NCEC
Member of WSP

The SPILL 2.0

CONTENTS

Listings below are interactive

Welcome to the fourth issue of the NCEC public sector newsletter, The Spill 2.0, which is designed to share chemical incident knowledge to ensure the safety of responders.

The Spill provides the latest information on chemical incident knowledge and effective emergency response from the National Chemical Emergency Centre (NCEC).

Funded by the Department for Transport and Chemical Industries Association, NCEC has delivered the Level 1 emergency response component of the UK Chemsafe scheme for over fifty years through a 24/7/365 dedicated telephone number provided only to the emergency services and other nominated organisations. We have an expert team of chemical emergency response specialists, who support emergency responders dealing with any chemical incident, regardless of scale or location. As well as providing advice, including hazards, decontamination, and reaction predictions, we will endeavour to contact the manufacturer if further assistance is necessary.

NCEC additionally delivers chemical advice through the European Intervention in Chemical Transport Emergencies (ICE) scheme, which provides a robust network of experts across Europe, who share information as required to facilitate response to incidents.

PALYTOXINS

Palytoxins are extremely toxic substances released by certain marine corals or animals, either as a defence mechanism or to assist them in catching prey.

Palytoxins are produced by a species of plankton – microscopic organisms that live in symbiosis with corals. They play an important role for these organisms, serving as a chemical defence mechanism to help deter predators and inhibit the growth of competing microorganisms. They are also released as a response to environmental stressors such as changes in temperature, salinity, acidification, nutrient availability, or bleaching events, helping the corals to survive and thrive in varying conditions.

Palytoxins are considered one of the most poisonous non-protein substances known. They can bioaccumulate in fish, crabs and mussels. There has been a worldwide increase in poisonings and exposures to palytoxins, ranging from fatalities of those who have ingested contaminated seafood to dermal, ocular, and inhalational exposures of aquarium hobbyists.

AQUARIUM HOBBYISTS AND THEIR RISK FROM PALYTOXINS

In the UK, palytoxins are commonly encountered in aquariums. Conditions in a home aquarium are often ideal for soft corals, and they will colonise an aquarium relatively quickly. Preventing the overgrowth of corals requires frequent eradication and a commonly recommended method of removal is to use boiling water and a scrubbing brush. This method of cleaning can cause the toxins to be released and become airborne, putting marine aquarium hobbyists at risk of exposure through inhalation or their eyes.

When buying corals, there is an inconsistent standard of information given to the purchaser, with some sellers not giving any warning of the potential dangers of handling corals.

Persons can therefore become exposed to palytoxins when interacting with the corals in an inappropriate manner – usually when cleaning the aquarium. Causing the coral stress, by removing it from water, scrubbing it, or changing the water too quickly, may lead to it the release of palytoxins, which can readily become airborne.

SYMPTOMOLOGY OF EXPOSURE

Palytoxins are considered fatal if swallowed, in contact with skin, or if inhaled.

The main symptoms of palytoxin poisoning following exposure via the skin, eyes or by inhalation are:

- Fever (more than 38°C), cough, headache, difficulty breathing, sore throat, runny nose, chest pain, rapid heart rate, skin redness / rash, swelling, numbness / tingling, muscle pain, irritation of the eye, sensitivity to light and conjunctivitis.
- Additional indicators may include the detection of a foul smell or a bitter / metallic taste in the mouth.

The symptoms of palytoxin poisoning can develop quickly following exposure. If you suspect palytoxin poisoning has occurred, you should seek urgent medical attention and advise medical staff that the individual involved has been handling corals and that palytoxin poisoning is suspected. However, there are no reported fatalities involving inhalational exposure to aquarium hobbyists.

KEY ACTIONS FOR SUSPECTED RELEASE

The immediate area of any suspected release should be evacuated and no one allowed to return until decontamination has been carried out.

For a suspected palytoxin exposure, those affected should be removed to fresh air and exposed areas washed thoroughly with water. Clothing should be removed to prevent the spread of any contamination. They should then be assessed by medical personnel as soon as possible. Hospital monitoring may be required depending on the severity of the symptoms. There is no specific antidote, but non-steroidal anti-inflammatories and antihistamines have been used during treatment. Those carrying out decontamination should wear self-contained breathing apparatus, full fire kit, gauntlets and rubber boots (alternatively overalls, gloves, eye protection, e.g. glasses or goggles, and a FFP1 / FFP2 respirator mask will offer sufficient protection and may be used in place of the above if required).

The damaged coral should be double bagged for safe disposal and any affected areas thoroughly ventilated. Palytoxins can be denatured using domestic bleach diluted by one part bleach to nine parts water (followed by water rinsing). Where this is not suitable, hard surfaces, soft furnishings, or equipment should be washed with warm soapy water. Under no circumstances should any surfaces be vacuumed.

Any contaminated food or drink should be disposed of. If a kettle is near the release, then the kettle should be disposed of as a precaution, along with any soft toys in the area. It may be sensible to suggest the involvement of a specialist contractor if the contamination is expected to be high and suitable personal protective equipment is not available, although this will incur a commercial cost.

The UK Health Security Agency (UKHSA) may be contacted for detailed information on the toxins and their biological effects after exposure.

CHEMSAFE RELATED CALLS

Chemsafe has received several calls linked to palytoxins over the years, typically involving Emergency Service personnel being called to a domestic property where the occupiers are displaying unexplained symptoms after cleaning an aquarium. We would typically advise the caller to contact UKHSA (previously Public Health England) for more detailed information on toxins and their biological effects after an exposure. However, we can provide detailed information on the appropriate response to this type of incident, including suitable decontamination and disposal requirements, to make the scene safe again.

In one incident, someone had been scraping soft coral polyps (of a type known as pulsing xenia) from rocks within an aquarium. The material that had been scraped off was left in the bedroom of the individual overnight, causing the entire household to become unwell, experiencing breathlessness, coughing, fever and eye irritation. The person that had carried out the aquarium cleaning was the worst affected.

