Buildings as Safe Havens

A Practical Guide

Guide

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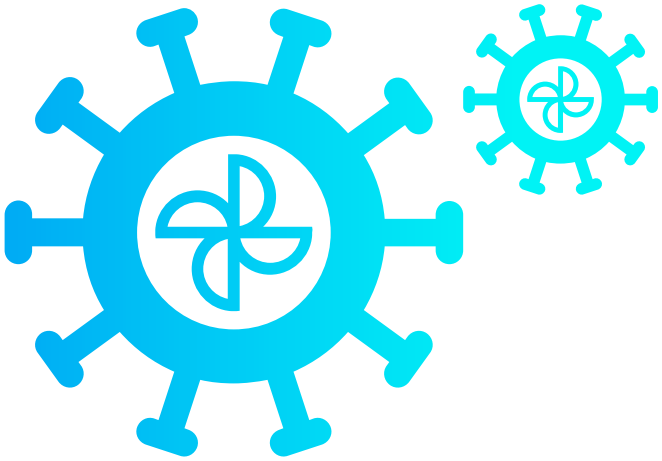
Foreword

by Professor Cath Noakes OBE

It is not surprising that reducing the risk of fires is the primary focus of what will be a torrent of primary and supporting legislation, but in truth, it is likely that the poor standard of building ventilation can be linked to many more deaths.

Covid-19 has been shown to be transmitted through the air. Even if only 10% of all Covid-19 related deaths could be directly attributed to the failure to adequately ventilate indoor spaces, that would be **more than 15,000** since the start of the pandemic - a shocking statistic that should make everyone sit up and take notice.



The pandemic has taught us a tremendous amount about the importance of better ventilation to make buildings more infection resilient. We now have clear epidemiological evidence that better ventilation reduces the risk of airborne virus transmission, and several studies for a range of diseases suggest the reduction in risk may be between 30% and 50%. But we have also known for decades about the link between good ventilation and better sleep, productivity, and a reduction in respiratory conditions such as asthma.

Computer modelling and analysis of outbreak data were key to understanding that we were facing an airborne threat from Covid-19 and allowed us to change tactics from focusing on cleaning surfaces. Subsequent studies have also revealed vital information about the possibility of room-to-room transmission in the most infectious cases due to the pressure differences that allow airborne pathogens to travel relatively long distances.

The most significant finding, however, is that far too many of our buildings are simply under-ventilated despite the clear guidelines and regulatory requirements that have been in place for many years.

The recommended ventilation rate of 10 litres per person per second of clean air is likely to be very effective for protecting health and well-being, but many buildings fail to achieve this level.

This means that we don't necessarily need new regulations, but it is essential that we improve our ability to achieve the standards already in place.

The challenge for every building owner and operator is not always to deliver more air, but the right amount of cleaner air.

To make buildings more resilient we need both short-term solutions and a long-term strategy. For example, local air cleaners based on HEPA filtration or UVC disinfection are important tools, but they are not an alternative to improving the general ventilation.

The wider problem is that most buildings in this country do not have any active ventilation management. At the top end of the market, the issue is well understood, and expertise is on hand to put best practice into effect. Now we must urgently expand our expert workforce to help the thousands of buildings that have no ventilation strategy and lack the information and expertise to prepare for the next health emergency...which will undoubtedly come.

That is why I am delighted to support the work BESA has been doing to raise awareness and provide free guidance to help develop greater competence and compliance across the ventilation industry.

Its suite of indoor air quality (IAQ) guidance is an invaluable tool in our strategy for developing a larger and more competent specialist workforce able to take the lessons we have learned about how ventilation can make buildings more infection resilient and turn them into practical measures.

This guidance is designed to give building managers a better grasp of the complexities of IAQ and arm them with the right questions to challenge the competence of their FMs and building services providers. It also explains the options available for different building types and will be invaluable in helping specifiers avoiding so called miracle cures for IAQ problems.

BESA is also supporting the efforts of the ventilation industry to raise awareness of the issue and emphasise the importance of only using suitably qualified practitioners and proven solutions when addressing this critical safety topic.

The concept of turning buildings into **'safe havens'** that reduce the risk of viral infections and respiratory illnesses is one we should all be working towards, and I commend the BESA working party for creating this guidance.

Professor Cath Noakes, OBE FREng FIMechE

is Professor of Environmental Engineering for Buildings at the University of Leeds and deputy director of the Leeds Institute for Fluid Dynamics. She also co-chaired the Environment and Modelling Group, a sub-group of the government's Scientific Advisory Group for Emergencies (SAGE) during the pandemic.

Introduction

Providing people in your building with clean, healthy air is increasingly important. So it's vital to ensure that systems in your building work to provide it. But the range of technology on offer can seem overwhelming and it can be a challenge to know where to start.

This Guide provides practical advice from the Building Engineering Services Association (BESA) on how to achieve and maintain good indoor air quality (IAQ).

It focuses on workplaces such as offices, schools and public buildings (rather than specialist laboratories or industrial plants). The aim is to make your building a safe haven with good indoor air quality and a plan to monitor and maintain that quality.

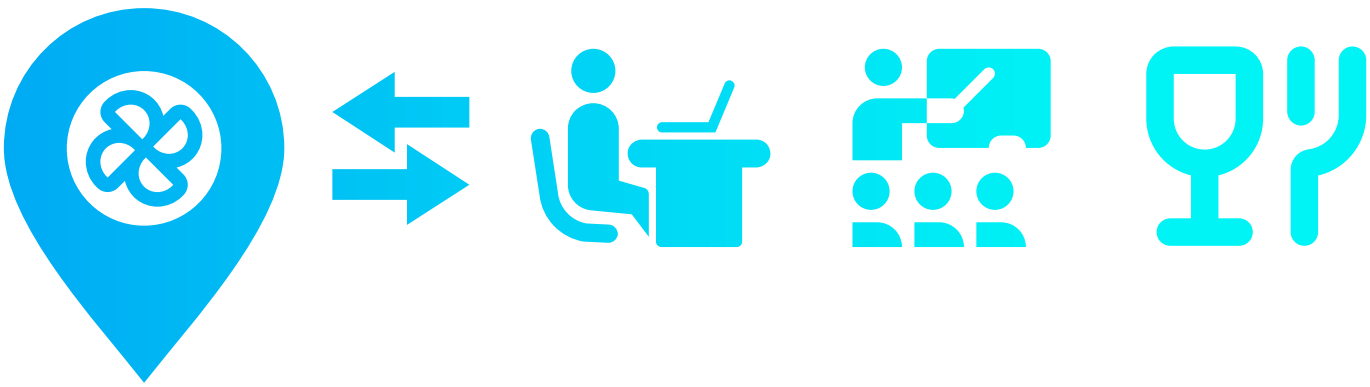
We take a step-by-step approach to getting the most from working with IAQ specialists, so that you can achieve the best results for your building.

