GAS SAFETY UK CLIENT UPDATE FOR AUTUMN 2006
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Independent & Cost-Effective Gas Safety Solutions

PREPARED BY: DAVID BAYLISS, TECHNICAL MANAGER
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Dear All,

Welcome to the Autumn 2006 edition of our Client Update. With the summer holidays now a memory and the dark, damp & cold of winter beckoning, we can turn our attention back to gas safety matters at our workplace.

Odd as this may seem, it struck me recently that some of our clients seem to have forgotten about the range of gas safety solutions that we offer...

1. TRAINING MATTERS

First & foremost my personal goal is to provide cost-effective cylinder and cryogenic gas safety training for our clients. So, if you are thinking about organising a course on [say] the safe use of cylinders or how to safely decant liquid nitrogen then let us know. We offer a range of 'standard' courses and we will also tailor training to suit your particular needs. It's also worth bearing in mind that we are independent of any gas supply company and, therefore, we can be impartial.

2. BE ADVISED

If you need advice on practical gas safety matters then, as always, we are here to help. From site surveys and formal reporting right through to help with the selection & purchasing of gas control equipment (regulators, valves, flashback arrestors, etc.), connectors and tubing for setting up a piece of equipment, we're only a phone call or e-mail away.

3. INSTALL THE EQUIPMENT CORRECTLY, MAINTAIN IT & TEST IT TOO

Our facility for the design, installation and testing of gas cylinder manifolds and pipelines has continued to go from strength to strength. Large multi-gas systems through to single cylinder or vessel supplied pipelines must all be correctly installed and regularly tested and inspected. Again, if you need help just let us know.

4. YOU DON'T HAVE TO BE IN THE UK TO USE GAS SAFETY UK

Whilst we are a UK-based organisation, we do export items of our gas control and safety equipment all over the world &, thanks to e-mail, safety questions from clients who are overseas can also be addressed. Indeed, our installations team have been called upon to work outside of the UK as well.

And, with these points restated, we can move along to some of the [more popular] questions that have been asked recently...

For example:

Q. 'What is the likely outcome of our nitrogen cylinder venting into the laboratory as a result of hose failure downstream of a cylinder-mounted regulator'

A. Further to previous comment & discussion on this type of assessment, the following points may be

noted:

1. A regulator is designed to control [downstream] pressure but NOT flow-rate; unless the flow-rate is extremely high.

2. In this failure mode (where the hose or tubing has become detached or blown-off), the cylinder contents are free to discharge into the room very rapidly.

3. Taking a recent enquiry as an example, the following example may be helpful:

1 x 'K' size cylinder of nitrogen contains ~7.77 cubic metres of nitrogen at stp.

For one of our two-stage regulators, operating at 4 barg, the flow-rate, in failure mode (which is used in the calculation for safety relief valve selection), would be ~1.0 cubic metre of nitrogen gas per minute.

Hence, if this were to occur in a room measuring 4 metres x 4 metres x 3.5 metres (= 56 cubic metres) the resulting oxygen concentration could be as low as 18% oxygen v/v; i.e. just below the recommended/permissible minimum of 19% oxygen v/v.

Q. From this initial assessment of the hazard, what is the risk and, more importantly, what, if anything, should I do about my findings?

A. In short, we needn't concern ourselves too much in this case. This is for 2 very obvious reasons:

(i) 18% oxygen v/v should not represent a health or safety hazard to most adults and, depending upon the rate of air changes for this room, this value may not actually arise - given that discharge occurs over a period of <8 minutes - and that the discharge of gas would be very noisy, and could, quite possibly, drive personnel out of/deter entry into the area affected.

(ii) In terms of likelihood, this is a relatively unusual situation. Hose detachments, tubing failures and so on do occur but not very often. When it does happen though, it is rarely caused by regulator failure which, in turn, causes the hose to burst or the tubing to blow-off from it's connection. More commonly, this type of discharge arises because inappropriate hose/tube/connections have been used.

By ensuring that regulators are properly selected, maintained and tested (especially for outlet pressure 'creep') and, also, by making sure that the hose or tubing is properly selected and fitted/connected (for the both the fluid and the possibility of over-pressurisation) then we can be confident that the hazard has been addressed and controlled at source.

