British Council for Offices
Briefing Note
August 2020

# THOUGHTS ON LIFT AND ESCALATOR DESIGN AND OPERATION AFTER COVID-19

## Introduction

Vertical transportation (VT) is a vital service in any office, and particularly so in taller buildings. The need for social distancing during a pandemic reduces the number of passengers that can use a lift car, and may ultimately limit the occupancy of a building.

The readily available solution to a reduction in lift capacity mainly involves altering management procedures – rather than radically changing the physical installation – because any changes need apply only while social distancing is required during a pandemic. In addition, any significant changes to VT installations will be expensive, in terms of both the equipment involved and the likely loss of occupiable area.

This briefing note explains the effect of social distancing on VT and proposes solutions based on demand reduction and low-cost amendments to installations. It builds on the earlier BCO publication *Thoughts on Office Design and Operation after COVID-19*.[1]

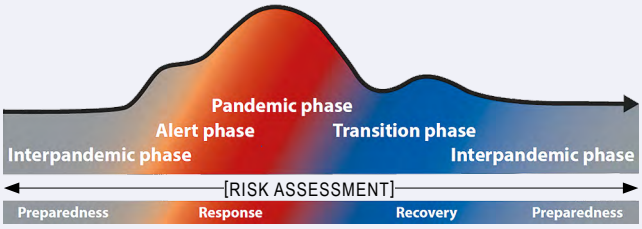
## Pandemic phases

The influenza phases shown in Figure 1 reflect the World Health Organization's (WHO's) assessment of global risk for each virus with pandemic potential.[2] Influenza (flu) and COVID-19 are both contagious respiratory illnesses, but they are caused by different viruses.

The nature of the actions needed to deal with a pandemic outbreak is based on a risk assessment, which informs the guidelines that should be applied at each phase. The four phases are:

- Alert – early warning of newly infective virus.
- Pandemic – global spread and exponential growth of cases.
- Transition – de-escalation and recovery.
- Interpandemic – period between outbreaks.

The safety measures applied to VT systems will depend on the prevailing phase. (*Note*: A local spike in cases may require a return to the response of an earlier phase.)




*This continuum is according to a 'global average' of cases, over time, based on continued risk assessment and consistent with the broader emergency risk management continuum

*Figure 1*
The continuum of pandemic phases
*Source: WHO*[2]

## The challenges for VT systems

In the earlier BCO briefing note,[1] the key virus contamination routes were identified as:

- contact
- airborne – large and small droplets
- faecal–oral.

The main risk of acquiring the virus while using VT systems is via the contact and airborne routes of infection. It is also known that the risk of transmission is higher in confined indoor spaces with poor ventilation, and is increased by the length of time spent in close contact with an infected person.

The key opportunities to reduce the risk of infection while using lifts and escalators are through maintaining social distancing, wearing masks and improving ventilation to minimise droplet transmission, and by the implementation of effective hygiene/sanitisation measures and hands-free lift controls to minimise contact transmission.

It is straightforward to thoroughly clean lifts and escalators at frequent intervals, but maintaining social distancing and providing adequate ventilation in these areas is much more challenging.

The risk of infection from contact with common touch points (e.g. lobby call buttons and touchscreens, in-car floor buttons and handrails) can be significantly reduced by using a combination of hands-free controls and materials that are inimical to viruses (Figure 2).[3]

Social distancing on escalators is relatively easy to achieve, but it is more challenging in lifts. In both cases the effect is to reduce the passenger-carrying capacity.

Lifts, in common with many other mass transportation systems, are generally small, confined spaces where a 2 m separation is not possible. However, one positive is that the time spent travelling in a lift is very short, being usually only a few minutes.

Building occupants should be required to wear masks in all common areas, including when using lifts and escalators, although this would be a management choice.

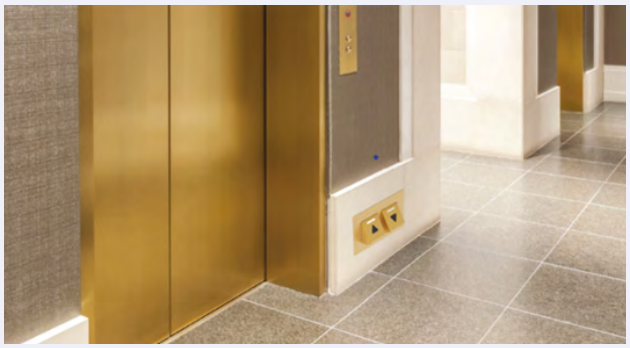
## The effect of social distancing on lift and escalator capacity

### Lifts

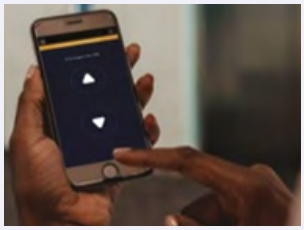
The main impact of social distancing is to reduce the number of people who can enter a lift car. The current BCO *Guide to Specification*[4] recommendations assume that each person in a fully loaded lift car occupies 0.21 m² (Figure 3),* and the lift traffic calculations (used to determine the size and number of lifts needed) assume that under peak load conditions the lift is 80% full. On this basis, a typical 2,000 kg lift could carry up to 16 people.

