



Independent workplace compliance



## White Paper

# Air pollution, air quality and the workplace

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## Air pollution, air quality and the workplace

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Rightly, air quality and air pollution are high priority aspects, nationally and internationally. For decades, we have seen improvements in areas (Sulphur dioxide levels in the UK and the Montreal Protocol for Ozone depleting substances (ODS), are two examples), but increasingly factors both natural and man-made are causing persistent problems.

We saw a similar situation with our workplaces during the pandemic, and the significant influence air quality played there. Post-pandemic, how will employers and employees see the role of air quality in the workplaces of the future, and what could influence this?

Here we look at the subject of air quality/air pollution from a global and workplace management perspective.

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## 1. What is air pollution?

The World Health Organisation (WHO) defines air pollution as “contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere.”

Air pollution occurs from both natural and anthropogenic (the influence of humans on nature) sources, examples of which can include volcanic activity, pollen, sandstorms, heatwaves, wildfires, burning fossil fuels, deforestation, and smog.

Air quality is defined as the extent to which the air in a particular place is pollution-free. Primarily air quality, and as a result, air pollution can be broken into three constituents, these being gases, dusts/particulates and biological (bacteria, pollen etc.).

Within the workplace, air quality is governed by the local ambient air, the processes/activities in that workplace and the level of control the owner/employer/occupier has (naturally ventilated, mechanically ventilated, local exhaust ventilation, etc.). A more detailed breakdown of workplace related air quality/air pollution constituents would include, for example:

- **Gaseous** - e.g. Carbon monoxide, Carbon dioxide, Oxides of nitrogen, volatile organic compounds (VOCs), other compounds and chemicals;
- **Dusts/Particle matter** – e.g. PM2.5, PM10, carbon, crystalline, paper, soil and wood dust; and
- **Biological** – e.g. general bacteria, Legionella, fungi, moulds, pollen, other allergens, etc.

Some of the constituents will be influenced, by the local environment, some internally generated and all by the ability of the workplace to control them.

[Air pollution \(who.int\)](http://who.int)



## 2. What are the effects of air pollution?

The WHO identifies air pollution as a serious problem and the second highest risk factor for noncommunicable diseases. In 2019 it highlighted that:

- 99% of the world's population was living in places where the WHO air quality guidelines levels were not met;
- The combined effects of ambient air pollution and household air pollution are associated with 6.7 million premature deaths annually; and
- Ambient (outdoor) air pollution is estimated to have caused 4.2 million premature deaths worldwide.

Ill health can be a result of exposure to air pollution in ambient (outdoor) air pollutants, as well as those from the domestic/household environment. Air pollution also disproportionately affects the young, the old and those with pre-existing health conditions.

Ambient air pollution has been attributed to 4.2 million deaths in rural and urban areas. Primarily exposure to fine particulate matter is the main cause (WHO) In 2019:

- 37% were due to ischaemic heart disease and stroke;
- 23% of deaths acute lower respiratory infections;
- 18% due to chronic obstructive pulmonary disease (COPD); and
- 11% of deaths were due to cancer within the respiratory tract.

In 2019, household air pollution exposure was attributed to 3.2 million deaths worldwide (WHO), including:

- 32% from ischaemic heart disease;
- 23% are from stroke;
- 21% are due to lower respiratory infection;
- 19% are from chronic obstructive pulmonary disease (COPD); and
- 6% are from lung cancer.

In UK workplaces, occupational lung disease is estimated to cause 12,000 deaths each year linked to past exposures at work (HSE figures). Asbestos related diseases, COPD and non-asbestos related lung cancers are the largest contributors to these deaths.





Poor air quality in the workplace has also had a host of other illnesses and affects attributed to it. Some of these are life threatening and debilitating, others would more likely cause user dissatisfaction with their environment. Example would include:

- Asbestosis/Silicosis/Bronchitis;
- Lung infections;
- Cardiovascular disease;
- Central nervous system – headache, cognitive function;
- Emphysema;
- Reproductive system/infertility;
- Asthma;
- Nose, eye, throat irritations;
- Other organs – liver/spleen.

A good example of a pollutant that can have several negative impacts in the workplace is Carbon dioxide (CO<sub>2</sub>). In Great Britain CO<sub>2</sub> is classed as a substance hazardous to health. For some workplace where CO<sub>2</sub> is a by-product of a process (e.g. brewing), at raised levels it can act as both an asphyxiant and toxicant, therefore needing careful monitoring and management. In most workplaces however, CO<sub>2</sub> is typically generated through the occupants of the premises and its levels controlled through ventilation, mechanical or natural. In these situations, it is more likely to cause, tiredness, headaches, or loss of cognitive function/ productivity as levels increase.

Other air pollutants having recently seen a raised level of inspection and activity by enforcing agencies are respirable crystalline silica (RCS) and wood dust.



