

## COVER STORY

# Ventilation – key to safe emergence from the Covid-19 pandemic

Dara McGowan

Dara McGowan is a Technical Consultant in Partel, a company with Irish roots who manufacture and supply high-performance systems and materials for the low-energy building sector, including a variety of ventilation systems. Dara has an in-depth understanding of ventilation regulations and a practical knowledge of how ventilation systems work. He developed the national skills specifications for the Department of Housing Planning and Local Government-supported NZEB Ventilation course offered by the Waterford and Wexford Education and Training Board (WWETB), and continues to provide support for tutors delivering these courses. In this article McGowan outlines the importance of adequate ventilation as we emerge from the coronavirus pandemic.

## What the experts say

Face coverings, social distancing, good hand hygiene and vaccination have been strongly encouraged by the World Health Organisation as measures to combat Covid-19. In addition to these measures and with a focus on returning to indoor gatherings, numerous organisations have identified improved ventilation as a crucial building control initiative for minimising the risk of Covid-19 transmission.

The US Environmental Protection Agency explains that increasing outdoor air ventilation helps reduce the concentration of airborne contaminants, including viruses. Increased ventilation also reduces surface contamination by removing some virus particles before they have the chance to land on surfaces. The World Health Organisation also

believes that understanding and controlling ventilation can “reduce the risk of indoor health concerns, including preventing the virus that causes Covid-19 from spreading indoors.”

An ASHA publication agrees and adds that filtration should be a key consideration when mechanical ventilation is used. The UK and Irish Governments have also identified ventilation as a key consideration as we move towards reopening, with both establishing a panel of experts to research how best to improve ventilation. While there are different recommendations for improving ventilation based on building type and existing ventilation strategy, the general consensus from the experts is that increasing outdoor air ventilation reduces the risk of Covid-19 transmission.



## How to increase ventilation in buildings?

The ability to increase ventilation in a building depends on the ventilation strategy being used. As indoor activities resume, business owners appear more interested in their ventilation strategy than ever before. In particular, school and office ventilation enquiries have significantly increased this year.

Ventilation strategies can be divided into two broad categories – natural ventilation and mechanical ventilation. Natural ventilation is the traditional ventilation strategy used in Ireland, where passive intake ventilators, hole-in-the-wall vents for example, are used to facilitate air movement. Mechanical ventilation relies on motorised fans which typically run 24 hours a day, pulling or pushing air in or out of the building.

Where a building is naturally ventilated, we have limited control over the ventilation system itself. Instead, we utilise the buildings “purge ventilation” strategy. Purge ventilation is designed into buildings to ensure they can deal

with excess ventilation demand from time to time. This is typically done using openable windows and/or doors. In their *Practical Steps for the Development of Good Ventilation Practices in Schools V3 guidelines*, the Department of Education essentially encourages teachers to open windows and doors during class to reduce the risk of Covid-19 transmission. Where possible, windows on opposite sides of a room/building should be opened as this creates a cross-ventilation effect.

While all new buildings must meet minimum purge ventilation requirements, some existing buildings may be incapable of increasing ventilation through these means, in which case ventilation upgrades should be considered. It is worth noting that purge ventilation poses inherent challenges such as noise, security, pollution and of course discomfort.

## Mechanical ventilation

The US Environmental Protection Agency has encouraged increasing ventilation in schools, offices and commercial spaces through the use of mechanical systems. Mechanical ventilation can be divided into several subcategories, which we will elaborate on later. Most mechanical ventilation systems are designed to meet a “general ventilation rate”. This is the amount of air the ventilation system is moving in its normal setting, typically measured in litres per second (l/s) or cubic metres per hour (m<sup>3</sup>/hr).

The general ventilation rate can be calculated in a number of ways, depending on the building type and whether the building is new or old. For example, for a new dwelling in Ireland the Building Regulations typically require 0.3l/s per square meter of floor area. Here in Partel, we aim for this requirement when designing ventilation upgrades in existing dwellings as well, ensuring we achieve modern-day air quality standards for the occupants.