Some kind of poisoning was suspected when the family realised that their dogs were also showing signs of lethargy. Fire Service crew members were the first on the scene, but about 50 Emergency Service personnel attended the scene in total, including three ambulances, due to the initially unknown nature of the release.

Following on-scene appraisal of the incident, all family members and four responders were taken to hospital, with some of the family kept in overnight for monitoring. The clothes of the occupants were left behind at the scene of the incident to reduce the potential for ongoing contamination. Police Officers secured the house overnight, while windows were left open to ventilate. The road was closed as a precautionary measure until approximately midnight and locals were advised to stay indoors.

CONCLUSION

While there are various import prohibitions and restrictions on the trade of coral in the UK, there is no requirement to provide hazard or proper use guidelines when coral is bought. Furthermore, guidelines that are made publicly available can be piecemeal and inconsistent. Purchases come without hazard warnings or proper user guidelines and knowledge that is spread among the public can be unreliable.

Whilst these toxins clearly benefit the host organism, e.g. as a defence mechanism against predators, they can pose a risk to the unwary or foolhardy if handled incorrectly. However, with the increased availability of information via the internet, it would be expected that palytoxin incidents would remain at a relatively low level in the future.

Sources:
OATA - The Ornamental Aquatic Trade Association - The Voice of the Ornamental Fish Industry
W01W0116-2614JGHEEN.pdf
History and Toxinology of Palytoxins
https://ccinfoweb2.ccohs.ca/hsdb/records/8132.html

LIGHT PORTABLE ELECTRIC VEHICLES AND POWERED TRANSPORTERS

Light portable electric vehicles (PEVs) and powered transporters are a growing category of transport devices designed for short urban journeys.

Although light PEVs are typically associated with battery powered transport devices, the term "powered transporters" covers a variety of novel personal transport devices which are mechanically propelled (propelled by a motor) as well as, or instead of, being manually propelled. It therefore includes electric scooters (e-scooters), electric bicycles (e-bikes), hoverboards, Segways and powered unicycles. These devices are transforming urban mobility, offering a sustainable, efficient, and cost-effective alternative to traditional transport. Their growing popularity stems from convenience, reduced carbon emissions, and affordability.

LEGAL FRAMEWORK

There is no specially designed legal framework for light PEVs but powered transporters fall within the definition of a "motor vehicle" as defined in the Road Traffic Act 1988 as "any mechanically propelled vehicles intended or adapted for use on roads".

In other spaces various laws and regulations restrict the use of motor vehicles, which includes powered transporters. The way in which they restrict the use of powered transporters depends on where that use takes place. Crucially, they cannot be used on the pavement, cycle lanes, car parks or privately owned roads. Therefore, powered transporters can only be used on private land with the permission of the landowner.

To be lawfully used on public roads, the powered transporter must meet several different requirements, including:

- Insurance.
- Payment of vehicle tax.
- Licencing and registration.
- Driver testing and licencing.
- Use of relevant safety equipment (e.g. helmets).

If the user of a powered transporter can demonstrate compliance with all the above requirements, they theoretically could be used on public roads (and in other currently restricted spaces). However, it is unlikely that complete compliance with the requirements would be achieved, making it an offence to use them. Currently, in the UK only e-scooters participating in official rental e-scooter trials may be used legally on roads (and in other currently restricted spaces).

ELECTRICALLY ASSISTED PEDAL CYCLES

If an e-bike meets certain criteria, it can be classed as an electrically assisted pedal cycle (EAPC), which have their own regulatory framework and can be used as if they were a standard pedal cycle. These criteria are:

- To be fitted with pedals that can propel it.
- To have an electric motor with a maximum continuous rated power not exceeding 250 watts.
- To cut off any electrical assistance when it reaches 15.5 miles per hour (mph).

The e-bike must have the manufacturer's name, maximum continuous rated output of the motor and nominal voltage of the battery clearly marked on it. It is becoming increasingly common to convert a standard pedal cycle into an EAPC, either at home or via a retailer, as a cheaper alternative and more eco-friendly alternative to purchasing a new e-bike. However, these conversions are frequently not compliant with the regulations around motors producing more than 250 watts and the batteries are not made to UK / EU standards so they can have faulty electrics, or insufficient brakes.

To this end, the Office for Product Safety and Standards has recommended that retailers do not offer e-bike conversions because of the difficulty in ensuring that the resulting device is safe and legal to use. Furthermore, the person / retailer performing the conversion is seen to be the "manufacturer" of the e-bike and must comply with additional legal requirements and may be liable for damage caused by any defect.

BATTERY FAILURES

One popular component to a powered transporter's practicality is the ability to charge and store it in the home, preventing theft, corrosion and increasing the battery life of the device. However, while storing an e-scooter or e-bike inside is extremely low risk, charging it within the home has the potential to lead to catastrophe. Most often, this is caused by the lithium-ion (Li-ion) battery within the powered transport failing. There are many reasons why this could happen, including:

- Internal manufacturing defects.
- Physical damage.
- Substandard quality.
- Electrical abuse - over-charging / discharging.
- Internal electrical failure i.e. a short-circuit.

While there is currently limited data on the number of fires caused by e-bikes or e-scooters, e-bikes are now the fastest growing source of fires in London. The London Fire Brigade reported eight such fires in 2019, rising to 24 in 2020 and 59 in 2021 – an exponential increase. On average, there is an e-bike fire in London once every two days.

