

Links	REHVA Guidance https://www.rehva.eu/fileadmin/user_upload/REHVA_COVID-19_guidance_document_ver2_20200403_1.pdf	CIBSE Guidance https://www.cibse.org/coronavirus-covid-19/coronavirus-covid-19-and-hvac-systems	BCO Guidance http://www.bco.org.uk/Research/Publications/Thoughts_on_Office_Design_and_Operation_After_Covid-19.aspx	ASHRAE Guidance https://www.ashrae.org/file%20library/about/position%20documents/pd_infectiousaerosols_2020.pdf	Max Fordham Comments
Central recirculation	Avoid/turn off	Avoid/turn off - unless it's the only way of providing adequately high ventilation rates to all occupied rooms	Avoid in new buildings. Consider installing HEPA filters in existing buildings	Run on systems on full fresh air where possible. ASHRAE don't suggest avoiding in the future, but do suggest making sure filtration is at least MERV-13, or highest level achievable	Broad consensus. Retrofitting fine filters such as HEPA into existing systems is not always practical/possible and may reduce ventilation flowrates MF view: Effectiveness for risk reduction needs considering holistically and may be building specific. High temperatures and condensation at heating/cooling coils may be beneficial at removing Covid particles
Local recirculation	Turn off if possible. If using, keep running 24/7 and sterilise with 60C LTHW for 1 hour or 40C LTHW for 24 hours	Note on Covid and HVAC says "Less of a concern" consider if it enhances air distribution and helps reduce risk of stagnant air. Potentially retain and use. Ventilation guidance says it's acceptable: allows more fresh air to be provided, gets more fresh air to occupants, and can make an environment more comfortable It depends on the context: if it's in a room with very little outside air, then may create air movement and spread airborne viral particles: avoid. If it's in a room with good ventilation, then could help avoid stagnant air, and could provide improved comfort with enhanced ventilation rates	Clean frequently and thoroughly. Provide regular maintenance at condensate drainage pans to prevent mould/bacteria growth. In new buildings, design FCUs to avoid condensation	Some guidance specific to healthcare buildings. No particular guidance otherwise	Difference in guidance. REHVA recommendations are hard to do and very energy intensive, particularly during warm weather Designing FCUs so that condensation is avoided can be quite hard to do, and has various consequences, such as no dehumidification during summertime MF view: Effectiveness for risk reduction needs considering holistically and may be building specific
Mechanical ventilation generally	Run continuously, with full fresh air volumes during occupied periods and 2 hours either side, setback otherwise	Run continuously, with full fresh air volumes during occupied periods and 2 hours either side, setback otherwise	Run ventilation plant continuously, but with setback outside occupied hours. WC ventilation to run continuously, ensuring negative pressure in WC cubicles. Disable demand controlled ventilation	Run systems longer, increase ventilation rates, provide local room cleaning units,	Consensus. Also useful for diluting cleaning products etc which will likely be used a lot out of normal occupied hours. No particular guidance on fresh air volume flowrates beyond running existing systems at maximum duty. MF view: Agree for now, but review as weather gets warmer/cooler. This has potentially large consequences for a building's energy consumption. The benefits of high night time ventilation may be small if the aerosol half life is low. Higher fresh air flowrates during winter lead to much drier air
Heat recovery devices - thermal wheels	Takes a fairly nuanced view. They suggest inspecting the units to see how they are configured, including pressure risks. Well set up units can have cross-contamination equivalent to a plate heat exchanger. Poorly configured or operating units can be circa 20%, which is not acceptable.	Turn off, but make sure the systems operate to minimise leakage flow between air streams	Unspecific and inconclusive - acknowledgement that some thermal wheels may allow cross contamination - these need careful specification and maintenance, and in some cases should be temporarily suspended during outbreaks	Have general comment to bypass energy recovery ventilation systems that potentially leak contaminated exhaust air back into the outdoor air supply	General caution around thermal wheels and the risk of recirculation of air MF view: Turn off initially and review. Do this now while weather is mild and particularly before hot weather + cooled spaces, or cold weather and heated spaces
Heat recovery devices - plate heat exchangers	No particular view - deemed low risk	No particular view - deemed low risk	No particular view - deemed low risk	No particular view - deemed low risk	Consensus MF view: agreed
Education of building occupants	Not mentioned	The recommendations may make things less comfortable. Ensure occupants are informed.	The recommendations may make things less comfortable. Ensure occupants are informed.	Not mentioned	MF view: Agree with CIBSE. Management/education should also lead to people avoiding being in an airflow from another person
Energy efficiency	No particular concern	Public health benefit outweighs additional energy demand imposed	Some measures will increase embodied and operation carbon emissions	Health, safety and welfare of occupants is primary. Notes some options for reducing energy usage if buildings are unoccupied.	Consensus MF view: Effectiveness for risk reduction of measures needs considering holistically - some measures may have large effects on energy efficiency and little effect on covid risk once other aspects of a building's covid risk are managed
