Improving Indoor Air Quality

A reference guide on best practice and the role of coatings

Tomorrow Included®

JOHNSTONE'S® TRADE

Introduction

Sustainability and wellbeing are without doubt the hottest topics when it comes to building design and construction.

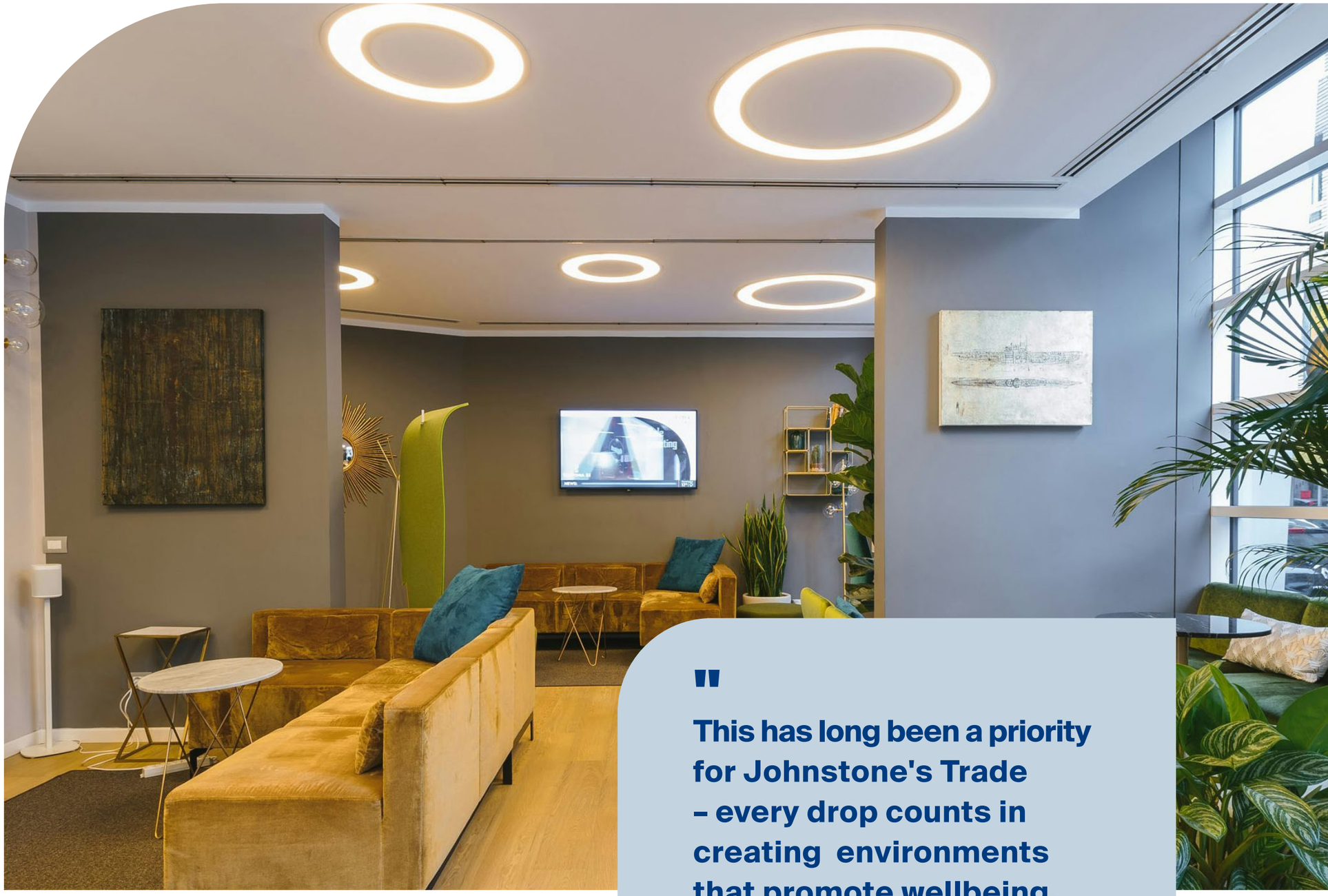
As we become more socially and environmentally responsible as an industry, more projects than ever before are being driven by a resolute desire to have a positive impact on people and the planet. This means architects, designers and contractors are increasingly on the lookout for ways to improve sustainability across all aspects of a build – and one area that's continuing to gain momentum is indoor air quality (IAQ).