CONTROLLING A LI-ION BATTERY FIRE

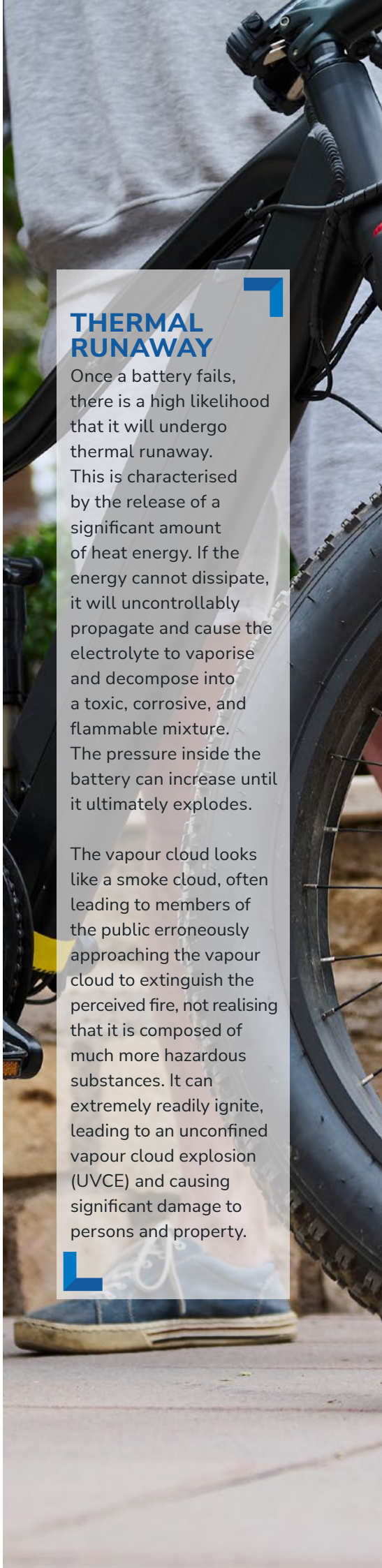
Due to the positive feedback loop involved in thermal runaway, it is extremely difficult to control a Li-ion battery fire. Water has a high heat capacity so it readily cools the fire but does not prevent the chemical reaction from continuing when used as the extinguishing media. The most practical option is to place the powered transporter into a container of water (a skip or wheelie bin may be readily available and of an appropriate size) to completely submerge the battery, which will eventually stop the reaction.

Other alternatives such as using powder further contains the heat, so chance of reignition is high. Foam formulations are being developed and investigated as a future option, but it must completely smother the fire and specialist foams are unlikely to be rapidly available in public or domestic spaces. There is currently no industry standard to fight a Li-ion battery fire and allowing the damaged powered transporter to burn out may be a reasonable consideration (or may already have occurred by the time first responders arrive).

RECOMMENDATIONS TO REDUCE RISK

The National Fire Chiefs Council has released safety guidance to spread awareness of the dangers of powered transporters. Members of the public should not store powered transporters near escape routes, particularly in flats where there is only one entry / exit point. Furthermore, it should never be charged overnight or with a non-manufacturer approved charger. E-bikes and e-scooters etc. should be purchased from reputable retailers to reduce the likelihood of the device containing a defective battery. If the device becomes damaged due to an accident, it should be appropriately disposed of and replaced immediately.

Sources:
Powered transporters - GOV.UK
EAPC standards and legal requirements - GOV.UK
E-bikes and e-scooters fire safety guidance - NFCC
Prevention of fires caused by dangerous e-bikes and e-scooters



THERMAL RUNAWAY

Once a battery fails, there is a high likelihood that it will undergo thermal runaway. This is characterised by the release of a significant amount of heat energy. If the energy cannot dissipate, it will uncontrollably propagate and cause the electrolyte to vaporise and decompose into a toxic, corrosive, and flammable mixture. The pressure inside the battery can increase until it ultimately explodes.

The vapour cloud looks like a smoke cloud, often leading to members of the public erroneously approaching the vapour cloud to extinguish the perceived fire, not realising that it is composed of much more hazardous substances. It can extremely readily ignite, leading to an unconfined vapour cloud explosion (UVCE) and causing significant damage to persons and property.

PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

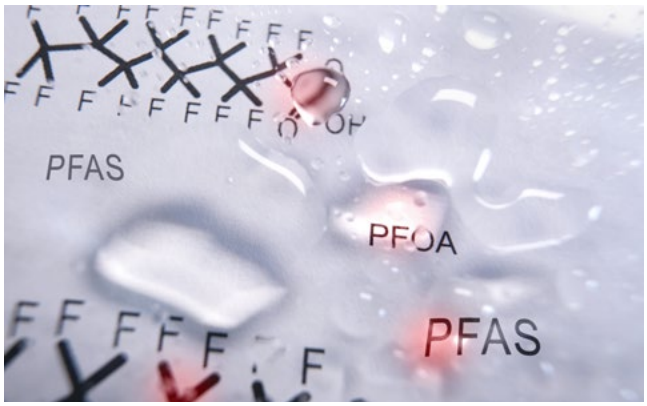
Per- and polyfluoroalkyl substances (PFAS) are synthetic chemicals valued for their resistance to heat, water, and oil. However, they are extremely persistent in the environment, mobile, and capable of accumulating in wildlife and humans.

PFAS refers to a wide group of man-made chemicals that are widely used in various consumer and industrial products (e.g. water and stain repellent textiles, firefighting foams, food contact materials, and cosmetics).

The term PFAS does not describe whether a compound is harmful or not, it merely describes common elements to their structure. They all consist of a fluorinated carbon chain that may be fully (per) or partially (poly) fluorinated.

WHY THE CONCERN?

For many PFAS currently in use, there is a lack of detailed knowledge on their chemical structures, properties, uses and toxicological profiles. However, one fact is consistent - their carbon-fluorine bonds are the strongest known in organic chemistry and difficult to break. This property results in their extreme persistence in the environment, hence their nickname, “the forever chemicals”.



Therefore, they are of increasing concern as many are likely to be persistent in the environment, whilst some are also known to be mobile, toxic and bioaccumulative. They are known to damage ecosystems and to be moderately or highly toxic to human health. Two of the most discussed PFAS, perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), have been classified in Europe as carcinogens.

HUMAN HEALTH EFFECTS

Scientific studies have linked some PFAS to adverse effects on human health and ecosystems, with suggested links to a variety of health issues, including high cholesterol, ulcerative colitis, thyroid disease, kidney and testicular cancer, and pregnancy-induced hypertension.