Ductwork cleaning	No change to normal operation.	No change to normal operation. Follow industry guidance, use appropriate PPE, bag waste material and dispose of safely.	"Regular and scrupulous" (along with all other maintenance)	No change to normal operation (comply with ASHRAE Standard 180-2018), but consider using PPE	Consensus
Additional measures	Room air cleaners with HEPA filters can be useful. Germicidal UV only considered suitable for healthcare facilities	For high occupancy / where it's difficult to increase vent rates, consider air cleaning or disinfection. Includes local HEPA filtration, and germicidal UV. In-duct UV-C only recommended for recirculation of air.	No specific additional measures	Where modifications to HVAC systems are not possible, consider portable air cleaning or disinfection. Includes local HEPA filtration, and germicidal UV.	MF view: Reasonable but expensive - Effectiveness for risk reduction needs considering holistically and may be building specific. Approaches should avoid blowing clean air at potentially infectious people
Unventilated rooms	Not mentioned	Consider prohibiting access	Not mentioned	Not mentioned	MF view: CIBSE guidance reasonable. Such rooms are likely to be little used and viral particles would denature over a day
Natural ventilation	Use where viable	Make use of windows and doors where practicable, secure, and safe. Accept increased energy use. Mitigate discomfort where possible. Avoid stagnant air (e.g. single-sided vent and deep plan room - consider recirc fan)	Unspecific, but use natural ventilation as much as possible, including in spaces which are otherwise mechanically ventilated and at the expense of thermal comfort	Note can be useful, also state results can be unpredictable, suggest reviewing guidance for projects.	Not a consensus. MF view: we broadly agree with ASHRAE, review to ensure sufficient outside air changeover for spaces whether mechanical or natural. Fresh air rates can be checked by measuring CO2 concentration, which is linked to the fresh air input per person in a space. Buildings need to be managed so that people are not in airstreams which spread aerosolised covid
Relative humidity	No benefit in terms of affecting coronavirus viability, can operate as normal	Keep above 40% if possible	BCO suggest people more susceptible to infection when RH <30%. Where there is no active humidification, allow for future installation of it. BMS systems should measure and record RH. Acknowledgement that increases fresh air in winter will lead to lower RH	Quote some evidence of 40-60% RH being generally unfavourable for microorganism survival. Some evidence showing RH below 40% impairs mucus membranes etc. Don't come to a general statement on RH setpoints, but recommend humidification in colder climates where RH < 40% inside during winter	Disagreement MF view is that adding humidification is onerous and energy intensive, particularly during winter - Effectiveness for risk reduction needs considering holistically and may be building specific Some of the industry guidance that leads to much higher fresh air flowrates would tend to lead to very dry environments during winter - this might also encourage more humidification
Filtration	No change to filtration generally, but use appropriate PPE, bag waste material and dispose of safely when changing filters.	Don't introduce HEPA to a non-HEPA system: risk of reducing ventilation flow rate	Consider introducing HEPA filters to recirculating systems	Recommend enhancing filtration to MERV generally Recommend recirculating local systems with HEPA filters	Not a consensus. MF view: agree with CIBSE - don't compromise flow rate. Local filtration via in-room recirculating units may be useful for un-ventilated rooms, if their use is necessary.
Ultra-violet treatment	Only considered suitable for healthcare buildings	Only considered suitable for healthcare buildings	Not mentioned	Ultra violet germicidal irradiation is well documented. Local in-room units can be effective. Actively suggest adding to either central systems, or using local units.	Not a consensus. MF view: adding UV treatment is onerous and energy intensive: it's effectiveness for risk reduction needs considering holistically and may be building specific
Drainage	Close lid of toilets when flushing Ensure water seals in place on drainage traps				MF view: REHVA guidance is reasonable, has no energy impact, and can be implemented through behaviour change.
Toilet ventilation	Run continuously, ensure at negative pressure. Open windows only when there's not a mechanical system.	Retain mechanical ventilation where provided. Use open windows only when mechanical ventilation is not available.	Consider supply as well as extract	Run continuously, ensure at negative pressure. Keep windows closed	Consensus MF view: agreed
Displacement ventilation			May help because displacement vent generally designed to avoid local recirculation in the occupied zone within a space		There is not evidence or a consensus on this MF view: Likely to be building specific. Displacement ventilation systems often involve air movement along the ground and up around people, which may increase covid aerosols by picking up particles from fomite surfaces.
Building readiness	Defers to WHO guidance	Provide some general guidance on re-opening buildings		Re-opening information provided: https://www.ashrae.org/technical-resources/building-readiness	MF view: Should be done in conjunction with a management plan for occupancy