The Indoor Air Quality Guide and Canvas

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About this Guide

This guide has been produced by the British Property Federation's Technology and Innovation Working Group as a preliminary guide to clients as to how to define and articulate intentions around improving air quality in leased commercial buildings. The guide has been defined for the following reasons:

- Indoor air quality has become more pivotal to the operations of real estate customers since the advent of Covid-19
- Indoor air quality can deliver a range of benefits, with some being more empirically supported than others, and this guide signposts to reputable sources of information in delivering those goals, while encouraging the weighing of goals and options
- it encourages the framing of a coherent briefing of the outcomes a client wants to achieve for delivery by technical experts

The information contained in this guide is of a general nature and should not be considered advice or relied upon for any business decisions. The authors have sought to provide up-to-date information but no liability is accepted for errors in the content when published or in the future.

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Why Air Quality?

Indoor air quality has been subject to standards to preserve human health for some years, but it is only more recently that there has been a rise in interest in using indoor air quality to deliver enhancements and benefits. Research has shown that indoor air quality within commercial buildings in some urban areas may be significantly inferior to that of exterior air quality.[1] The study of outdoor air quality, and rule-setting, has outpaced that of indoor air quality partly because the effects of outdoor air quality have at times been historically more visible and the relative ease with which outdoor standards can be defined. Yet, indoor air quality problems are becoming recognised internationally as an important risk factor for human health[2] and one that has a more pronounced effect upon those who are health impaired, the elderly or the very young. With the advent of Covid-19, it is becoming seen as an important way to help to make workplaces safe for return by using indoor air quality management as a means to mitigate the risk of transmission.
Sources of detriment to human health are varied in buildings but can exist in the form of:

- allergens
- particulates
- volatile organic compounds from surfaces, coverings, equipment such as printers and decorative materials
- higher concentrations of certain gases than normal (e.g. nitrogen dioxide, carbon monoxide and sulphur dioxide)
- The presence of harmful gases due to local conditions (e.g. radon)

The most effective ways [3] to address the above sources of detriment are through:

- pollution source avoidance
- adequate ventilation
- air filtration

More recently, there has been a growing interest in improving indoor air quality for the enhancement of human health. Standards such as Well[4] have declared the ancillary benefits of better air quality in workplaces.

How to use this guide?

This guide is primarily intended to help improve air quality in existing buildings through managerial approaches and better monitoring. However, the approach set out can be applied to help client teams to think about air quality at design or major renovation phases of the building lifecycle. It is not intended as a means to develop or a substitute for a technical briefing, but it is intended to provide a useful thought process for decision makers and implementers within real estate companies to deploy to consider options for improving air quality, and then convey those requirements to technical teams.
The canvas within this document can be used as a means to curate discussions around framing internal air quality requirements. Each square on the canvas is supported by some further guidance and signposting to useful materials within this guide.

1 https://www.cibsejournal.com/technical/learning-the-limits-how-outdoor-pollution-affects-indoor-air-quality-inbuildings/
2 https://www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications/2010/whoguidelines-for-indoor-air-quality-selected-pollutants
3 https://standard.wellcertified.com/air
4 https://standard.wellcertified.com/well

Your Goals

Air quality will rarely be a goal in and of itself but a means to an end. It is first important to consider why you are choosing to improve air quality. This clearly is distinct from the means you might choose to achieve an improvement in air quality, but will provide an anchor to your entire thinking and framing of your brief. It will help you to determine who needs to be involved, what resources you will need and how you will know if you have been successful. It is recommended that you start with this square on the canvas.

You can have ancillary goals to be achieved through improving air quality. You might choose to team energy efficiency improvements with air quality improvements. If that is the case, you may need to consider what the likely effect of choosing to improve energy efficiency would be - for example, some installations would be more energy efficient than others.

Consideration of activities needs to be framed also in terms of constraints, so that these can be navigated where necessary. If regulatory permissions are necessary or occupiers need to give consent, this will affect timings and may need to be pursued once a technical brief has been assembled.

Communicating Your Goals

Improving air quality in the building may be something you wish to communicate to your customers, even if you do not require their consent. This may be because they have their own CSR reporting obligations, and/or report to their employees on standards in the workplace. It is useful to convey this information in a format that is useful to the customer where possible; this is especially true in the case that a consent is required where communicating the benefits of the actions being undertaken will not only help to secure consent but help secure buy-in.

Involving Customers

There may be improvements that require actions on behalf of customers and these should be communicated at the earliest available opportunity. If options can be presented to the customer, and their implications, all the better. This distinguishes between permissions and buy-in; encouraging the customer to participate where possible will be beneficial when it comes to maintaining the benefits of improvements, ensuring adequate maintenance and maintaining customer satisfaction.

