. Some window and portable air conditioners may pull in air from outside. In some large multifamily units, heating and cooling may be supplied by Packaged Terminal Air Conditioning (PTAC) units with similar outdoor air intakes. There may also be specific ventilation intakes unrelated to any heating or cooling system. In all these cases, social distancing rules are recommended between those intakes and people outdoors.

## Q17: MY HOME HAS WALL-MOUNTED DUCTLESS MINI-SPLIT AC UNITS. I KNOW THEIR FILTRATION IS MINIMAL. CAN I IMPROVE FILTRATION OF SMALL AND POTENTIALLY INFECTIOUS AIRBORNE PARTICLES?

**A:** High efficiency particle filtration is rarely an option in such equipment. Instead, consider operating a portable air cleaner that has a high clean air delivery rate (CADR) in North America, a high clean air efficiency (CAE) in Europe (see additional info [here](#)), or is equipped with a HEPA filter and does not emit ozone. For more information, the EPA's guidance to air cleaners and air filters in the home is [here](#).



## Q18: MY CONDO APARTMENT (OR DORMITORY ROOM) HAS HORIZONTAL, HOTEL-STYLE AC UNITS INSTALLED THROUGH THE EXTERIOR WALL. CAN I IMPROVE FILTRATION OF POTENTIALLY INFECTIOUS AIRBORNE PARTICLES?

**A:** High efficiency particle filtration is rarely an option in such equipment. Instead, consider operating a portable air cleaner that has a high clean air delivery rate (CADR) in North America, a high clean air efficiency (CAE) in Europe (see additional info [here](#)), or is equipped with a HEPA filter and does not emit ozone. For more information, the EPA's guidance to air cleaners and air filters in the home is [here](#).





## Q19: MY CONDO APARTMENT (OR DORMITORY ROOM) HAS A VERTICAL, HOTEL-STYLE AC SYSTEM INSTALLED IN A SIDE WALL NEAR THE EXTERIOR WALL. CAN I IMPROVE FILTRATION OF POTENTIALLY INFECTIOUS AIRBORNE PARTICLES?

**A:** High efficiency particle filtration is rarely an option in such equipment. Instead, consider operating a portable air cleaner that has a high clean air delivery rate (CADR) in North America, a high clean air efficiency (CAE) in Europe (see additional info [here](#)), or is equipped with a HEPA filter and does not emit ozone. For more information, the EPA's guidance to air cleaners and air filters in the home is [here](#).



## Q20: I AM READING THAT OZONE CAN KILL VIRUSES. SHOULD I GET AN OZONE GENERATOR OR SIMILAR PRODUCT FOR MY HOME?

**A:** No. Ozone at high enough concentrations can inactivate the SARS-CoV-2 virus, but these levels of ozone are generally well above levels considered safe for occupant exposure.

For air cleaning devices, ASHRAE holds the position that:

*Devices that use the reactivity of ozone for the purpose of cleaning the air should not be used in occupied spaces because of negative health effects that arise from exposure to ozone and its reaction products. Extreme caution is warranted when using devices that emit a significant amount of ozone as by-product of their operation, rather than as a method of air cleaning. These devices pose a potential risk to health*

Electronic air cleaning products have been known to emit ozone incidentally. ASHRAE recommends products that have been [certified as certified air cleaning devices](#) by the [California Air Resources Board](#) or as zero ozone emitting devices using UL 2998.

For more information: the full text of ASHRAE's position on filtration and air cleaning is [here](#) and the EPA guidance on residential air cleaners is [here](#).

## Q21: Is It Recommended To Have A Blower Door Test Done On My House When COVID-19 Is Present In The Community?

**A:** If there is an infected or vulnerable person in your single-family home it is advisable to delay testing. Otherwise, it is generally okay to go ahead with the blower door test. However, blower door tests of occupied multifamily dwellings are not recommended.

A blower door moves a large amount of air, which in general should reduce the concentration of any virus-containing particles, but it can also re-suspend dust which might contain viral particles. For this reason, it would be best to stay out of the home and away from the blower door during the tests and at least an hour from the time the blower door is shut off, or if that is not possible to wear N95 masks. You should discuss safety with the contractor in advance to ensure they will be following company or manufacturer safety protocols that consider factors such as technician health, appropriate PPE, social distancing and surface disinfection. If both pressurization and depressurization tests are being done, it is recommended to do the pressurization test first.



