



Workplace Health and Safety Queensland

SAFETY ALERT

Safe filling of portable aluminium alloy cylinders

Purpose

The purpose of this alert is to inform all businesses and people who fill aluminium alloy cylinders of the risks of death and injury from cylinder explosion.

A recent incident has occurred in NSW where a person filling an aluminium alloy cylinder suffered serious bodily injury, including amputation, after the SCUBA cylinder that he was filling exploded.



Figure 1 Exploded cylinder

Initial investigations by Workcover NSW have indicated that the cylinder was being filled correctly and that the cylinder had had visual, hydrostatic and appropriate non-destructive (eddy current) testing. The cylinder was manufactured in 1983/84.

The cylinder involved in the recent incident was an “at risk” cylinder.

Workplace Health and Safety Queensland advises a risk assessment should be undertaken prior to any decision to fill “at risk” cylinders to eliminate or minimise the risk from explosion.

Background

Ongoing catastrophic failures involving certain aluminium alloy cylinders worldwide has prompted Workplace Health and Safety Queensland (WHSQ) to alert persons associated with these cylinders of potential hazards involved in their use.

An alert was issued initially in 1993 and then in 1997 following explosive aluminium cylinder failures. These failures have continued to occur worldwide, sometimes with severe injuries and property damage resulting.

Luxfer, a major manufacturer has recorded a further 7 ruptures since 1997, two of which involved Australian made cylinders.

Research has revealed that problems exist with cylinders manufactured from certain compositions of aluminium alloy. These problems cause a small percentage of cylinders to be rejected during routine inspections.

Problem cylinders

SCUBA cylinders manufactured from aluminium alloy 6351 are presently the main basis for concern. WHSQ strongly advises that all SCUBA cylinders manufactured from this alloy, and other aluminium alloy cylinders 15 years or older, be non-destructively examined **annually** for cracks and flaws in the neck fold and thread areas by competent and suitably equipped persons.

This should be in association with annual internal visual and hydrostatic inspections by competent and suitably equipped persons covered by Australian Standard [AS 2030.1:1999](#)

The verification, filling, inspection, testing and maintenance of cylinders used for storage and transport of compressed gases. Part 1: Cylinders for compressed gases other than acetylene (known as the SAA Gas Cylinder Code).

At risk SCUBA cylinders manufactured from aluminium alloy 6351 include:

- Luxfer aluminium alloy cylinders manufactured between 1972 and 1988 (check oldest hydrostatic test date stamped into cylinder)
- Luxfer aluminium alloy cylinder specification DOT SP6498
- Luxfer aluminium alloy cylinder specification DOT E6498, E7042, E8107, E8364, E8422
- CIG (Australia) aluminium alloy manufactured in or before 1990 (check oldest hydrostatic test date stamped into cylinder)

Faulty cylinders

Cylinders found to have unacceptable cracking or flaws during routine inspections must be rejected.

The owner should then contact the cylinder manufacturer to lodge a warranty claim. WHSQ has been advised that cylinders suffering material faults in the form of unacceptable internal surface cracks and flaws are being replaced by the manufacturers under warranty arrangements

Safe operation basics

SCUBA cylinders should be maintained in a safe condition. The following rules will assist in achieving this condition:

- Ensure each cylinder is regularly inspected and known to be safe before filling.
- Do not permit a cylinder to be filled to a pressure greater than the working pressure stamped on the cylinder.
- Do not fit a taper threaded valve unit into a parallel threaded cylinder.
- do not tamper with the valve unit safety valve fitting or rupture disc.
- Do not use a cylinder damaged by incorrect handling or storage and showing evidence of

surface gouging, dents or partially broken fittings.

- Do not allow contaminants into your cylinder in the form of salt water or moisture.
- Do not allow a cylinder to come in contact with fire or temperatures above 150°C. This is particularly vital if repainting is considered using heat curing modern painting systems.
- Do not use any SCUBA cylinder which loses pressure or shows evidence of leakage, no matter how small. Leakage reduces calculated underwater time and may indicate imminent cylinder failure. If a cylinder leaks whilst filling, immediately cease filling, discharge the cylinder and evacuate the area.
- Cylinders should only be refilled in a manner that limits risk to personnel and property. SCUBA cylinders manufactured from aluminium alloy 6351 should be filled inside a suitable enclosure or in a way that prevents injury and property damage.
- Use proper cylinder filling equipment and procedures and refrain from fast filling. SCUBA cylinders manufactured from aluminium alloy 6351 should not be filled faster than 600 psi (40.8 atm) per minute.
- Never fill a cylinder without evidence of a valid test date. Most cylinder failures occur during the filling process.
- SCUBA cylinders should not be modified, for example by skimming off corroded neck material, unless the procedure is recommended by the manufacturer, in other documented procedures or to an applicable standard.

Advice regarding filling of cylinders can be found in section 1.3.7 of the *Compressed Air Recreational Diving and Recreational Snorkelling Industry Code of Practice 2000*.

Further information

For more information visit www.worksafe.qld.gov.au or contact the WHS Infoline on 1300 369 915.

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