IAQ has made its way into the health and wellbeing conversation and is now a key criterion in industry-led green building standards such as BREEAM and WELL. If architects want to achieve these all-important accreditations, they must demonstrate the ways in which their design has taken indoor air quality into consideration.

When specifying and designing with IAQ in mind, it is crucial to understand the main pollutants, their sources, current guidance and standards, and the practical steps that can be taken to prevent or mitigate damage. In this reference guide, we will explain what IAQ is, the latest regulations, and the methods available to support occupant health and wellbeing, including the specification of low emissions coatings.

This has long been a priority for Johnstone's Trade – every drop counts in creating environments that promote wellbeing. We're committed to helping architects build spaces with Tomorrow Included™, our holistic approach to sustainability, to put long-term user wellbeing first. By focusing on the indoor environment as early as possible in the design process, architects can ensure their buildings continue to support end users long into the future.

Julie Tait
PPG A&D Technical Specification Manager



> **"This has long been a priority for Johnstone's Trade – every drop counts in creating environments that promote wellbeing."**

What is indoor air quality and why is it so important?

Indoor air quality (IAQ) is the quality of air in and around buildings and structures[1]. We spend 90% of our time indoors[2], so the air quality in these spaces must be a central consideration in the design and construction process.

There are a large range of indoor pollutants to be considered, such as radon gas, moisture, formaldehyde and other volatile organic compounds (VOCs) – all of which can be detrimental to IAQ. Emission of these pollutants can occur both during the construction process and once the space is in use, being emitted not only from heavy construction materials, but from interior furnishings and finishes, too. In fact, studies show that indoor air pollution is 3.5 times higher than outdoor air pollution on average and can be up to a staggering 560 times higher.[3]

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> **Poor IAQ can sometimes have an impact on health and wellbeing**

The impact on health

Poor IAQ can sometimes have an impact on health and wellbeing, so it's important for the safety of building users to specify products that mitigate this risk.

VOCs are a large group of compounds including acetaldehyde, tetrachloroethylene and the more well-known formaldehyde. These compounds are crucial to the IAQ conversation, as they can have a wide range of health effects and, importantly, there are opportunities to reduce emission in indoor spaces. Awareness of the impacts of health and wellbeing has refocused efforts to tackle VOCs in coatings with renewed urgency. However, effective management of VOCs is a challenge as there are lots of them and they are all very different. They are measured as total volatile organic compounds (TVOC), which is a cumulative measure of all the VOCs in a sample.

Common sources of VOCs[4]

- Furnishings such as carpet, upholstery and furniture
- Building materials such as flooring adhesives and composite wood products
- Paints, paint strippers and other solvents
- Wood preservatives
- Office equipment such as photocopiers and printers
- Glues and adhesives

Potential health effects

- Irritation of the eyes, nose and throat
- Asthma and other respiratory problems
- Headaches
- Nausea
- Damage to the liver, kidneys and central nervous system
- Increased cancer risk

These long and short-term impacts on health and wellbeing underscore the vital role of architects and specifiers in protecting occupants. It also highlights the positive impact they can have by making the right choices, including choosing coatings designed to be at the heart of wellbeing-focused spaces.

What are the standards around IAQ?

Certification Schemes

Third-party industry certification schemes incentivise the development of design and construction approaches in which a commitment to improving IAQ is actively demonstrated.

The most well-known scheme is BREEAM[7], a comprehensive sustainability certificate led by BRE which is meticulous in its assessment of planning, construction, use and refurbishment.

BREEAM has registered millions of buildings and represents a drive towards universal sustainability best practice rather than just ticking the regulatory boxes. The recent BREEAM New Construction manual introduces IAQ at an early stage, requiring an indoor air quality plan to be completed at RIBA Stage 2. BRE also provides certification down to the product level; for example, a BRE accreditation on a coating or varnish is a powerful endorsement of that product's sustainability credentials.

The WELL Building Standard™[8], meanwhile, is a vehicle which ties together construction standards and regulations into a certification which signals a project's commitment to its responsibilities. The standard is heavily focused on health and wellbeing, and its requirements are drawn from a global group of users, health professionals, industry stakeholders and building scientists.

The first section of the WELL guide is dedicated to air as a whole and offers detailed advice split into "preconditions" and "optimisations", based on whether a measure can be built into the space or applied after completion.