The Chartered Institution of Building Service Engineers (CIBSE) recommends that to achieve social distancing the permitted occupancy in the lift car should be 1 person per square metre, rounded down.[5] A 2,000 kg lift has a floor area of about 4.2 m², which results in a reduced capacity of 4 people (Figure 4).

On first sight, a reduction from 16 to 4 people seems significant, but the reduction in capacity is effectively offset by a reduction in demand (see below).



Toe-to-Go foot-activated elevator



Otis eCall

Card reader

*Figure 2*
Means of reducing hand contact with common touch points
*Courtesy of: (top) Mad Elevator Inc., source Forbes, 15 June 2020;[3] (bottom) Otis Elevator Company*

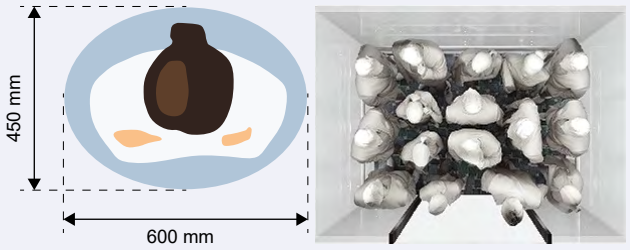
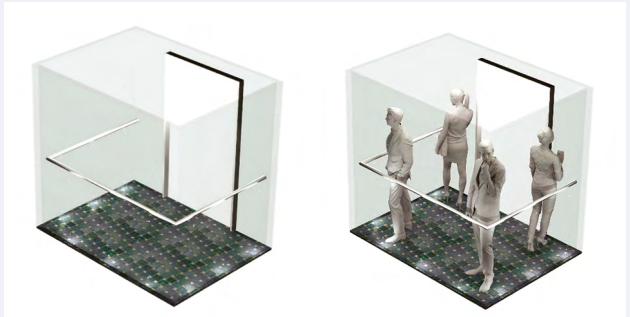



*Figure 3*
The space occupied by each person in a fully loaded lift car
*Courtesy of: (left) D2E and (right) Hoare Lea*



Empty 2,000 kg car

2,000 kg car with 4 people

*Figure 4*
CIBSE recommends that to achieve social distancing the permitted occupancy in a lift car should be 1 person per m²
*Courtesy of Hoare Lea*

* The footprint area recommended by CIBSE is an ellipse.
Area of an ellipse = $abπ$
where $a$ is the radius of the long axis and $b$ is the radius of the short axis. Thus 0.30 m × 0.225 m × 3.14159 = 0.21 m².

The first action for an occupier to take when a pandemic is declared is to reduce office occupancy, with some or all staff being asked to work from home. During the transitional recovery phase, a return-to-work plan will include reduced occupancy levels in the workplace, staggered start and finish times, and reducing the number of lift journeys that an individual can make during the working day. The CIBSE guidance[5] suggests:

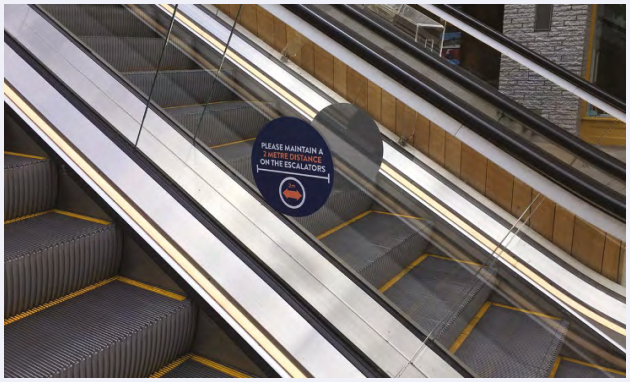
> "The building management may need to consider restricting the number of trips a person makes in a lift whilst in the building. This may then match the lift capability with a reduced demand. This may also reduce queueing in lift lobbies to a safe level.
>
> Example: *Each person may make no more than two up trips and two down trips per day.*
>
> This could be managed by a token scheme."

