

WHITEPAPER: THE HIDDEN DANGERS OF DUST AND FUMES



In this whitepaper:

- Long-term health risks of dust and fumes
- Different types of dust
- Fumes, gases and mists
- Common dust and fume-producing construction activities
- The Hierarchy of Controls and the 3C's® methodology
- Engineering controls for dust and fumes

Dust and fumes can both cause significant long-term health risks if left uncontrolled during construction works and these health risks are often underestimated. The Construction Dust Industry Survey identified that over 14% of participants were not aware of dust being a health risk and simply considered it a nuisance¹.

The Health and Safety Executive (HSE) regularly update their dust and fume guidance to help minimise the long-term health risks caused by these hazards, but the onus to implement the correct measures remains with contractors and site teams. When a hazard is less obvious or the work in progress is not as straightforward as expected, compliance can seem difficult to achieve.

RVT Group have put together this whitepaper to help understand what construction activities can cause harmful dust and fumes and provide best practice guidance on how to tackle it - prevention is always better than cure!

^[1] citb.co.uk/media/tyundx0s/construction-dust-industry-survey

Dust Long-Term Health Risks

Many construction jobs create large amounts of dust, which scientific studies have linked to these significant risks:

- Death due to heart or lung disease, including cancer, silicosis, asthma and chronic obstructive pulmonary disorder (COPD).
- Non-fatal heart attacks
- Irregular heartbeat
- Aggravated asthma
- Decreased lung function
- Increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.
- Nasal cancer
- Dermatoses
- Asbestosis
- Systemic poisoning

Health effects resulting from exposure to dust may only become obvious after long-term exposure.

Types of construction dust

Silica Dust

(or respirable crystalline silica) containing materials like granite, concrete, mortar and sandstone.

Wood Dust

from softwood, hardwood and wood-based products like MDF and plywood.

Fibrous Dust

from asbestos and other such materials.

Lower-Toxicity Dusts

from materials containing very little or no silica, such as gypsum (eg in plasterboard), limestone, marble and dolomite.

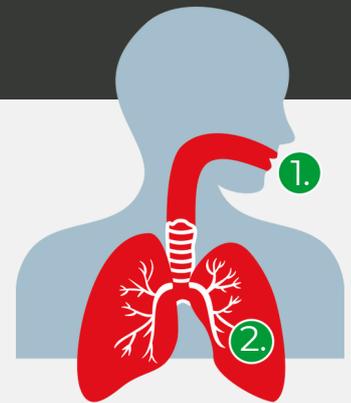
The Control of Substances Hazardous to Health (COSHH) regulations sets a limit on the amount of dust that workers can safely breathe (called a Workplace Exposure Limit or WEL). When compared to a penny it is tiny – like a small pinch of salt.

Inhalable vs respirable dust

Dust particles come in a range of sizes. The smaller dust particles have the biggest impact on workers' health.

Inhalable dust is deposited in the upper respiratory tract and usually cleared by mucus. It is still hazardous to workers' health. **This type of dust is produced during typical demolition work, woodwork, chasing, cutting etc.**

Respirable dust is so fine it can get deep into the lungs and cause serious health problems. The largest of these fine particles are 30 times smaller than the width of a human hair. **This dust is produced when working with materials that contain quartz, cobalt, or crystalline silica (eg concrete, mortar, sandstone), and by grinding masonry drill bits.**



1. Inhalable dust

Breathed in the nose or mouth; usually cleared via mucus.

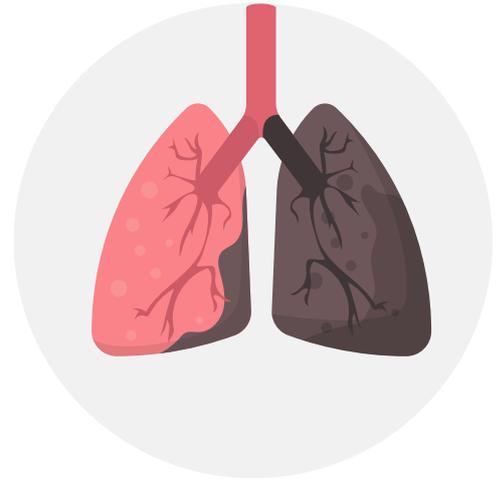
2. Respirable dust

Small enough to get deep into the lungs, in the alveoli.

Fume Long-Term Health Risks

Exposure to fumes, mists and gases can have adverse long-term health effects:

- Chronic Dermatitis
- Lung Cancer
- Kidney Cancer
- Lung infections/reduced lung function
- Neurological effects
- Asthma
- Pulmonary siderosis
- Damage to nervous system and anaemia
- Decreased fertility
- Depression
- Stomach Ulcers



Health effects resulting from fume exposure may only be obvious after long-term exposure.