## Q22: WILL OPERATING MY EVAPORATIVE COOLER REDUCE RISKS?

**A:** Yes, provided your unit ventilates the house with outdoor air. Direct evaporative cooling takes air from outside and cools it with evaporation and sends it indoors. This type of evaporative cooler will increase ventilation rate like an economizer or summer whole-house cooling fan and would similarly reduce risk. Some evaporative coolers do not take their air from outside and do not increase ventilation. Be sure to find out which type you have.

Portable evaporative coolers may be helpful for comfort, they probably won't reduce risks of airborne infection unless, like direct evaporative coolers, they supply outdoor air to the house.



## Q23: I LIVE IN A TROPICAL CLIMATE. I HAVE NO MECHANICAL VENTILATION SYSTEM BECAUSE MOST OF THE DAY MY WINDOWS ARE OPEN, BUT FOR A FEW HOURS OF THE DAY I CLOSE MY WINDOWS AND TURN ON THE AIR CONDITIONING. WHAT CAN I DO TO REDUCE MY RISK OF COVID-19 INFECTION DURING THESE PERIODS?

**A:** When there are periods of very low ventilation, a portable air cleaner can reduce the risk of COVID-19 infection. The best options include HEPA filtration and some sort of disinfection such as from UV-C. When buying electronic air cleaners, it is important to have them certified to be low ozone emitting. The Environmental Protection Agency has more information available on [air cleaners for the home](#).



## Q24: THE EXHAUST VENTS IN THE BATHROOM AND KITCHEN OF MY APARTMENT CONNECT TO A CENTRAL EXHAUST SHAFT. I READ THAT CENTRAL EXHAUST CONNECTIONS SOMETIMES LED TO COVID TRANSMISSION RISKS IN CHINESE AND KOREAN STUDIES. WHAT SHOULD I DO?

**A:** Central exhaust systems in all parts of the world are designed to ensure that air only goes out—never into—the apartment from a central exhaust duct. In the US and Canada, most codes require a continuously operating exhaust fan at the top of the duct, and/or a back-draft damper at every local exhaust connection. These measures prevent air from one apartment entering another via the central exhaust duct. Other international codes and construction practices provide different means of ensuring that air always moves into—never out of the exhaust ducts.

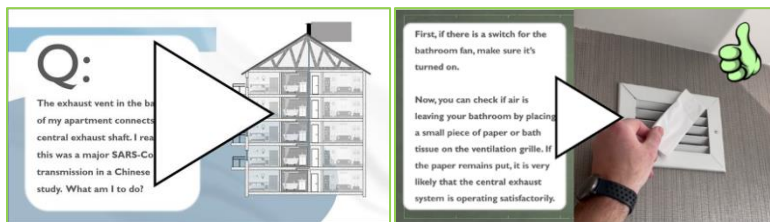
No matter the local code or construction practice, as long as air is always moving into the exhaust grilles, there is little risk of COVID-19 transmission through a central exhaust system. You can check the safety of your connections. Use something that can make a small amount of smoke such as an incense stick. Place the smoke near the exhaust grille. Alternatively, place a tissue over the exhaust grille. If the smoke seems to be coming toward you, or if a tissue is blown off rather than held against the grill by air leaving the apartment, there could some risk of air transfer from another apartment. In such cases take the following actions:

- If there is a switch that activates a local exhaust fan, turn it on and repeat the test to make sure air is now leaving your apartment.

- If there is no local fan, or if air is still entering the apartment from the exhaust duct, seal off that opening with cardboard or plastic sheeting and tape.
- Notify the building manager of the potential risk and ask for their plan and their schedule for correction of this problem.

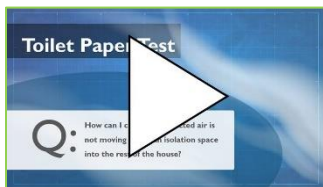
(Note that your bathroom or kitchen may also have a supply air grille as part of your heating, cooling or ventilation system, which blows conditioned air into the apartment by design. Don't accidentally seal off these supply grilles)

For videos of how to check your exhaust vent go to <https://vimeo.com/460681697> and <https://vimeo.com/511387096>



## Q25: HOW CAN I CHECK THAT POTENTIALLY INFECTIOUS AIR IS NOT MOVING OUT OF AN ISOLATION SPACE INTO THE REST OF THE HOUSE?

A: If a member of the household is infected, it may be useful to create an [isolation space](#) for that individual, to reduce the flow of viruses-laden air to other parts of the house.



To keep potentially infected air from leaking into the rest of the house, that isolation space must remain at a lower pressure than the rest of the house. This is usually accomplished by mounting a fan in a partially open window and running that fan, so it expels room air to the outdoors.