Understanding the basic principles and types of equipment available means you can have more productive conversations about what you want to achieve for the quality of air in your building.

Recommended actions include carrying out a review to discover the main factors affecting air quality for occupants. BESA advises working through this process with your expert partner provider so that you can identify the methods and equipment that might be most suitable for your requirements.

At the end of this document, you will find an **IAQ Risk Assessment Form**. You can work through this with an expert to evaluate each room or zone being evaluated for IAQ risk factors. This will help you to identify where remedial work is required as soon as possible, or recommended for future budgeting

The guide will also help you to devise and deliver an **IAQ Strategy Document** for your building. This can be shared with your in-house maintenance team, or FM provider, to set out a clear policy and ongoing activity list to maintain IAQ in the long-term.



Some background

Indoor air quality and ventilation - what are they and why do they matter?

Studies from the UK government and the World Health Organisation recognise that the air we breathe has a significant impact on human health.

Pollution is also generated inside buildings for example by furnishings, finishes and materials off-gassing or shedding contaminants. The Covid-19 pandemic in the early 2020's has served to illustrate one very important example of contaminants introduced by occupants.

We discuss some of the main indoor pollutants later in this Guide, but you can find out more about IAQ and its impact on health in our publications *HW001 A beginner's guide to indoor air quality* and *HW002 BESA Guide to good practice: Indoor air quality for health and well-being*. These easy-to-read publications also explain some different types of contaminants found in our air - indoors and outside.

You have probably heard the term 'ventilation' a lot in the past two years, particularly in relation to reducing the presence of Covid 19 from indoor spaces. But what is ventilation and why does it matter so much?

Ventilation is the process of removing stale air from a building and replacing it with air from outside. There are several ways to ventilate buildings (which are outlined later in this Guide) according to factors such as building size and type.

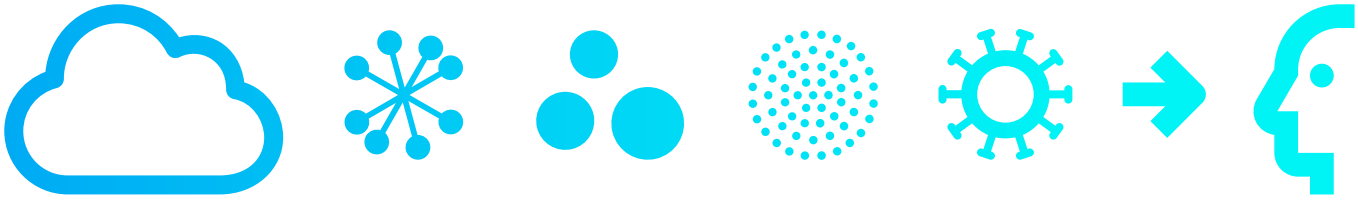
The main benefit of ventilation is that it supports good indoor air quality by flushing out airborne pollutants and contaminants from indoor spaces. However, the air that is introduced into the building must be clean and free of pollutants.

In fact, ventilation is now regarded as one of the most important investments building owners and managers can make for the health and productivity of occupants.

Government Chief Medical Adviser Professor Chris Whitty raised this very point at a conference in 2021:

