# Health & Safety Guidance

unite theUNION Health & Safety

# Ventilation and COVID

For more information on Covid, Unite reps should refer to COVID -19 guidance on the Unite Covid-19 webpage (https://www.unitetheunion.org/campaigns/coronavirus-covid-19-advice/)

## Ventilation and $CO_2$ measurements to combat airborne COVID-19 contamination

There is robust evidence supporting the significance of airborne aerosols in the transmission of the COVID-19 virus. Implementing effective ventilation systems reduces airborne transmission of COVID-19 aerosols. Employers must adopt strategies to ensure sufficient ventilation rates and to avoid simple recirculation of air in workplaces.

Carbon dioxide ($CO_2$) sensors can be used as indicators of the build-up of exhaled air and serve as a simple way to monitor and optimize ventilation. Most $CO_2$ monitors are the Non-dispersive Infrared (NDIR) type, and these are the ones that should be used. The aim is to measure $CO_2$ levels from human breath, so testing should be done when the space has its normal users in it, doing their normal activities, and not when areas are empty or under populated. The British Occupational Hygiene Society has published very simple guidance on $CO_2$ monitors at https://www.bohs.org/app/uploads/2021/09/CO2-Monitoring-and-Covid-19-Some-Basics.pdf. BOHS also has a Simple Ventilation Self-Help Guide for Workplaces at https://breathefreely.org.uk/ventilation-tool/

Assuring a minimum ventilation rate of 4 to 6 air changes per hour (ACH) and maintaining carbon dioxide levels below 700 to 800 ppm is advised, although the ventilation type and airflow direction and pattern should also be taken into account. The World Health Organisation also recommends ventilation rates of 8-12 litres per second per person (l/s/p). The World Health Organisation has set out a "Roadmap to improve and ensure good indoor ventilation in the context of COVID-19" https://www.who.int/publications/i/item/9789240021280

Researchers, from the University of Cambridge and Imperial College London, have used mathematical models to show how SARS-CoV-2 – the virus which causes COVID-19 – spreads in different indoor spaces, depending on the size, occupancy, ventilation and whether masks are being worn. These models are also the basis of a free online tool, Airborne.cam, which helps users understand how ventilation and other measures affect the risk of indoor transmission, and how that risk changes over time.

## HSE Advice

The UK Government has provided guidance (https://www.gov.uk/guidance/working-safely-during-covid-19/offices-factories-and-labs#offices-3-1) on ventilation and the use of $CO_2$ monitors, pointing to HSE advice, (https://www.hse.gov.uk/coronavirus/equipment-and-machinery/air-conditioning-and-ventilation/index.htm#article).This includes:

> ***"Identifying poorly ventilated areas by using $CO_2$ monitors***
>
> *Carbon dioxide ($CO_2$) monitors help employers identify poor ventilation so they can improve it and reduce the risk of spreading COVID-19.*

### *How $CO_2$ monitors help identify poor ventilation*

*The priority for your risk assessment is to identify areas of your workplace that are usually occupied and poorly ventilated. $CO_2$ monitors can help you do this.*
*People breathe out $CO_2$. If there is a build-up of $CO_2$ in an area it can indicate that ventilation needs improving. $CO_2$ monitors don't measure levels of coronavirus but using them can tell you if an area needs improved ventilation.*

### *Types of monitor to use*

*The most appropriate portable devices to use in the workplace are non-dispersive infrared (NDIR) $CO_2$ monitors.*

### *How to use a monitor to measure $CO_2$*

*Follow the manufacturer's instructions to understand how to use your monitor correctly.*

#### *Where to place them*

*$CO_2$ levels vary within an indoor space.*
*Place them at head height and keep them away from:*

- *windows*
- *doors*
- *air supply openings*

*Position the monitors over 50cm away from people as their exhaled breath contains $CO_2$. If your monitor is too close it may give a misleadingly high reading.*
*Try out several locations to find the most representative position for the monitor in the space. In larger spaces more than one sampling location will usually be required.*