The difference between fumes, gases and mists

Fumes

Made up of very fine solid particles and usually created by heating a material and causing chemical reactions until it evaporates. As this cools, it becomes vapour and, then, very small particles.

Gases

Substances that are completely in a gaseous state at normal temperatures and pressures. Some liquids or solids have an associated gaseous phase which is called a "vapour".

Mists

Dispersions of liquids in gases in the air. They are formed during nebulisation of liquids, during condensation from the vapour phase and during chemical processes. After sedimentation, the liquid particles of mists lose their particulate form, unlike undissolved solid particles which generally retain their form.



Shocking HSE statistics

The below stats were preventable. The next few pages of this whitepaper details how it could have been avoided.

12,000

Lung disease deaths each year are linked to past dust exposures at work

Over 500

Construction workers die annually from breathing silica dust

13,000

Deaths each year from occupational lung disease/cancer due to dust and chemicals

19,000

Estimate new breathing/lung problems are linked to work each year.

[See where we found these statistics >](#)

Common construction activities

Dust-producing activities

Examples of activity that causes dust during construction works are:

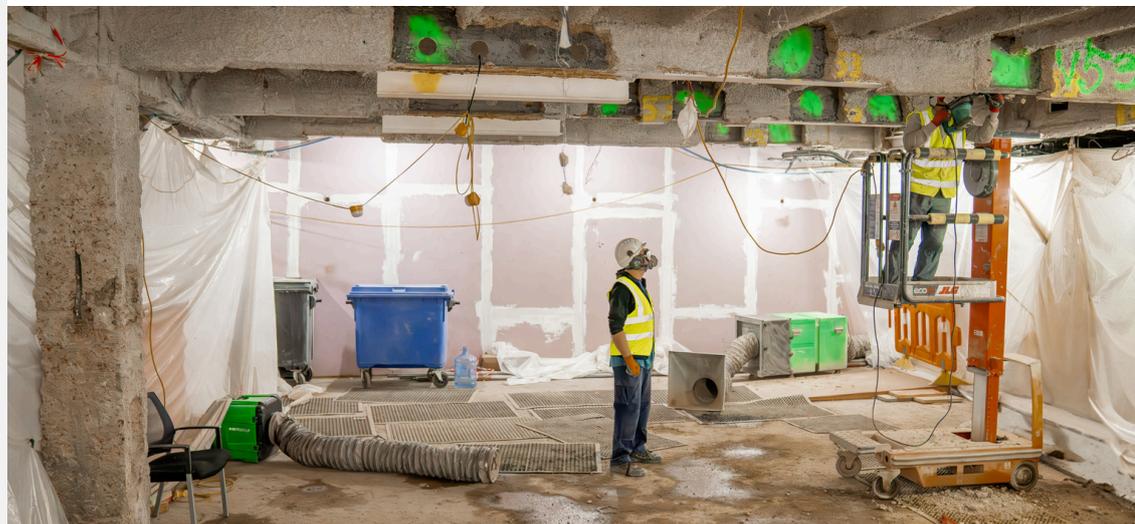
- Concrete cutting, drilling, or grinding
- Demolition work
- Sandblasting and abrasive blasting
- Dry sweeping of construction sites
- Mixing dry cement or mortar
- Wood cutting and sanding
- Excavation and earthmoving
- Plasterboard cutting or sanding
- Roofing work (e.g., cutting tiles, asphalt)

Fume-producing activities

Examples of activity that causes fumes during construction works are:

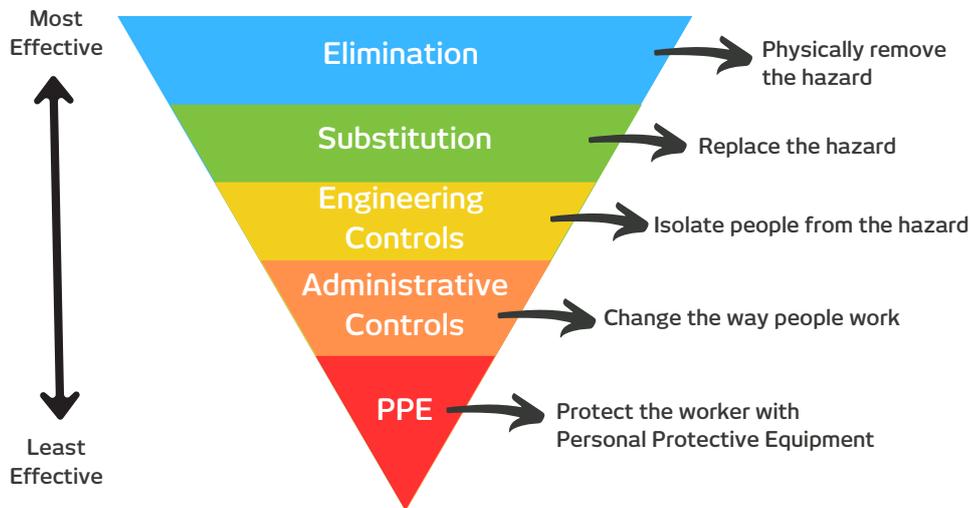
- Welding, cutting, or brazing metals
- Asphalt paving or roofing
- Operating diesel-powered machinery
- Hot work on painted or coated surfaces
- Applying solvent-based paints, adhesives, or sealants
- Cutting or heating Plastics, PVC, or foam insulation
- Torch-applied bitumen roofing

These lists are not extensive. Each activity has different health risks depending on the exposure length and dust type.



