

# TECHNICAL BULLETIN

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**#108** September 11, 2000

## **LUXFER TECHNICAL BULLETIN ENTITLED “INSPECTION AND REPLACEMENT PROCEDURES FOR LUXFER SCBA HOOP-WRAPPED ALUMINUM-LINED CYLINDERS MANUFACTURED FROM 6351-T6 ALLOY.” (Sept. 11, 2000)**

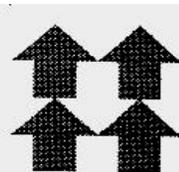
Products Affected: All Survivair Respirators Using the Compressed Air Cylinders as specified in the following Luxfer Technical Bulletin

Luxfer Gas Cylinders has asked manufacturers who have sold SCBA which utilize Luxfer cylinders manufactured from 6351-T6 aluminum alloy to assist them in disseminating the attached bulletin. Please read this technical bulletin and take whatever action is appropriate. If you have customers who may have the cylinders described in the bulletin, contact them immediately and distribute the Luxfer bulletin to them.

<b>WARNING</b>
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**DO NOT FAST FILL THE CYLINDERS SPECIFIED IN THIS TECHNICAL BULLETIN**

The maximum fill rate for the cylinders specified in this technical bulletin shall not exceed 500 psig per minute. Refer to Survivair Technical Bulletin #103, Cylinder Filling Procedures, for further information.



## **Luxfer Gas Cylinders Technical Bulletin**

September 11, 2000

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### **Inspection and Replacement Procedures for Luxfer SCBA (Life-support)**

<sup>1</sup> Excerpted from *NIOSH Respirator User Notice* (December 7, 1999), page

## Hoop-wrapped Aluminum-lined Cylinders Manufactured from 6351-T6 Alloy

### From 1977 through mid-1988, Luxfer Gas Cylinders manufactured two types of SCBA hoop-wrapped aluminum-lined cylinders in the United States from 6351-T6 alloy:

- Model L045W cylinders (4,500 psi): Survivair part number 9151-68
- Model L045N cylinders (2,216 psi): Survivair part number 9161-11

Although a small number of hoop-wrapped 6351-alloy cylinders have exhibited a metallurgical phenomenon known as sustained load cracking (described below), thus far no cracked Luxfer cylinders have been reported by Survivair. Most hoop-wrapped 6351 cylinders have already been retired from service because they have reached the 15-year life limit mandated by the US Department of Transportation (DOT). Since mid-1988, Luxfer has been manufacturing these cylinder models from 6061-T6 aluminum alloy, which is not susceptible to sustained load cracking.

In December 1999, the National Institute for Occupational Safety and Health (NIOSH) issued a NIOSH Respirator User Notice to inform cylinder users that “certain high-pressure aluminum seamless and aluminum composite hoop-wrapped cylinders made of aluminum alloy 6351-T6 are susceptible to sustained load cracking (SLC) in the neck and shoulder area.” The notice went on to say: “It is important to note that only a small percentage of cylinders made from alloy 6351-T6 have actually been found to exhibit sustained load cracking. Moreover, out of several million cylinders manufactured from this alloy by various companies, NIOSH and the US Department of Transportation (DOT) are aware of only 12 ruptures within the United States.”<sup>1</sup> All but one of the ruptures, which included cylinders for a variety of applications, occurred during filling.

After consulting with DOT, SCBA manufacturers and Luxfer, NIOSH issued safety precautions to reduce the risk of death, serious injury or property damage from cylinder ruptures. Luxfer concurs with these safety precautions, excerpted below, which should be followed with all remaining Luxfer L045W and L045N hoop-wrapped cylinders made of 6351-T6 alloy.

## NIOSH-recommended Safety Precautions to be Followed With Luxfer SCBA

### Hoop-wrapped Aluminum-lined Cylinders Made of 6351-T6 Alloy

1. **Increase the frequency of internal visual inspections.** An internal visual inspection should be performed on an annual basis, as recommended by DOT. The internal visual inspection, which is performed by removing the cylinder valve, inserting a high-intensity light probe and an angled mirror into the cylinder and examining the inner surfaces of the neck and shoulder area. This internal inspection should be performed by a qualified inspector in accordance with comprehensive inspection guidelines for high-pressure aluminum cylinders. Examples of recognized inspection guidelines include the Compressed Gas Association (CGA) C-6.1 *Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Cylinders* and Volume 1 of *Luxfer’s SCBA Cylinder Visual Inspection Guide* [which may be downloaded for free from Luxfer’s website at [www.luxfercylinders.com](http://www.luxfercylinders.com)]. At the time of the annual inspection, Luxfer recommends that the cylinder neck be tested with an eddy current testing device such as Visual Plus or Visual Eddy. When properly maintained and used, eddy current devices contribute significantly to early detection of

<sup>2</sup> Additional comments by Luxfer, not found in the NIOSH text, are in brackets.

difficult-to-observe sustained load cracks in the necks of 6351-alloy cylinders. However, an eddy current device should be used as a supplement—*not a substitute*—for a diligent visual inspection by a qualified inspector.]<sup>2</sup> Any discovered evidence of a crack, defect, or damage requires the cylinder to be removed from service.

