

COVID-19 Guidance

July 2020

Guidance on Ventilation and Air Conditioning

Occupational Health and Safety Service
HSD210M (rev 1)



UNIVERSITY OF
CAMBRIDGE

Guidance on Ventilation and Air Conditioning

(Joint Guidance Document of SafeSpace Team and Estates Division)

Scope of this Guidance document:

- To provide some background information around the types of ventilation systems that exist
- It is aimed at DSOs and Facility Managers to have some basic information at hand when they are in consultation with HVAC engineers and Estate Management.
- It aims to assist BSOs when reviewing risk assessments for work with genetically modified organisms (GM work), specified animal pathogens (SAPO), Schedule 5 material and other biological agents during the Covid-19 period. Any proposed change in air handling/ventilation might affect this type of work and it is therefore important to ensure compliance with legal requirements of biological and chemical hazards.
- To assist departments and institutions when having to make decisions around air handling in general, which will come to the fore during the warmer summer months

Overview of Sections

- **Section 1: General principles of air handling during Covid-19 period**
- **Section 2: Key actions**
- **Section 3: Types of ventilation provision (see CIBSE document for more detailed information)**
- **Section 4: Recommendations for areas with natural ventilation**
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Section 1: General principles of air handling during Covid-19 period

- If you are uncertain about aspects of air handling in your department: consult the Estate Division (for University managed buildings) or contact a HVAC engineer (Heating, Ventilation and Air Conditioning) through your local Landlord. This will be NHS Estates, Serco or other Landlord. The University's Estates Division can be contacted via safe-to-occupy@cam.ac.uk
- Minimise risk of airborne transmission of SARS-CoV2 by increasing air supply and exhaust ventilation with supplying as much outside air as is reasonably possible.
- Underlying principle: dilute and remove airborne pathogens to reduce the chance that these can become deposited on surfaces or inhaled by room users.
- Avoid recirculation/transfer of air from one room to another unless this is the only means to provide adequate high ventilation to all occupied rooms.
- Consider prohibiting/severely restricting access to rooms/zones with no direct supply of outside air, especially where users would be occupying this space for considerable lengths of time (longer than 30 minutes). This might include basement rooms or storage areas.

Section 2: Key actions

- Understand your ventilation system – if you are in doubt or if you are concerned get in contact with either your local HVAC engineer (for buildings managed by NHS Estates, Serco and other companies) or contact the University's Estates Division (via safe-to-occupy@cam.ac.uk) for University managed buildings.
- Run your ventilation at higher volume flow rate where possible.
- At nights and at weekends: don't switch ventilation off, but continue to run systems at lower speed where possible.
- Avoid recirculation/transfer of air from one room to another.
- Instruct building occupants to flush toilets with the lid closed.
- Recirculation of air within a single room is acceptable if it is complemented by an outdoor air supply.
- Visually inspect all ductwork systems at the grilles and diffusers: blocked grilles and grille dampers reduce ventilation and increase risk of Covid-19 transmission. This is mainly applicable to extract and return air grilles, especially toilet extracts.

- **For comfort cooling:** University Estates Division recommends comfort cooling units (eg recirculatory air conditioning units) switched off where possible and to only switch them on for short periods when needed. Where this cannot be isolated, a departmental risk assessment must consider and identify the approach to be taken, this may vary from restricting the room use to a single user or providing adequate face coverings or specific PPE/RPE to protect individuals.

Section 3: Types of ventilation provision (see CIBSE and other documents for more detailed information, located at end of this guidance)

- Natural ventilation ('opening windows', grilles, wind catchers)
- Mechanical ventilation (eg use of fans transporting air through ductwork):
 - Supply/Extract.
 - Heat Recovery (using heat from the warmer stale exhaust air to use heat to warm the incoming cold air).
 - Extract only systems (eg often used in toilet blocks and wet room facilities).
 - Air Conditioning system **without fresh air feed into the unit**. This 'conditioning' is achieved by warming/cooling air and they are not part of the ventilation system: they take air already in a room and warm and cool it before releasing it back (recirculate it) into the room. **These air conditioning systems are not delivering outside air and are therefore not diluting (reducing) any airborne pathogens.**