An example of this occurred in Jersey, following a leak of firefighting foam in the 1990s from an airport fire training ground into the neighbouring area and water supplies. PFAS have since been implicated in a range of chronic health effects to islanders, and 70% of islanders tested had higher than threshold levels of PFAS compounds in their blood.

The European Commission estimates that the cost of managing PFAS pollution, managing associated health conditions and decontaminating sites could be €440bn in the European Economic Area by 2050 if legislation does not change. Without action, about 4.4 million tonnes of PFAS will enter the environment within the next 30 years.

THE PROPOSED RESTRICTION

The proposal uses the 2021 OECD / UNEP definition of PFAS, which encompasses more than 10,000 substances. It will restrict the availability of PFAS as they may not be manufactured, used, or placed on the EU market above specific concentration thresholds. This could save €110bn of PFAS-associated harm by 2050.

However, exemptions are foreseen where alternatives are not technically or economically viable, with transition periods ranging from five to twelve years and essential uses in medicines, plant protection and biocidal products remain exempt.

IMPACT TO FIRE SERVICES

In April 2025, EU Member States formally adopted a sector-specific restriction banning PFAS in firefighting foams – the most advanced PFAS restriction so far. Research conducted by The European Commission and the European Chemicals Agency (ECHA) showed that about 30,000 tonnes of firefighting foams are produced in the European Union (EU). Despite previous restrictions on certain PFAS in firefighting foams, 18,000 tonnes (60%) of the current formulated tonnage of firefighting foams contain PFAS. Fluorinated firefighting foams are

the cause of many cases of contamination in Europe, both of soil and drinking water. The exact PFAS contained in firefighting foams is often unknown due to manufacturer confidentiality.

The research also showed that fluorine-free firefighting foams are available, technically feasible and have been successfully used in most of the sectors identified.

In the UK, the regulatory picture is fragmented and following Brexit, we are not legally bound to follow the path of the EU. Nonetheless, regulations applying to PFAS are expected to increase in the coming years.

The Health and Safety Executive's (HSE) REACH work programme conducted a six-month public consultation ending in February 2026 to gather stakeholder views on PFAS in firefighting foams. This links to the HSE's scientific analysis and evidence base for potential restrictions on PFAS use in firefighting foams, which recommended that firefighting foams are more quickly regulated than other uses of PFAS as they are one of the largest sources of direct PFAS release into the environment.

Personal protective clothing used in several industries also contains PFAS because of their superior resistance to oil, water, and stains. They are used throughout the outer layer, middle barrier, and thermal liner. The amount and types of PFAS in the clothing varies from one manufacturer to the next.

However, it is important to note that no direct link has been established between PFAS-containing clothing causing impacts to health.

FUTURE CONSIDERATIONS

For protective clothing, which must meet certain standards, including minimum requirements for water repellence, there is no clear frontrunner to replace PFAS. However, researchers and manufacturers are exploring alternative materials that offer the same level of protection, durability, and resistance to water and contaminants, without the associated potential health risks.

This pursuit may lead to a greater emphasis on sustainability and health safety in the creation of protective clothing, incorporating biodegradable, non-toxic, and recyclable materials that meet stringent performance standards.

The Fire Industry Association (FIA) recommend that organisations start to plan for a move to fluorine-free firefighting agents, particularly where restriction extensions are short, but for the longer 10-year exemptions there is more time. It should be noted that there is no legal requirement in force as of February 2026 in the UK. However, with the EU restriction published, the timelines are now clear for Europe and once all the transitional measures have expired, it will be entirely in place from October 2035.

The shift to fluorine-free systems isn't as simple as swapping one foam for another. Fluorine-free foam (F3) has different viscosity and performance characteristics, meaning some systems will require significant modification. Since July 2025, C8 PFAS foam cannot be used, with anticipated restrictions to C6 foam on the horizon, and in 2030 sales of C8 foams are expected to be prohibited.

Fire services should map their risks, by keeping a record of which PFAS are being used in their supply chains and in their jurisdiction. This can prove challenging, because the class of chemicals is large and naming conventions vary, but it allows planning for future regulatory change and reduces the risk of inadvertent breaches of new rules. Supply chain disruption can also then be anticipated for procurement purposes and mitigated in advance.

Sources:

Reconciling Terminology of the Universe of Per- and Polyfluoroalkyl Substances | OECD

Registry of restriction intentions until outcome - ECHA

All news - ECHA

FIA-Guidance-PFAS-Update-December-2025.pdf

PFAS in firefighting foam (FFF) restriction proposal

Jersey 'forever chemicals' contaminated private water supply - BBC News

Environmental focus – PFAS | Fire Protection Association

EU says 'forever chemicals' ban could save €110bn by 2050

THE TOXIC TWINS: CARBON MONOXIDE AND HYDROGEN CYANIDE

Carbon monoxide (CO) and hydrogen cyanide (HCN) are key components of smoke from domestic fires that act together to severely reduce the body's ability to metabolise oxygen, potentially leading to fatality.

Historically, home furnishings were made of natural products such as cotton, wool, and wood. Incomplete combustion of such materials releases CO. Although not specifically known to be the toxic component of smoke, Aristotle commented as far back as the third century that "coal fumes lead to heavy head and death". Years later, CO was named as a key contributor to fatalities from fires.

Since the 1960s, there has been a dramatic increase in the amount of synthetic material within domestic furnishings. Examples of synthetic materials include polyurethane spray foam insulation, laminate flooring, synthetic carpeting, PVC pipes, polyester and pressed-wood furniture, and plastic electronics. The outcome is an increased proportion of toxic combustion products released from domestic fires, such as sulfur dioxide, hydrogen chloride, nitrogen dioxide, and HCN.

In the 1970s, the Fire Service began to recognise that inhaling smoke from fires has not just a detrimental effect, but a long-term toxic effect. Recently, it has been discovered that the combination of CO and HCN has a greater than expected toxic effect, leading to their nickname, "the toxic twins".

