

Emergency Isolation of Gas Circuits in the Event of a Ruptured Bell Umbilical



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IMCA promotes improvements in quality, health, safety, environmental and technical standards through the publication of information notes, codes of practice and by other appropriate means.

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- ◆ Safety, Environment & Legislation
- ◆ Training, Certification & Personnel Competence

The Association is organised through four distinct divisions, each covering a specific area of members' interests: Diving, Marine, Offshore Survey, Remote Systems & ROV.

There are also four regional sections which facilitate work on issues affecting members in their local geographic area – Americas Deepwater, Asia-Pacific, Europe & Africa and Middle East & India.

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I Introduction

A study of accidents involving the rupture of bell main wire and/or surface to bell umbilical has emphasised the following:

- a) the divers can be thrown about and injured or momentarily shocked at the onset;
- b) there is likely to be an ingress of water if the external door is not closed;
- c) surprisingly often, people fail to shut off valves on some circuits.

Points a) and b) can be improved by the use of safety belts and by always keeping the outer bottom door closed during ascents or descents.

Point c) can be explained by the fact that divers in such a situation are emotionally upset, that not all valves are prominently displayed nor can they be clearly seen as being in an open or closed position, and that often, some are hidden behind equipment (umbilicals, survival bags, etc.).

2 Department Of Energy Memo No. 8, 1982

The above memo reads:

"In order to improved the diver safety when surface umbilicals are ruptured, the following actions should be taken:

Wherever reasonably practicable, all gases and hot water circuits to diving bells should be fitted with a type of non-return valve (non-return valve, flow fuse, deadman handle, etc.) in addition to hull integrity valve."

3 Observations

- 1 Non-return valves would operate only as long as the pressure inside the bell was higher than the surrounding pressure. This is not the case on the bottom.
- 2 Some circuits, such as:
 - ♦ gas sampling to surface for analysis;
 - ♦ pressure measuring circuits, pneumos; etc.cannot be equipped with non-return valves, as it would compromise their normal functions, but these would presumably be covered by the phrase "wherever reasonably practicable".
- 3 Flow fuses do not seem to be of any value for this purpose.
- 4 A 'dead man' valve on the bell pressurisation circuit could function, but would present the following inconveniences:
 - ♦ bell pressurisation would have to be done from the bell (it is often done from the surface);
 - ♦ in some cases of diving emergency this bell pressurisation line could not be used for either blowing gas into or for bleeding gas out of the bell;
 - ♦ some systems of gas recovery by 'surface loop' make use of this circuit.
- 5 Non-return valves inside the bell for water circuits could be fitted, but:
 - ♦ they would present (one more) flow restriction;
 - ♦ they would corrode rapidly;
 - ♦ they could not be fitted on the hot water dump circuit.
- 6 Using non-return valves or other devices (on circuits where they are compatible) in addition to 'skin' valves will increase the number of projections, sources of injury and fragility (greater leverage).
- 7 Circuits such as bell decompression, bell flooding, trunking equalisation, etc., which are not connected to any umbilical circuit cannot be fitted with such devices and must always be closed by hand in an emergency.

4 Conclusions

The Safety & Technical Committee, after numerous and exhaustive consultations, advises the following:

- 1 The circuit supply breathing gas to the diver(s) must be fitted with a non-return valve.
- 2 As a principle, all gas or water circuits penetrating the bell should be equipped with shut-off valves inside and outside located as close as possible to the wall and as unobstructive as possible. Such valves should be of a type that clearly indicates if they are in the open or in the shut position ('¼ turn' or 'ball' type).
- 3 All valves should be clearly labelled by name as well as by a number.
- 4 An emergency water-proof list of all the valves that must be shut to ensure the pressure integrity inside all bells is to be provided in the bell. A duplicate must be kept on the surface, and the contingency plan must provide for the shutting (and accounting for via through-water communications) of all these valves. The list should also show those valves which must be left open.

The above conclusions are our recommendations on what is “reasonably practicable”.

Diving contractors who consider fitting additional devices, along the lines suggested in Memo No. 8 are invited to weigh carefully the implications of over complicating circuits in relation to questionable safety gains.