



BREATHE EASIER: 5 INDOOR AIR QUALITY QUESTIONS ANSWERED

In its report entitled [Health, Wellbeing and Productivity in Offices](#), WorldGBC identified physical features that organisations should measure and assess. One of the more important items to measure is Indoor Air Quality (IAQ), the subject of this briefing note.

To help you understand this issue and begin to take action, we provide answers to five commonly asked questions and then list resources where you can find additional assistance.

WHO NEEDS TO BE CONCERNED ABOUT IAQ?

You do. Anyone involved in the commercial real estate sector -- from the provider to the occupant of space -- is (and increasingly will be) affected by the issue of IAQ. Interest in this area is growing as people have a new understanding of (and ability to measure) the effects of the office environment on their personal health, wellbeing and productivity. The commercial ramifications are potentially significant should the quality of an asset become synonymous with the quality its indoor environment, a trend which appears to be emerging.



Photo credit: Skanska

This is not just a technical issue. Buildings that do not perform well in terms of IAQ are at risk of being viewed negatively in the market, and there are indications that tenants may use this issue during transactions (such as due diligence and rent reviews). If you have not yet considered indoor air quality and its impact on your business, this is the time to start.

WHY IAQ?

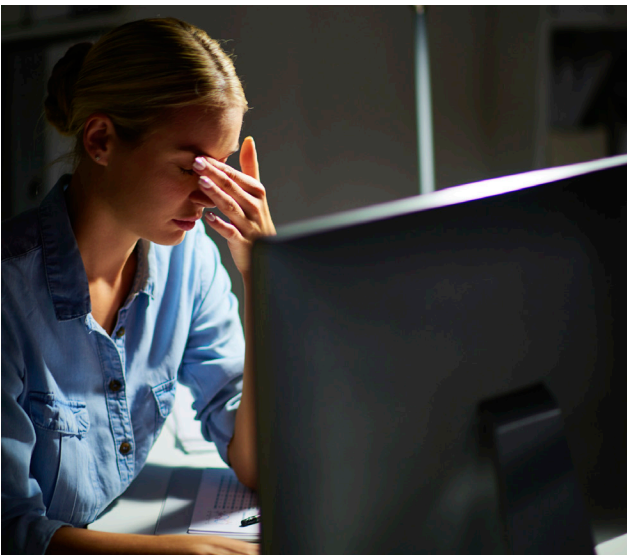
The quality of indoor air has a significant impact on the health, wellbeing and productivity of building occupants. Although many news stories focus on poor outdoor air, the reality is that for many people (particularly office workers) indoor air is far more important and far less healthy than the air outside their building.*

A “General Rule of 90” shows why this is of such importance to the office sector:

- Individuals spend about 90% of their time indoors (so home and work environments can impact upon a business); and
- Expenditures on people comprise 90% of an organisation’s expenses.

Of the metrics considered in the WorldGBC report IAQ is one of the most critical because:

1. Poor IAQ has a negative impact on occupant health;
2. Studies have shown that the quality of air can significantly enhance or hinder worker performance;
3. IAQ can be measured objectively, so it is possible to know directly and affirmatively whether your space has good indoor air quality or not; and
4. Unlike outdoor air, indoor air is largely within your control and a function of the design and management decisions you make.



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WHAT DO WE MEAN BY IAQ?

IAQ is one aspect of the more general topic of indoor environmental quality (IEQ), which includes air quality, but also other categories such as daylight, thermal comfort, etc. IAQ is typically composed of two broad features: conditions (such as humidity and temperature) and pollutants (either natural or manufactured). Both conditions and pollutants can be measured and have performance benchmarks in regulation, building codes or green building certifications.

Conditions

Two conditions that are normally considered in assessments of IAQ are humidity and temperature. Humidity levels, which are a measure of the moisture content within the air, can pose health risks and comfort issues when they are either too low or too high. Temperature operates in the same manner and often, although not always, temperature and humidity levels rise and fall together.

Pollutants

Indoor air pollutants can be either natural (such as carbon dioxide) or manufactured (for example, from product particles or combustion). High levels of both can have negative consequences for people who are exposed to them. The main health effects of indoor air pollution include short-term physical irritation and sickness along with loss of concentration and a decrease in cognitive ability. Longer-term exposure to more dangerous pollutants may lead to more serious health concerns, including higher risks of cancer.

Fortunately, there are design and management decisions you can take to decrease the amount of pollutants in your commercial offices. It is important to measure IAQ so that you can understand your current level of performance and put into place procedures that ensure you are providing a quality environment for your workers.

The top two types of air pollutants that are most frequently considered in green building certifications are:

- Manufactured, including volatile organic compounds (VOCs), such as formaldehyde and benzene; and
- Natural, such as carbon dioxide and ozone.

The first type is found in building materials (such as paints and furniture). So the products you choose have an enormous impact on the quality of air your occupants breathe.

