COVID-19 Fact sheet

Guidance on controlling ventilation in schools and other indoor workplaces

This information outlines a range of considerations for controlling ventilation in schools and other indoor workplaces to reduce the risk of COVID-19 transmission.

What are the risks?

- The risk of viral transmission increases with the number of people occupying the same indoor space.
  - The volume of the room and the distance between occupants are important considerations.
- Ventilation is key to preventing stagnation of air. Stagnation occurs when the exchange of fresh air from the outside is low. The amount of air entering the room, known as the air-exchange rate, needs to be as high as feasibly possible, taking into account comfort of the occupants, activity and infection risk.
- Vocalisation such as talking, shouting or singing, considerably increases the concentration of viral aerosol.
- **Exposure to aerosols – which are tiny particles invisible to the eye – in a room with other people increases with time and it's advisable to shorten the time spent in a room and use breaks (where the room is unoccupied for a time) if the space has been used for vigorous exercise or singing, or if the ventilation is poor.**
- Other considerations include:
  - Increasing fresh air coming into the room
  - Ensure other key principles are applied when there is a high risk of viral aerosols

Existing measures to reduce the risk of COVID-19

- There are a range of existing measures that can reduce the risk of COVID-19, including:
  - getting vaccinated
  - wearing masks
  - physically distancing at least 1.5 metres apart
  - washing hands frequently
  - staying at home when feeling sick
  - getting tested if someone has any COVID-19 symptoms.
- Fresh air entering a room is another key measure to reduce the risk of COVID-19.
- Fresh air from outdoors is important because most transmission of COVID-19 occurs indoors through tiny particles invisible to the eye, called aerosols, which are produced when infected people breathe, speak or cough. Fresh air dilutes out these particles and displaces stale air in a room.
- The amount of air that enters the room is called the air–exchange rate**.** To improve the air-exchange rate:
  - open the windows in naturally ventilated buildings
  - increase the air flow rates in mechanically ventilated buildings where windows cannot be opened
  - consider air purifiers if good air exchange rates (ventilation) cannot be achieved, but first take advice from experts such as occupational hygienists or mechanical (air) engineers.

How do I assess the situation?

- What is the number of occupants and their interactions?
- Singing, talking loudly or exercising will increase aerosol generation and increase risk of disease transmission.
  - wear masks
  - consider microphones so the speaker does not need to raise their voice.

- Is it a high traffic flow area where people only interact fleetingly, or will people congregate for longer periods of time? The latter is a higher risk situation.
- What is the risk profile of the occupants? For instance, are they older people with other illnesses such as lung disease?
- What levels of occupant comfort is required? For instance, temperature, noise, and air movement.
- Consider temperature impacts of running air purifiers, or adding higher grade filters into existing HVAC systems.
- Are there issues such as needing to be able to hear? Air purifiers of sufficient capacity to clear a room of aerosols can be noisy, especially if there is more than one purifier.

How do I assess the room?

- Experts such as qualified engineers or occupational hygienists can assess the ventilation requirements.
- Consider the room size including volume and available floor area, as well as:
  - the way occupants enter the room and the potential for congregating in a small corridor or hallway where social distancing cannot occur
  - alternative arrangements for occupants that need to congregate before entering a room.
- What is the occupancy level and how are occupants physically distanced?
  - How is the room to be operated? Are occupants distanced, located in small groups, or all together?
- What are the occupants' activity in the room?
- Singing, talking loudly or exercising will increase aerosol generation and increase risk of disease transmission. Wearing of masks or using microphones reduces the risk.
- Are there other forms of ventilation available that would increase air changes?
  - Is it possible to increase ventilation?
    - Is there a HVAC system that can increase fresh-air intake?
    - Can higher efficiency filters be retrofitted?
- Is there natural ventilation such as windows that can be opened?
- Are there other ways to improve air movement, such as opening doors and windows?
  - In some cases, windows cannot be opened; sometimes due to being 'glued' shut from paint
  - Find a way to repair these windows, noting security may form part of the reason the window has been rendered un-openable
  - Investigate improving ventilation through the HVAC system
  - Preferably use available rooms with better ventilation

Improve ventilation of rooms where multiple people congregate

- Generally, increasing the proportion of outdoor fresh air (make-up air) that enters the enclosed space reduces the concentration of aerosols (and other particles) that are suspended in the indoor air.
- Open windows if you can but consult with an engineer if mechanical systems are also used, such as Heating, Ventilation, and Air Conditioning (HVAC) or split systems.
- Create cross breezes (window and door open, if possible, or at either ends of the corridor).
- Don't forget about common spaces, especially corridors. Consider improving ventilation of congested corridors where people may congregate and where physical distancing may be difficult to control.
- Mechanical ventilation, mainly through HVAC, refers to a ducted air-conditioning system that removes spent/stagnant air from indoors, supplies fresh air from the outside (air exchange), and heats and cools the air.