LEED is another of these schemes. Set up in 2000 by the U.S. Green Building Council, the system rates buildings based on a points system that extends from 'Certified' on 40-49 points up to 'Platinum' on 80+ points. Within the Indoor Environmental Quality section, there is a significant total of 8 points on offer for projects which prioritise indoor air quality.[10]

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Indoor air quality is a relatively new consideration in policymaking compared to some other aspects of sustainability, meaning dedicated IAQ regulations and standards are limited.

Until now, the built environment industry has largely taken the initiative to regulate itself, and its focus on IAQ has only become stronger as people returned to workplaces following an extended period of remote working and the potential benefits are significant. It has been estimated that we stand to gain £1.6 billion and 7 million working days if indoor air quality is brought in line with WHO guidelines.[6]

The Future

The Future Buildings Standard, introduced in 2025, is intended to update the ventilation portion of the Building Regulations for non-domestic buildings. Approved Document F is the key section, so here is a quick guide to the points most relevant to IAQ.[11]

Approved Document F Fit for the Future?

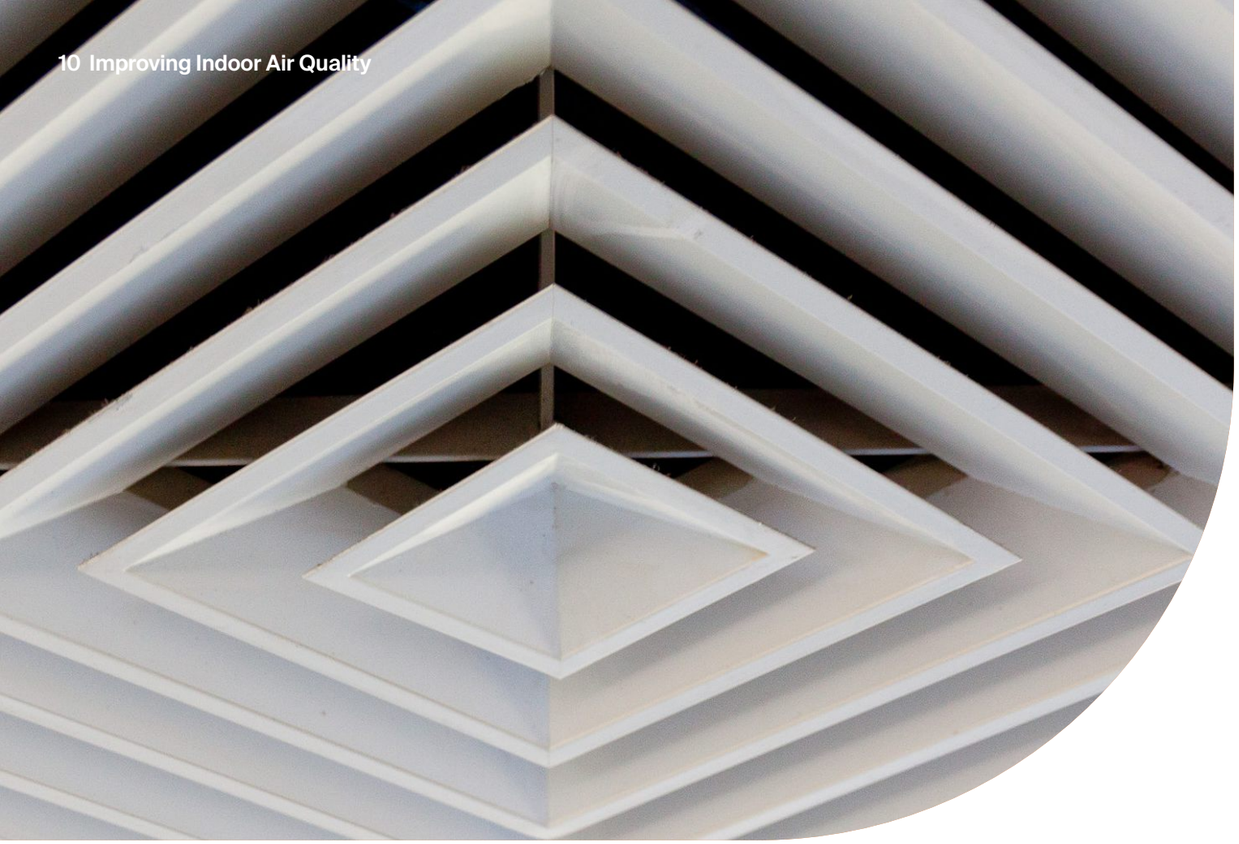
'Occupiable' rooms (rooms where people can be reasonably expected to spend prolonged periods of time) must have a means of measuring air quality.

