



A Safety Warning

– CO₂ fire extinguishers



CO₂ fire extinguishers can be life savers in the event of fire, but could they also be potential killers?

DGUV, the umbrella organisation of German Statutory Accident Insurers, had increasing numbers of enquiries from member companies about the hazards to individuals from extinguishing fires with CO₂ extinguishers in confined spaces. Only mathematical estimations of the diffusion of CO₂ in confined spaces were available and there was a need for clarification.

A safe maximum concentration of CO₂?

A project was established by DGUV to determine a safe maximum concentration of CO₂ in air, and to subsequently calculate the minimum open floor space for the safe use of carbon dioxide extinguishers. The results were published in a safety guide in 2019 (Note 1). One of the key findings of the study was that ceiling height beyond 2 metres height does not add to the safety of the CO₂ application as the gas is concentrating at lower levels.

Danger of CO₂ poisoning rather than lack of oxygen.

The study highlighted the danger of CO₂ poisoning rather than asphyxiation (lack of oxygen), which had previously been believed to be the main danger. The level of oxygen can still be sufficiently high, having dropped only slightly, however the CO₂ concentration can have increased to a dangerous level. As a guide, poisoning symptoms are to be expected from 4% CO₂ volume and a risk of death from 8% volume. The tests also proved that the previous room volume-related estimation for safe application of CO₂ extinguishers had to be changed to an area-related method as room heights above 2 metres were found to be of minimal impact on the safety of the CO₂ extinguisher application.

The overall conclusion was that a 2 kg CO₂ fire extinguisher requires at least 11 sq. metres of free floor space and a 5 kg CO₂ fire extinguisher at least 27.5 sq. metres (free floor space being the visible area of the floor not covered by solid objects).

5kg Co₂
27.5 square metres

2kg Co₂
11 square metres

DGUV recommendation for free floor space (visible area of the floor not covered by solid objects)

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Germany issues new CO2 extinguisher checklist.

In Germany, the BVFA, the German fire industry trade association, has issued a checklist on CO₂ fire extinguishers incorporating the calculation. The main German extinguisher producers have a question and answer section on their websites referencing the report and including check lists similar to that of the BVFA.

Where does this leave the UK?

The recently published BS5306-0 (Note 2) and the public consultation version of BS5306-8 (Note3) have sections on the effect on people of CO₂. BS5306-0 says “extinguishing concentrations of carbon dioxide create a lethal atmosphere, and it is thus confined to normally unoccupied areas. NOTE At carbon dioxide concentrations in the range 5% to 10% breathing becomes increasingly laboured and a 10% concentration might be regarded as the danger level for most people. A concentration of 10% is sufficient to cause unconsciousness, and if not removed from the area, the subject could die.”

In contrast, the public consultation version of 5306-8 in clause 4.0 and 4.2 CO₂ does not identify the dangers saying that: “A range of information needs to be assessed by the competent person to ensure that the most suitable media are selected. Personnel will be exposed to the media and the products of combustion whilst extinguishing fires... The media available in portable extinguishers, their firefighting properties, and their effects on people, property and the environment are described in the Commentary on clause 4.0. In 4.0 it says “Co₂ is non-conductive, its discharge is louder than that of other extinguishers. It does not leave any residual deposits that require cleaning up after extinction and is not usually subject to environmental controls.”

The potential dangers of CO2 fire extinguishers and their correct installation needs to be recognised and addressed in the code of practice.

A dilemma on the use of extinguishers on electrical fires arises. Powder extinguishers are not advised for internal use and the dangers of CO₂ extinguishers without a large free area space has been proved in tests, yet the use of water based extinguishers, even those that have passed the electrical conductivity test, is not allowed in the publication consultation version of 5306-8. When the relative dangers are considered, electrocution, where no instances have been recorded by the Health and Safety Executive, or the possibility of CO₂ poisoning, what is the answer? There should be a choice and 5306-8 must recognise this before it is published.

The fire industry and the drafters of the standards need to take note of best practice and, where important safety information is available, use it so products are safe and correctly installed to protect the public.

Note 1: DGUV October 2019” DGUV Information 205-034 Einsatz von Kohlendioxid (CO₂)-Feuerlöschern in Räumen”- (Use of carbon dioxide (CO₂) fire extinguishers in rooms) 28 pages in German

Note 2: BS5306-0 Guide for selection, use, and application of fixed firefighting systems and other types of fire equipment -BSI 2020

Note 3: Public consultation 5306-8 “Selection and positioning of portable fire extinguishers- Code of practice” BSI website 2020

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