## Escalators

The risk of transmitting infection via escalators can be effectively reduced by social distancing and maintaining a 2 m separation. Clear signage must be provided to encourage social distancing (Figure 5).

Social distancing will significantly reduce the capacity of an escalator, typically to between 20% and 30% of its usual level. In heavily trafficked environments, such as mass transit and retail environments, this could present a challenge, but in most office applications escalators are used more for their speed and convenience to move people between the lower floors of a building or to convey passengers to a lift entry level. Consequently, in most offices where escalators are part of the VT design, all the available capacity is rarely used.

Clear instructions of how to use the escalators and good management to avoid queues forming at the approaches on and off the escalators are key to minimising the impact.


Oxford Westgate


John Lewis, Kingston

*Figure 5*
Signage to encourage social distancing on escalators
*Courtesy of: (top) PressOn; (middle) isGroup; (bottom) Charlie Bibby/FT*

### Mitigating factors

Much work has been done to assess the impact on office capacity when the COVID-19 secure measures recommended by the authorities and industry bodies are put in place. Current experience indicates that office occupancy is likely to be 25% or less of the non-pandemic figure. When combined with staggered start and finish times – carefully managed between the building manager and occupiers – the lifts and escalators should provide a satisfactory service.

Increased use of stairs, where good ventilation and social distancing can be maintained, will also reduce the load on VT systems, albeit that this will mainly be limited to the lower floors of a building and for able-bodied occupants only. Where a building has special-use lifts outside of the main passenger-carrying groups (e.g. goods lifts, firefighting lifts), these may also be used to increase capacity.

## The importance of good ventilation

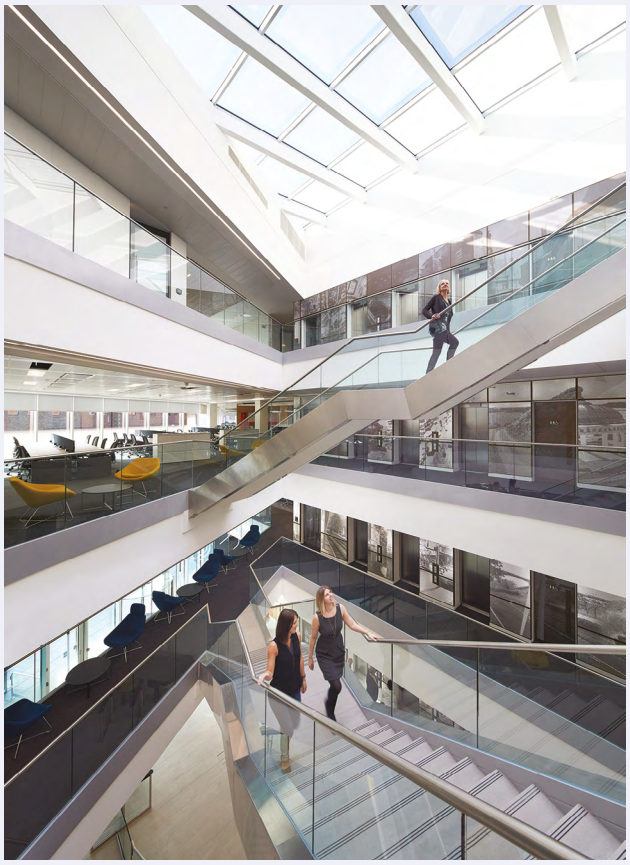
The WHO acknowledges that some reports of outbreaks in crowded indoor spaces suggest that aerosol transmission of the COVID-19 infection is possible.[6] Its new guidelines suggest that people should avoid crowds and good ventilation in buildings should be ensured, and, in addition to social distancing, it encourages the use of masks when physical distancing is not possible.

Poor ventilation is associated with increased infection rates for airborne diseases. High ventilation rates should decrease the risk of infection. Escalators in offices are usually installed in large open spaces, and provided these spaces are well ventilated the risk of airborne transmission is low.

Lift cars, on the other hand, are small confined spaces, so it is important that they are as well ventilated as possible. They are usually ventilated through the action of the doors being opened when the lift is stationary, and through forced natural ventilation through low- and high-level openings when the lift is in motion, or by the action of a mechanical extraction fan.

A mechanical extraction fan provides the most certain and consistent form of ventilation for a lift car. It is recommended that where an extraction fan is installed it should be operated continuously on its highest speed while the lift is in use. Where a fan is not installed, it is recommended that one be installed.

The air drawn into the lift car when the doors are closed is taken from the lift shaft. In some cases, the lift shaft itself may be a sealed space, so consideration should also be given to providing fresh air ventilation to the shaft.



