

# HEATING VENTILATION AND AIR CONDITIONING (HVAC) SERVICE SYSTEMS TO PREVENT SPREAD OF CORONAVIRUS

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## OBJECTIVE

Our objective is distil published information on ventilation to enable a better understanding of how ventilation systems can be utilised in reducing the risks associated with airborne droplets and aerosols during the Covid-19 pandemic



# PRESENTATION OVERVIEW

1. Transmission routes
2. Droplets and aerosols
3. Different types of ventilation
4. Indoor Air Quality (IAQ)
5. Recommendations to limit the spread of COVID – 19
6. Summary



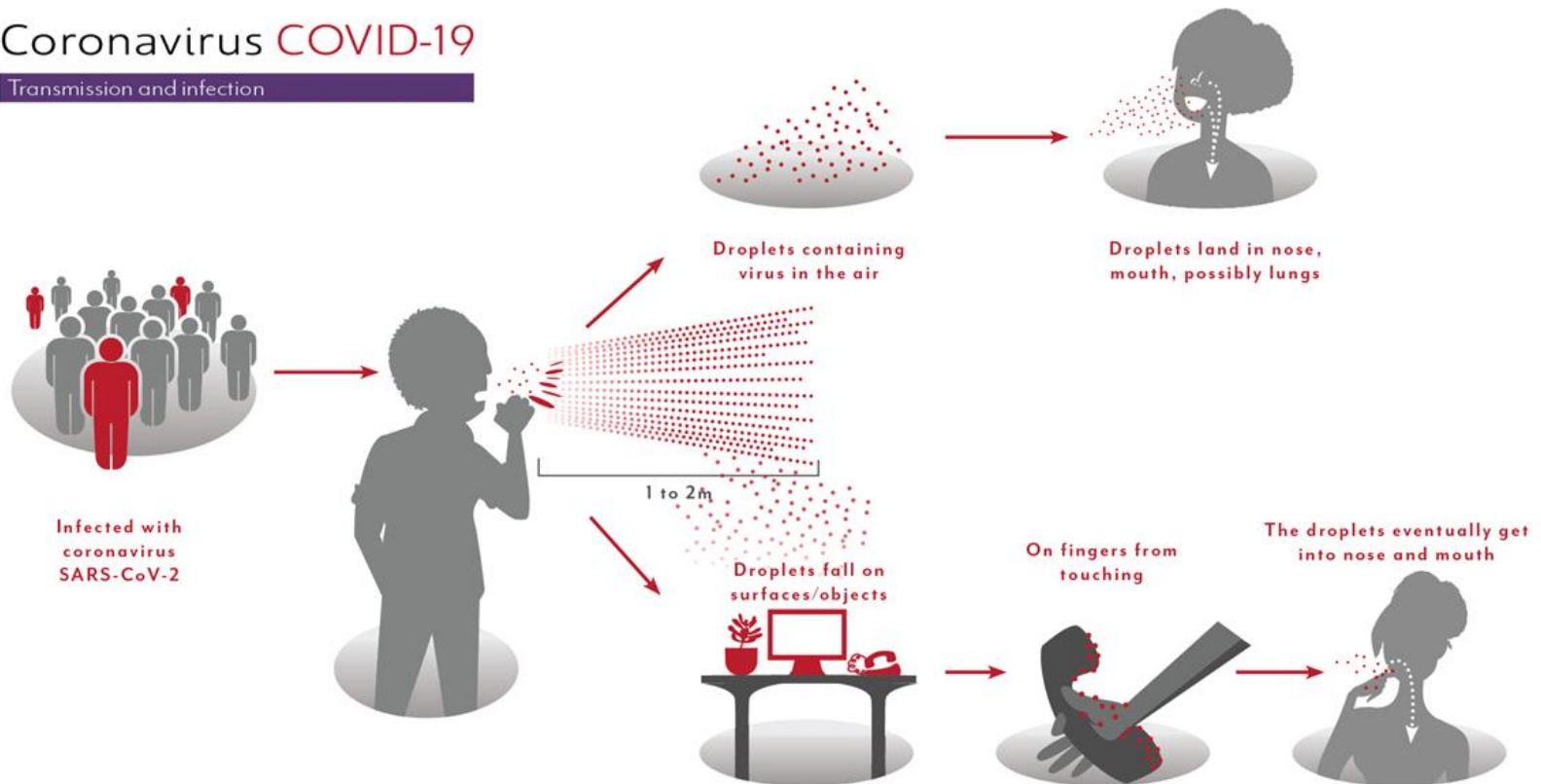
# **TRANSMISSION ROUTES**

# TRANSMISSION ROUTES

1. 1-2 m close contact region arising from droplets and aerosols
2. Long-range airborne (aerosol-based) transmission
3. Surface contact through hand to hand, hand to surface, for example, hands on phone.

## Coronavirus COVID-19

Transmission and infection



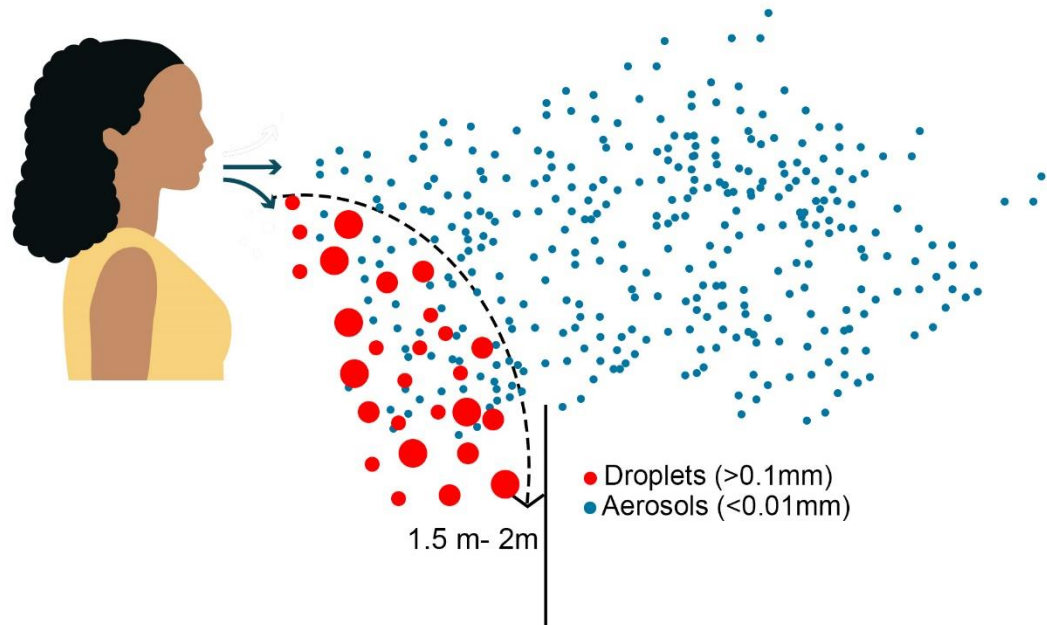


# **DROPLETS AND AEROSOLS**

# DROPLETS AND AEROSOLS

Airborne transmission can be divided into two categories :