CARBON MONOXIDE

CO is a colourless, odourless, tasteless, flammable gas. Humans are therefore unable to detect it directly and must rely on monitors. It is toxic if inhaled, with Workplace Exposure Limits (WELs) of 20ppm for an 8-hour period and 100ppm for a 15-minute exposure.

There is increased public awareness of the dangers of CO poisoning from domestic appliances, such as gas boilers or hobs, with an additional regulatory push to install CO monitors in rental properties. While this may prevent chronic exposure, it will not prevent inhalation of smoke in domestic house fires. CO's method of toxicity is through its affinity for haemoglobin, the main molecule that transports oxygen in the blood. Since CO is 250 times more likely to bind to haemoglobin, breathing in a small amount of CO can dramatically reduce the amount of oxygen carried around the body to cells, tissues, and organs, eventually resulting in chemical asphyxiation. The brain is particularly susceptible, leading to significant neurological effects.

Symptoms of exposure	
CO	
Headache	Confusion
Drowsiness	Nausea / vomiting
Flushing	Chest and muscle pain
Dizziness	Weakness
Loss of vision	Seizures
Respiratory failure	Myocardial infarction

HYDROGEN CYANIDE

Like CO, HCN is a colourless, flammable gas. It is often described as having a bitter almond taste and smell, although this is subjective and it is estimated that only 1 in 3 can detect this unique odour.

It is significantly more toxic than CO, with an 8-hour WEL of 0.9ppm and a 15-minute exposure of 4.5ppm. This is because HCN attacks the body in a different manner to CO as it has a high affinity for the enzyme cytochrome C oxidase. This enzyme is essential for aerobic respiration within all cells, i.e. the process of using oxygen to form energy. Without this enzyme, irrespective of blood oxygen levels, the body can only produce energy using anaerobic respiration. The consequence of this is a build-up of toxic substances (e.g. lactic acid) in the body. Organs with a high oxygen demand are the most rapidly affected, therefore neurological and cardiological effects are common.

Symptoms of exposure	
HCN	
Headache	Confusion
Drowsiness	Anxiety
Flushing	Stupor
Perspiration	Rapid breathing
Tremors	Cardiac arrhythmia
Coma	Respiratory depression / arrest

SYNERGISTIC EFFECTS

As illustrated above, several of the effects of CO and HCN are similar. However, the critical issue is that they synergise to have a greater effect on the body compared to being inhaled separately, as they both affect the body's ability to transport and use oxygen. This combined effect of CO reducing the available blood oxygen, and HCN preventing the cells from being able to convert the available oxygen into energy can have fast and deadly effects.

Another effect is that HCN causes hyperventilation, which CO does not. This increases the rate at which both HCN and CO are breathed in. There is test data which demonstrates that at low concentrations of HCN (< 100ppm), it takes greater than 20 minutes for casualties to become incapacitated, whereas at higher HCN concentrations (200ppm), the time to unconsciousness is 2 minutes. HCN will therefore act more rapidly to initiate disabling effects in a domestic fire, compared to CO, which acts over a longer time. Once a casualty is incapacitated by HCN, they will continue to breathe in HCN and CO while still alive. With CO being the predominant component of smoke, a postmortem will reveal a significantly higher concentration of CO in the blood, disguising the fact that HCN was the primary contributing fatal factor.

IMPLICATIONS

The prevailing thought previously was that once a victim had been removed from smoke and into fresh air, they would recover. However, it is now understood that this is not necessarily the case. Exposure to high levels of CO can be fatal, but what is often overlooked is the presence of HCN. The symptomology of CO and HCN exposure is non-specific, with a wide range of neurological and / or cardiac effects that are not indicative as to whether there is CO or HCN toxicity involved. Early recognition of potential exposure is key, as symptoms may otherwise be attributed to stress, panic, or underlying health issues instead of smoke inhalation. It is now thought that firefighters who experience dizziness, weakness, and rapid heart rate after a fire could be feeling the effects of HCN, and that it may be a contributing factor to heart attacks and cardiac arrest during or following exposure to smoke.

TREATMENT

Prompt treatment for those experiencing symptoms of smoke inhalation is critical to assess whether CO and HCN are the cause. Casualties should be removed to fresh air and treated with 100% oxygen, along with artificial respiration if necessary. Vitamin B12 or sodium thiosulfate may be administered in hospital to treat HCN poisoning but, unless blood samples are specifically analysed for HCN poisoning, it is often missed. Even if successfully treated, there can be several long-term effects of HCN poisoning, such as Parkinson-like symptoms, changes to the brain chemistry, and structural changes to the heart.

PRECAUTIONS

Firefighters should be aware that casualties can off gas some of these contaminants. It is therefore possible that emergency responders working on a casualty can become secondarily exposed to the same contaminants, including HCN. Emergency responders should wear appropriate personal protective equipment at all stages of rescuing victims from a fire and monitor for toxic gases. As the effects of CO and HCN are greater in combination, using their individual exposure limits is unlikely to reflect the severity of the symptoms that could be encountered if they are both inhaled. Self-contained breathing apparatus should be worn until it has been determined that the air is safe to breathe, and equipment and personnel decontaminated according to guidelines (e.g. shower within an hour). Finally, officers should monitor their own condition and the behaviour of others, with the understanding that HCN may be the culprit of unusual symptoms, not just the exertion of the job.

Sources:
ToxicTwinWPpdf2023.pdf
Carbon monoxide poisoning | Health topics A to Z | CKS | NICE
The-Toxic-Twins-_-Brief-Review.pdf

TRANSPORT VS SUPPLY CLASSIFICATIONS

Transport law focusses on immediate health risks that may occur during transport, whereas supply law includes additional health classifications that incorporate long-term effects.

Supply and transport law both seek to communicate the intrinsic hazards of chemicals to those who will be interacting with them. Whilst based on similar principles and testing criteria, their aims are slightly different. This is because they have different end users and circumstances of use.