Offices must have an airflow of either 10 litres per second per person (current guidance) or 1 litre per second per m2 floor area (new guidance) – whichever provides the highest total rate.

Guideline exposure limits are given for indoor air pollutants:

Pollutant	Exposure Limit	Exposure Time (average)
Carbon Monoxide (CO)	100mg/m3	15 minutes
	30mg/m3	1 hour
	35mg/m3 (occupational average)	8 hours
Nitrogen Dioxide (NO2)	200µg/m3	1 hour
	40µg/m3	1 year
Formaldehyde (CH20)	100µg/m3	30 minutes
	10µg/m3	1 year
TVOC	300µg/m3	8 hours

Striving to achieve industry certifications, such as those offered by BRE and WELL now means going beyond the regulations set by policymakers to deliver projects which are able to provide evidence of their commitment to supporting end users' wellbeing.



How can indoor air quality be improved through building design?

In pursuit of spaces that prioritise people's health and wellbeing, there are two ways that architects and designers can improve IAQ – mitigation and elimination.

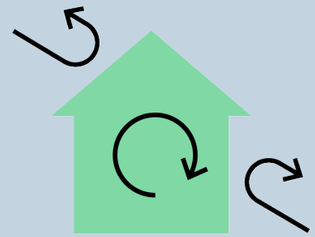
Mitigation

There are certain sources of pollution that architects and designers are powerless to change. This is the case for almost all external sources and a few internal ones; the challenge is mitigating the damage these pollutants can do to occupant health.

With pollutants from outside, such as carbon monoxide and nitrogen dioxide, sufficient airtightness can prevent them entering inside spaces. Where ingress is inevitable, or the pollutant comes from an internal source, ventilation and filtration can be used to limit the negative effects.

Airtightness[12]

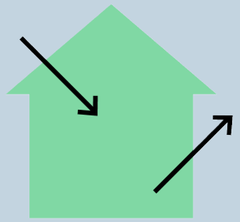
Airtightness relates to restricting the flow of outdoor air into a space. While this supports IAQ, airtightness requirements have mostly been driven by a desire for energy and thermal efficiency, with the improvement to IAQ simply being a welcome by-product. Nonetheless, ensuring these requirements are met can go a long way to keeping out external pollutants.



Ventilation[13]

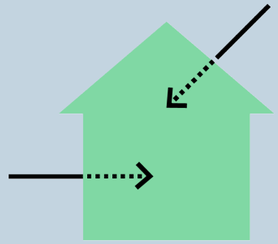
Ventilation is perhaps the most obvious response to IAQ issues across the board, understood as the best way to remove a wide range of pollutants from spaces. But it is not an easy fix, and swapping inside air for outside air often is not enough to sufficiently improve IAQ.

Ventilation should be applied on a large scale to whole buildings to recirculate air and on a small scale to specific settings where pollutants are more common. These systems should be specific to the types of pollutants they are likely to encounter, for example ventilation hoods in kitchens and extractor fans in bathrooms.



Filtration[14]

Filtration is a key component of an effective ventilation system, particularly in terms of mitigating pollution from external sources. When bringing air in from outside, filters that catch pollutants can be crucial to ensuring the air is as 'fresh' as possible. They also provide the opportunity to recycle internal air.



As filtration technology improves, so do opportunities for its application. No longer restricted to being part of the ventilation system, filter technology has been woven into construction materials with filtering properties.

Conventional filters are grouped in terms of the size of the particles they allow through; the smaller the particles, the better the filter. There's a lot out there, but Global Technical Standard ISO 16890:2016 puts forward three broad efficiency classes for filters.

In descending order of particle size:

- ePM10 (Low efficiency)
- ePM2.5 (Medium efficiency)
- ePM1 (High efficiency)

But simply choosing the most expensive filter available is no guarantee of performance. Specificity is as important as quality – there is no one-size-fits-all solution, and the breadth of filters available demonstrates the importance of an informed approach to improving IAQ.

> "Legislation is slowly but surely promoting better IAQ, and by familiarising themselves with low emissions products now, architects and designers can get ahead"

Elimination

If meaningful improvements to IAQ are to be made, it's important to tackle the sources of pollution and prevent harmful emissions before they can have an impact.

Specifying materials that have a limited impact on or even improve IAQ will ensure projects protect future users throughout a building's lifecycle.

Legislation is slowly but surely promoting better IAQ, and by familiarising themselves with low emissions products now, architects and designers can get ahead.