The Hierarchy of Controls

The hierarchy of controls helps tackle hazards in a structured way, starting with the most effective measures to keep people safe, progressing to the least effective. By systematically applying control measures, it mitigates the health risk on site, prevents accidents, and creates a culture based around health and safety. This diagram illustrates the hierarchy of controls:



If you cannot eliminate or substitute the hazard, you will need to explore suitable **engineering controls** such as dust and/or fume extraction systems.

It is important to understand that one size does not fit all. You need to carefully identify the hazard and assess the risks before you select a suitable control method. It's not just about selecting the right unit - installation and set up are equally important.

[Read our full whitepaper on The Hierarchy of Controls here >](#)

RVT Group's Approach to Engineering Controls

For best practice and increased chance of compliance for dust and fume, you need a solution that will 'Capture', 'Contain' and 'Control' the hazard - We call this the 3C's[®] Methodology:

Capture the hazard

Position the dust or fume extraction unit as close as possible to the activity to ensure the dust is captured at source.

Contain the hazard

The work area should be as contained as possible to prevent dust/fume migrating into surrounding environments.

Control the hazard

Implement any further controls that may help the extraction process such as negative or positive pressure systems



All three elements must be taken into consideration to achieve effective health hazard control.

Engineering Controls For Managing Dust

Dust Extraction/ LEV Systems

High-airflow extraction and filtration units extract dust at the source, removing the hazard before it can come into contact with workers. In order for an extraction or LEV system to be effective, it must have a suitable hood, fan, filter, ducting and discharge point. The type of filter required will depend on the substance you are working with, for example you would need a HEPA filter when extracting Silica Dust. You also need to ensure that the hood is the right shape and size, and that the fan provides enough airflow. RVT's LEV units all undergo Thorough Examination and Testing and are ideal for capturing hazardous dust.

Dust Enclosures

Enclosures help contain dust and put a physical barrier between the hazard and workers nearby - the perfect solution for localised cement mixing, replacing floor tiles and other dusty activities.

Dust Vacuums

Sweeping with a broom disturbs settled dust which then becomes airborne, making it more likely to be breathed in by those nearby. The HSE explain that an industrial vacuum or on-tool extraction is preferable to a broom. There are different categories of vacuums available depending on the type of dust you are handling. RVT Group provide powerful M class and H class vacuums which are ideal for collecting settled dust and debris.

Dust Suppression

A popular choice for managing dust from activities such as groundworks and demolition as it controls dust in two ways. Firstly it can be used to dampen surfaces to prevent airborne dust being generated in the first place. Secondly, if dust is already airborne, the mist will intercept any airborne dust particles and pull them to the ground, preventing workers from breathing it in.



Dust extraction



Dust enclosure



Dust extraction



Dust vacuum



Dust suppression

Engineering Controls For Managing Fume

Welding Fume Extraction

In 2019, new scientific research found that exposure to mild steel welding fume can cause lung cancer and possibly kidney cancer in humans. As such, the HSE tightened up the requirements for welding fume extraction and filtration. RVT offer a portable welding fume unit which is ideal if you are working in a small area or need to frequently move around site. RVT also offer a mobile welding fume unit that has an extendable arm and is more suited to working at a bench.

Local Exhaust Ventilation (LEV)

RVT Group's powerful LEV filtration units can be fitted with up to three stages of filter media (e.g. EU4, EU7, Carbon, HEPA), and has the option of an integrated spark guard. For maximum effectiveness, the hood should be placed as close to the activity as possible.

Multi-spigot Fume Extraction

RVT Group offer large scale, industrial extraction units, with high airflow and high air pressure. These units accommodate 8 extraction ports that can be split into further extraction points depending on site requirements.

Ventilation

In many cases, you would need LEV to extract the contaminants at source, but may also need general ventilation to dilute residual airborne contaminants. This is particularly important if you are working in an enclosed or confined space, where the air might quickly become contaminated. RVT Group offer a wide range of axial and centrifugal fans, with airflows of up to 120,000m³/h. We also offer ATEX units for use in hazardous environments.

[Speak to a member of the RVT Group team about dust and fume control >](#)