Following Brexit, UK supply law is UK REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals). It is a chemical safety regulation that applies to the use, manufacture, and supply of chemicals within the UK. Its purpose is to protect human health and the environment from chemical risks, ensure proper risk assessments and information for safe use, and control chemicals in workplaces, products, and supply chains. The hazards of the chemicals are communicated via CLP (Classification, Labelling and Packaging) regulations.

Transport law applies to the movement of dangerous goods via different modes of transport, which are road, rail, air, sea, and inland waterways. There are distinct regulations applicable to each mode of transport, however they all serve to protect those in the transport chain from exposure to bulk and packaged quantities of chemical substances. They cover a wide range of topics, including the classification, packaging, documentation, marking, loading, and movement of dangerous goods. The primary method of moving chemicals in the UK is by road and therefore this article will focus on the Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2025 and its derogations as implemented by The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (CDG) 2009.

CLP

Pictograms are used to communicate the hazards of a product. They are red outlined diamonds with a black image on a white background and are one of either physical, health or environmental hazard categories. They are designed to be intuitively understood without needing any explanation. They are found on product labels, safety datasheets (SDS), and sometimes on outer packaging e.g. cardboard boxes, that contain multiple bottles of product. Examples include:

Alongside the pictograms, there will be hazard warning phrases that describe the nature and severity of a hazard associated with a pictogram. For example, a flame pictogram could be accompanied by “Extremely flammable liquid and vapour”, “Highly flammable liquid and vapour” or “Flammable liquid and vapour”. This gives both a visual and written warning where the base hazard (flammability) can be immediately interpreted and further clarified by reading the hazard statements.

ADR

Transport law classifies chemicals into nine classes based on physicochemical properties:

Class 1: Explosives
Class 2: Gases
Class 3: Flammable liquids
Class 4.1: Flammable solids
Class 4.2: Substances liable to spontaneous combustion
Class 4.3: Substances which, in contact with water, emit flammable gases
Class 5.1: Oxidisers
Class 5.2: Organic peroxides
Class 6.1: Toxics
Class 6.2: Infectious substances
Class 7: Radioactives
Class 8: Corrosives
Class 9: Miscellaneous, including environmentally hazardous substances and lithium-ion batteries

These classes are consistent across all modes of transport, so it is a global system. Depending on the results of test criteria, every substance can be assigned a class, possibly with subsidiary classes.

From this, they can be assigned a UN number, a 4-digit number which encodes the primary and subsidiary classes and consequentially other aspects of compliance, such as how it must be packaged.

Linked to each UN number is an Emergency Action Code (applied for transport in the UK only) that encodes the most appropriate firefighting medium, personal protective equipment (PPE), environmental measures and public protection actions.

Furthermore, classes can be subdivided into packing groups (PG) which may have different EACs. Chemicals assigned to PGI have a higher degree of danger, PG II a middle risk, and PG III a lower risk.

KEY DIFFERENCES

Transport law places much more emphasis on physical and health effects that can cause immediate danger to personnel exposed to a release during transport. This is because, if the regulations are correctly followed and no incident occurs, there is no / minimal contact between persons in the transport chain and the chemicals they are moving. Additionally, exposure to chemicals should not be happening on a regular basis, so the chance of chronic or repeated exposure is extremely low.

As a result, transport law has a higher threshold before substances are classified as hazardous. An example for this is toxicity. Transport law only considers chemicals toxic by ingestion if a dose of 300mg/kg or less can cause ill-effects. However, CLP considers chemicals toxic by ingestion if a dose of 2000mg/kg or less can cause ill-effects. Therefore, some chemicals may be classified as toxic for supply, but not for transport.

Equally, due to the target audience of supply law and anticipated repeat exposure risk, there are health effects that are included in supply law which are not explicitly included in transport law classes. Examples of this are carcinogens, mutagens and reproductive toxins. These hazards are associated with chronic exposure, which is expected in industries where employees are repeatedly using the same chemicals as part of their profession e.g. laboratory technicians, cleaners, or factory workers.

Additionally, the greater scope of hazards is designed to protect a larger proportion of the population as the products considered are in the public domain. Therefore, vulnerable members of the population must be factored in, such as infants, the elderly and the immunocompromised. This leads to the lower threshold for substances to be deemed hazardous.

RELEVANCE TO FIRST RESPONDERS

Transport law is particularly useful for quickly resolving large-scale incidents. Using the UN number, PG and EAC, generic information can be used to create a basic strategy to mitigate risk. In most instances, the specific details of a substance's physicochemical properties are not known, for example a flash point, but its range will be because this prescribes the PG the product is transported under. This suits the emergency nature of the incident, since a reasonable level of information can be obtained without fully identifying the exact product involved, and the nature of the response means that the precautions taken will not vary for substances within the same PG.

Of course, since the exact product is not always identified, there can be hazards that are not captured by transport law i.e. the chronic health risks. First responders are in a position where they attend incidents involving dangerous chemicals more frequently than those in the transport chain, and yet they are not necessarily aware of long term or repeat exposure effects. Obtaining this information will require further research into the chemical.

The SDS comes directly from the manufacturer so it will have more detailed and product-specific information on how to resolve an incident. However, it is designed for an end user and therefore the recommended actions are targeted towards their expertise, capabilities and situational use so the data may need additional interpretation to make it operationally viable for a large-scale incident. It may also be time consuming to source a specific SDS and therefore time spent locating this should be considered against the level of risk of the incident, in lieu of using general data sources (e.g. UN numbers).

The likelihood of a first responder suffering a detrimental effect from an unknown chronic health effect can be readily mitigated by following standard processes, including wearing appropriate PPE, and keeping interaction with the chemical to a minimum.

Sources:
ADR 2025
CLP
UK registration, evaluation, authorisation and restriction of chemicals (REACH) - HSE

ASBESTOS

Asbestos fibres present a significant risk to health. Whilst undisturbed, undamaged asbestos poses little harm to health, airborne fibres present a major cause of concern.