If a department has this type of air conditioning, then the number of people working in that area must be severely limited (depending on size of room), ideally to single occupancy. A face mask must be used in these areas. It would be good if the lamellae/oscillating blades of the air outlet could either be fixed to horizontal, parallel to the ceiling or fixed to blow vertically down, thus avoiding air to be blown across people's faces.
 - Air Conditioning system **with part fresh air supply into the unit**. These units can be managed much better as there is a diluting (and reduction) of airborne pathogens. Beware of the direction of air coming out into the room: avoid to have the air blowing across people's faces and if this can't be done, the wearing of face masks is strongly advised.
- Specialist localised exhaust ventilation. This is used to remove large amounts of air from a specific location, eg cooker hoods, local exhaust from CNC machinery, fume hoods. It is important to investigate whether the replacement air is coming from the outside (windows/doors) or from other indoor areas. Also be aware how the air is being drawn into the exhaust ventilation: these still could draw the air across the user's face. Therefore the wearing of a face mask might be necessary.
- No obvious ventilation strategy. Certain areas might not have an identifiable ventilation system, eg corridors, staircases. These areas are a significant risk and the ventilation provision should be addressed and/or face coverings/face masks to be worn. This is of particular importance in corridors/staircases where no one-way system can be implemented.

Section 4: Recommendations for areas with natural ventilation

- **Opening of external doors and windows** (Beware of fire doors and building security issues!). If possible windows should be open at least 15 minutes prior to room occupation. If there are both high level and low level openable windows, then it is recommended to open the high level windows during cooler weather in the first instance to reduce cold draughts. To maximise air flow, both high and low windows should be opened. For recommendations using single-sided ventilation and cross ventilation see CIBSE document (see Sources at end of this guidance).
- **Windows in toilet blocks** should be left open as long as reasonably possible and windows in adjoining rooms should also be open (Beware security issues!). Toilet blocks with mechanical extract ventilation, the extract ventilation should remain constantly on (24/7) and windows in the toilet block remain closed. A notice maybe required on toilet doors/walls to explain this and discourage opening. It is important to keep access doors to toilets closed to ensure the ventilation dilutes and removes any pollutants rather than recirculating them to the rest of the building.
- **Window restrictors.** These reduce the opening area of windows, thereby reducing the potential for ventilation. Beware of safety and security of occupants! Removal of restrictors to boost air flow should only be done after a risk assessment has been done: eg risk of clashes with people outside walking past open windows and the risk of falls from upper floors.
- **Security considerations for open windows.** Consider security issues, especially when the building is not occupied. A walk-round may be required to ensure all windows that pose a security issue are closed. Where there is no security risk, it is recommended to leave windows open overnight on warm/hot days to maximise the purging of air.

Section 5: Recommendations for Areas with Mechanical Ventilation

There are different air handling systems, all of which require different safe management strategies.

- **Supply/Extract system.** Extended operation times are recommended with a 2 hour head-start ventilation before the building is used and a 2 hour lower speed time after the building has been vacated. CO2 set points must be adjusted (see CIBSE document for more details – see Sources).
- **Heat recovery.** Please consult with manufacturer's literature. Ensure that units are inspected regularly to ensure there are no leaks.
- **Recirculation sectors in centralised air handling units.** It is recommended to avoid central recirculation during SARS-CoV-2 episodes to prevent the risk of airborne transmission and the recirculation of airborne viral particles in the building. The system should bypass the recirculation sector and should be supplied with 100% outdoor air wherever possible. This may impact the building cooling/heating capacity. Information/education of staff and a relaxing of dress codes may be required. Where

units have 'return air filters': these do not normally filter out particles with viruses effectively (unless they are HEPA filters). HEPA filters should only be used in air filters that have been designed to house these, otherwise there is a high possibility of air leaking around the HEPA filter, thus rendering the air filtration inefficient.

- **Changing or cleaning filters.** Soiled/clogged filters in the extract and supply air grilles will seriously affect the performance of an air handling system. It is important that filters are regularly cleaned and exchanged according to maintenance schedules. Clogged extract air grilles/filters reduce air change rate and thereby lead to increasing recirculation of used room air. HVAC engineers/contractors changing these filters may be at risk from infection if there recently has been an infection amongst staff in the building (for more information, see REFCOM Bulletin TB/048/3: COVID-19 AND AIR CONDITIONING SYSTEMS). Estates Division maintenance staff and departmental Facility Managers should be aware of this risk and be adequately trained to conduct such activities in a safe manner. General staff (working in the vicinity of grilles) should be excluded from the area when filter changes/cleaning activities are carried out. This activity MUST be risk assessed.
- **Room air cleaners.** Room air cleaners effectively remove particles from air, but they need to have at least HEPA filter efficiency. However, as the air flow is limited, the floor area they can effectively clear is typically less than 10 m². The units must not be located in a stagnant zone, but should be located in the centre of the room or close to the breathing zone (that would require one air cleaner per person).
- **Specialist localised exhaust ventilation.** These units should continue to be operated as normal. However, the way of travel of the make-up air should be considered and should ideally be come from outdoor air rather than adjacent rooms.