- HVAC is a good option to reduce viral aerosols in indoor public spaces through the principle of air dilution. Improving ventilation with ducted air conditioning can be achieved by increasing the air exchange rate. Please consult with a mechanical (air) engineer.
- **Fans do not reduce aerosol concentration. They merely mix existing air.**
- In indoor spaces such as corridors, common lifts, areas without windows, and where there are many occupants, including vulnerable people, please consult with mechanical (air) engineers or with an occupational hygienist to:
  - review the HVAC system
  - explore the possibility of increasing the air exchange rate.
- They may be able to recommend increasing the air exchange rate (better air flow with more fresh air intake from outside).
  - The experts can also monitor the differential pressures within and between rooms. These pressures control the flow of air and determine where the virus particles will spread.
- Some HVAC systems have filters. Please consult with your mechanical engineer to determine the effectiveness of the filters to reduce very fine particles.
  - An upgrade of the existing HVAC systems and their filters may also need to be considered, but this should be discussed with the experts as this may considerably increase the energy costs.
- Where airflow cannot be improved, air purifiers with HEPA filters (high efficiency particulate air filter) could be considered. However, air purifiers with HEPA filters have not yet been demonstrated to prevent disease in an experimental situation.

Using air purifying devices to reduce the risk of COVID-19

- Air purifiers are just one part of the measures that might reduce the risk of COVID-19.
- The primary and most important measures to reduce COVID-19 include vaccination, excluding symptomatic people, management of density, mask wearing, and opening windows/doors on a regular basis.

Carbon Dioxide (CO_2) monitoring

- Devices that monitor Carbon Dioxide (CO_2) can assess whether ventilation is good or poor (stagnant or not). As people breathe out, the indoor air concentration of CO_2 will increase if there is not enough air exchanged with fresh air.
  - CO_2 monitoring can assist in testing ventilation. High CO_2 levels are a proxy for poor air exchanges.
- Scientific evidence does not support the linking of CO2 concentrations to the likelihood of being infected by COVID-19. This means that high levels are not necessarily an indicator for disease risk. Low levels do not exclude possible transmission. While this is a limitation for using CO_2 as a proxy for airborne transmission risk of COVID-19, it can still be used as a relative risk indicator.
- CO_2 levels:
  - Outdoor background levels are around 400 ppm
  - Indoor levels should ideally be below 600 ppm; which is also useful for overall health considerations
  - 800 – 1500 ppm indicates moderate relative risk of infection
  - >1500 ppm indicates poor ventilation and a high relative risk of transmission depending upon sources, such as the number of people present and their activity.
- **CO_2 cannot be used** to test the quality of in-room air purifiers because these devices do not change the CO_2 levels, only the aerosol (particle) concentration.

Important considerations about portable HEPA air purifiers

- Some air purifiers have been shown to reduce aerosol or small particle levels effectively in rooms after a short period of time. This aspect of air purifiers is also useful for reducing bushfire smoke and air pollution particles in buildings.
- There have been no randomised control trials or experiments to demonstrate that stand-alone air purifiers reduce the likelihood of COVID-19 transmission.
- There have been no trials to demonstrate whether air purifiers can cause unforeseen harm.
- Indoor air specialists should be engaged to advise on the effectiveness of air purifiers needed to ventilate a particular room. They will advise on the type of air purifier based on their clean air delivery rate (CADR), the volume of the room, and its intended use.
- Consideration must be given to the noise levels of air purifiers as they must run at high air flow settings to be effective.
- Some air purifiers do not have high efficiency particulate air filters (HEPA), which are very effective at removing very fine particles such as aerosols that people breathe out.
    - Only choose filtering units with HEPA filters
    - Some air purifiers require two filters to achieve HEPA status.
- Air purifiers require maintenance of their filters.
    - The cleaning or replacement of contaminated filters can be a hazardous procedure if infected people have been in the room.
- **Portable air purifiers will not alter CO_2 levels.**
- **Portable air purifiers do not change the room air-exchange rate because they do not bring fresh air from the outside into the room.**
- The efficiency of an air purifying device is dependent upon a number of factors.
    - Have an expert determine the size, type and number required to adequately reduce aerosol (particulate) matter levels in a room
    - The number of times the entire room's volume of air passes through the filter is an important factor. This must happen many times per hour to be effective
    - Obtain the services of an expert to size the unit for each room.
- Consider external air quality
    - Note that smoke, traffic pollution (idling cars near drop-off/pick-up zones or busy roads) may impact the indoor air quality if windows are opened.
- Ensure stagnant/stale air is not simply moved from one room to another
    - Corridors, such as in schools, are places of high activity and high density. Moving stale air from a room into a corridor may place those in corridors at risk of COVID-19 infection.