#### *How to get accurate measurements*

- *Follow the manufacturer's instructions, including those on calibrating your monitor*
- *Single or 'snapshot' readings can be misleading. Take several measurements throughout the day, when the room is occupied, to represent changes in activities, the number of people using it and ventilation rates*
- *As weather changes you may need to repeat monitoring due to differences in ventilation, for example from opening windows and doors*
- *Record $CO_2$ readings, number of occupants and the type of ventilation you're using at the time. This information will help you decide if an area is poorly ventilated*

#### *Understanding the numbers and when to take action*

*The amount of $CO_2$ in the air is measured in parts per million (ppm). A consistent CO2 value below 800ppm is likely to indicate that an indoor space is well ventilated.*
*$CO_2$ levels consistently higher than 1500ppm in an occupied room indicate poor ventilation and you should take action.*
*$CO_2$ levels below 800ppm are recommended for areas with continuous:*

- *talking*
- *singing*
- *high levels of physical activity such as sport or dancing*

*Remember that $CO_2$ measurements are only a broad guide to ventilation rather than demonstrating 'safe levels'."*

Physical distancing, a mitigation put in place to address droplet transmission, is also effective in reducing the chances of aerosol inhalation because aerosol concentrations are much higher in close proximity to an infected individual.

WHO, and many national public health agencies, still recommend maintaining physical distances of either 1 or 2 m. However, this distance is not sufficient to protect against aerosols that travel beyond this range. If large droplets dominated transmission, distancing alone would have effectively suppressed the transmission of COVID-19. As has

been repeatedly shown in super spreading events, airborne transmission occurs in poorly ventilated rooms when occupants inhale infectious room air.

Additionally, although distancing helps by moving people away from the most concentrated parts of respiratory plumes, distancing alone does not stop transmission and is not sufficient without accounting for other measures, such as ventilation, the number of people emitting infectious aerosols, and the amount of time spent in enclosed spaces (196). The unknown number of asymptomatic infected individuals present in specific environmental settings is an additional challenge in respiratory disease control. Engineering measures to reduce aerosol concentrations through ventilation disinfection remain critical to reducing airborne transmission risks.

It is absolutely clear that airborne transmission is a major pathway for the spread of COVID-19. It is worth noting that measures to improve indoor air quality will lead to health benefits extending well beyond the COVID-19 pandemic.

Several organisations have published advice on ventilation systems and air quality. These include CIBSE (Chartered Institution of Building Services Engineers) https://www.cibse.org/news-and-policy/august-2021/new-air-cleaning-guidance-for-reducing-covid-19-sp , BESA (Building Engineers Services Association) and REHVA (Federation of European Heating Ventilation and Air Conditioning Associations) - see https://www.thebesa.com/media/837805/besa-guidance-covid-19-practical-measures-for-building-services-operation.pdf)

## Use of air cleaning and filtration units

Air cleaning and filtration units which employ either high efficiency particulate air (HEPA) filters or ultraviolet-based devices are also advocated by some organisations to help remove viruses and other pathogens and allergens from the air. However, they are not a substitute for ventilation and the HSE has been clear that employers should prioritise any areas identified as poorly ventilated for improvement in other ways before considering using an air cleaning device. Therefore they should only be used in addition to, not instead of, adequate ventilation.

When used properly, air cleaners and HVAC (Heating, Ventilation and Air Conditioning) filters can help reduce airborne contaminants including viruses in a building or small space. By itself, air cleaning or filtration is not enough to protect people from COVID-19. When used along with other best practices, including social distancing and mask wearing, filtration can be part of a plan to reduce the potential for airborne transmission of COVID-19 indoors.

Air cleaners and HVAC filters are designed to filter pollutants or contaminants out of the air that passes through them. Air cleaning and filtration can help reduce airborne contaminants, including particles containing viruses. Portable air cleaners (also known as air purifiers) may be particularly helpful when additional ventilation with outdoor air is not possible without compromising indoor comfort (temperature or humidity), or when outdoor air pollution is high.