Section 6: Recommendations for areas with no obvious ventilation strategy

If there is no obvious ventilation strategy in a room/zone, then building users should be discouraged from using these spaces. If they are used only transiently (stairwells, corridors), then more robust cleaning regimes should be implemented and the wearing of face coverings/mask should be considered.

Section 7: Special considerations for research departments

- **Lab areas running at positive air pressure (eg for clean room activities).** There is no scientific evidence available at the moment regarding the safety implications of this room/laboratory type. Therefore it is difficult to say whether it is possible for an asymptomatic person working in that area to spread the virus to areas outside the positive pressure environment. Factors to consider when assessing the risk are:
 - The room size
 - The magnitude of the positive air pressure
 - Where the positive air is discharged to (corridor?)
 - How close the asymptomatic person is to the exit door
 - How the ventilation to that room is configured in a spatial context.

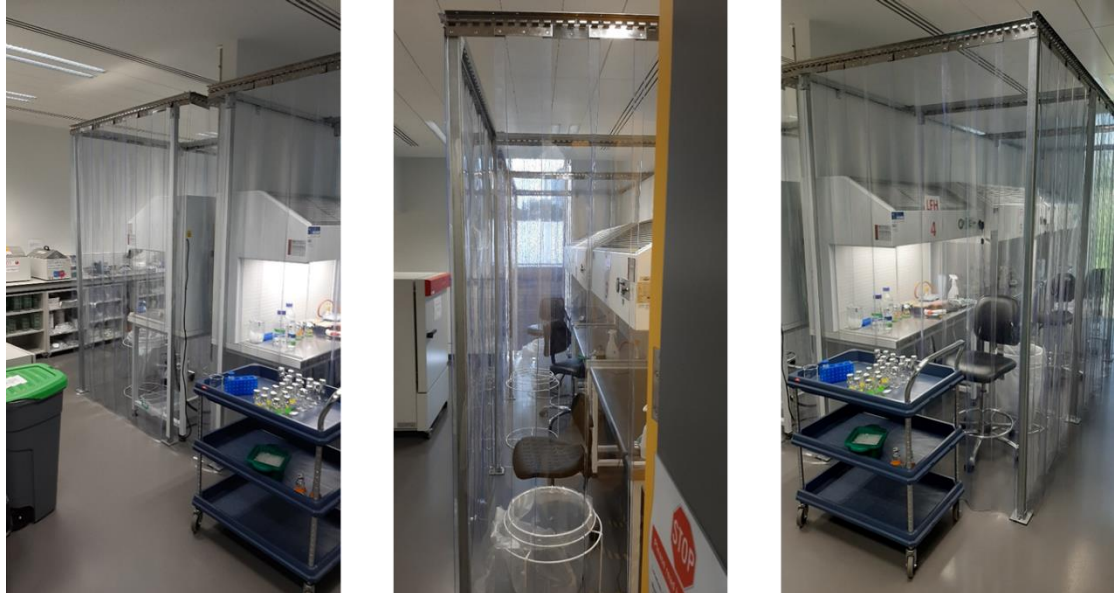
It is reasonable to assume that any forced (positive) air passing a person's face will drag with it droplets/aerosols to the floor and depositing virus particles onto the floor. Control measures for this scenario could be to set the positive air pressure to neutral and if this is not possible to either stop the activity or wear surgical face masks. Good thorough cleaning of all floor and horizontal surfaces is essential. Limiting the number of persons in that room, possibly to single occupancy. However, this must be assessed by competent personnel.

- **Use of portable humidifiers and dehumidifiers.** These pieces of equipment must be maintained properly to be operated in a safe way. They recirculate air, which must be avoided and they also can harbour other hazardous microbes such as legionella bacteria. If they need to be used (eg for conservation work in museums) then the following factors should be considered when assessing the risk:
 - The room size
 - Limit the number of persons working in that room if there is no other mechanical ventilation available which ensures the extraction of used ('contaminated') air.
 - Be mindful of the direction of the air coming from the unit: it should not blow across user's faces. The wearing of face coverings/masks is strongly advised.
- **Use of humidifiers/dehumidifiers within a central air supply.** These units are safe to use and should not pose a problem.
- **Use of portable air-conditioning units.** If these are for the purpose of comfort cooling, then they should only be used when needed and switched off after use. When they are in use, then the number of people in that room should be limited as these units are recirculating air.
- **Cold rooms.** Most cold room are enclosed spaces without a fresh air supply and are therefore a high risk area due to their powerful air conditioning units. Recent scientific publications have shown that Sars-CoV2 (the virus causing Covid-19) is extremely stable at 4 °C. This means that a 'one in/one out' system must be implemented and face coverings must be worn when accessing the cold room. Where work is carried out within the cold room (i.e. to maintain experimental temperature conditions at 4 °C) for a longer period, a Type 2R surgical mask must be worn to control the moist conditions due to condensation.

