

# Safety Alert – Cylinders manufactured from aluminium alloys HE30/AA6082 and AA6351 and used primarily for gases for underwater breathing apparatus

## Health and Safety Executive – Safety Alert

**Department Name:** Energy Division

**Bulletin No:** ED 1-2018

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**Target Audience:** SCUBA diving, those that supply breathing air through an umbilical hose and those used to fill SCUBA cylinders.

**Key Issues:** 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.

There have been several recent catastrophic failures of aluminium cylinders used primarily to contain gases for underwater breathing apparatus and manufactured from aluminium alloys HE30/AA6082 and AA6351. 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.

## Background

Serious harm was caused by failure of an HE30/AA6082 cylinder in England in 2017, which followed similarly harmful failures of AA6351 SCUBA cylinders in Indonesia and Australia in 2016. Cylinders manufactured from these alloys are known to be susceptible to sustained-load cracking (SLC). These cylinders were manufactured by several companies in several countries between 1963 and 1995. Thus, any cylinders still in use are between 23 and 55 years old.

Luxfer Gas Cylinders manufactured HE30/AA6082 and AA6351 cylinders in England and AA6351 cylinders in the USA and Australia. Walter Kidde Company in the USA, CIG Gas Cylinders in Australia (acquired by Luxfer Gas Cylinders in 1997) and Reynolds Tube Company Ltd (later known as TI Hollow Extrusions) in England also manufactured cylinders from these alloys.

## **Inspection and testing requirements for cylinders manufactured from HE30/AA6082 and AA6351 and used primarily for underwater breathing apparatus**

Cylinders used at work or filled by a person at work—including SCUBA cylinders, cylinders that supply breathing air through an umbilical hose and cylinders used primarily to fill SCUBA cylinders—must be suitably inspected and tested to ensure that they are safe. Inspection frequency must be in line with requirements of BS EN 1802 for “Gases for underwater breathing apparatus”. It is also recommended that cylinders not used or filled at work be subject to similar inspections and tests.

An eddy-current test must be conducted in addition to the required visual inspection. This test shall be conducted by a competent and qualified cylinder inspector who has been trained in the specific use of eddy-current testing equipment.

**If a cylinder is equipped with a thread adaptor, the adaptor must be removed prior to visual inspection and eddy-current testing.**

It should be noted that Luxfer Gas Cylinders currently only approves two eddy-current devices for such testing: Visual Plus™ and Visual Eddy™.

The relevant standard describing inspection requirements for aluminium cylinders containing gases for underwater breathing apparatus is BS EN 1802 (due to be replaced by BS EN ISO 18119). This standard requires that inspection and testing be carried out by a competent person. Although there is no unique legal definition of competence for cylinder testing, HSE considers that the following provide a suitable level of confidence in a cylinder inspector’s competence for this task:

- Appointment by the Secretary of State for Transport for the purposes of inspection of gas cylinders
- Working within the terms of an industry-accredited scheme.

The appointment or accreditation should be for the specific type of cylinder concerned.

## **Actions required**

Check to see if any of your cylinders are manufactured or suspected to be manufactured from aluminium alloys HE30/AA6082 or AA6351. Check for specific alloy-related markings or for a manufacture date (the earliest date stamped on the cylinder) prior to 1995. If you believe that a cylinder may be made from either of these alloys, then you should assess the risk of continued use by considering the cylinder’s age, history of use and previous testing.

If you cannot determine the alloy and appropriate information as described in BS EN 1802—e.g., if you cannot easily read markings on the cylinder or if markings are missing—you must remove the cylinder from service, safely release the gas and render the cylinder incapable of holding pressure.

If you are unable to confirm that eddy-current testing was performed on an HE30/AA6082 or AA6351 cylinder, remove it from service, safely release the gas and do not use the cylinder until eddy-current testing can be performed.

## **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.

## **Relevant legal documents**

- Health and Safety at Work etc act 1974.
- Diving at Work Regulations 1997 (6)(3)(b).

## **Further information**

### **General note**

Please pass this information to any of your colleagues who may have this product or equipment or may operate this type of system or process.

All cylinders that are transported for the purpose of work must be tested at an approved [Vehicle Certification Agency \(VCA\)](#) test centre.

This alert sheet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.