Asbestos refers to a group of naturally occurring fibrous minerals that are valued for their heat-resistance, strength, and inert nature. There are three main types of asbestos known as blue asbestos (crocidolite), brown asbestos (amosite), and white asbestos (chrysotile), although their colour should not be used to conclusively identify them.

Asbestos containing materials (ACMs) were historically widely used across many industries, for example in cement, insulation, roofing, fireproofing, vehicle brakes, ceiling and floor tiles, paints, coatings, and adhesives. However, it was subsequently discovered that inhaling asbestos fibres can cause severe health complications.

Due to this, since 2000 it has been illegal to use asbestos in the construction or refurbishment of any premises, but there are many thousand tonnes of legacy material spread throughout the UK.

In the UK, asbestos is now regulated by the Control of Asbestos Regulations (CAR) 2012, which governs the importation, supply, use, maintenance, removal, and disposal of (ACMs).

WHY THE CONCERN?

Because asbestos is a naturally occurring product, everyone is exposed to asbestos at some time during their life. Low levels of asbestos are present in the air, water, and soil.

However, asbestos is a known human carcinogen that primarily affects the lungs. When damaged, it releases microscopic fibres and, if these are inhaled, they can become lodged in the airways and cause inflammation and scarring. Over time, this can develop into serious diseases including:

- Mesothelioma.
- Asbestosis.
- Lung cancer.
- Pleural disease.

The greatest risk factors for developing asbestos-related illnesses are the dose, duration and source of exposure, specific asbestos type inhaled, and genetics. Symptoms often develop decades after the initial exposure, so may only be circumstantially attributed to asbestos.

ASBESTOS CONTAINING MATERIALS

For first responders, asbestos is most often encountered during incidents involving infrastructure constructed or refurbished before the year 2000. Typical scenarios include fires, structural collapse, weather damage, or rescue operations. ACMs may be disturbed by heat, impact, or mechanical damage, leading to the release of respirable fibres. The risk is highly dependent on the type and condition of the material involved.

Higher risk materials generally contain a greater proportion of asbestos and are therefore more brittle, readily releasing asbestos fibres into the air when damaged. Furthermore, the type of asbestos contributes to the likelihood of airborne fibres, as blue or brown asbestos are more fragile than white. Sprayed coatings, lagging and insulating board are more likely to contain blue or brown asbestos. Asbestos insulation and lagging can contain up to 85% asbestos and are most likely to give off fibres. The number of fibres released from asbestos insulating board can be equally high if power tools are used.

On the other hand, asbestos cement contains only 10% - 15% white asbestos. The asbestos is bound into the cement, and the material will only give off fibres if it is badly damaged or broken, so this poses a lower risk.

RISK IDENTIFICATION

Asbestos cannot be identified reliably through visual characteristics, odour, immediate signs of exposure (e.g. coughing) or routine detection equipment.

Risk assessments therefore rely on contextual and environmental indicators, such as:

- Age and construction type of the building.
- Visual appearance of damaged materials.
- Information from occupiers or site representatives.
- Presence of asbestos signage or registers (where accessible).

In emergency situations, this information is often incomplete or unavailable. As a result, first responders must frequently operate under the assumption that asbestos may be present, particularly in older buildings.

This precautionary approach is essential because lack of obvious hazard does not equate to lack of risk.

CONTROL MEASURES

As the primary risk from asbestos is inhalation of fibres, control measures are focused on preventing respiratory exposure. There is clear guidance available for persons who regularly interact with asbestos e.g. asbestos removal contractors. It is important to note that while no safe exposure threshold has been defined, there is a recommended control limit for workers regularly exposed to asbestos of 0.1 fibres per cm^3. Because there is no safe exposure threshold, the same guidance states that every effort should be made for levels to be appreciably below 0.1 fibres per cm^3, with an asbestos-clean workplace having less than 0.01 fibres per cm^3. Any exposure greater than 0.6 fibres per cm^3 peak level (measured over 10 minutes) is not considered to be a low-intensity or sporadic exposure and appropriate respiratory protective equipment (RPE) should be worn.

For first responders, asbestos exposure is rarely able to be measured, nor is specialist asbestos removal equipment likely to be present. In addition, they may be repeatedly and unknowingly exposed to asbestos throughout their career. Therefore, the risk of responding to any incident with suspected asbestos involvement should be mitigated using the following generic operational controls:

- Appropriate RPE.
- Minimising disturbance of suspect materials.
- Avoiding unnecessary cutting, breaking, or handling of debris.
- Avoiding dry sweeping.
- Using water to suppress dust where operationally appropriate.

Practically, structural firefighting kit and breathing apparatus or a well-fitted P3 filter will provide a suitable level of protection.

DECONTAMINATION

Asbestos fibres can adhere to clothing, personal protective equipment (PPE) and other operational equipment. While the risk from a single contamination event is low, repeated contamination without effective decontamination may contribute to cumulative exposure.

Decontamination procedures should focus on absolutely minimising the disturbance of any fibres. Recommendations include:

- Not rubbing any exposed areas or equipment.
- Carefully removing affected clothing, avoiding pulling over the head if practical.
- Double bagging contaminated clothing for specialist disposal or cleaning.
- Using damp, disposable cloths to wipe down hard surface kit, such as boots.

Importantly, asbestos related diseases do not present immediately, which can lead to an underestimation of risk when compared to hazardous substances that cause rapid injury. Maintaining consistent hygiene and decontamination standards is therefore critical.