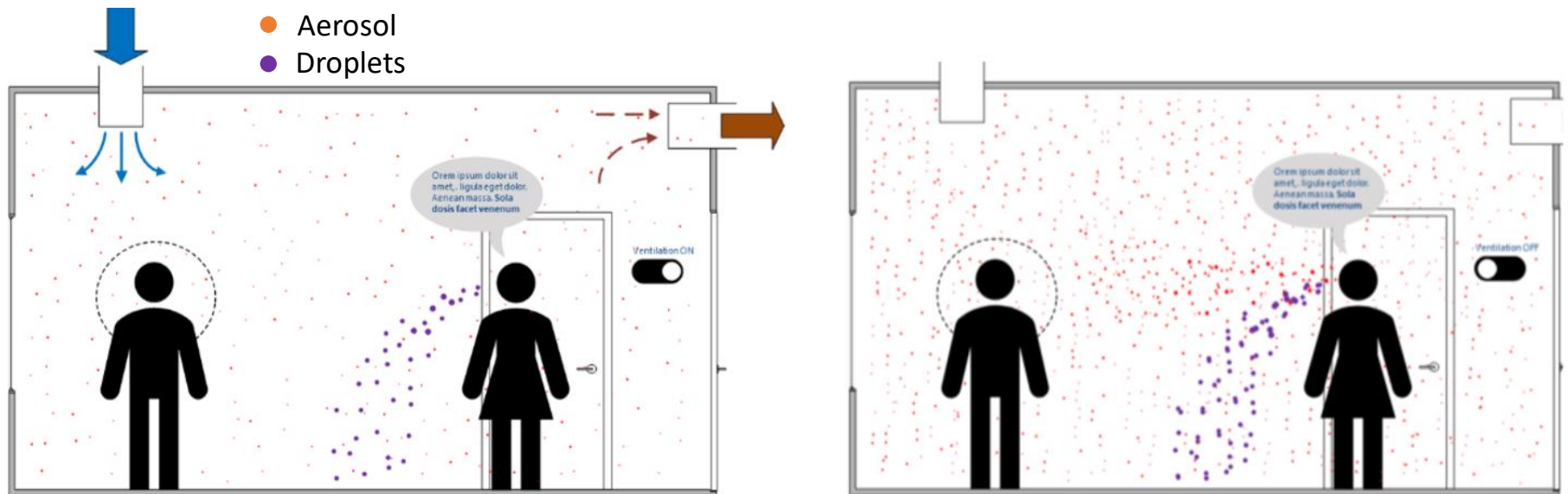
1. Short-range droplet transmission applies to droplets that fall within 2m of the infected person.
2. Long-range airborne transmission applies beyond 2 m distance for aerosols.



