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Memo

To Safety Co-ordinators (for onward transmission to all schools)

From Dr Melanie Taylor, University Safety Advisor

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Reference Safety Circular 7/2005

Carbon dioxide cylinders

There have been 2 recent incidents in Life Sciences when CO2 cylinder bursting discs failed in service in laboratories. UMIST also experienced 2 such incidents a few years ago. To those present at the time of failure, the evidence of failure would be obvious and (hopefully) they would leave the laboratory promptly and take steps to prevent re-entry, but if a cylinder discharges into an empty room, and people enter at a later date, there is a risk that they could be affected by an asphyxiating atmosphere, or experience symptoms of CO2 exposure. These include headache, nausea, loss of consciousness.

Gas cylinders are normally very safe. In fact, the British Compressed Gas Association (BCGA) states that instantaneous release of the contents of a compressed gas cylinder is “an almost inconceivable event, and not foreseeable as part of normal working”.

However, in view of our own experiences, schools should review their risk assessments for CO2 cylinders in use, in storage and in transit (particularly in lifts and any other confined space). The following information and advice is offered:

- cylinder structures vary with the type of compressed gas and many are not fitted with pressure relief devices. CO2 cylinders have bursting discs which operate if the pressure exceeds the maximum permissible service level (50 bar)
- The bursting disc failure allows total loss of contents ie it does not relieve pressure and re-seat, as a pressure relief valve would.
- CO2 is stored as a liquid under pressure. The suppliers’ procedures allow for ullage expansion, under normal temperature fluctuations, but if procedures are not strictly followed, it is possible for solid CO2 to form at the base of the cylinder and over-filling to occur.
- Cylinders should be stored below 50ºC (away from local heat sources, glazing which is subject to direct sun, etc) and used only in well-ventilated areas.
- In all the incidents to date, a full, newly-delivered cylinder has been taken into the laboratory from cold conditions outside. The cylinder has warmed up quickly to ambient temperatures before any gas has been taken off, and an excess internal pressure has built up.

- In cold weather particularly, cylinders should be allowed to warm up to room temperatures before transportation to labs, eg in loading bays, well ventilated and attended stores. Internal pressures could be checked, and gas discharged in the open air as an additional precaution, before transportation.
- If an incident does occur, staff should vacate the area immediately and prevent re-entry until it can be established that CO2 levels are below the occupational exposure standard and there is no oxygen deficiency.
- Always report incidents to the cylinder supplier – there may be faults with their filling technique, and they should be made aware of this.
- Mark the defective cylinder clearly with a label indicating its history and mode of failure, and report the incident to the Safety Office using the incident report form.
- A safety data sheet on CO2 is available at http://www1.boc.com/uk/sds/industrial%5Ccarbon_dioxide.pdf
- Remember that the risk assessment should include the risk of using CO2 in enclosed spaces. Details of how to calculate the effects of a complete loss of CO2 gas are given in BCGA Guidance Note GN11 *Use of Gases in the Workplace – the management of risks associated with reduced oxygen atmospheres, 2002*. It is available on the Technical Indexes OSH CD collection available electronically through the University libraries.

Faculty Safety Co-ordinators will be happy to provide further assistance and advice.

Dr Melanie Taylor
University Safety Advisor