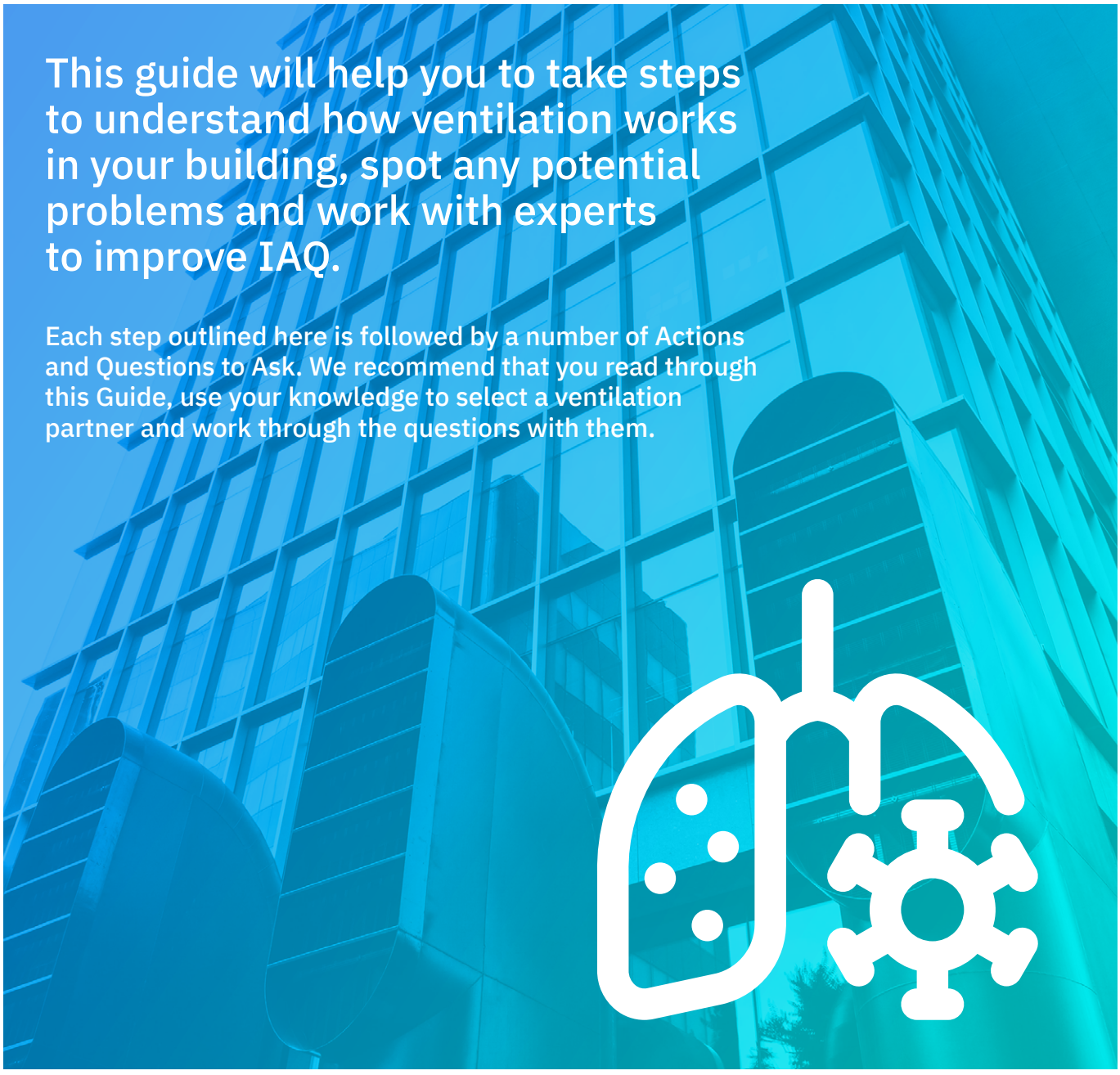
> **"We have realised the extraordinary importance of improving the ventilation of workplaces, not just for Covid but also for many other respiratory infections,"** he said. **"If we invest in that now, we'll both help the aftermath of Covid, but also cut down on things like flu outbreaks."**

Since outdoor air can be too cold, too hot, too moist or too dry, a careful balance needs to be drawn between comfort and the environmental and financial costs of controlling indoor temperature, humidity and draughts.



Buildings as Safe Havens

Better IAQ in your building



This guide will help you to take steps to understand how ventilation works in your building, spot any potential problems and work with experts to improve IAQ.

Each step outlined here is followed by a number of Actions and Questions to Ask. We recommend that you read through this Guide, use your knowledge to select a ventilation partner and work through the questions with them.

Step 1:

Understand air quality in and around your building - gather data

The first stage to improve indoor air quality is to understand the current IAQ in your building.

This means assessing air quality levels inside and outdoors around your property. It may be possible to find public sources of information on outdoor air pollution in your area.

Or to assess pollution through an initial survey and measurement. Ideally, measurement should be continuous, to track progress and to spot any problems.

Monitoring equipment

There is a growing range of affordable air quality measurement technologies on the market.

Hand-held devices are useful for tracking down the source of problems, but for continuous monitoring it is sensible to consider having monitors installed in and around your building.

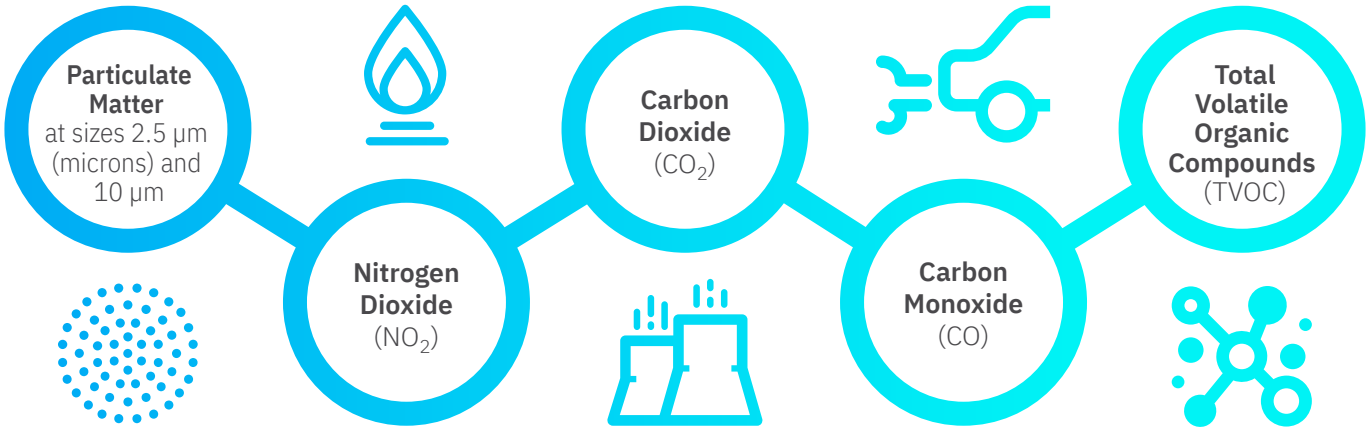
There are some quality assurance schemes for air quality monitors which can help to identify products that will provide reliable information. One example is the RESET Air Standard.

BESA also recommends avoiding monitors which estimate the presence of pollutants such as carbon dioxide (CO_2) by reference to other factors such as total volatile organic compounds (TVOCs) using software only or which claim to indicate mould contamination by reference only to relative humidity. These approaches may produce inaccurate data.

More reliable CO_2 monitors use Non-Dispersive Infra-Red (NDIR) measurement technology. This equipment may be slightly more expensive but will provide significantly more accurate data.

What to measure?

Today's monitoring technology can measure a wide range of contaminants. However, unless your building has local issues, that you are aware of, it may be best to concentrate on a smaller range of easier-to-measure pollutants at the outset:



See the BESA Guide to good practice:
Indoor air quality for health and wellbeing for more information on monitoring contaminants.