# DROPLETS AND AEROSOLS

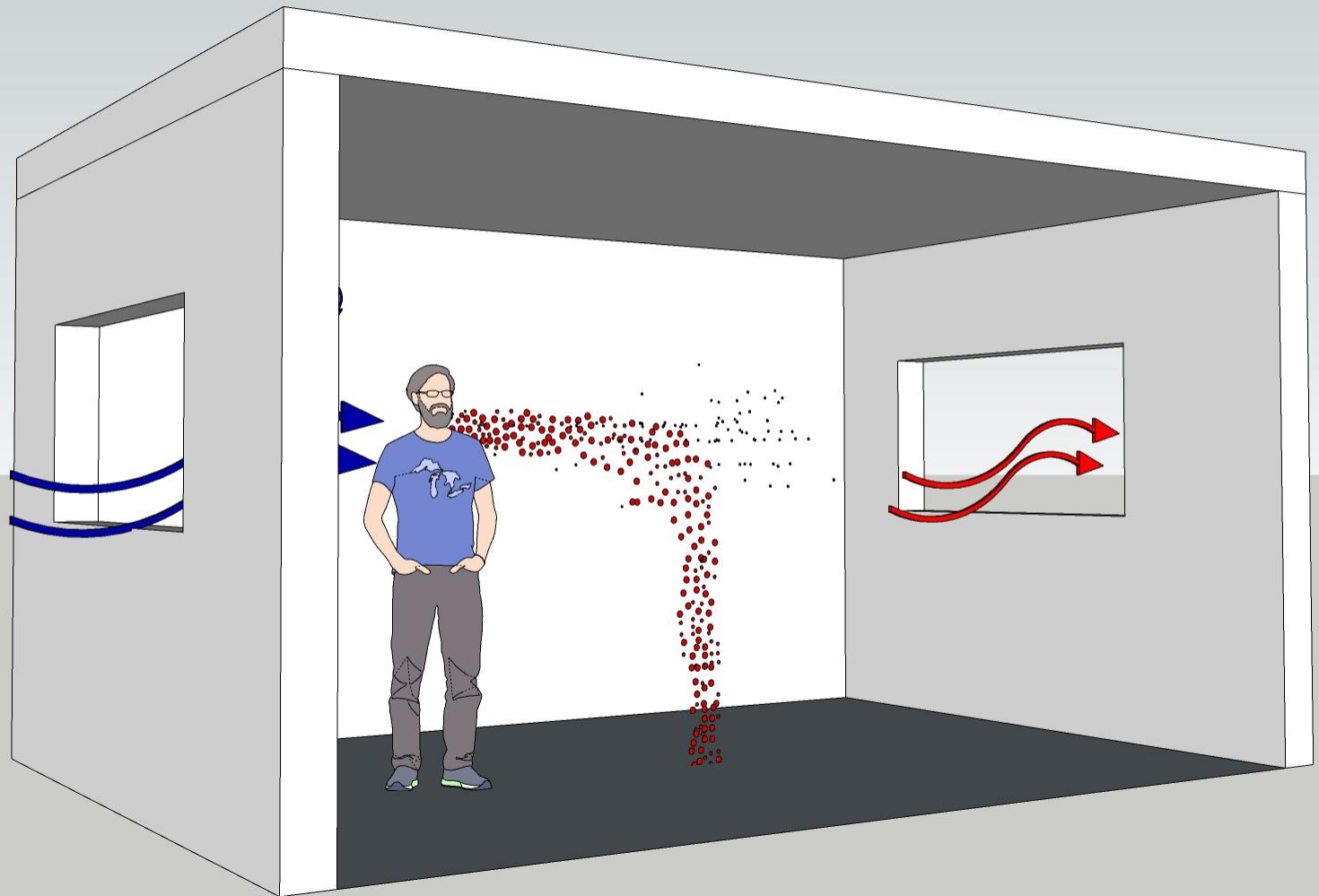
A close contact within the first 2m creates high exposure to from both large droplets and aerosols.