Whilst the discussion set out above may provide a useful illustration, it should be noted that where the gas is potentially harmful (i.e. at concentrations which are lower than those which would give rise to oxygen deficiency, e.g. in the case of carbon dioxide discharge or, more obviously, toxic gas discharge), then an additional control measure (e.g. a flow arrestor of 'fuse') may be appropriate. Similarly, in the case of a discharge of a flammable gas (e.g. hydrogen) we could anticipate the production of an explosive atmosphere in the same room (56 cubic metres) well within 1 minute!

Importantly, whilst the likelihood is equally low, the impact could be catastrophic and our control measures should reflect this assessment; fixed-point hydrogen detection linked to an automatic shut-off valve would be both reasonable and practicable.

If you have any questions about this type of risk assessment or the possible control measures that may be appropriate then please feel free to get in touch; as always, we'd be happy to help.

During the last few weeks we have also had quite a few questions related to PPE selection during liquid nitrogen decanting & handling operations. For example:

Q. Is it advisable to wear a polycarbonate faceshield and browguard whilst handling liquid nitrogen?

A. Further to advice we have provided in earlier Updates, the relevant Codes of Practice recommend the use of a faceshield whenever 'spraying or splashing' of liquid can occur; e.g. during decanting or pouring of the liquid. We would also recommend that safety glasses are worn even if a faceshield is also worn; the eyes are still protected even if the faceshield is raised.

Full-face protection is particularly important during decanting from pressurised tanks to open dewars via flexible [stainless steel] hoses. If the pressure/flow-rate is too high, typically if decanting is rushed, then this activity carries with it the danger of the hose being pushed out of the flask, leading to a 'whip' and spray effect. Under such circumstances the faceshield also provides mechanical protection against the 'whipping' hose causing face and/or eyes injuries.

Clearly, where there is a risk of spraying or splashing of liquid onto the body itself then a suitable apron should also be worn; an apron can also prevent liquid from entering pockets or similar 'traps' in clothing. Fitting a phase seperator to the hose outlet can also help to prevent this type of event by reducing the rate of liquid flow from the hose into the flask.

There seems to be some 'expert advice' in circulation at present that suggests the faceshield may actually collect liquid nitrogen vapour, during decanting, and cause asphyxia leading to subsequent collapse, death?!

The reports we have received of this 'advice' are alarming - especially where people have actually decided implement it!

If this notion has been put forward then it may worth considering the following points:

(i) As far as we are aware, this type of accident has never happened anywhere (unless you know different): 0(?) incidents in many millions of handling activities.

(ii) Cold nitrogen vapour is heavier than air and as long as the individual concerned is in an upright position and is still breathing, so there will be some air movement under the faceshield, the vapour shouldn't affect the breathing zone to any serious degree.

(iii) If you were to stand on your head and stop breathing during the dewar filling operation you might be able to do this - personally though, I think it seems unlikely.

Q. Should PPE be selected to take into account the risk of specimen rupture when samples are removed from liquid nitrogen storage?

A. Yes, if no other control measure can be put into place. It would, of course, be preferable to prevent liquid nitrogen from [accidentally] entering the specimen container - by properly closing the tube or vial prior to immersion in liquid or, as some users now do, by using an additional seal arrangement.

Certainly it is always advisable to allow 'thawing' to take place behind some kind of barrier (e.g. perspex), in a glove-box or similar type of container. These measures can, along with training and good practice, deal with danger of a ballistic injury (especially to the face or eyes) at source.

*If samples are stored at ~-196 degrees, a temperature increase of 49 degrees is required to arrive at the critical temperature.

And finally...

In case you've never believed that it's possible to identify a gas by it's appearance...

Photograph 1. LIQUID OXYGEN
The distinctive blue colour of liquid oxygen may be seen.

Photograph 2. LIQUID ARGON
As with liquid nitrogen, liquid argon is a colourless, water-like liquid.

If you have any questions about the issues covered in this Update then please feel to get in touch with us at the address below.

Gas Safety UK is a Division of BJ Industries Ltd
Claylands Ave., Dukeries Industrial Estate,
Worksop, NOTTS, S81 7DJ, U.K.
Tel: 01909 501771
Fax: 01909 501022
E-mail: sales@bj-industries.co.uk
Web: www.gas-safety.uk.com

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