You can check with a short length of toilet tissue that your isolation space is staying at a lower pressure than the rest of the house. From a position inside the house, hold that short length of tissue along the gap at the base of the door of the isolation space. Then take your hands away from the tissue. If the tissue remains held against the door gap for at least three minutes, then isolation is probably effective. It means that air is moving from the rest of the house into the room, so that any potentially infectious air inside the room is being contained (“isolated”) and expelled to the outdoors rather than being allowed to leak back into the rest of the house.

However, when that length of tissue falls away from the base of the door instead of being held against





hours, wear a mask, and open all the windows long enough to change the air completely. An hour or so is usually sufficient.

## Q29: HOW CAN I CHECK THAT POTENTIALLY INFECTIOUS AIR IS NOT MOVING INTO A PROTECTED SPACE FROM THE REST OF THE HOUSE?

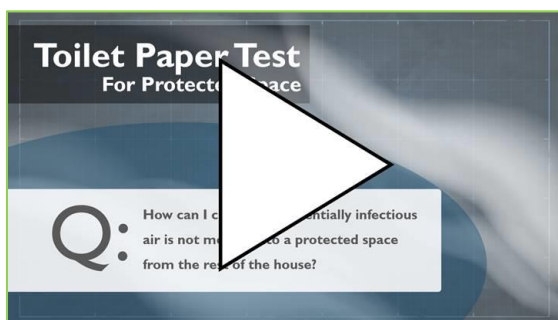
**A:** If a member of the household is a high-risk individual it may be useful to create a protected space for that individual to reduce the risk of the individual being exposed to potentially infectious air. [Additional Guidance for Creating a Protected Space](#).

To keep potentially infectious air from leaking in from other parts of the house, that protected space must remain at a higher pressure than the rest of the house. This is usually accomplished by mounting a fan in a partly-open window, and running that fan so it forces outdoor air into the room.

You can check with a short length of toilet tissue that your protected space is staying at a higher pressure than the rest of the house. From a position inside the protected space, hold that short length of tissue along the gap at the base of the door between the protected space and the rest of the house. Then take your hands away from the tissue. If the tissue remains against the door gap for at least three minutes, then protection is probably effective. This means that air is moving from the protected space to the rest of the house, so that any potentially infectious air outside the protected space remains in the rest of the house.

However, when that length of tissue falls away from the base of the door instead of being held against the gap, it means the protected space is no longer effective. In that case, check to make sure that any central system HVAC inlet and outlets are sealed off with cardboard and masking tape. Also make sure the window fan is operating in a way that forces outdoor air into the protected space, and that any other windows in the space are either closed tightly or only barely cracked open (less than 1/4" (6 mm).

For a video on the "toilet paper test protected space" go to <https://vimeo.com/483255730>.



## Q30: SHOULD I OPEN MY WINDOWS TO PROVIDE MORE OUTDOOR AIR AND REDUCE THE RISK OF COVID -19 PROPAGATION?

**A:** Not necessarily. There are circumstances where opening windows is not a good idea or where there are better options. In general, it is preferable to use a mechanical ventilation system if available. If no mechanical ventilation is available, consider the following situations before opening windows.

### In single-family detached homes:

Windows can be opened if:

- it does not cause thermal discomfort for occupants
- it does not change the airflow principles of a protected or isolation space [<https://www.ashrae.org/technical-resources/residences-faq>]
- outdoor contaminants are at acceptable levels [<https://www.ashrae.org/technical-resources/residences-faq>].
- there are no home security or other concerns

Otherwise, [portable HEPA air cleaners are recommended](#).

### In dwellings in multifamily buildings:

Opening the windows may cause air transfer between dwellings through internal air leaks. Therefore, portable HEPA air cleaners are recommended, rather than opening windows.

If portable air cleaners are not available, the following options may be used if they do not cause thermal discomfort for occupants and if the outdoor pollution level is acceptable.

- Option 1 (preferred option): Mount fans in the window openings. Two fans are needed: one supply fan blowing air in and one exhaust fan extracting air, the airflow rates of these fans should be the same.
- Option 2 (if fans are not available): Open windows when outdoor conditions are acceptable (for example, during mild weather conditions).

In both cases, it is better to open windows to an unobstructed outdoor space rather than to a restricted space such as a light well.

If you can smell odors from other dwellings, then close the window(s). Odor transfer indicates the possible transfer of other air contaminants, including infectious aerosols.

