

COVID-19

What impact on building services design?

The SARS-CoV2 virus which causes Covid-19 has had a significant impact on all aspects of our lives and none more so than on the built environment. Its emergence has highlighted potential long-term risks that have forced many people to rethink what the workplace is. The early signs indicate that much of this change will focus on remote working, but also that the office environment is here to stay and will need to adapt to meet these emerging demands, writes *Cian Dowling, Director, Axiseng.*

There are several sources of information on how SARS-CoV2 will impact the design and operation of HVAC systems. However, guidance should be taken from recognisable bodies in that field such as CIBSE, REHVA and ASHRAE.

All these bodies have a common thread to their advice which is that increasing ventilation rates in buildings is the most effective means of reducing the risks to occupants. The principle is to dilute and ideally remove airborne pathogens as much as possible, thus reducing the risk to the users of the space. This will have



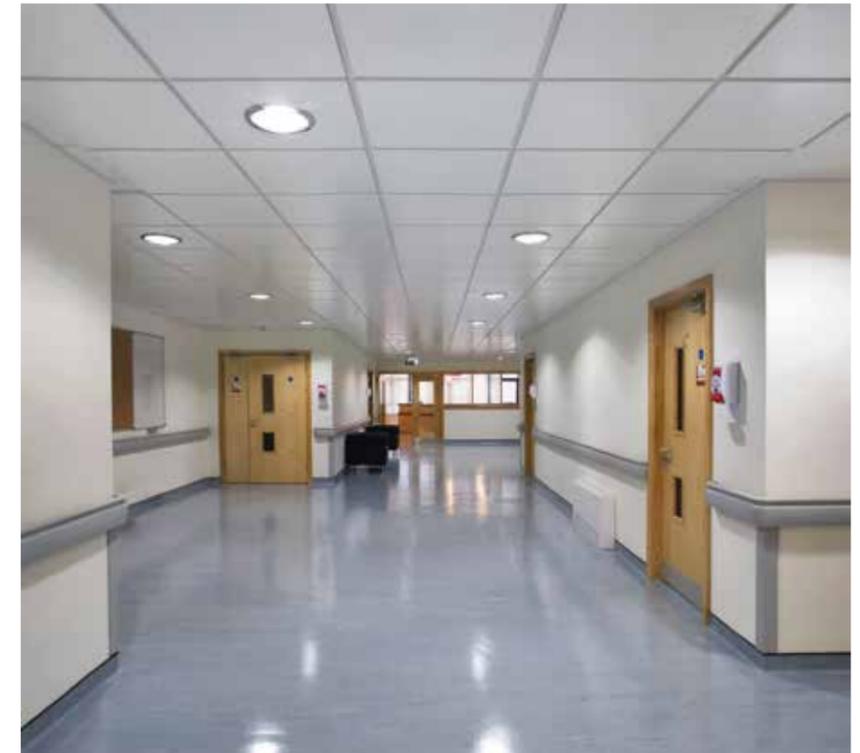
an impact on the design and operation of existing buildings, largely due to current thinking that SARS-CoV-2 ("the virus") is more likely to spread from within the building, and not through the supply of external air. Therefore, increasing fresh air into a building is an important element in reducing the risk of spreading the virus.

Firstly, let's look at the design of new buildings. Increased fresh air will have an impact on the size of risers and plant spaces required to house them. It will also impact on ceiling void depths, as duct sizes increase to deliver the fresh air to the occupied spaces within the building. Consideration could be given to increasing duct velocities. However, this would need to be balanced with the current Part L requirements for Specific Fan Power (SFP) and resultant potential noise issues. The overall volume increases could be avoided by a reduction in occupation densities in buildings, though we are currently not seeing a reduction in the densities being requested by building clients in the market.

For toilet ventilation, it is often the case that the toilet area has an "extract only" and the make-up air is taken from the adjacent areas such as the corridor or office. While this arrangement is regulation compliant, it does encourage air to be drawn from the office area to the toilet area, which is a confined space. Consideration should be given to dedicated supply and extract air to the toilets which limits the negative pressure that the toilets are under. This will reduce the transfer of air from the office to the toilet area and will increase the overall fresh air rate in the building. Like all other increases in fresh air intake, this will require additional riser space when compared to an "extract only" system.

Heat recovery is also an important element of any energy efficient building. Separation of supply and extract is an important consideration. Avoiding recirculation of extract air has always been an important consideration when locating intakes and discharges, but this will become more important in the context of managing the virus spread within a building. Increasing the rate of filtration is not something that is advised in the fight against the spread of the virus by any of the bodies noted already so normal rates of filtration continue to apply.

An alternative design option may well be to consider natural ventilation or displacement. An engineered, naturally-ventilated



Cherry Orchard nursing units are a reminder of the extra challenges presented by care homes and hospitals.

building will largely rely on moving significantly more fresh air to control the space than say a fan coil unit (FCU) system. In recent years this has not been a popular option for owner occupiers or developers but perhaps it has more merit when consideration is given to increasing fresh air rates. It is unlikely to appeal to most, but perhaps worth considering.