The general ventilation rate for an office space or school, on the other hand, is typically based on the number of occupants on each floor of the building. When designing any ventilation system, it is good practice to size the

units to allow for additional ventilation when necessary. Therefore, a premises with a well-designed mechanical system can increase the ventilation rate where the risk of Covid-19 transmission is high by simply adjusting the setting on the ventilation system. While dealing with Covid-19 the World Health Organisation recommends 10l/s per person in both residential and non-residential settings, and 60l/s per patient (or six air changes) in healthcare facilities.

For business owners, landlords and homeowners, I strongly encourage you to reach out to a ventilation designer who can calculate an appropriate minimum ventilation rate for your property. This will help determine whether the existing system is adequate or not. This service is often available for free, as with here in Partel, as part of the technical support we provide.

## Inadequate ventilation – what are the options?

When upgrading a building’s ventilation system, you must first decide what ventilation strategy you want to utilise – natural ventilation, a continuous mechanical extract (CMEV) system, or a mechanical ventilation system with heat recovery capabilities (MVHR). In my experience, natural ventilation is no longer popular in Ireland and so I will not elaborate on this system here.

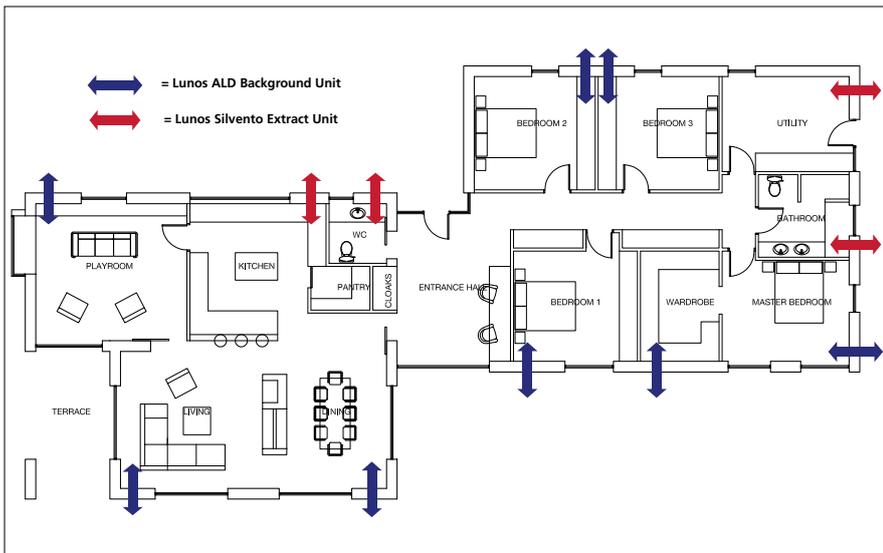
Continuous extract systems are typically the most cost-competitive form of mechanical ventilation. Such systems continuously extract air from the wet rooms of a building using fans, while fresh air is drawn into the building via background ventilators installed in habitable rooms. This type of system can achieve excellent indoor air quality, can be incredibly quiet and can operate at an almost negligible cost.



LUNOS Nexxt Unit uses counterflow heat exchange technology.



LUNOS E260 unit uses regenerative heat exchange technology.



Sample decentralised CMEV design for a domestic project.