2. **Inspections should be performed by qualified individuals.** A fire department or other SCBA user may choose to perform these annual inspections in-house, or may contract with a qualified outside inspector. In any case, individuals inspecting for evidence of SLC or any other cylinder damage or imperfection must be able to follow visual inspection guidelines competently and should be trained by accomplished instructors experienced in visual inspection of cylinders.

A fire department or other SCBA user choosing to outsource the inspection process should verify the qualifications and capability of the contracted inspector. Internal visual inspection has been shown to be highly effective in the discovery of SLC defects. *However, these inspections are only effective when properly performed.* Therefore, emphasis should be placed on inspector training and diligence in the inspection process.

US DOT requires that hydrostatic retesting and requalification be conducted by registered agents who have been certified by the DOT and who have been issued a valid Retester's Identification Number (RIN) by the DOT Research and Special Programs Administration (RSPA). The recommended annual visual inspection does not have to be conducted by a DOT-certified RIN holder. However, as stated above, the visual inspection should be conducted by someone who has been trained, qualified, and shown to be competent in conducting visual internal inspections.

3. **Submit cylinders for non-destructive testing at regular intervals between required requalification testing.** While DOT requires the requalification (hydro-testing) of DOT-3AL seamless aluminum cylinders every 5 years, and of aluminum-lined composite (hoop-wrapped) cylinders every 3 years, it is recommended that cylinders be submitted for ultrasonic testing, eddy current testing, or some other form of non-destructive testing in between the normal required hydro-tests. Non-destructive testing should be performed only by qualified and competent inspectors who understand the proper use of such equipment. The qualifications of any cylinder inspector or tester should be verified prior to contract negotiations.
4. **Do not refill any cylinder that has lost internal pressure for no apparent reason.** Unexpected loss of cylinder pressure may be an indication that sustained load cracks have developed in a cylinder. Any cylinder that is found to have lost pressure for no apparent reason should be immediately removed from service, and an internal visual inspection should be conducted to evaluate the cylinder. This recommendation also applies to any cylinder, regardless of construction.
5. **Cylinders should only be refilled in a manner which limits risk to personnel and property.** It is recommended that all seamless aluminum DOT-3AL and Composite aluminum hoop-wrapped cylinders manufactured of 6351-T6 alloy be filled or "topped off" inside a suitable enclosure or in a way that prevents injury and property damage. A number of compressor manufacturers, as well as other companies, produce and market enclosed cylinder refilling stations designed for this purpose.

<sup>2</sup> Additional comments by Luxfer, not found in the NIOSH text, are in brackets.

6. **Use proper cylinder filling equipment and procedures and refrain from fast-filling.** SLC growth occurs over several years, but such growth and the likelihood of cylinder rupture are accelerated when the cylinders are over-pressurized, filled without regulators and the proper filling apparatus, or fast-filling. [As noted, most cylinder failures have occurred during the filling process.] The Luxfer-recommended fill rate for cylinders made of alloy 6351-T6 is below 600 psig per minute. Therefore, users should refrain from fast-filling cylinders constructed of alloy 6351-T6 aluminum. A just-filled cylinder should not feel warm or hot to the touch. The cylinder must never be filled to a pressure above the service pressure stamped on the cylinder.
7. **Check for valid re-test date before filling.** No cylinder, regardless of construction type, should be filled if it has exceeded the valid service life or re-test (requalification) dates specified by DOT.<sup>3</sup>

## **Replacement of Luxfer SCBA**

### **Hoop-wrapped Aluminum-lined Cylinders Made of 6351-T6 Alloy**

If a Luxfer L045W or L045N hoop-wrapped cylinder made of 6351-T6 aluminum alloy is found to have a sustained load neck crack or a manufacturing defect, Luxfer will replace the cylinder at no charge until further notice. For more information about Luxfer cylinders and cylinder replacement procedures, contact Luxfer customer service at 800-764-0366.

<sup>3</sup> Excerpted from *NIOSH Respirator User Notice* (December 7, 1999), pages 2-4.