Some cold rooms have condensation traps within the air handling unit for the cold room, but this does not offer protection from the virus. The area of concern are the large fans distributing the air within the room.

- **Use of laminar flow cabinets (eg for sterile media preparation).** These type of flow cabinets carry the risk of (sterile) being blown towards the cabinet user. Would the user be asymptomatic, the virus would be spread into the room towards other co-workers. Hence only 1 user can be in that room at a time as well as the user having to deep clean the surrounding areas following the use of cabinets. Another control measure (which was chosen by one University department) controlled the risk by

installing custom-made enclosures around each individual workstation (see images below). However, it is important that once the curtains/enclosures are installed, the laminar flow cabinets need re-testing by the maintenance/servicing contractor before they can be used. This is necessary to take into consideration the altered flow dynamics.



- **Lab areas which operate under biological containment.** Working with certain materials require legal compliance with regards to containment. Any proposed change in air handling/ventilation might affect the containment of lab areas. Hence the storing or handling of certain materials must be properly risk assessed by researchers, reviewed by the departmental BSO and approved by the departmental Health & Safety Committee. The work with the following materials are bound in a legal framework:
 - Genetically modified organisms (GM work)
 - Specified animal pathogens (SAPO)
 - Schedule 5 material
 - Biological pathogens in Hazard Groups 2 and above
 - Animal Work

DSOs, BSOs and Facility Managers must collaborate and consult the appropriate Estate Management team to assist with this.

Section 8: Recommendations for shower facilities

There is the potential risk of transmission of Coronavirus between users of the showering facilities. Aerosols created during the showering might contain virus expelled unknowingly by the user and can settle both inside the shower cubicle, but also outside the shower area onto floors, walls and any other fixtures.

Shower rooms will almost always have a humid air extract system and will receive their air intake either mechanically or naturally (windows, other via adjacent rooms). If departments decide to take showers out of general use, but keep them for emergency situations only (eg chemical spill onto personnel), then the department must ensure that the showers are regularly flushed to control the risk for legionella. Please consult with Estates Division for advice of how these must be maintained.

If departments decide to continue using showers for staff to use on a regular basis (eg following sport, exercise or commuting to work by bike/running), then a dedicated risk assessment must be written and very robust cleaning must be introduced. Regular flushing also must be maintained (see above). The Safety Office has published a guidance document for use of showers (see: <https://www.safety.admin.cam.ac.uk/system/files/hsd209m.pdf>).

Departments are advised to remove shower curtains (or wash them daily) and either install wipeable shower screens or keep the area as a wet room. All walls and floors within the shower should be disinfected at least daily and the use of showers must be monitored and recorded.

Section 9: Sources/publications used for this document

- CIBSE, Chartered Institution of Building Services Engineers, London, *CIBSE Covid-19 Ventilation Guidance, Version 2, 12May2020*. <https://www.cibse.org/coronavirus-covid-19/coronavirus-covid-19-and-hvac-systems>. This guidance has useful images of the various mechanical ventilation types, making it easier for DSOs and Facility Managers to recognise what systems they have in their buildings.
- NAADUK, National Association of Air Duct Specialists UK, *COVID-19 Guidance for Ventilation Hygiene*, <https://www.naaduk.co.uk/wp-content/uploads/2020/04/NAADUK-COVID19-Guidance-04.pdf>. This is a very good publication, which explains the importance of well- maintained air handling systems and has some excellent diagrams of the effect of both good and poor ventilation systems.
- REHVA – Federation of European Heating, Ventilation and Air Conditioning Associations, *REHVA COVID-19 Guidance document (Version April 3, 2020)*, https://www.rehva.eu/fileadmin/user_upload/REHVA_COVID-19_guidance_document_ver2_20200403_1.pdf. This publication is referenced by NAADUK (see above).
- REFCOM Bulletin TB/048/3: *COVID-19 and Air Conditioning Systems*, <https://www.thebesa.com/media/837569/updated-9the-april-refcom-tb-48-4-covid19-ac-systems.pdf>