There may be some instances in which sensors and other monitoring would be appropriate for the purposes of maintaining air quality if they were situated in customer-controlled spaces. This is certainly something that would need customer consent, but it is important that the implications are spelled out. For example, consent to install sensors is problematic if it is not accompanied by buy-in to ongoing activities around ensuring that improvements to air quality are delivered and maintained through management and maintenance action. While there are few processes that exist to ensure a straightforward resolution to the above, we suggest that where an improvement in air quality is driven by the owner, a without prejudice conversation should be held at an early stage (i.e. before or during the drawing up of a client brief). This can be followed-up with a more formal conversation when a technical brief is assembled, but avoids nugatory costs if the customer is not minded to cooperate at an early stage.

If progressing from occupier to owner, given the owner's involvement in running building services and consents required for alterations, brokering their involvement will be critical.

Both owner and customer may need to be mentally prepared in either scenario for unplanned issues to be detected that may require remediation, and which may have costs associated with them.

Framing Requirements of Supply Chains

Maintaining air quality is likely to have an ongoing implication for:

- building management
- asset management
- customer relations
- facilities management
- data capture, processing and interrogation
- any ongoing reporting obligations (e.g. to the company CSR reporting)
- The occupier – may require behavioural changes

It is important to consider in outline where responsibilities would lie at the stage of pulling together the client brief. Some obligations may be one-off (e.g. in the case of a project involving the installation and commissioning of new plant) but there may be ongoing obligations in terms of maintenance and monitoring that need to be clearly assigned to avoid inertia and a lack of follow-up.

Framing Objectives

Attaining understanding of operational building performance may be the primary motivator for seeking an improvement to air quality, or it may be that air quality goals have manifested for another reason (e.g. a desire to seek a building sustainability certificate such as Well). In the latter case, getting an understanding of how the building currently performs will be necessary in order to understand the potential for improvement.

While there may be qualitative goals associated with improving indoor air quality, it is likely that you will wish to have some quantitative KPIs so that you can track progress over time. With some goals, both will be inherent (e.g. in the case of seeking a certification standard like Well) but in the absence of compliance with a set framework, you may wish to relate KPIs to building performance metrics you have available to you and which are within the range of attainment.

The WELL requirements include suggested KPIs, but it may also be possible depending on the building design, including building management system (BMS) capabilities to assist in monitoring progress .[5]

Procurement Choices

There are a number of steps that can be taken to improve air quality simply by making different choices in the course of providing services. For example, cleaning hours can be altered and products used can be switched for ones that contain fewer counterproductive agents to indoor air quality.

Similarly, mitigatory measures can be taken to control dust and other pollutants arising from construction works, and measures can be taken on completion of works to purge spaces of remaining pollutants (e.g. via an air purge).

Consideration can be given to replacement of surfaces and coverings for ones that both contain fewer pollutants such as VOCs, but also are less absorbent of agents that may be present in the internal air (e.g. soft furnishings involving fleecy coverings).

5 https://v2.wellcertified.com/v2.2/en/air

Maintenance Choices

Internal air quality in practice should match with realities. This is not only to ensure that investment in internal air quality achieves results, but also to deliver on other benefits such as:

- ensuring that legislative and standards-based obligations are delivered when they concern building services and systems
- maintaining compliance with relevant legislation concerning health and safety in the workplace
- ensuring that plant and machinery is operated according to warranties and within parameters
- ensuring that customers are obtaining benefit from any actions taken

There may be splits in responsibility between the client and customers in plant and machinery which requires maintenance. Achieving whole building internal air quality may require supportive materials such as a green lease or ancillary agreement to coordinate activities. However, in procurement terms, separate contracts will be required.

Materials relating to suggested maintenance regimes for air quality can be found in the CIBSE Guide TM44.[6]

Planned Preventative Maintenance (PPM) programmes can be adapted to ensure systems are proactively managed, instead of reactively. Consideration should be given to sources of information (e.g. sensor data, BMS data) that can be used to understand nominal performance and to signal when something requires adjustment or investigation. In so doing, consideration should also be given to who needs to be incentivised and empowered to take action.

Reconfiguration/Adaptation

Reconfigurations or adaptations to space within a building may be taken to improve air quality. Reducing VOCs arising from surfaces, reducing the spread of contagions may be addressed by replacing surfaces and coverings with other choices. Similarly, avoiding absorbent materials (e.g. carpeting, fleecy materials in soft furnishings) can reduce the trapping of gases and compounds that are not conducive to human health.

A menu of choices that can be considered is available via the Well standard[7]. Similarly, the Better Buildings Partnership has created a Responsible Fit-Out Toolkit for owners and occupiers of offices[8].

Replacement/Improvement

There will be instances where better maintenance cannot help with further improvements in air quality. CIBSE Guide B2[9] contains details on the pros and cons of different modes of ventilation that may aid decision making around suitability of a system for a building, and trade-offs.