How to spot low emissions products

Industry certificates are available for individual products, with the BRE Environmental Product Declaration[15] (EPD) serving as a trusted benchmark of sustainability. These certifications have traditionally covered sustainability and embedded energy, and serve as important signifiers of a company's commitment to improving reducing the impact of their products. Regarding the effect on IAQ in particular, look out for certificates which set out a product's adherence to IAQ guidelines such as those included in BREEAM and other certification schemes. To find out what certifications a particular product has, visit the manufacturer's website or specification directories[16].

Of course, not all paints are the same in terms of their impact on indoor air quality, so a specific approach is needed depending on the type and purpose of the coating. BREEAM, in its newest construction manual, gives maximum TVOC content values for different types of paints and coatings for a space to receive a credit towards its certification[17].

Product category	Free TVOC content of ready-to-use product (grams per litre (g/l))
Interior matt walls and ceilings (Gloss <25@60°)	10
Interior glossy walls and ceilings (Gloss >25@60°)	40
Interior trim and cladding paints for wood and metal	90
Interior trim varnishes and wood stains, including opaque wood stains	65
Interior minimal build wood stains	50
Primers	15
One-pack performance coatings	100
Two-pack reactive performance coatings for specific use such as floors	80

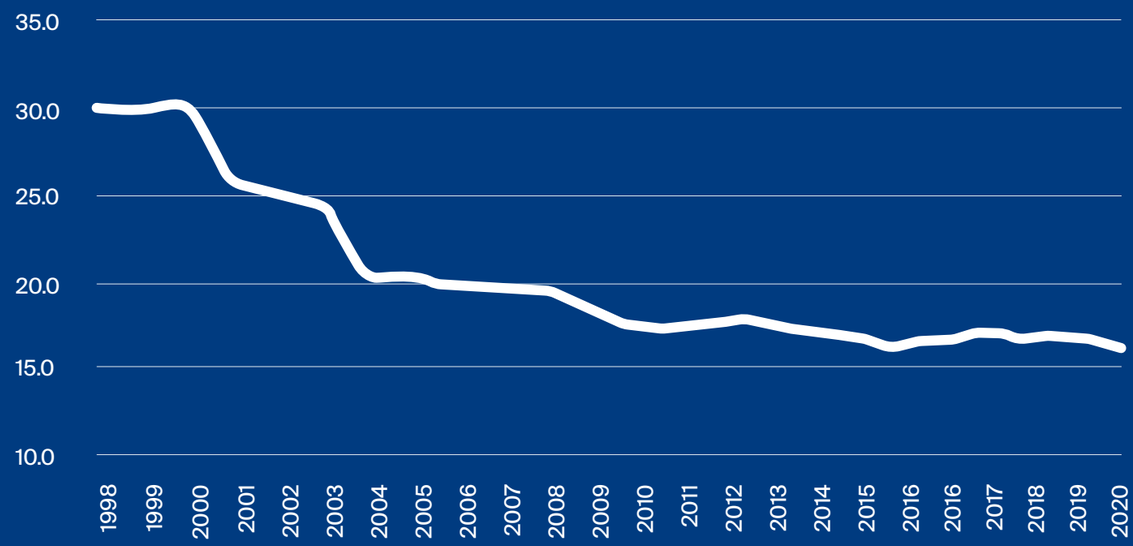
Coatings that care

To help improve indoor air quality and sustainability more broadly, the coatings industry has undergone a big shift away from solvent-based paints containing higher VOCs towards more water-based paints in the past couple of decades, with water-based paints now accounting for 84% of all paints sold[19].

Coatings manufacturers have been investing in innovative updated formulations and technologies that provide low emission products that do not compromise on performance, so that architects and designers can feel confident when specifying for this purpose.

What is more, many of these coatings have had their low emissions properties certified with environmental product declarations.

Decorative solvent-borne paint sales as a % of all volume sold[19]



Exploring the Johnstone's Trade Low Emissions portfolio

By offering a range of coatings that meet the relevant VOC requirements for each product type, Johnstone's Trade makes it simpler for architects and designers to specify the products required while maintaining the sustainability and wellbeing credentials they are aiming for.

It's important that products that meet these guidelines are accessible for projects across the built environment sector, not just those with the budget to opt for more expensive ranges designed for this purpose.