KPMG, Leeds
*Courtesy of Sheppard Robson*


*The images above have been sourced from https://www.kone.com/en/news-and-insights/stories/elevator-etiquette-for-staying-healthy.aspx*
*Copyright Kone*

## Effective hygiene measures

The COVID-19 virus spreads through contact with contaminated surfaces or close contact with infected people.

CIBSE[5] recommends that:

> "All surfaces touched or likely to be touched, including the lift push buttons, doors, door frames, etc., should be cleaned regularly according to a risk assessment. The frequency shall be determined by the lift usage. In a large busy office building it might be every 15 minutes."

A similar high frequency of cleaning should be adopted with respect to escalators, with a particular focus on handrails.

It is important that VT users follow simple measures such as avoiding touching their face, and washing hands or using sterilising gel after using lifts and escalators.

## Management measures

Management measures that can be implemented when needed and withdrawn when not, include:

- adjusting the lift controls to reflect the reduced traffic, for example grouping floors into discrete zones served by specific lifts (this is particularly relevant for destination control)
- reducing the dwell time (the length of time for which doors stay open to allow passengers to board) and disabling the door edge system (to prevent the door reopening on contact with passengers, as used on London Underground lifts and trains)
- controlling queuing through public spaces, past turnstiles and, particularly, in lift lobbies and escalator approaches (correct management of arrival times should reduce the need for queuing)
- making mask-wearing compulsory in common spaces and particularly in lifts (mask wearing in lifts is a requirement in the CIBSE guidance[5])
- providing hand sanitising stations at the entry and exit points of lifts and escalators
- marking escalator steps and lift floors to show the allocated space for and required orientation of passengers (Figure 6)[6]
- providing clean, disposable, objects (e.g. coffee stirrer, straw, tissue, glove) to press pushbuttons in lifts where hands-free operation is not possible[5]
- cleaning all shared-contact surfaces frequently.


*Figure 6*
Markers to show the allocation of space and the required orientation of passengers in lift cars[7]

*Copyright: (top) MIA Studio | Shutterstock; (middle) Navin Tar; (bottom) Kritthaneth | Shutterstock*

## Physical changes to existing systems

Further interventions can be considered to upgrade existing installations.

For lifts:

- Increase mechanical ventilation, where installed, to help dilute any airborne contaminants.
- Provide vents in the lift shaft to prevent build-up of contaminated air.
- Install an air-treatment system with high-grade filtration and UV irradiation, to reduce airborne contaminants and also to sterilise lift-car surfaces (research is needed to quantify the benefit).
- Embed UVGI germicidal LED lamps with UV light (recessed or wall-mounted) to irradiate the car surfaces – the UV-C light is automatically activated only when the lift is empty because human exposure is dangerous and can cause acute damage to the eyes (research is needed to quantify the benefit).
- Upgrade control systems to allow for touchless operation via mobile phones, security access cards or foot-operated buttons. (Some manufacturers are offering facial recognition and voice operation interfaces, but these are not widely available.)
- Install easily cleaned lift car finishes and antimicrobial surfaces.

For escalators:

- Substitute standard handrail belts with antimicrobial handrails.
- Install handrail UV sterilisers (research is needed to quantify the benefit).

## Design features for new systems

At the height of the COVID-19 outbreak in the UK in April 2020, a survey of decision-makers and influencers in the commercial office sector was conducted, asking what aspects of lift use would be most affected by the pandemic.[8] The results are shown in Figure 7.

Hygiene concerns outranked all others, with almost 90% of respondents concerned about the hygiene measures that would be needed in lifts and lobbies. This also explains the second highest response, which was to remove the need to touch lift-car buttons and control panels.

The other responses all concern the effect of social distancing on lift performance. However, because of the reduced demand (see earlier) there is no need to increase the capacity of VT systems beyond current design standards to maintain satisfactory performance.

Ensuring adequate space for people to maintain social distancing may lead to a reconsideration of the size of reception areas and lift lobbies in new buildings, as developers weigh up the costs and benefits of providing larger spaces, but the key design recommendations for new office buildings are as follows:

- ensure that the minimum lift lobby dimensions recommended in BS EN 81-20:2014[9] are provided
- for office use select wide, shallow lift-car configurations in preference to narrow, deep cars – this allows faster loading and unloading and easier social distancing (Figure 8)
- select doors at least 1,100 mm wide
- install mechanical ventilation fans in all lift cars and provide fresh-air ventilation to lift shafts