6 https://www.cibse.org/Knowledge/knowledge-items/detail?id=a0q20000008I7evAAC
7 https://standard.wellcertified.com/air
8 https://www.betterbuildingspartnership.co.uk/responsible-fit-out-toolkit-offices
9 https://www.cibse.org/getmedia/8c7fe54c-b712-49e3-9bb1-44bf9f3fdaa0/An-outline-of-CIBSE-guidance-onIAQ.pdf.aspx

Replacement of systems is accompanied by disruption and expense, possible regulatory obligations (e.g. seeking planning permission for some types of installation) and seeking customer consents in cases where there will be disruption to conditioned hours and/or a need to enter the occupier's space.

Once a decision is taken to improve building systems, it may be that clients will wish to team improved air quality with the pursuit of energy efficiency goals. CIBSE Guide F (2012)[10] encourages that the two can go hand-in-hand, and includes some approaches that can be deployed. Further, The BPF has produced its own Aftercare Guide[11] which sets in place a system for monitoring building performance in commercial buildings for the open market.

Controls can be used to improve systems, and CIBSE Guide H (2009)[12] includes useful strategies for dealing with poor indoor air quality.

Review/Iteration

The performance gap between the design expectations of buildings and their performance in operation is well-documented[13]. Cibse Guide M (2014)[14] on maintenance engineering and management has a focus on setting air quality indicators and their routine review as a means to review progress, but also to ensure that accounting is given for seasonal and other periodic variations.

Appendix A – Client Brief Canvas

The below canvas is intended to build on the content of the guide and help with decision-making throughout the process of constructing a client brief. It is best to begin at the top left corner and progress to bottom right.

10 https://www.cibse.org/getmedia/8c7fe54c-b712-49e3-9bb1-44bf9f3fdaa0/An-outline-of-CIBSE-guidance-onIAQ.pdf.aspx
11 https://www.betterbuildingspartnership.co.uk/tale-two-buildings
12 https://www.cibse.org/getmedia/8c7fe54c-b712-49e3-9bb1-44bf9f3fdaa0/An-outline-of-CIBSE-guidance-onIAQ.pdf.aspx
13 https://www.betterbuildingspartnership.co.uk/tale-two-buildings
14 https://www.cibse.org/Knowledge/knowledge-items/detail?id=a0q20000008I7oZAAS

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Agreeing Goals What is the primary purpose of improving air quality? What are the primary means for delivering on that purpose? How did this obligation come about? Does it entail obtaining regulatory permissions? Are you taking the opportunity to make other improvements? What constraints do you have (e.g. customer permissions)? What site specifics are there?	**Communicating your purpose** Will customers understand your purpose? How have you been communicating management of the building so far? What channels do you have available? Are there any vulnerable individuals or groups that you will have to maintain a particular focus on? Who needs to be involved?	**Involving Customers** Will you be seeking actions on behalf of customers? Can you point to actions already taken on your own part to encourage engagement by customers? How might you clearly convey the benefits and any risks from the customers' perspective? Would customers be accepting of air quality monitoring in their space? What information would they need to make a decision? Can you approach customers informally to sound them out?	**Framing requirements to your supply chain** What would your supply chain need to do differently to deliver your proposals? Would there be any disruption? How can that be managed? How will you know if you've been successful? Can you use examples to motivate supply chains to help? Have you obtained buy-in internally from those implementing?	**Framing objectives** Do you know how your building performs relative to others? Can you access benchmarks, commission analysis or undertake peer comparison? Have you access to documentation relating to air quality in the building (e.g. air conditioning inspections, radon assessments that you can compile to support an assessment?) What measures will you use to gauge and convey success (e.g. certification)?
What procurement choices can you make around occupier services to improve air quality? How are spaces cleaned and maintained? Are products used conducive to air quality? Are surfaces antimicrobial? Air quality management during any construction works?	**What maintenance choices can be made to improve air quality?** Are building managers empowered to undertake anticipatory maintenance? What information sources do you have to analyse air quality? Can you use proxies (e.g. via the BMS?) Do you have a program of maintenance of filters, checking flow rates, flushing that will help with air quality?	**Reconfiguration/ Adaptation** When replacing coverings and surfaces, can you make pro-IAQ choices? Do you have a customer fit-out guide? Has it been reviewed to encourage good choices in air quality? What opportunity points are coming up in the building lifecycle?	**Replacement/ Improvement** If maintenance has been undertaken, what installations are still underperforming? Can you make a business case for improvements/ replacements? What is the risk of not taking action? Can better controls help?	**Review and Iteration** Who will need to inspect/review the outcome? How are you going to monitor performance to ensure it meets expectations? Can you channel learnings into future projects? How would you convey those to decision makers and implementers? How will you convey results to your customers?