Step 1:

Understand air quality in and around your building - gather data

Outdoor - air around your building

The quality of air outside a building affects what happens to the air inside. For example, if a school is close to a main road, heavy traffic can increase particulate matter or exhaust fumes (NO_2) inside the building. And it's not only buildings in cities and towns that can be impacted by outdoor pollution. Chemicals such as fertilisers and pesticides used in the countryside can also have an impact on the IAQ in rural buildings.

Measuring the quality of outside air is therefore helpful for long-term IAQ strategies. For instance, it can identify periods during the year or day when outdoor pollution reaches high levels. This means that the facilities team can anticipate when windows need to be closed and mechanical ventilation adjusted to meet ventilation needs, or instance.

Information on outdoor pollution is available from the government website, **uk-air.defra.gov.uk**. Since 1997, local authorities in the UK must review air quality in their area.

Where they are unlikely to meet national standards, they must declare an Air Quality Management Areas (AQMAs) which sets out a plan for cutting pollution levels. A list of AQMAs can also be found on the DEFRA website.

Where and when to measure?

Ventilation and IAQ specialists will be best placed to locate monitors and around your building. There are many factors which affect air movement (and the pollutants in it) around a space, such as position of the room in a building, height of a space or type of ventilation system. Positioning monitors correctly ensures that you have a clear understanding of indoor air quality - and can spot where there may be problems.

It is ideal to monitor indoor and outdoor air quality over a longer period in order to get a full picture of how IAQ changes and what external factors such as heavy traffic during rush-hour are having a significant impact. Again, this is something that your partner supplier expert will advise on.

Benchmarking your results - what should good IAQ look like?

Measuring air quality in and around your building is a crucial first step. But it is also important to have a benchmark for comparison to understand where improvements might be required.

Requirements for removal of contaminants in the air are included in the Building Regulations (Part F in England and Section 3.14 of the Scottish Building Regulations 2020). However, these rules establish ventilation rates rather than offering an indication of acceptable levels for different indoor pollutants.

The World Health Organisation provides guidance on acceptable target levels and there are other voluntary schemes such as the WELL Building Standard or AirRated which offer indoor air quality benchmarks.

BESA publication HW002: Guide to good practice: Indoor air quality for health and well-being includes a table that shows the recommended levels of common contaminants that is a useful benchmark when measuring IAQ.

Step 1 Actions:

- **A1** Decide what elements of IAQ you need to monitor and focus on specifying monitors that meet recognised standards such as RESET.
- **A2** Ideally, IAQ monitoring should be a continuous activity in your building, so speak to your partner supplier about monitors that will provide quality data over the long-term.
- **A3** Data analysis is vital for understanding and managing your building IAQ. Ensure that your monitoring system has a way to collect, store and provide analytics, preferably via a remote dashboard.
- **A4** If your building has a building management system (BMS), it may be useful to consider linking your monitoring activity to it, although this may require some third-party integration.
- **A5** Use the benchmarking table above to understand the status of your IAQ, and take the actions outlined in this Guide, working with your contractor partner to improve IAQ.

Step 1 Questions to ask:

- **Q1** What contaminants/pollutants do these monitors measure?
- **Q2** Do these devices meet RESET standards?
- **Q3** What is the lowest detection limit and level of accuracy at that limit for the contaminant of interest and how does that compare with the target for that contaminant?
- **Q4** How is the monitor calibrated?
- **Q5** How is data collected from the monitors?, Who is analysing the data - and how is that information presented?
- **Q6** Can these monitoring devices link to my BMS (e.g. through an open protocol such as BACnet) or will I need third-party integration to my BMS?

Step 2:

Conduct a building review - identify improvements

A review of your building means you can get know what aspects of its design and systems are helping (or hindering) the air quality inside.

BESA recommends working through this review with an IAQ expert who can provide technical insights.

You can record the results of your review using the **Building Review Spreadsheet** at the end of this Guide.

The importance of zones

Different areas of a building are used for various activities, and sometimes by diverse types of occupants. If we think of a school, for example, it includes classrooms which may be occupied by more than 30 students and a teacher for most of the day; there may be an assembly hall or gym for sports which is occupied by larger groups once a day; and there may also be on-site kitchens or a separate staff room.

In an office building, you may have some open plan areas, along with meeting rooms, a staff kitchen, and an atrium.

It is useful to review these areas as separate 'zones'. This approach allows you to consider different issues which affect indoor air quality in these areas. If new equipment is needed to improve IAQ, each area may benefit from different solutions.

It is almost certain that each zone will need a unique approach to measurement and maintenance to ensure good IAQ.

The table included in this guide allows for as many zones as you need. The aim is to ensure the project is manageable by your team. For example, where classrooms are all a similar size, it is not necessary to consider each one a separate zone. However, it may be sensible to classify specialist areas such as laboratories, metalwork rooms or home economics areas separately as they are used for activities which may produce specific contaminants.

Similarly, in offices where there are specific areas for photocopiers or printers or perhaps an in-house server room with requirements for IT cooling, these should be considered separate zones.

Step 2 Actions:

A1 Use the table in this Guide to carry out a review of your building - work with your expert supplier to ensure technical points are covered.

Step 2 Questions to ask:

Q1 Do I need a monitor in each zone?

Q2 How do I identify the data for each zone?

Step 3:

Plan and prioritise improvements

The **Building Review Spreadsheet** is designed on a traffic light system: **Red**, **Amber** and **Green** - and works in tandem with the **IAQ Monitoring Spreadsheet**.

Urgent actions are highlighted in Red

The Amber category indicates activities which should be included in medium-term improvement plans

Green means that the standard achieved is acceptable and should be maintained going forward

For example, IAQ monitoring for an office close to a main road may indicate that during periods of heavy traffic during rush hour, particulate matter increases significantly inside the building.

You may also note from your building review that meeting rooms facing the road do not currently have ventilation systems with modern filtration.