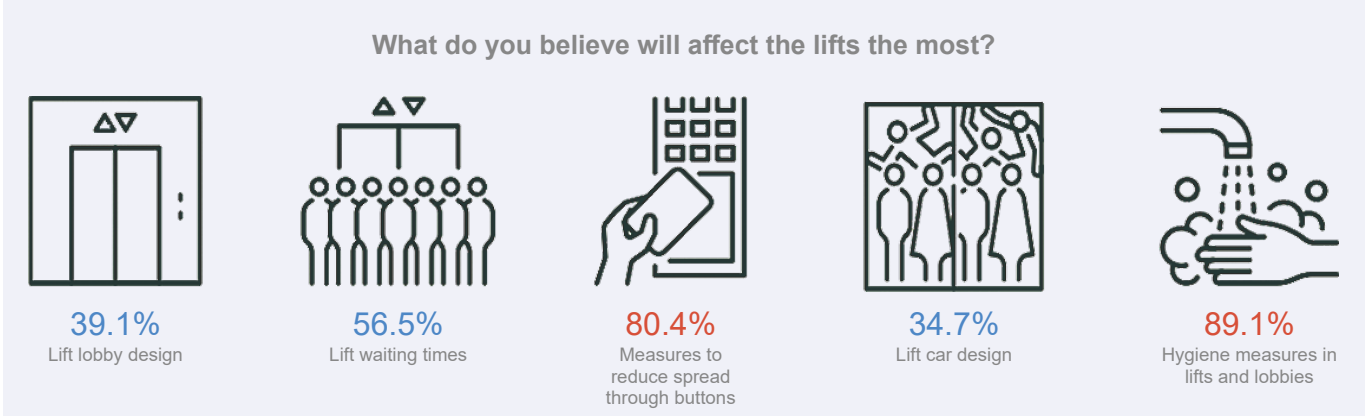



*Figure 7*
Results of the D2E survey (April 2020) on lift use post COVID-19
*Source: D2E*[8]

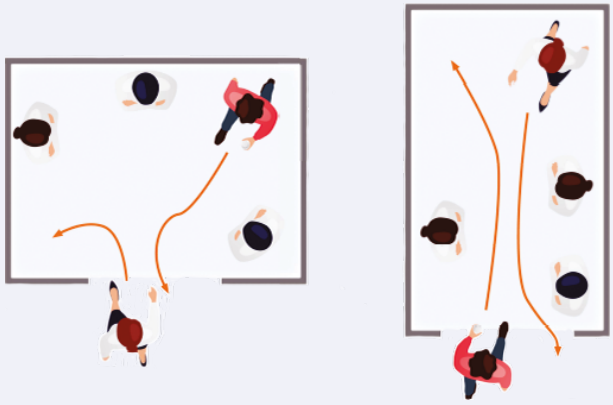



*Figure 8*
Wide, shallow lift-car configurations allow faster loading and unloading and easier social distancing than narrow, deep cars
*Source: D2E*[8]

- consider access routes to and from special-use lifts so they can be used more easily to supplement the main passenger lift group(s) during a pandemic
- include controls that reduce or eliminate the need to touch lift buttons and operating panels
- select easily cleaned finishes in lift cars
- where possible, provide a space in between – or separate – up and down escalators
- consider adding a third escalator or a stair between the up and down escalators to provide additional resilience.

If a vaccine is found to prevent against COVID-19 many of the measures outlined in this briefing note will cease to be immediately relevant, but another similar pandemic would require the same response. The COVID-19 virus has made us acutely aware of the pivotal role played by the built environment in protecting our health and wellbeing, and in doing so may have reset our approach to the design and operation of future buildings. ■

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## ABOUT THE BCO

The BCO is the UK's leading forum for the discussion and debate of issues affecting the office sector. Established in 1990, its membership base comprises organisations involved in creating, acquiring or occupying office space, including architects, lawyers, surveyors, financial institutions and public agencies.

The BCO recognises that offices don't just house companies, they hold people and so what goes on inside them is paramount to workplace wellbeing.

## ABOUT THE AUTHORS

The Technical Affairs Committee (TAC) is the voice for the BCO on technical aspects of the built environment. It is responsible for the organisation's globally recognised best practice guides on office specification and fit-out, and acts as a forum for new ideas and discussion to address the technical challenges facing the workplace sector.

This paper has been authored on behalf of the BCO Technical Affairs Committee by Neil Pennell (Head of Design Innovation and Property Solutions at Landsec) and Peter Williams (Technical Advisor to Stanhope). Neil and Peter are both members of the TAC and editors of the BCO Guide to Specification and Guide to Fit-Out.

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Michael Seddon -WSP

Steven Truss – WSP

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78–79 Leadenhall Street, London EC3A 3DH
+44(0)20 7283 0125 www.bco.org.uk
@BCO_UK /BCOonline /BCOonline