Sustained load cracking in aluminium cylinders manufactured from aluminium alloys HE30/AA6082 and AA6351

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A susceptibility to sustained load cracking (SLC) has been identified in cylinders manufactured from aluminium alloys of specific grades, manufactured between 1963 and 1995. Sustained load cracking is a metallurgical anomaly occurring in cylinders that have remained pressurised for sustained periods of time.

IOGP Life Saving Rules:

Bypassing safety controls

WorkSafe New Zealand Safety Alert

There have been two recent incidents of serious harm in the Asia-Pacific region caused by the catastrophic failure of self-contained underwater breathing apparatus (SCUBA) cylinders manufactured from aluminium alloy 6351. As a result of these incidents in August 2017 WorkSafe New Zealand issued a Safety Alert entitled "Cylinder design approvals withdrawn".

In its Safety Alert WorkSafe New Zealand announced that it had decided to withdraw approval for SCUBA and self-contained breathing apparatus (SCBA) cylinder designs which used aluminium alloy 6351. The withdrawal came into effect from 31 October 2017.

UK Health and Safety Executive (HSE) Safety BulletinOn 8 March 2018 the UK HSE issued Safety Bulletin ED 1-2018 entitled "Cylinders manufactured from aluminium alloys HE30/AA6082 and AA6351 and used primarily for gases for underwater breathing apparatus".

The publication of this bulletin was prompted in part by the Asia-Pacific incidents, but also by an incident of serious harm caused by the failure of an HE30/AA6082 cylinder in England in 2017.

The UK HSE bulletin states the following:

These cylinders should only be used if they have undergone thorough visual inspection and testing with an eddy-current device by a competent inspector (see inspection and testing requirements below).

Failure to conduct such inspection and testing could result in serious harm.

Cylinders to be inspected and tested include those used for SCUBA diving, those that supply breathing air through an umbilical hose and those used to fill SCUBA cylinders.

If you are unable to determine whether a particular cylinder is made from one of these alloys, remove it from service, safely release the gas and do not use it until the alloy can be identified and proper inspection and testing can be conducted.

- Cylinders that cannot be identified from markings on the cylinder must be

removed from service, condemned and rendered incapable of holding pressure.
- Cylinders that fail visual inspection or eddy-current testing must be condemned and rendered incapable of holding pressure.

IMCA Guidance to Members

In view of the information provided by the Worksafe New Zealand alert and the UK HSE bulletin, IMCA recommends that cylinders manufactured from aluminium alloys HE30/AA6082 and AA6351 are not used on member worksites.

Members are advised to take the following actions:

1. Check if any cylinders are manufactured or suspected to be manufactured from aluminium alloys HE30/AA6082 or AA6351.

2. Check for specific alloy-related markings or for a date of manufacture (the earliest date stamped on the cylinder) prior to 1995. If there is reason to believe that a cylinder may be made from either of these alloys, then the cylinder should be removed from service. The gas should be safely released, the cylinder rendered incapable of holding pressure, and safely disposed of.

3. If it is not possible to determine the alloy and appropriate information, e.g. if the cylinder markings are missing or cannot easily be read, then the cylinder should be removed from service. The gas should be safely released, the cylinder rendered incapable of holding pressure, and safely disposed of.

Identification of Affected Cylinders

The WorkSafe New Zealand Safety Alert contains a list of cylinders affected by the withdrawal of WorkSafe cylinder design approvals. This has been reproduced overleaf as a means of assisting members to identify affected cylinders.

The UK HSE Safety Bulletin contains the following guidance on identifying cylinders manufactured from HE30/AA6082 and AA6351 aluminium alloys.

Cylinders stamped with any of the following markings are manufactured from HE30/AA6082 or AA6351:

- HE30
- HOAL 1
- HOAL 2
- HOAL 3
- HOAL 4
- BS5045/3/B
- BS5045/3/B/S
- AA6351
- P****X (as part of serial number)

- P****P (as part of serial number)

Note: On some small cylinders manufactured at Luxfer's Aldridge, England, plant, the above markings may not be present. In that case, the alloy can be determined from the three-digit type number stamped around the base. If the three-digit number is of the form 1**, 3** or 5**, then the alloy of manufacture is AA6351.

List of Cylinders Affected by the Withdrawal of WorkSafe New Zealand Approval

MANUFACTURER	DATE OF MANUFACTURE	COUNTRY OF MANUFACTURE	DESIGN SPECIFICATION	LAB NUMBERS
All (unless specified below)	Jan 1972 – June 1988	UK, US	DOT E 6498 DOT SP 6498 DOT E 7042 DOT SP 7042 DOT E 8107 DOT SP 8107 DOT E 8364 DOT SP 8364 DOT E 8422 DOT SP 8422	
Luxfer Gas Cylinders Ltd		US	DOT E 6498	LAB 143a LAB 148a LAB 193a
Luxfer Gas Cylinders Ltd	Prior to Dec 1989	US	DOT 3AL	LAB 143b LAB 148b LAB 193b
CIG (Luxfer Gas Cylinders Ltd)	Jan 1975 – Dec 1990	Australia	AS 1777	LAB 056 LAB 137 a/b LAB 138 a/b LAB 139 a/b/c LAB 261 a/b/c LAB 450 LAB 625 LAB 626 LAB 627 LAB 628
Walter Kidde		US	DOT E 7042 DOT SP 7042	
Walter Kidde	Prior to Feb 1990	US	DOT 3AL	
Luxfer Gas Cylinders Ltd		UK	DOT E 8364 DOT SP 8364	
All	Prior to 1984	US	DOT E 7235 DOT SP 7235 DOT E 8023 DOT SP 8023 DOT E 8115 DOT SP 8115	These cylinders have a 15-year authorised service life.
Luxfer Gas Cylinders Ltd	Jan 1970 – Dec 1994	UK	HOAL 2 Others	

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