This would be deemed a 'Red' priority as particulate matter is a danger to occupants and filtered air is necessary to bring IAQ in that zone to an acceptable level.

Selecting the right equipment for your IAQ requirements is essential. As indoor air quality has risen up the government and business agendas, the number of products on the market has grown - along with claims for performance that may not be all they seem, as the market is unregulated.

Our next section offers some insights into technologies that support good IAQ in buildings to help you identify what best suits your needs and your budgets in the long-term.

Step 3 Actions:

A1 Use the Building Review and IAQ monitoring results to identify priorities for improving IAQ where necessary.

A2 Work with your supplier partner to establish a timetable that deals first with the 'Red' urgent actions - this may mean reducing the ingress of harmful pollutants from a busy road, for example.

A3 Check whether you require improvements to your existing equipment (e.g. new filters for ventilation systems) or additional tools to support IAQ in your building.

A4 Check if it's possible to change building use patterns to improve IAQ. For example, moving classes to different areas of the school at different times of day; or ventilating rooms between classes.

Step 4:

Invest for the future - select the right technology for your building

No single piece of equipment will guarantee good indoor air quality in a building. Achieving and maintaining good IAQ is a question of understanding what needs to be achieved (by identifying the unique issues affecting your building) and putting together a system to address those issues.

Every building is different, so the solution must be a best fit for your circumstances. Your expert supply partner will be able to discuss and recommend appropriate solutions.

Whatever equipment is specified, it will work at its best if it is accompanied by a commitment to continuous monitoring, maintenance and IAQ improvement, which means developing an **IAQ strategy** for your building and its occupants.

The key technologies to achieve good IAQ

Monitoring equipment

This should be an early purchase if your building does not currently have equipment that can measure and monitor the main contaminants mentioned in Step 1 of this Guide. Monitoring is not confined to the early stages of an IAQ improvement process - it is an ongoing requirement for maintaining indoor air quality and occupant health.

The RESET Air Standard website provides a list of accredited monitors for indoor, outdoor and in-duct applications, including details of what each monitor will measure. The focus of the RESET Air Standard is to collect accurate data across five main parameters: PM2.5, TVOC, CO_2, temperature, and humidity. Grade B monitors are suitable for use in commercial buildings as they provide 'actionable indoor air quality data at scale'.

Step 4:

Invest for the future - select the right technology for your building

Collecting data on air quality in and around your building is only the first step in the monitoring process. Collating and analysing that data to create actionable information is key to successful IAQ management.

It is therefore important to consider this point when selecting monitors. They should be able to integrate with your building management system (BMS) or allow the data to be collected centrally (either on-site or by a service provider).

Systems should allow for clear visibility of the data, so that any peaks in contaminants or changes in IAQ can be quickly spotted. Approved Document Vol. 2 (2021) calls for CO_2 monitors to be mains-fed, but modern battery-powered equipment can be reliably substituted, provided that there is a low-power warning and a maintenance regime to refresh batteries.

In the long term, harnessing IAQ data to a modern control system means that it may be possible to send automatic notifications to the facilities team to act on an IAQ issue, reducing the impact on occupant health or comfort. This will depend on the capabilities of your building management system, but investment in this technology can pay dividends in terms of better indoor air quality.

Another important benefit of data collection and management is that it becomes possible to measure the impact of implementing IAQ improvements and translating that into energy savings and productivity enhancements within your organisation.

Collection and use of data will be central to developing an IAQ strategy and putting it into action. In Step 5 of this Guide, we will consider the main elements of a strategy, which should inform the selection of your data collection and analysis tools.

Questions to ask about monitors and monitoring:

Q1 Who will maintain the monitors?

Q2 How will the accuracy of the monitors be maintained? Are they self-calibrating?

Ventilation

Ventilation is the bedrock of good indoor air quality. Its function is to remove stale air from a building and to introduce outdoor air into the space. Part F of the Building Regulations makes ventilation a legal requirement for buildings, and there are several approaches used, depending on the type and design of a building.

Natural ventilation

Natural ventilation supplies air to and removes air from a building without the use of mechanical equipment such as fans. This can include simply using the windows in the building to open when required.

Some buildings are designed to use natural processes such as cross ventilation (where air is 'pulled' through a building by natural air movement and buoyancy).

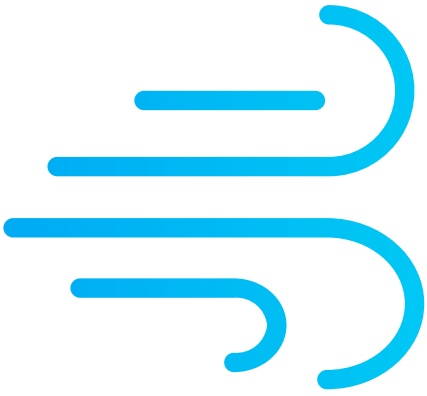
Natural ventilation systems can include features such as trickle vents above windows; solar chimneys to draw warm air up and out of a building (pulling in cooler air at a lower level); or wind towers.

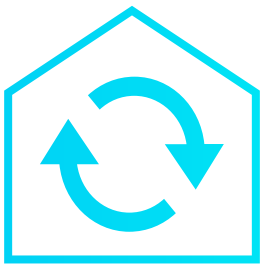
Benefits:

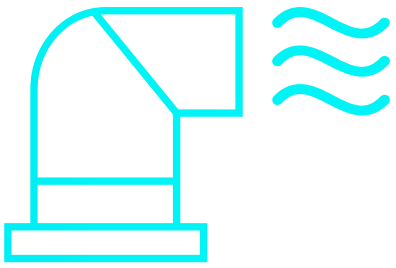
- No mechanical parts which reduces system energy use, and therefore energy costs
- Few moving parts also reduces the need for maintenance
- Lower embodied carbon (compared to mechanical ventilation systems

Drawbacks:

- Difficult to adopt in an existing building
- Less control over ventilation rates (e.g. if there is a need to increase ventilation rates as per Part F Building Regulation requirements)
- Dependent on overall building design for successful operation







Step 4:

Invest for the future - select the right technology for your building

Mechanical ventilation (and MVHR)

Mechanical ventilation makes use of fans and other equipment to move air into and out of a building. Ventilation systems are often driven by equipment such as air handling units (AHUs) connected to ducts which run throughout the building. Some systems use the energy from warm, extracted air to pre-heat air entering the building - known as mechanical ventilation with heat recovery (MVHR).