Aerosol concentrations and cross-infection from 2m or more from an infected person can be controlled with ventilation and air distribution solutions.

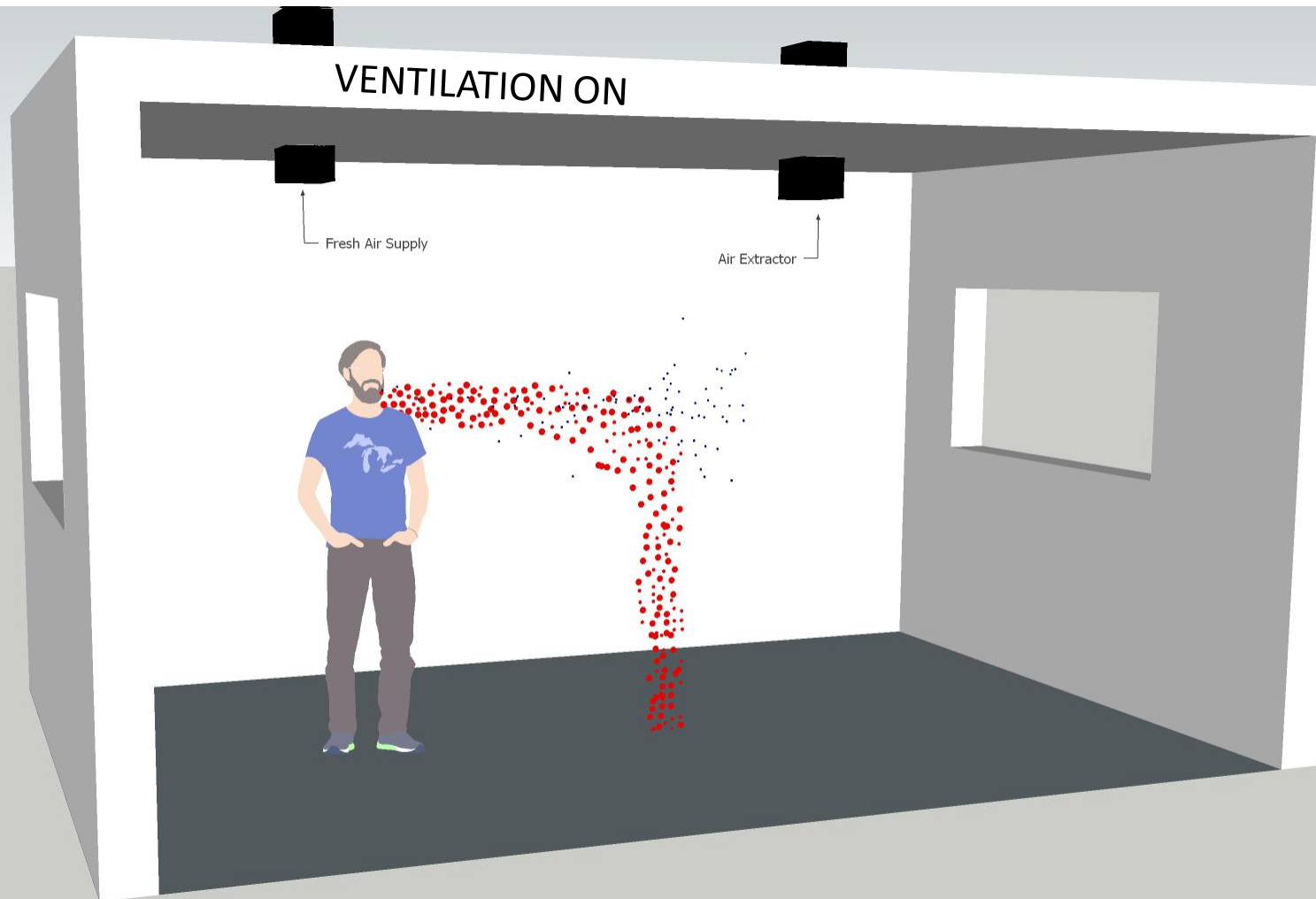




# DROPLETS AND AEROSOLS



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# **DIFFERENT TYPES OF VENTILATION**

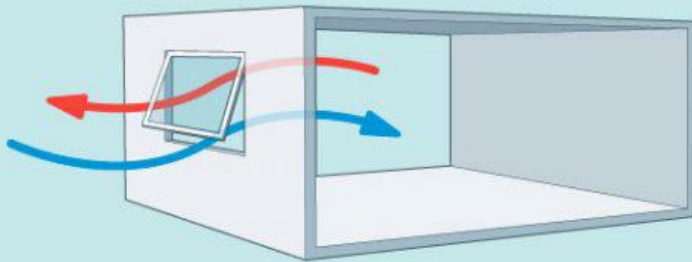
# NATURAL VENTILATION

Natural ventilation describes ways that fresh air can enter the building without using fans or mechanical means.

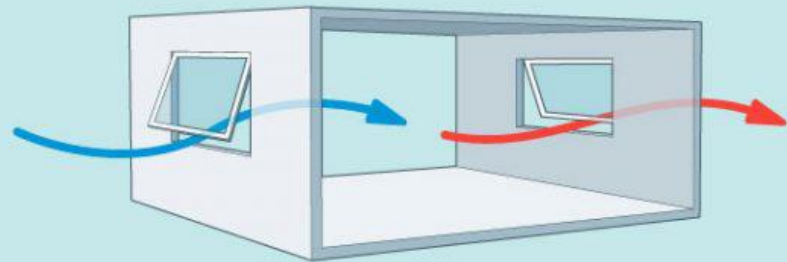
Air can enter through openings in the building such as windows, doors, and other vents.

Natural ventilation can be divided into single sided and cross ventilation.