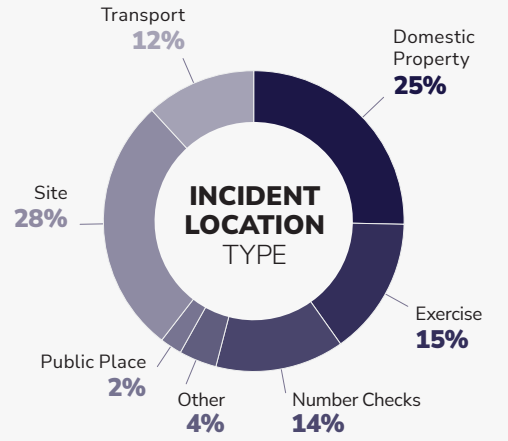
Sources:
The Control of Asbestos Regulations 2012
Asbestos: toxicological overview - GOV.UK
Incident management: asbestos
Asbestos Exposure and Cancer Risk Fact Sheet - NCI
Asbestos Guide to Managing Asbestos
https://www.cancer.gov/about-cancer/causes-prevention/risk/substances/asbestos/asbestos-fact-sheet

LATEST CALL STATISTICS AND TRENDS

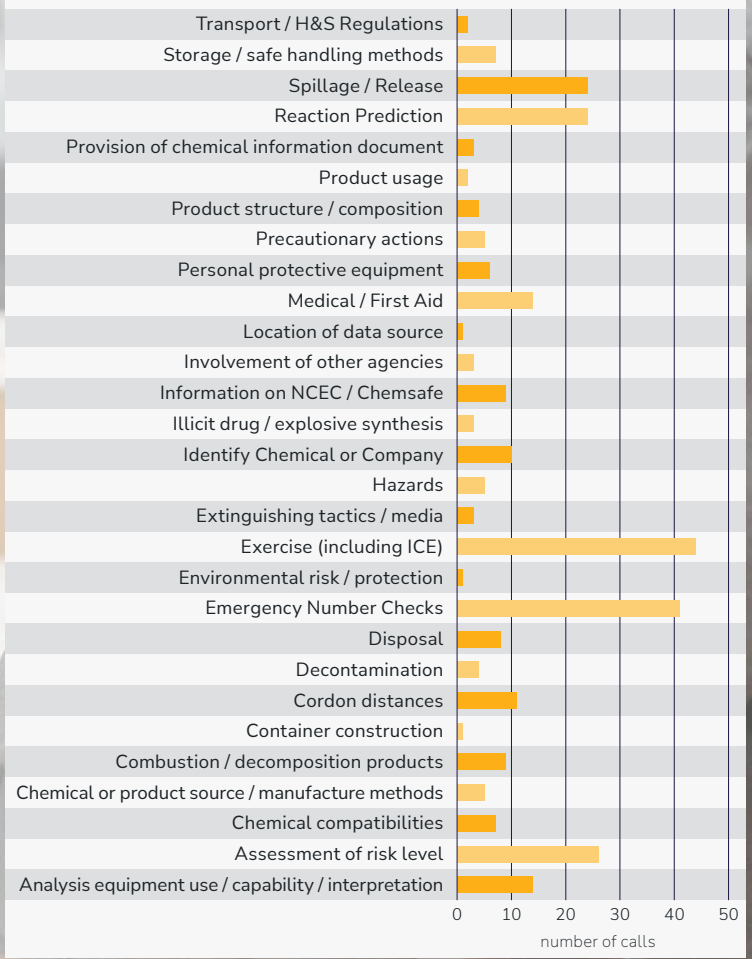
CHEMSAFE INCIDENT TRENDS
April 2025 - March 2026

- **Suspicious activity** in terms of drugs, IDL's, finds by the authorities, suspicious purchase activity, hobby chemists etc.
- **Suspected gas leaks / fires**
- **Unknown substances**
- **Cleaning chemical spillages / reactions / fires**
- **Water treatment chemicals** (water supply and pool chemicals)
- **Batteries**
- **Individual Chemical Exposure (ICE) incidents**

CHEMSAFE April 2025 - March 2026



MAIN ENQUIRY TYPE



chemsafe

NCEC provides refresher training for all eligible Chemsafe users.

The objectives of the training are to provide:

- A better understanding of the Chemsafe scheme and the role of NCEC within it.
- Technical training on individual chemical exposure (ICE) incidents.
- Technical training on waste fire incidents.

We discuss and review examples of the calls we have taken and run interactive scenarios based on real Chemsafe calls to enhance knowledge and promote shared learning.

Emergency Services Refresher Training

FREE

The training is approximately 6 hours long if every element is required but it can be tailored according to which sessions you want to receive (the core Chemsafe session must be delivered).

It is completely free of charge and can be delivered in person or virtually.

Contact details:
01235 75 3363
rcd.chemsafe@wsp.com

Funded by UK Government

cia CHEMICAL INDUSTRIES ASSOCIATION

NCEC Member of WSP

Hazmat 2027: The UK's Premier Event for Hazmat Professionals

19-20 May 2027, Crowne Plaza Hotel, Stratford-upon-Avon

HAZMAT 2027 ANNUAL CONFERENCE
SPECIALIST ADVICE: +44 (0) 1235 753654 NCEC

Now in its 18th year, NCEC's Hazmat conference is the ultimate forum for Hazmat Professionals to share experiences and gain knowledge with like-minded professionals working in the hazmat and chemical incident industries. The two-day conference draws on the knowledge and experience of a broad range of multi-agency hazmat professionals and industry leaders, including NCEC's emergency responders and chemical experts. With presentations and case studies from leading experts to interactive workshops on hazmat-related subjects, Hazmat 2027 truly is the premier event for all Hazmat professionals.

REGISTER YOUR INTEREST TODAY

Visit link here

Or scan the QR code

Super-early bird registration deadline: **30th September 2026**

Save £135 on the standard price by taking advantage of our limited time **super-early bird offer**. Super-early bird registrations are now open. Book before the **30th September** to secure this exclusive price.

Conference supporters JOIFF

Organised by: NCEC Member of WSP

KEEP IN TOUCH

If you have any comments about 'The Spill' or experiences of using the Chemsafe service that you would like to share, please contact us using the details below.

You can also contact us if you would like to know more about Chemsafe, and the other services and products provided by NCEC.

NCEC will be exhibiting at the Emergency Services Show at the NEC on the 16th – 17th September

Please come and visit us at Stand C2 within the Collaboration Zone

TEL
(sales and enquiries):
+44 (0) 1235 753654

EMAIL
rcd.chemsafe@wsp.com

NCEC
Member of WSP