What are the considerations for selecting an air purifying device?

- **Air purifying (portable air filters/purifiers) have not been scientifically tested to ascertain whether they reduce risk of COVID-19.**
- Technical criteria:
    - Obtain the services of a qualified engineer or occupational hygienist to determine the size, number and positioning of devices, and if they are to be used in conjunction with other control measures.
    - Consider the sizing and number of devices required for effectiveness, including:
        - room volume
        - occupancy level

        - occupancy activity. For example, music where singing takes place, physical activity, library, or teaching.
- Noise levels of devices may impact on use of room such as classrooms or offices.
- Devices should be checked for efficacy. Does the device do the job the manufacturer purports they do? There are no standards for portable units.
    - You will need the services of a professional to determine if the unit(s) are suitably sized, have the correct filters and are placed and operated that ensures maximum efficiency in removing particles from the air.
- Other considerations:
    - Is the electrical power supply sufficient? Will the electrical circuit be overloaded?
    - Who will ensure the units are not moved, such as in a classroom?
        - If units are moved, how will the occupants know where units should be placed?

Maintenance of air purifiers

- Servicing
    - All units will require servicing, from both a mechanical perspective and dealing with trapped material in the filtration unit.
        - Find out how often the unit needs to be serviced and cleaned
        - Does the unit provide an indication when they require servicing or cleaning or are there recommendations from the manufacturer? If not, seek advice from the manufacturer or an expert.
- Filters
    - Some units have multiple filters
    - Some filters can be cleaned, while others need to be disposed of.
- Can the filters be cleaned? If so, find out how this can be undertaken safely, and how often.
    - Filters can overload with particles such as dust, pollen, human skin and hair. Filters that overload can be dangerous
        - Overloaded filters may cause the unit to overheat
        - Overloaded filters may shed trapped particles filling the air with germs (virus, bacteria, fungi etc) and dust and pollen that could infect people or exacerbate respiratory conditions such as asthma
        - Find out whether units provide an indication that filters may be approaching maximum capacity.
- Cleaning filters (if required) – check with the manufacturer.
- Set-up a schedule of how and who will undertake the cleaning of the filters
- Ensure a standard operating procedure (SOP) is created for each type of air purifier
- Infection control of personnel handing the units will be important. Include these details in the SOP.
- Replacing filters (if required)
    - Set-up a schedule of how and who will undertake replacement of filters
    - Ensure appropriate infection control, including disposal of filters, when this is undertaken.

Monitoring

- Efficiency
  - Only an expert in indoor air quality/air conditioning will be able to tell you whether the units are performing as expected
  - Ensure the service schedule is followed
  - Ensure the cleaning schedule is followed
  - Ensure the filter-replacement (if required) scheduled is followed.
- Carbon Dioxide (CO_2) cannot be used to check if air purifiers are working
- Monitor air exchange rates (how much clean air is entering the room)
  - CO_2 monitoring may be able to aid in determining whether exchange is occurring. Please consult with an expert.
- The Clean Air Delivery Rate (CADR) is an industry standard measure of the volume of air that the air purifier can clean.
  - Check with an expert to ensure the sizing of the unit is appropriate and its operation is achieving the correct turn-over rate.
- Environmental monitoring
  - Noise levels may cause annoyance or prevent occupants of the room hearing each other
  - the temperature can be impacted by the motors that run the air filters. Portable units can raise the temperature of the room. Please seek advice on how to manage this.

More information

- Email public.health@sa.gov.au
- Call the SA COVID-19 Information Line on 1800 253 787
- Visit www.sahealth.sa.gov.au/COVID-19

For more information

Health Protection and Licensing Services
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