**SINGLE SIDED VENTILATION**

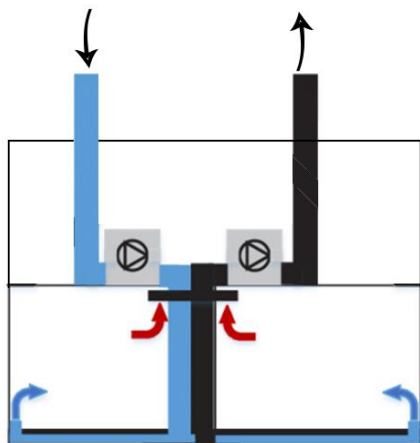


**CROSS VENTILATION**



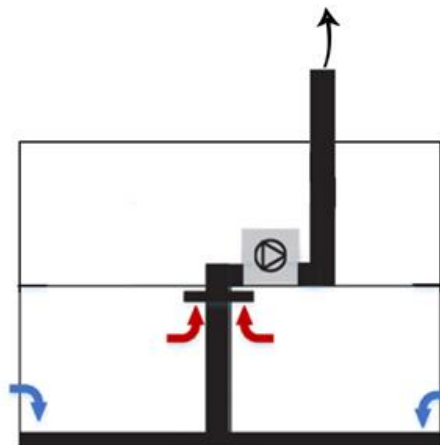
# MECHANICAL VENTILATION

The main principle in this type of mechanical ventilation is a series of ducts and inlet grilles which deliver outside fresh air into a space. Another set of ducts which extract stale air out of the room and exhaust it to the outside.



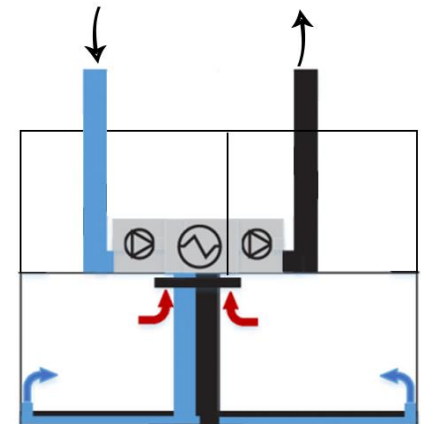
Supply and exhaust air ventilation

In this system a fan is used to extract air from the room directly to the outside and air enters the room to replace the extracted air through gaps under the door or vents.



Exhaust air ventilation

Mechanical ventilation systems use heat recovery to extract heat from the warmer stale exhaust air and use that heat to warm the incoming outside air.



Supply and exhaust air ventilation with heat recovery



# **INDOOR AIR QUALITY (IAQ)**

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- CO2 concentration is a key indicator of air quality.
- Researchers have shown that poorly or non-ventilated indoor spaces can increase the likelihood of aerosol transmission of Covid-19. It is recommended to install CO2 sensors at all the occupied zones
- During the pandemic the CO2 detectors should be set to measure the lowest level of Co2 presence.
- It is important that all systems are properly maintained and used in accordance with the designers strategy
- Another method of sanitizing the indoor air quality is by using Ultraviolet germicidal irradiation (UVGI).
- UVGI decomposes the bacteria and viruses thought ultra-violet C (UVC) radiation. However, UVC can generate ozone and free radicals, which are hazardous in closed spaces.



