

Tackling infection risk in buildings

Workplace solutions
and the implications
for real estate



How can we reduce infection risk in buildings?

The coronavirus crisis is forcing businesses to look at their approaches to risk management. Amid rapid change and deep uncertainty, business-critical decisions have to be made in the coming weeks and months that will have long-lasting effects.

What's the right decision at the right time?

As we prepare to bring people back into buildings, we must think about how we can design and reconfigure those buildings to protect people now, while future-proofing against COVID-19 and any subsequent infection outbreaks.

Organisations that own, manage or lease real estate assets should develop a strategic plan for different scenarios of how the COVID-19 situation might evolve. The aim of such a plan is to deliver predictable outputs and desirable outcomes with respect to maintaining the health and wellbeing of employees and building occupants, while safe-guarding business continuity under this 'new normal'.

Alongside the negative impacts, COVID-19 provides some opportunities, not least as an agent of change, driving businesses to become more resilient and efficient, and raising awareness of best practice in human-centric building design. Furthermore, there is hope of a renewed focus on the fight against climate change, environmental sustainability and social equity, accelerating our transition towards a vibrant low-carbon future and economic stability.

This paper provides a summary of the issues facing workplaces and the wider real estate sector with respect to COVID-19 and potential future outbreaks of similar illnesses. The issues and solutions proposed should be considered common to a range of building typologies.

Details in this document are based on the best available knowledge at the time of publication. However, science around the treatment, control and prevention of COVID-19 infections – and developments towards an eventual vaccine – are constantly evolving. Our COVID-19 resource hub brings together this evolving information and is updated weekly, providing our clients with a best-in-class service to manage their risks. Talk to us for more information.



Knowing how and when to act is the core question for many businesses. A strategic plan will help leaders steer a clear path forward.

The future workplace

Social distancing measures mean many aspects of collaboration will not be feasible for the foreseeable future.

The COVID-19 crisis shows that enterprises must increase corporate resilience and help ensure community wellbeing by embracing digital collaboration tools and practices.

Companies that have already embraced future-of-work practices are likely to be well-positioned to sustain their operations and respond quickly to the demands of navigating COVID-19. However, many businesses will gradually need to bring their workforce back into a formal office environment. Collaboration, performance and wellbeing must be at the centre of any return-to-office strategy.

The following pages provide an overview of the key issues and solutions building owners and operators should consider as employees return to work. We pay attention to the applicability of global standards within the workplace, such as the WELL Building Standard and how these schemes can be leveraged as a framework for increasing resilience and reducing the risks of viral spread.



Ventilation

Viruses can spread via direct transmission (sneezing and coughing) and also through airborne droplets circulating in the workplace for hours.

We can be exposed to viruses through respiratory droplets when someone nearby sneezes, coughs or speaks. These droplets vary in size, and smaller droplets can be carried on air currents and inhaled by people at greater distances from the source (for example in a room where the ventilation brings air from one side of the room to the other).¹

Where health professionals confirm guidance on the role of ventilation and air distribution on virus lifecycles in the workplace, we can undertake the following:

Fresh air and recirculation

Increase fresh air rates to flush out viruses and pollutants alike; target >30% outdoor air (OA) provision above an ASHRAE 62.1 baseline² or, to align with the WELL Standard target, >60% above ASHRAE minimum ventilation requirements. Both CIBSE and ASHRAE recommend supplying fresh air at as high a rate as possible.

Transitioning to DOAS system to supply 100% OA can greatly enhance air quality – these initiatives should be balanced with the energy consumption penalty. Buildings able to operate with 100% OA should do so.

Recirculation should be eliminated wherever possible – unless this is the only way to provide adequate fresh air.³

Adjust CO₂ limits

A proxy for fresh air rates, CO₂ concentrations should be minimised; between 450-600ppm would be deemed an appropriate range, given likely social distancing and reduced occupancy densities.

Disable demand-controlled ventilation

Many office buildings have started to use this technology in meeting rooms to reduce energy consumption. However, it should now be disabled to maximise fresh air delivery.

Filtration

Enhanced filtration in the form of HEPA grade filters (EU 10-14) can capture particles and droplets containing the virus.

Treatment

UV-C generators and bipolar ionisers installed in AHUs can kill viruses and bacteria. Portable air cleaners (PACs) are useful for reducing viral spread at source.

Extract ventilation

Toilet accommodation is shown to be an area where virus concentrations can build up. Ensure that extract ventilation is running constantly and sufficiently to prevent any ‘backflow’ of this air into the workplace.

Use natural ventilation

As well as supporting the pathway to net-zero buildings, natural ventilation can often provide additional air exchange and dilution in mechanically-ventilated buildings. In buildings without mechanical ventilation, airflow can be variable and unpredictable; however, good airflow can be achieved by going beyond random window openings to engineer airflow intentionally, even at the cost of thermal comfort.