The benefit of this approach is that MVHR systems simultaneously extract stale air from a building and provide a supply of filtered air. While doing this, the units simultaneously recover valuable heat energy for maximum efficiency. MVHR units can also include filtration of pollutants such as NOx and particulate matter to improve IAQ. The filter specification should be reviewed critically as many designs are supplied with, or only capable of running low-efficiency filtration. Some units can be equipped with carbon filters to remove a portion of gas-phase pollutants such as nitrogen oxides.

Some areas in buildings may require specialist ventilation systems for extraction of humidity (for example in kitchens, school laboratories or wet rooms) or other contaminants. These areas may be subject to health and safety regulations, and should be discussed with specialists.

Benefits:

- Ventilation rates are controllable and predictable
- MVHR is an energy efficient approach to ventilation
- Mechanical ventilation systems can be more easily retrofitted to existing buildings

Drawbacks:

- Capital cost for equipment and installation
- Maintenance costs - ventilation ductwork cleaning; AHU servicing etc

Questions to ask about your ventilation system

Q1 Do you have natural or mechanical ventilation?

Q2 Is the system currently in a good condition?

Q3 How old is it?

Q4 Do you know the rate (in litres per second) at which air is entering the building?

Q5 Who currently maintains the system?

Q6 Is there reasonable access for maintenance for work such as replacement of filters, cleaning ductwork and general plant maintenance?

Q7 Can filters be upgraded without affecting system performance?

Q8 Are the internal grilles the correct type?

Q9 Do you have fire dampers or volume control dampers (VCDs) in the system?

Q10 Have the system air flows been commissioned in the last 12 months?

Q11 Should you consider upgrading to a more efficient system?

Step 4:

Invest for the future - select the right technology for your building

Air conditioning

Air conditioning is generally used to cool or heat an indoor space. The objective is to improve comfort conditions for occupants. Air conditioning is also used to cool specialist zones such as IT server rooms, for example. While ventilation is at the heart of indoor air quality, air conditioning can help to ensure that indoor temperatures are comfortable throughout the year. Air conditioning can also remove humidity from the air, which protects indoor air quality by reducing the potential for mould contamination.

Air conditioning systems can also be fitted with filters (see our section below) to help remove pollutants from indoor air. Modern air conditioning filters can eliminate a range of contaminants including viruses, and enhance the filtration provided through the ventilation systems. One important point to note about air conditioning systems is that they are not an alternative to ventilation. Systems which recirculate air can have a negative impact on indoor air quality, so it is vital to work with your supplier to ensure that the air conditioning system supports your IAQ strategy, rather than hampering it. There are several types of air conditioning system used in the UK. The specification of a system is dependent on the size and requirements of the building.

Benefits:

- Air conditioning offers temperature and humidity control, supporting occupant comfort
- Prevents overheating in the UK's increasingly warm summer months
- Can enhance filtration of indoor air

Drawbacks:

- Energy use of air conditioning and related operational costs
- Regular maintenance required to ensure optimal performance
- Air conditioning is not an alternative to ventilation and the system must support your IAQ strategy.

Questions to ask about your air conditioning system:

Q1 What is the age of your system? And its current condition?

Q2 Is the system being serviced by qualified and competent providers (e.g. F Gas certified)

Q3 Do the controls work correctly?

Q4 Do users understand how to use the controls?

Step 4:

Invest for the future - select the right technology for your building

Filtration and air cleaning

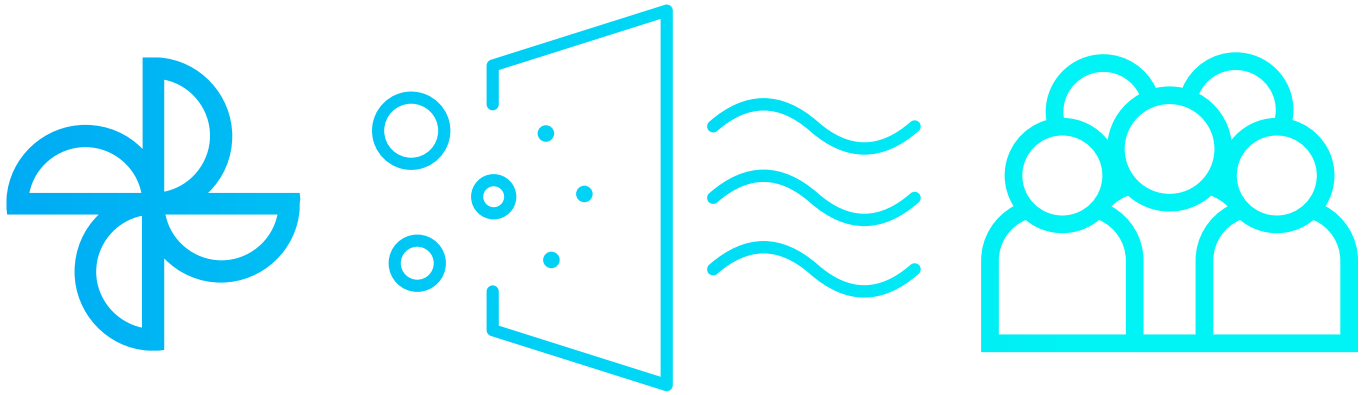
Filtration is one of the most important factors in achieving good indoor air quality. Filters in a ventilation system remove unwanted contaminants from the air as it enters the building. The importance of filtration has been widely recognised in the past few years, and there is now a convergence of standards and guidelines which help to identity the best filters for a building's requirements.