## Effective removal of viruses

In order for an air cleaner to be effective in removing viruses from the air, it must be able to remove small airborne particles (in the size range of 0.1-1 µm [micron]). Manufacturers report this capability in several ways. In some cases, they may indicate particle removal efficiency for specific particle sizes (e.g. “removes 99.9% of particles as small as 0.3 µm”). Many manufacturers use the Clean Air Delivery Rate (CADR) rating system to rate air cleaner performance. Others indicate they use High Efficiency Particulate Air (HEPA) filters. In order to select an air cleaner that effectively filters viruses from the air, choose: 1) a unit that is the right size for the space you will be using it in (this is typically indicated by the manufacturer), 2) a unit that has a high CADR for smoke (vs. pollen or dust), is designated a HEPA unit, or specifically indicates that it filters particles in the 0.1-1 µm size range.

## Air cleaning in Workplaces

The HVAC systems of large buildings typically filter air before it is distributed throughout a building, so consider upgrading HVAC filters as appropriate for your specific building and HVAC system. The variety and complexity of HVAC systems in large buildings requires professional interpretation of technical guidelines.

Consider using portable air cleaners to supplement increased HVAC system ventilation and filtration, especially in areas where adequate ventilation is difficult to achieve. Directing the airflow so that it does not blow directly from one person to another reduces the potential spread of droplets that may contain infectious viruses.

Air cleaning may be useful when used along with source control and ventilation, but it is not a substitute for either method. Source control involves removing or decreasing pollutants such as smoke, formaldehyde, or particles with viruses. The use of air cleaners alone cannot ensure adequate air quality, particularly where significant pollutant sources are present and ventilation is insufficient.

## Do not use ozone generators in occupied spaces

Some products sold as air cleaners intentionally generate ozone. These products are not safe to use when people are present because ozone can irritate the airways. **Do not use ozone generators in occupied spaces**. When used at concentrations that do not exceed public health standards, ozone applied to indoor air does not effectively remove viruses, bacteria, mold, or other biological pollutants.

## Action

In discussions with employers, Unite reps should seek to establish agreed standards for ventilation rates, i.e.

- a minimum ventilation rate of 4 to 6 air changes per hour, or
- maintaining $CO_2$ levels below 700 to 800 ppm, or
- ventilation rates of 8-12 litres per second per person (l/s/p).

## Further Information

**Unite** Covid Guidance https://www.unitetheunion.org/campaigns/coronavirus-covid-19-advice/
**World Health Organisation** "Roadmap to improve and ensure good indoor ventilation in the context of COVID-19" March 2021 https://www.who.int/publications/i/item/9789240021280
**UK Government** guidance (https://www.gov.uk/guidance/working-safely-during-covid-19/offices-factories-and-labs#offices-3-1)
HSE guidance, (https://www.hse.gov.uk/coronavirus/equipment-and-machinery/air-conditioning-and-ventilation/assesssment-of-fresh-air.htm
**CIBSE** (Chartered Institution of Building Services Engineers - https://www.cibse.org/news-and-policy/august-2021/new-air-cleaning-guidance-for-reducing-covid-19-sp,
**BESA** (Building Engineers Services Association) and REHVA (Federation of European Heating Ventilation and Air Conditioning) see - https://www.thebesa.com/media/837805/besa-guidance-covid-19-practical-measures-for-building-services-operation.pdf
**BOHS** (British Occupational Hygiene Society) https://www.bohs.org/app/uploads/2021/09/CO2-Monitoring-and-Covid-19-Some-Basics.pdf
**BOHS** also has a Simple Ventilation Self-Help Guide for Workplaces at https://breathefreely.org.uk/ventilation-tool/
**Cambridge University/University of London**, modelling indoors transmission of the SARS-CoV-2 virus https://airborne.cam/