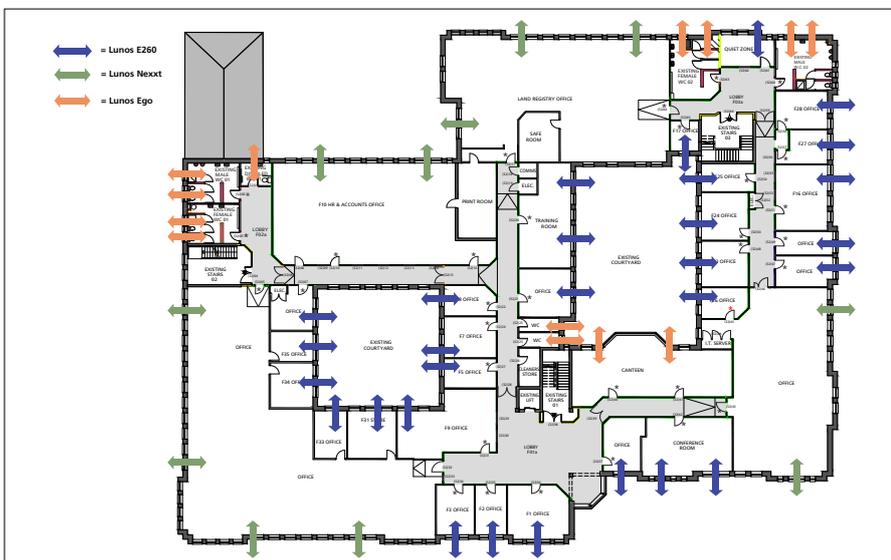
Clever extract systems, such as the LUNOS Silvento unit, can even respond to demand, increasing ventilation rates automatically in response to movement, humidity, time, temperature, CO2 or VOCs. While CO2 does not directly indicate Covid-19 in a room, it has been identified as a key indicator of poor air quality, and hence a CO2-sensitive ventilation unit can be a valuable tool in minimising transmission risk. The only obvious downside to such extract systems is that they do not recover heat, which can impact energy bills and occupant comfort.

Where budgets allow, mechanical ventilation with heat recovery is the best ventilation strategy to utilise in most occupied buildings. Such systems have all the benefits of an extract system, but in addition can recover

most of the heat from the outgoing air and use it to temper the supply air. This can be done through a variety of heat recovery methods, counter flow and regenerative heat exchange (see Image 2) to name just two. (See images previous page).

It is important to note that such heat recovery systems are not recirculating, and so the risk of Covid-19 transmission is not increased via the heat recovery process (recirculation of air is highly discouraged when attempting to minimise virus transmission). In practice, MVHR systems supply air at a higher temperature, keeping occupants comfortable, while significantly reducing the building's energy demand.

In one office renovation project Partel designed and supplied recently, it was shown that the LUNOS Nexxt



Full decentralised MVHR design for a large office building.

MVHR system reduced the energy demand for space heating by 76%.

**How disruptive is a ventilation upgrade?**

Achieving adequate ventilation for a new building is much less complicated than doing so in an existing one. Space can be allocated for the ventilation unit, while ceiling heights can be specified to accommodate dropped ceilings to hide ductwork. However, there are thousands of existing homes, business and education buildings across the country that are in desperate need of ventilation upgrades. If a home has mould issues, an office gets stuffy or students are struggling to stay awake during class, the building likely has inadequate indoor air quality.

While these effects were somewhat tolerable before, the correlation between poorly-ventilated spaces and Covid-19 super spreader events has prompted people to prioritise air quality. Luckily, there are systems on the market that are particularly suitable for retrofitting. Partel is the official distributor of the LUNOS ventilation system in Ireland and the UK. LUNOS specialises in decentralised CMEV and MVHR ventilation systems, which make them incredibly simple to retrofit. Indeed, there are several ventilation suppliers in Ireland who will design a system free – upgrading your ventilation system may be less disruptive than you think.

The *Lancet* Covid-19 Commission views the return to school as a “once-in-a-generation opportunity for health-based improvements to school buildings, such as improving indoor air quality”. I believe this statement can be applied more widely to all buildings. Covid-19 has highlighted the importance of indoor air quality and finally encouraged many homeowners, landlords and building managers to look for ways to improve ventilation.

Adequate ventilation is one of the key factors to minimising Covid-19 transmission and so should be given due attention. Ventilation strategies must be realistic, user-friendly and appropriate for each individual project if they are to be effective and, in my opinion, should also aid in the constant battle against climate change, a true global crisis in itself. ■