Various Johnstone's Trade products have an Environmental Product Declaration which sets out the details of the product's carbon footprint and many have emissions certificates to highlight how they adhere to VOC and IAQ guidelines. These compliance certificates are all available on the Johnstone's Trade page at NBS source.

"IAQ is rightfully becoming a core priority on more and more projects. At Johnstone's Trade, we're committed to both leading the way in sustainable innovation and giving our customers the support and solutions they need to protect the wellbeing of building users."

Megan Esmond
Marketing Director UK&I

Aqua Guard Range

The Johnstone's Trade Aqua Guard range is our most durable water-based paints for interior and exterior wood and metal.

The interior solution has Innovative Surface Protection technology which provides the ultimate defence against scratches, wear and tear, and greasy finger marks, for a long-lasting finish.

The exterior range is formulated to deliver outstanding durability and weather resistance, providing up to 8 years life expectancy*.

Low emissions and sustainability credentials:

- Environnemental Product Declaration
- Indoor Air Quality Certificate (Interior only)
- Max 130g/l VOC content, EU limit value: 80g/l

*When applied in accordance with a project specific Johnstone's Trade Technical Specification and BS 6150:2019, Code of Practice for Painting Buildings.

Sol Silicate

A fully breathable coating with a matt finish, ideal for external and internal use on lime renders, lime cement-based plasters and most masonry surfaces.

The Sol Silicate technology is non film forming and fully breathable which prevents moisture build up and preserves the surface structure. With excellent water repelling properties to provide long lasting protection against weather and dirt, Sol Silicate Masonry naturally resists microorganisms such as mould and has limited combustibility due to its low organic content.

Low emissions and sustainability credentials:

- Environnemental Product Declaration
- Indoor Air Quality Certificate
- Max 20g/l VOC content, EU limit value: 30g/l

Acrylic Durables

A class 1 scrub rated emulsion available in Matt and Eggshell. The stain and mould resistant formulation makes it ideal for kitchens, bathrooms and high footfall areas.

Low emissions and sustainability credentials:

- Environmental Product Declaration
- Indoor Air Quality Certificate
- Matt: Max 0g/l VOC content, EU limit value: 30g/l
- Eggshell: Max 3g/l VOC content, EU limit value: 30g/l

Cleanable Matt

A matt emulsions that is designed to extend maintenance cycles through its excellent stain resistance and high durability. Designed for high traffic areas which require frequent cleaning. It helps to prevent stains setting into the paint and makes removing stains and marks easier.

Low emissions and sustainability credentials:

- Environmental Product Declaration
- Indoor Air Quality Certificate
- Max 10g/l VOC content, EU limit value: 30g/l

Perfect Matt

Eliminates the impact of visible application marks highlighted by critical lighting. The innovative Smooth Layer technology creates a flawless finish with ease on even the most challenging projects, whatever the colour scheme.

Low emissions and sustainability credentials:

- Environmental Product Declaration
- Indoor Air Quality Certificate
- Max 10g/l VOC content, EU limit value: 30g/l

Product emissions certificates and EPDs found here.

UltraLast Matt

A premium quality, scuff resilient matt wall paint that is stain resistant and can be easily cleaned – perfect for high footfall areas, commercial environments and public buildings. With low emissions levels, the paint has a reduced impact on indoor air quality.

Low emissions and sustainability credentials:

- Environmental Product Declaration
- Indoor Air Quality Certificate
- Max 1g/l VOC content, EU limit value: 30g/l

Part of a Comprehensive Strategy

Choosing low emissions coatings is just one step in improving indoor air quality and should be considered as part of a holistic design and construction strategy that includes both prevention and mitigation measures.

These products are not a substitute for effective airtightness, filtration and ventilation, but they ensure that these systems don't spend their time working on pollutants that don't need to be there. By specifying low emissions products and materials to minimise emissions at the source – while simultaneously implementing effective mitigation methods – architects and designers can best protect building users and the environment.

Protect the world today, make it more beautiful for tomorrow

At Johnstone's, we invest not only in today, but also in tomorrow. Through durable, high-quality products, energy efficient processes, and inspiring, sustainable solutions, we aim to make the world more beautiful and protect it for future generations.

We take great pride in our close relationship with professional painters, decorators, architects, and designers. We understand the unique needs and requirements of these individuals and industries. Recognising that the next generation depends on us, we are committed to continuously listening, learning, and innovating. Our goal is to deliver high-quality, sustainable product solutions and services that meet the evolving demands of our customers. By doing so, we aim to contribute to a brighter future for both our customers and the environment.

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