Air distribution for social distancing

Occupancy layout should consider airflow patterns and pathways, which should be verified through CFD modelling. This can inform staggering of workstations to reduce exposure to ‘stale’ air. Recent evidence from a South Korean call centre showed that high-density offices can be very high risk for the spread of COVID-19.⁴

Air speed and directionality

Careful attention should be paid to air speed and location of diffusers in buildings to avoid inadvertently transporting virus particles from infected people to others. This is especially applicable to buildings, where air conditioning and ventilation systems have been installed retrospectively or where these do not form part of a comprehensive designstrategy. This has recently been illustrated by a case in China, where a COVID-19 outbreak in a restaurant was associated with air conditioning.⁵

Keep building systems running for longer

If not already the case, consider 24/7 operation. This needs to be carefully considered as the energy penalties can be substantial and the significance of good passive design measures can become even more evident.

Social distancing measures mean that many aspects of collaboration will not be feasible for the foreseeable future.



Temperature and humidity



Keeping relative humidity between 40-60% reduces respiratory and viral transmission issues.⁶ However, while generally true for a variety of pathogens, these factors have not been shown to help with COVID-19 control.

Relative humidity plays a key role in the lifetime and size of respiratory droplets in air and on surfaces. It also impacts human sensitivity to infections. Immunobiologists have reported improved immunity against respiratory infections at mid-range relative humidity levels. This range is also the most unfavourable with regards to the survival of micro-organisms. However, specifically in the case of the SARS-CoV-2 virus, it has been shown that humidification of up to 65% has very limited or no effect on the stability of the virus.

Although nasal systems in humans can be more sensitive to infections at RH% of 20% or below, in European climate zones this tends to occur only for a few weeks during the winter months. For this reason, most buildings in Europe are not controlled for humidity and guidance from regional industry bodies does not call for the introduction of such systems for the purpose of pathogen control.

Ambient temperature can have an influence on the activity and spread of viruses. For example, other viruses that cause respiratory infections often occur in the winter months.⁷ There are indications that this is due to a reduced resistance of the mucous membranes in the nose when cold air is inhaled.

Where health professionals confirm guidance on the role of temperature and humidity on virus lifecycles, we can undertake the following:

- **Closely control humidity:** Keep relative humidity between 40% and 60% for general pathogen control. For most European countries, high humidity is not an issue, and humidification in winter is not common practice. However, where such systems are in place, control setpoints should remain unchanged.
- **Closely control temperature:** Ensure spaces in the building are not overcooled. With social distancing in place, there will be a lower heat load, so some air systems may need rebalancing to office spaces.

Maintaining consistently uniform indoor environments that suppress viral transmission requires more sensitive ACMV control strategies and diligent facilities management.

Materials and cleaning

Exposure to SARS-CoV-2 can take place via contaminated surfaces, with different materials affecting the life of the virus in different ways.

The life of SARS-CoV-2 on materials can vary from days to hours. On copper surfaces, the virus was not detected after 3-4 hours. On steel or plastic, the virus was detected up to 72 hours after initial exposure.¹ Risks can be minimised with adequate cleaning regimes in place and handwashing. However, the respiratory nature of the virus means surfaces can quickly become contaminated again if infectious individuals are nearby.

Where health professionals confirm guidance on the role of surfaces on virus lifecycles, we recommend the following initiatives:

Antimicrobial surfaces

International schemes such as the WELL Building Standard require that regularly used surfaces meet minimum antimicrobial criteria; copper and brass have been shown to perform well in this regard.

Touchfree access

Install automated doors, or remove them altogether where possible, especially for routes between WC facilities and canteens/pantries.

WC accommodation

International standards such as WELL or Fitwel, provide clear guidance on sinks, autotaps, soap dispensers and the use of disposable hand towels and hand dryers with HEPA filters. The criteria laid out are intended to prevent the virus deflecting out of the sink basin.

Personal hygiene support

Frequent handwashing has become the norm; to promote this, handwashing/sanitisation stations can be positioned at appropriate locations around the workplace.

Enhanced cleaning regimes

Certified cleaning supplies to sanitise and disinfect will be required as will stricter and more frequent cleaning regimes. The US-based Centers for Disease Control and Prevention (CDC)⁸ and the World Health Organization (WHO) provide good guidance in this area.⁹

Brass and copper have been shown to perform particularly well for reducing the lifespan of SARS-CoV-2 on surfaces.



Digital technology

The coronavirus crisis is forcing businesses to re-evaluate risk.

With renewed demand and use of digital collaborative and communication tools, there will likely be more investments to support digital infrastructure for working, and also for monitoring the physical workplace.

Key elements of a successful flexible digital roadmap which will aid quick transitioning to a remote workplace environment include:

Culture and adoption

Invest in technology and environmental optimisation to enable effective remote working and develop a communications plan on this policy both internally and externally.

‘Elastic’ collaboration

Rapidly deploy digital collaboration tools across the organisation and build bridges with your clients, partners and suppliers.