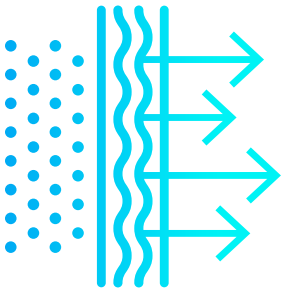
The global technical standard ISO 16890:2016 sets out three efficiency classes for filters, based on the size of particles that they remove from the air:

ePM1	**Best performing efficiency filtration, removing the smallest particulate matter from the air in HVAC systems**
ePM2.5	**Intermediate efficiency filtration**
ePM10	**Lowest efficiency filtration**

If your building has a supply air system in place, it is essential to check that filtration is included and at what quality. Upgrading to modern, high-quality filters can make a significant improvement on IAQ by removing many outdoor pollutants from air before it enters the building.

Depending on the type and age of your ventilation equipment, it may be possible to retrofit new filters without too much disruption to building operation. There are several filter technologies available on the market today, each has their own benefits and suitability for different types of building.





Panel filters

Panel filters are usually used as a prefilter in ducted housings and air handling units (AHU's). They are usually used for removing larger particles from the air above 5 microns in size. They are not so effective at removing health-damaging PM1/PM2.5 fine particles and need more frequent changing when compared with bag filters.

Bag filters

Bag filters are the most common air filters found in ventilation systems. These filters are found in ventilation systems where supply air is being drawn into the building (removing contaminants from outdoor air) and where stale air is being rejected from the building (this can help to protect air handling units). Bag filters designated ePM1 will be 50% to 95% efficient at removing PM1 fine particles.

HEPA filters

HEPA filters are high-efficiency particulate air filters and often used in critical air system applications such as laboratories, clean rooms and operating theatres. They are very effective at removing airborne virus particles and fine combustion particles such as the toxic particles from traffic emissions. These filters will remove close to 100% of PM1 particles so they offer effective removal of virus particles and toxic traffic combustion particles.

Carbon Gas filters

Carbon Gas filters are used where the air contaminant is a gas rather than particles. For example nitrogen dioxide (NO_2) is a traffic air pollutant identified by the World Health Organization as a pollutant of concern. Carbon filters with the correct design can remove NO_2 from the building supply air with a typical efficiency of about 90%.

Questions to ask about filters and filtration

Q1 Does my ventilation system have the correct filters for my needs?

Q2 Can I retrofit filters to my existing ventilation system without too much disruption?

Q3 Are the filters in place also supporting good energy efficiency in the ventilation system?

Q4 What are the lifecycle costs of the filters? If considering changing filters, ask about the impacts on energy use

Q5 Will the air be cleaner if I use more than one filter or one filter several times? There is a strong technical argument for multi-stage filtration for cleaner, safer air.

Q6 Are the filter mountings correct? Well sealed gaskets and tight retaining clips will prevent ‘air bypass’

Step 5:

Maintaining good IAQ - buildings as safe havens

Maintaining good indoor air quality is a process and should be based on a clear strategy which is shared with in-house facilities teams or external service providers.

The aim is to establish IAQ standards for the building, and to create an ongoing loop of monitoring, feedback and response to maintain those levels over the long-term. While this guide has focused on technology selection, it is equally important to remember that involving people in the strategy will be key to success.

The strategy should be adopted by those responsible for building services maintenance but getting buy-in from occupants will also be helpful. If people understand the benefits of good IAQ, they are more likely to support the activities of the facilities team.

Step 5 Actions:

A1 **Establish a plan for monitoring IAQ, including an action plan**

- Define FM responsibilities and stakeholders
- Details of ventilation strategy
- Details of IAQ monitoring process: equipment used; how data is collected and analysed; how information is distributed to the right team members to take action
- Building maintenance schedules
- Tenant reporting process
- Regular building performance reviews

A2 **Establish a purchasing policy for the building which supports IAQ. Consider items such as:**

- Building finishes - what contaminants / pollutants arise from paints, woodwork etc
- Cleaning products - consider switching away from harsh chemicals
- Renovation and construction work procurement - how can IAQ be protected during building maintenance and repair works

A3 **Undertake regular IAQ team reviews and develop a feedback loop to keep the IAQ strategy up-to-date and operational. Important points to include in reviews are:**

- FM stakeholders to meet and review performance
- Assess IAQ performance seasonally - especially year 1
- Review IAQ & Green Purchasing Polices
- Review results, create actions and set future goals
- Report results to occupants and set out future goals

Step 6:

Finding the right advice

Establishing a successful indoor air quality strategy for a building means working with experts who can support your goals.

Good IAQ requires a high level of coordination between systems and teams, so finding the right people to work with is crucial for success. BESA members are independently assessed to a high level of technical competence, commercial capability and best practice in health and safety. The aim of the Association is to provide peace of mind for clients who work with members.

You can find a full list of our members at:
thebesa.com/find-a-besa-member/
and search under 'Indoor Air Quality'
to find a specialist in this field.

Buildings as Safe Havens

Risk Assessment of Indoor Air Quality (IAQ) Form

Twenty Nine

Risk Assessment of Indoor Air Quality (IAQ)

A risk assessment sheet shall be completed for each fan coil unit or group of units in a common zone to account for local zone issues such as temporary screens which will divert/disrupt air patterns, the use of oscillating louvres, etc. This risk assessment applies to uses where the occupancy is of a sedentary nature only. Higher respiratory occupancy raises the risk of contamination of air in the zone considerably.

Client / Site Location	

Part 1 - Stop

Before you start	Yes	No	N/A
Are you authorised and qualified to evaluate the IAQ?			
Have you read the BESA IAQ Guides?			
Have you measured mechanical supply air volumes into the zone?			
Are the supply air volumes into the zone recorded anywhere? (Logbooks, O&M Manuals, etc., for example)			
Does the supply air volume meet or exceed the minimum requirements of CIBSE Guides A and B? (See below for guidance on this)			

CIBSE Guide A suggests a minimum supply air rate of 10 litres per second per person for office applications.