### 3. Air quality legislation/initiatives

There have been numbers of initiatives in place over decades to address specific aspects of air pollution nationally and internationally, examples of some of the regulations, initiatives and plans in the UK include:

- Environment Act 1995 (as amended in 2021)
- The Clean Air Act 1993
- Air Quality (England) Regulations 2000 (as amended in 2002)
- The Large Combustion Plants (National Emission Reduction Plan) Regulations 2007
- 25 Year Environment Plan (2018)
- National Emission Ceilings Regulations 2018
- Clean Air Strategy 2019

Since December 1997, local authorities in the UK have been carrying assessments and reviews of air quality, measuring air pollution, and predicting change. This information feeds into the national air quality objectives. Where areas are identified that are not likely to meet the objective requirements, "Air Quality Management Areas" (AQMAs) are formed, and specific plans produced to improve air quality – low emission zones are an example of this.

The national air quality objectives (originally linked to EU directive limits) as well as the updated WHO Global Air Quality Guidelines (AQGs), both target six key pollutants to monitor, in the words of the WHO "representing some of the most monitored and health critical pollutants". While five of these are the same for both initiatives:

- Particulate matter (PM 2.5);
- Particle matter (PM 10);
- Ozone (O<sub>3</sub>);
- Nitrogen dioxide (NO<sub>2</sub>); and
- Sulphur dioxide (SO<sub>2</sub>).



THE WHO AQGs use Carbon monoxide (CO) as their 6th indicator, whereas the UK uses Polycyclic Aromatic Hydrocarbons (PAHs). The target values differ too for the parameters. Net zero is another example of targeting by organisations and nations that are focussed on emissions reductions and control.

[Air\\_Quality\\_Objectives\\_Update.pdf \(defra.gov.uk\)](#)  
[WHO Global Air Quality Guidelines](#)

For workplaces, several different pieces of legislation for health and safety and environmental that directly impacts air quality/air pollution generally, and in instances where activities/processes are likely to see harmful levels of specific pollutants occurring, examples include:

- The Health and Safety at Work etc. Act 1974
- The Control of Substances Hazardous to Health Regulations 2002
- The Workplace Health safety and Welfare Regulations 1992
- EH40 – Workplace Exposure Limits
- The Fluorinated Greenhouse Gases Regulations (F gas) 2015





## 4. Air quality management

There are an increasing number of commercial and government sources providing information on ambient air quality. One example of this is supplied for the UK by Defra, through the UK Air - Air Information Resource. Within in this, the "Daily Air Quality Index" (DAQI), provides an index for air pollution and associated relevant health advice each day. The index operates on a 1-10 scale and divided into four bands, low (1) to very high (10).

[Home - Defra, UK](#)

[Latest measured levels based on data provided by the Environment Agency - Defra, UK](#)

For workplaces the HSE states, "employers must make sure there is adequate in enclosed areas of their workplace. Ventilation is the process of bringing in fresh air from outside and removing indoor air, which may, be stale, be hot and humid because of work machinery and processes or contain pollutants and other impurities".

[Overview - Ventilation in the workplace \(hse.gov.uk\)](#)

The Workplace Health, Safety and Welfare Regulations (1992), under Regulation 6 also requires employers to "ensure that every enclosed workplace is ventilated by a sufficient quantity of fresh or purified air".





When managing your indoor air quality (IAQ) considerations to make should include:

- Understand your workplace ventilation systems, how they operate and what levels of maintenance they have received. Are ventilation rates appropriate for the environments they are serving?
- Have ventilation systems or their operation been modified or changed because of, or in relation to, varying occupancy levels? Have these been assessed? Are supply and extract rates suitably balanced?
- For naturally ventilated buildings, do you consider local ambient air conditions and strategies for their management (i.e. local roadworks, building works etc.)?
- If using Carbon dioxide or other sensors, have these been appropriately calibrated?
- Are there any processes in place where you use local exhaust ventilation (LEV)? If so, have these been properly serviced and maintained?
- Do you have a policy and strategy for your indoor air quality? How are you demonstrating compliance with it?
- Do you assess your indoor air quality - analysing supplied and circulating air in terms of the levels of dust, micro-organisms, and gases? Typical parameters could include microbiological air testing, direct particle counts, gravimetric analysis of dusts and dust analysis and levels of gases including for example, Carbon dioxide, carbon monoxide, ozone and volatile organic compounds.
- Do you assess your building temperature, airflow profile and Carbon dioxide levels to identify any areas of poor ventilation?
- Have you any activities occurring in the premises which could adversely affect your indoor air quality? Do any of these require LEV?
- Have any of your net zero or other initiatives affected the operation/performance of your ventilation system? If so, have these been audited to check that the ventilation system is still providing the levels of control you need?
- Do you provide your employees with any information on air quality, either ambient or indoor?

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