Virtual work environment

Evaluate network bandwidth, accelerate device deployment, and leverage virtual environments to support increased mobile demand.

Seamless networking

Enable reliable and secure remote network connectivity to employees’ homes and seamless integration with customers and partners. Edge servers and high bandwidth network devices could be a solution and will reduce space compared to conventional server equipment.

Distributed continuity

Improve business continuity plans to include reduction in workforce, travel restrictions and largescale remote working environments.

Enhance network security. Leverage exception-based processes, expand ‘zero-trust’ network access approach, and automate with endpoint management detection and response.

Within the physical workplace, smart sensors and increased digital building systems could replace regular building management and automation systems. To optimise health and wellbeing of staff in the office we recommend considering the following:

Real-time indoor environmental quality (IEQ) devices

Install a fleet of Internet of Things (IoT) based IEQ monitoring devices across the workplace, monitoring indoor air quality at numerous locations in the occupied zone to track and optimise environmental quality to reduce viral spread. These sensors can monitor and trend temperature, CO₂ levels, and other pollutants. The devices can monitor a single building in real time via mobile applications, or using Mott MacDonald’s MOATA platform. They can also be rolled out across an entire portfolio and linked together via a central dashboard for data analytics and ACMV system optimisation.



IoT internal environmental quality devices can help track a range of parameters throughout a workplace, including humidity, temperature and CO₂ concentrations.

Social distancing and health policy

As companies plan for a future in which fewer people come into work simultaneously, they should seek to reduce occupant density in ways that improve rather than hinder flexibility and user experience.

Social distancing may initially include changing desk usage to keep an empty seat between occupants. In order to increase the spacing between seats while also getting the right people in the office at the same time, it may be necessary to implement hot desking, although the British Council for Offices expects that desk sharing will reduce.¹⁰

Other social distancing strategies could include reducing circulation around the office, especially along narrow corridors where people come into close contact, or making these areas 'one-way', to avoid human contact.

As employee densities reduce in offices, activity-based working (ABW) could be one effective way of leveraging the whole of the floorplate to maximise space for this purpose. This form of workplace has been shown to yield favourable outcomes with respect to physical and mental wellbeing.

Employees should take the opportunity to reconfigure workplaces to embed some of the wider aspects of the WELL Building Standard or Fitwel and good practice human-centric design. This could include adoption of biophilic design, quiet zones for employee rest or sleep, better access to natural daylight and circadian lighting to improve sleep patterns and improve resilience.

While imposing social distancing measures in the workplace, organisations should review opportunities to create a more human-centric space that caters better for employee physical and mental health.



Implications for real estate

In the real estate sector, the COVID-19 crisis has accelerated trends such as online shopping and e-learning, while the densification of work and living spaces is now under scrutiny.

Many industries and their supply chains, such as healthcare and food, are working hard to cope with the COVID-19 crisis, while dealing with a shortage of capacity and human resources. Conversely, the retail sector is taking a hit on demand, while transportation is trying to find ways to cope with increasing demand while reducing transmission risk to passengers and staff. These rapid changes are having a major impact on the operation of buildings all over the world.

This is an overview of the issues facing key real estate sectors and how organisations are responding.



Offices

In the short term, the flexible space sector is undergoing significant consolidation. However, even with the current switch to mass remote working, the physical office will maintain its importance for facilitating face-to-face interaction and collaboration. The importance of employee health, wellbeing and productivity in the workplace will have greater emphasis in the years to come.

Retail

The primary focus for retail businesses in the short term remains on preserving revenue. A rising number of retailers and leisure operators are assessing options to offset the losses from their physical store portfolios through innovative solutions. Proactive gym operators, for example, are offering subscription services to stream online workout sessions while high-end restaurants are offering meals for delivery or collection, and others have turned eateries into mini supermarkets. Further down the line, many retailers will rethink their operations and supply chains. Having the right infrastructure for the fulfilment of online orders continues to be crucial for trading.

Hospitality

International tourism has ground to a complete halt, with many airlines and cruise companies suspending flights and cruises for the foreseeable future. Once the industry starts to recover, travel patterns may shift toward 'drive-to-resort' destinations and those that are less dense, where travellers can be in open spaces and avoid large groups of people. People have become more self-conscious of being in close proximity to others and are fearful of contracting the disease in public places with questionable standards of cleanliness. This will likely change people's perception of casual lodging arrangements in favour of those that are professionally managed.

Logistics

Supply chain risk mitigation and resilience is becoming a key focus for companies. Companies are likely to undertake near sourcing of manufacturing which could rebuild domestic supply chain independence. Supply chains will be less reliant on one country in order to de-risk the production or distribution processes. We are also likely to see diversification of transport methods, including ports that provide multi-nodal transport options. COVID-19 will also accelerate trends already seen across the sector such as increased online activity, expansion of online grocery shopping, cross-channel retailing and the integration of technology into warehousing.

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