There is also some evidence that occupants are more susceptible to infection when the relative humidity is below 30%. This can happen during the colder months when the HVAC systems are largely in heating mode. Consideration should be given to humidity control though this will have an

effect on space, capital expenditure and operational expenditure. It will also impact on Part L requirements due to increased energy usage. The increased levels of fresh air in the winter months will tend to decrease internal humidity as more dry air is being introduced into the building. Having humidity measurement as part of the BMS within the occupied zones will add little cost at design stage and will give great comfort to both building operators and occupants.

For building operators, it is essential that they fully understand the operation of the ventilation system. There are several types of these in operation and small variants could mean the difference in them understanding fully how their supply and extract systems operate or not. From an operation point of view increased running time on air handling plant should be considered. Also, where demand control is in use this should be set up to achieve maximum fresh air



The Molesworth Street development with restaurant at ground floor and offices above typifies the type of challenge now facing building services designers.

“Any ventilation system using mixing as a means of heat recovery will need to be set to operate on full fresh air.”

to the building. Toilet ventilation plant should be run 24/7, ensuring that a negative pressure is maintained in toilet cubicles to minimise aerosols transmission. This will have an impact on energy usage but is generally seen as a small penalty when considered in the context of the pandemic being experienced.

A significant consideration in the operation of AHU, and in particular those with heat recovery, is to ensure that there is no significant leakage from the extract to the supply. This can be caused by poorly-designed or commissioned AHUs where the positive extract pressure can exceed the positive supply pressure at the heat exchanger.



The principles of wellbeing are very well incorporated in the Axa fit-out.

This should be checked and adjusted if required. Similarly, when maintenance is being carried out, or when a supply fan

fails on a system, care is needed to ensure that the positive extract pressure does not exceed the supply pressure at the heat exchanger. Also, any ventilation system using mixing as a means of heat recovery will need to be set to operate on full fresh air.

While clogged filters are not a contamination source in the context of SARS-CoV2, they reduce supply airflow which has a negative effect on the ability to remove and dilute concentrations of contaminant. Thus, filters should be replaced according to normal procedure when pressure or time limits are exceeded, or according to scheduled maintenance.

The emergence of UV filtration is also an interesting development. As noted, none of the bodies recommend the increase of filtration of outside air. However, could UV filtration within say an FCU provide a means of continuously filtering the air within the occupied space as it is continuously recirculated through the FCU? There are currently uncertainties about a variety of factors affecting UV performance, including dosage, wavelength and exposure time. A life-cycle analysis would be required on this as it has capital

and maintenance cost considerations.

In areas where it is difficult to increase ventilation rates, it may be appropriate to consider using local air cleaning and disinfection devices. The most appropriate devices are likely to be local HEPA filtration units or those that use UV radiation. Although neither of these have been proven to fully eliminate the virus, there is evidence that they can assist.

Considerations not related to the ventilation system would be the use of contactless technologies where possible.

less of a risk. There are also system integrators who can provide thermal scanning, facial recognition and checking that hand sanitisers have been used as part of the access control system.

Lifts are another area to be looked at. These are common points of contact for the majority of occupants in a building. Lift manufacturers have responded to this by integrating mobile phone apps in their destination control systems that allow the lift to be used without the need to touch any surfaces. This does not address the issue of social distancing within lifts and CIBSE

long been a point of debate within the building services industry. Several of the water storage requirements as set down by water by-laws are out of sync with current water usage and the drive for low-flow devices that organisations such as LEED and BREEAM have implemented. This will be further exasperated by the lower density of occupants within buildings. SARS-CoV2 is not necessarily present in the water system but, due to the lower usage from reduced occupancy, there may be stagnant water in systems which could result in bacteria growth and legionella risks.

One of the most talked about trends over the last few months is the move to cloud-based solutions and video conferencing for meetings. This is likely to continue even when people return to the office. Covid-19 will mean significant changes in tenant IT due diligence, connectivity requirements, and resilience of digital infrastructure to support businesses. This will, at a minimum, mean that developers will need to be able to demonstrate good connectivity, and may mean more developers need to consider Wirescore certification.

We see that the office is here to stay, though it is certainly going through a major change in how we approach HVAC design and the operation of buildings. Occupants of all buildings have had to embrace home working but there is a clear message that people miss the interaction of the workspace. Our industry has shown an ability to embrace change in many ways over the years and will continue to do this as we work our way through this pandemic. This will enhance the resilience of the buildings we construct and operate, and will no doubt bring new technologies with it. ■



Pharmaceutical facilities are perhaps the better examples of best practice in the industry.



Brewdog Dublin Outpost, Capital Dock, is a typical example of the challenges being faced by the retail and hospitality sector.

Contactless sanitaryware has long been in use and would be an obvious move. However, there are other contactless technologies which can be considered.

Access control can be operated on a contactless basis. This could be further developed to allow doors to motor open, but this can impact on people movements in a building as motorised doors are generally slower to open than the manual version. To avoid this perhaps some doors on main routes could be held open during office hours when security is

still recommends lift car occupancy should only be one person per car up to a rated load of less than 800 kg, and one person per square meter for lifts over this size. This has an obvious impact on lift travel times and handling capacity. It remains to be seen whether bodies such as The British Council of Offices (BCO) alter their current guidance to take account of this but, for now, buildings continue to be designed in accordance with BCO 2014 guidance.

Water usage in buildings has