A minimum of double the normal air supply rate is needed periodically (during pandemics, for example) and as much as reasonably practical or possible is recommended. If the normal ventilation rate cannot be achieved then consideration shall be given to using localised air cleaners such as UVC mobile units.

Is the IAQ being monitored continuously to determine peak periods where the IAQ levels are approaching or have reached poor levels?			
Are the IAQ readings always at a "safe" level?			
Has the zone had any risk assessment carried out by you or other parties resulting in seating plans or occupancy level control measures?			
Has any seating plan taken into account air flow or discharge from fan coil units?			
Is a fan coil needed to assist the distribution of the supply air being introduced to the zone?			

If answer is 'No' to any of the above, take required action or report to your supervisor. If in doubt ask!

Part 2 - Think

Safety and Health Assessment (if the hazard is present tick the box)	✓
Warning levels being triggered on monitors occasionally	
Warning levels being triggered on monitors regularly or constantly	
Insufficient supply air available	
Insufficient air movement or distribution of the supply air within the zone	
Other risk identified (State below)	

Circle any ticks for hazards that are significant and for which there are no (or inadequate) controls

If you have circled any hazards, Part 3 needs to be completed and additional controls put in place before systems should be used.

Risk Assessment of Indoor Air Quality (IAQ)

A risk assessment sheet shall be completed for each fan coil unit or group of units in a common zone to account for local zone issues such as temporary screens which will divert/disrupt air patterns, the use of oscillating louvres, etc. This risk assessment applies to uses where the occupancy is of a sedentary nature only. Higher respiratory occupancy raises the risk of contamination of air in the zone considerably.

Client / Site Location	

Part 3 - Act

Additional Safety Assessment (continue on separate sheet if required)

Hazard (Circled from Part 2)	Control Measures / Precautions	Remaining Risk (H / M / L)

Name	Signature of employer or self employed person
Date	

Part 4 - Review

End of Job Review	Yes	No
Are there any lessons for next time?		
Has the work created any new hazards		

If you have answered 'Yes' to either of these questions, make a brief note below and tell your supervisor.

If you have identified significant hazards in section 2 and been unable to fully address or mitigate them in section 3 then further action may be required to mitigate against poor IAQ.

Risk Assessment of Indoor Air Quality (IAQ)

Continuation sheet for further details if needed

Client / Site Location	

Name	Date

Continuation Sheet

Buildings as Safe Havens
A Practical Guide

Acknowledgements

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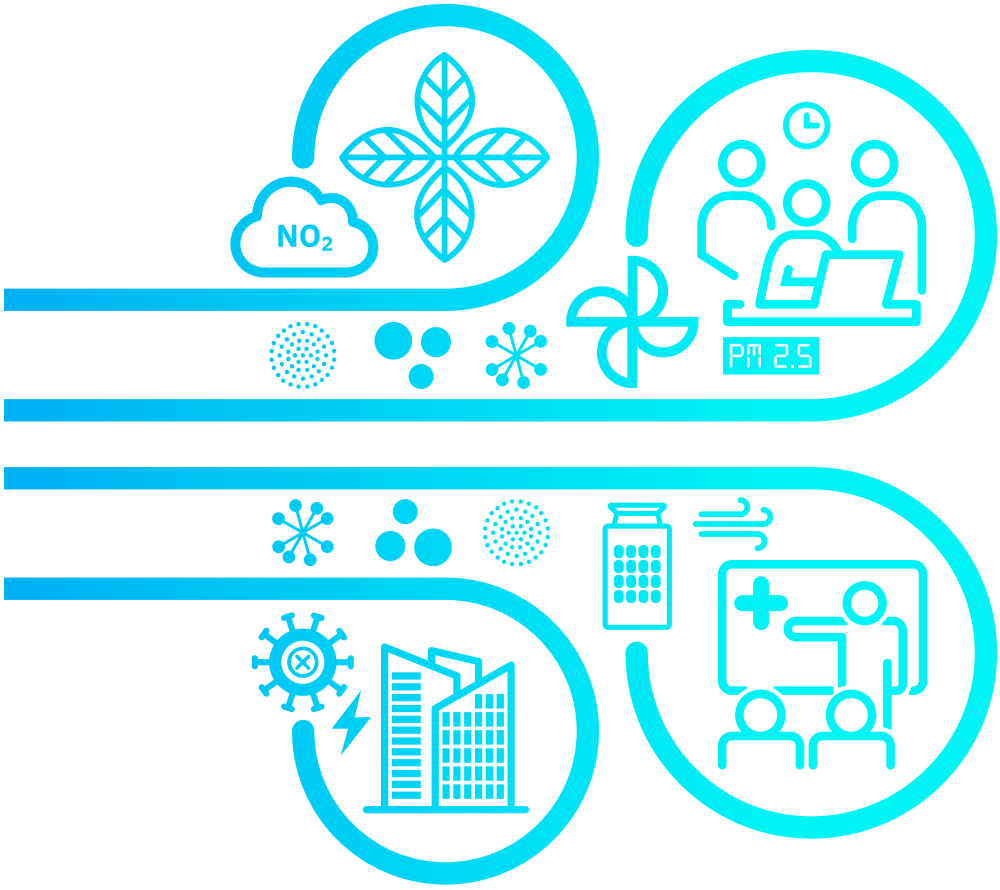

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Note: Refer to 'Installation Manual' and 'Instruction Book' for further 'Technical Information'. The fuse rating is for guidance only and please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrician/electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:675), R407C (GWP:1774), R134a (GWP:1430), R513A (GWP:631), R454B (GWP:466), R1234ze (GWP:7) or R1234yf (GWP:4). *These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No.626/2011 from IPCC 3rd edition, these are as follows. R410A (GWP:1975), R32 (GWP:550), R407C (GWP:1650) or R134a (GWP:1300).

Green Gateway
www.greengateway.mitsubishielectric.co.uk
Mitsubishi Electric UK's commitment to the environment

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