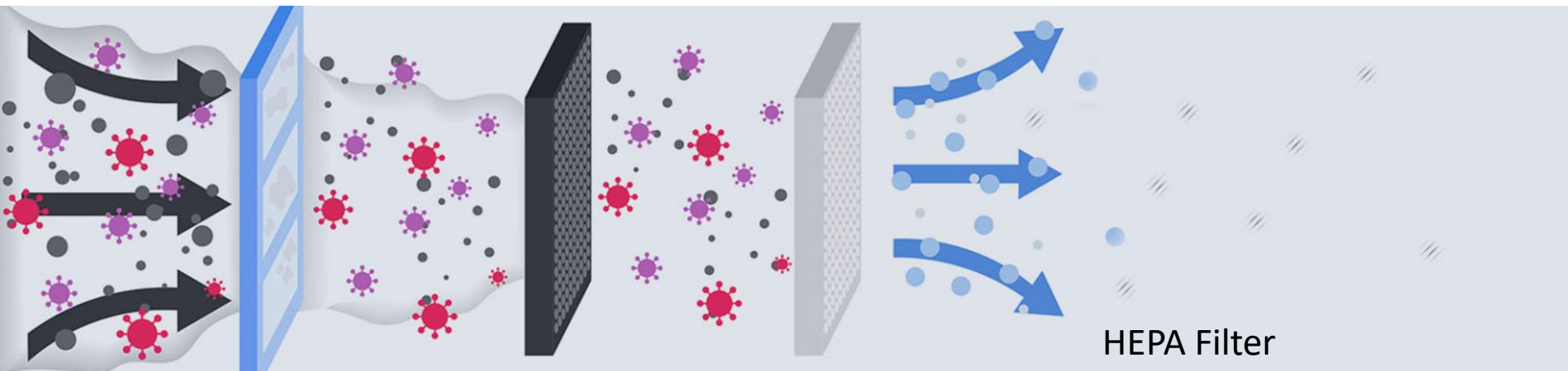
Ultraviolet Germicidal Irradiation



CO2 Monitor

# FILTERS

- Filters are used in ventilation systems for protection against impurities.
- Ventilation systems are generally equipped with filters, however these filters are not capable for filtering out the particles with the virus.
- To filter out the particles with the virus, the use of high efficiency filters is recommended, for example the HEPA (High Efficiency Particular Air) filters.
- HEPA filters are not easy to install in a existing ventilation systems.
- HEPA filters should comply with the manufactures instructions and building regulations.







# **RECOMMENDATIONS TO LIMIT THE SPREAD OF COVID - 19**

# RECOMMENDATIONS TO LIMIT THE SPREAD OF COVID – 19 AEROSLS

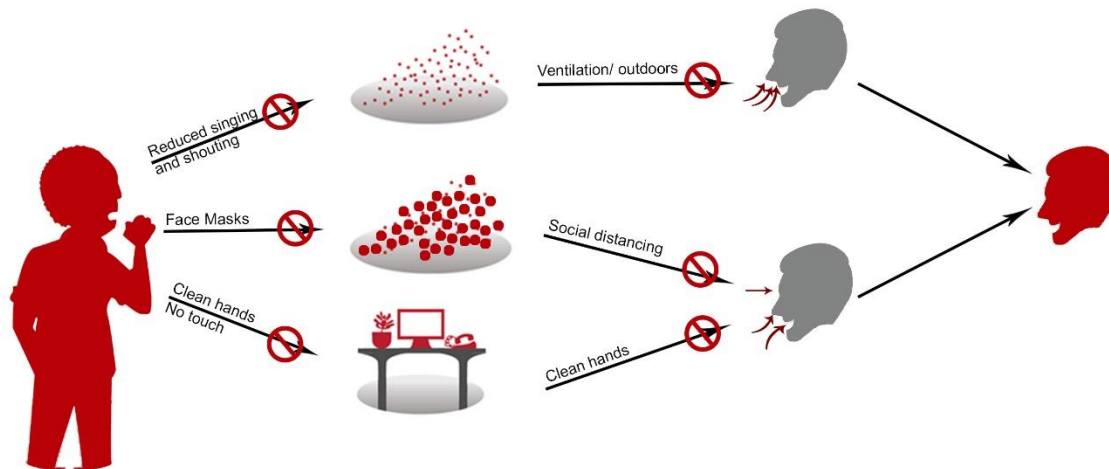
- Fresh air ventilation should be used as much as possible
- Open windows as much as possible
- Opening windows to create an airflow assists in limiting the impact of aerosols.
- Ventilation systems that comply with the requirements of the Building Regulations are considered adequate and subject too being operated and maintained properly will provide a Covid-19 defence
- It is preferable to start mechanical ventilation systems at normal speed 2 hours before occupying the building, this can be reduced once the building no longer has occupants
- Heating systems should be examined by specialists to ensure that extract air does not contaminate inlet air
- Avoid recirculation of air within the building
- Seek professional advice in respect of using HEPA filters, CO2 monitoring, or Ultra Violet devices



# SUMMARY

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- Fresh air is the most important methods to ensure effective ventilation
- Covid-19 spread by droplets that are generated by infected persons by coughing, sneezing, shouting, singing and playing musical instruments (particularly woodwind and brass)
- There is some evidence that aerosols which are part of the exhalation from an infected person may contribute to the spread of Covid-19
- Droplets are generally limited to travelling up to 2m from an infected person while aerosol may linger in the air for an indeterminate period
- Monitoring CO2 levels within a building provides a good indication of the effectiveness of a ventilation system i.e. high levels of CO2 = poor ventilation
- Ventilation plays an important part in dispersing aerosols





**THANK  
YOU**

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