Some natural substances, such as carbon dioxide, are naturally occurring, but can appear in unnaturally high levels if building ventilation is not sufficient. High levels of carbon dioxide have been shown to impede memory and higher-order thinking and encourage lethargy – a particular concern in the office environment. These health effects are temporary, happening quickly but also diminishing with a supply of fresh air.

Other pollutants that are typically measured in green building certifications include but are not limited to:

- Particulate matter (PM₁₀ or PM_{2.5}),
- Asbestos,
- Microbes (such as fungi and bacteria),
- Tobacco smoke,
- Carbon Monoxide,
- Sulfur dioxide and nitrogen dioxide,
- Radon,
- Ammonia, and
- Ozone.

In addition to the pollutants themselves, it is important to understand the impact of temperature and humidity, as these can have a synergistic effect. For example, higher temperatures and more humid environments provide more suitable breeding grounds for fungi and bacteria.

HOW CAN IAQ BE MEASURED?

IAQ can be measured using monitors placed in offices that provide readings of pollutants over time. These readings can be assessed by an expert to understand the pollutants involved and their levels, as well as likely sources and mitigation strategies.

Monitors are currently classified as Type A, B or C, depending on their application and the level of specificity and information they can provide. Certification schemes typically recommend using a Type B monitor or higher, which are meant for commercial use. (Class A is for laboratory use and class C is rated for consumers use).

One of the more interesting developments in this space has been the proliferation of IAQ monitors geared for consumer and individual use (Class C monitors). These low-cost, use-friendly devices have made measurement much easier and accessible to ordinary individuals and have served as something of a “gateway” for individuals and companies to better understand the importance of the indoor environment.

These devices typically have a base station that connects to the internet. Monitors placed around the building then feed data back to the base station,

which in turn stores user-friendly data in the cloud that can be accessed on personal computing devices or cell phones. There may be technical and scientific limitations to these devices in comparison to commercial monitors (and expert opinion) but their deployment points to an increasing awareness and knowledge base among consumers and non-experts.

A program that represents a blend of the two above approaches is the [RESET](#) certification. This program uses commercial-grade monitors and expert review but certifies building performance based on on-going monitoring and display of information to building users through data uploaded to the cloud and accessible by personal devices.



WHEN CAN I INFLUENCE IAQ?

There are essentially three main areas where you can influence the quality of air. First, and perhaps most importantly, is at product selection stage for every type of project from new build to minor fit out. Secondly, you can design the building and mechanical system to optimise IAQ. Thirdly, how you manage the building also affects the quality of air, meaning almost every building has an opportunity to improve.

Product Selection

Since air quality stems, in large measure, from what you put into the building, the decisions you make about product are critical, even for items as small as furniture. Many significant pollutants like VOCs and formaldehyde come from items such as stains, paints,

carpets, desktops and so on, so it is important to source such items carefully and responsibly.

Often items that contribute to good quality air can be had at no to low cost compared to conventional products, so the potential value ramifications of making good choices is significant. Of course, there are more costly ways to improve air quality such as advanced mechanical and filtration systems, but often these are needed only when outdoor air is poor or when conditions within the building merit this kind of intervention.

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Design

Architecturally, the building entries can be designed to include walk-off entryway systems to minimise pollutants from entering the building. Mechanically, ventilation rates can be increased to exhaust indoor pollutants. Additionally, methods of advanced filtration and purification can be incorporated into mechanical systems to ensure that the highest quality of air is being supplied to occupied spaces.

Maintenance and Management

IAQ is affected from everything from temperature and humidity control to the maintenance of equipment and filters, so good management is key. This also applies

to the management of suppliers, such as cleaners and other contractors whose products can very quickly (though usually, temporarily) degrade what is otherwise a quality indoor environment. Managing employee behavior through eliminating smoking indoors and in close proximity to entrances and air intakes is an easy win. Decreasing worker density can also help, as can increasing ventilation, but in both instances there might be negative environmental trade-offs in other areas, such as higher energy use and carbon emissions.

FOR MORE INFORMATION

There many sources of technical information about IAQ. The following is a sample list of some of the more internationally well-known agencies and resources, but since conditions and concerns about air quality can be geographical in nature, we urge you also to consider country or locally specific sources:

US EPA, *An Office Building Occupants Guide to Indoor Air Quality*
www.epa.gov/iaq/pubs/occupgd.html

The Building Research Establishment Indoor Air Quality
www.bre.co.uk/page.jsp?id=720

Australian Government, Department of the Environment, Indoor Air
www.environment.gov.au/topics/environment-protection/air-quality/indoor-air

RESET Certified
www.reset.build/#reset

Health Product Declaration
www.hpd-collaborative.org/

WorldGBC thanks [The Monomoy Company](#), [CETEC](#), [Arup](#), and [B+H Architects](#) for their contributions to this briefing note.

* Indoor air quality can be affected by the quality of outdoor air, as when it seeps inside or is drawn through deliberately for ventilation purposes. Nonetheless, indoor environments are themselves the originator of many air pollutants whose concentrations are far greater indoors than outdoors.

