

Guidance Note: Crack Detection in AA6351 Aluminium Alloy Scuba Cylinders – 09/00. Amendment 04 – 10/11.

This amendment relates to Luxfer UK's revised policy dated 17 July 2000, which was intended to clarify the UK situation. The main changes are that UK inspection periods have now been confirmed and the four monthly inspections for cylinders in continuous use have been withdrawn.

The Luxfer Policy is concerned with the **early** detection of "sustained stress (load) cracks" (SLC) that cannot be detected by optical means. Their overriding concern is for safety.

Luxfer **require** that, in addition to established inspection techniques, an eddy current non-destructive test (NDT) be carried out on cylinders manufactured by them from Aluminium alloy (AA) 6351.

Luxfer have stated categorically that no cylinder made from AA6351 alloy should be filled until an NDT inspection has been carried out. Therefore, fillers should ensure that these cylinders bear a label or other suitable mark that indicates crack detection has been carried out prior to filling.

1. **Manufacturers' recommendations and the law:** HASAWA requires that fillers, users and maintainers implement the manufacturers' safety bulletins. In effect, to ignore such a recommendation would be a technical breach of the law.
2. **Immediate NDT for Scuba Cylinders made from AA6351 alloy:** These cylinders must not be filled until they have undergone an NDT inspection, regardless of the last inspection or test date.
3. **Frequency of inspection AA6351 alloy cylinders:** Luxfer UK have confirmed that these cylinders require a **biennial** NDT inspection together with an inspection/test in accordance BS EN 1802. This inspection period takes precedent of the 2.5 year period in EN 1802
4. Luxfer have **withdrawn** the requirement for **Cylinders in "continuous use"**: i.e. subjected to repetitive filling, these **no longer require** an NDT inspection every 4 months.
5. **Luxfer Scuba cylinders made from AA6351 alloy between 1963 and 1995**, are marked thus:
 - HOAL 1,2,3 & 4
 - BS 5045/3/**B** or BS 5045/3/**B**/S
 - AA6351 alloy
 - HE30
 - P****X or P****P as part of the serial number.
 - Some small cylinders have a three digit code on the base: either 1**, 3** or 5**.

6. **Luxfer Cylinders made from AA6061 alloy:** Extensive testing has shown that AA6061 alloy is **not** susceptible to SLC and therefore, **does not require** an NDT inspection on cylinders made from this alloy. These are marked thus:
 - BS 5045/3/C or BS 5045/3/C/S
 - AA6061
 - P****Z as part of the serial number.
 - Some small cylinders have a three digit code on the base: either 2**, 4** or 6**.
7. **For non Scuba aluminium cylinders:** NDT inspection is **not required at this time**.

Note: 18mm, 25mm and 3/4" Visual Plus probes are available. The HSE have intimated that they will investigate anyone attempting to use this advice in order avoid the NDT requirement.
8. **NDT inspection on any Aluminium Cylinder?** Earlier eddy current testers were specifically tuned to AA6351 alloy, therefore, beware of the possibility of "false positive" results when used with AA6061 alloy.
9. **Non-Luxfer Aluminium Cylinders:** In the absence of a written policy from other manufacturers; cylinders made from a similar alloy should be tested as a precaution.
10. **Steel cylinders:** crack detection using NDT equipment is not required at this time.
11. **NDT plus a full inspection:** Each time an NDT is carried out, a full inspection, in accordance with BS EN 1802, must also be carried out, regardless of the date of the last inspection.
12. **Marking:** Each time a cylinder is inspected or tested for any purpose it must be stamped in accordance with BS EN 1802. Additionally the NDT shall be indicated by a suitable means.
13. **NDT stamping:** The ideal method of indication an eddy current test has been carried out is to stamp the cylinder with a suitable mark. This mark must be in a form that is easily recognised and traceable, for example, **Ve** and the Visual Eddy registration number is recommended.
14. **Labelling:** Labels can become detached, therefore, labelling alone is not recommended.
15. **Label placement:** BS EN ISO 7225 requires that labels on cylinders be visible at all times. Therefore, the NDT label should be placed where it will be visible to the filler.
16. **Acceptance for filling:** BS EN 1920 requires that only safe cylinders be filled. Additionally, filling an AA6351 alloy cylinder without complying with the manufacturer's requirements would be a breach of HASAWA.
17. **Approved Test Stations:** are only be required to hold NDT equipment if they intend to inspect/test AA6351 alloy aluminium alloy cylinders. The Test Station may opt to exclude this type of cylinder from their scope of work.
18. **Documentation (a):** A record of all NDT inspections and tests must be held on file. It is recommended that tester's amend their inspection/test work sheets to record this test.

This guidance is offered in good faith and is believed to be correct to the best of our knowledge. Nothing contained herein shall be deemed to override good practice, manufacturers' policies, the relevant Standards and the Law.

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19. **Documentation (b):** All test stations must add an addendum to the "Scope of Work" in their policy and procedures document stating that they do/do not intend to inspect or test AA6351 alloy aluminium alloy cylinders.
20. **Documentation (c):** In addition, those centres that intend to inspect/test AA6351 alloy aluminium alloy cylinders must add a written procedure and operating instruction for this test to their policy and procedures document.
21. **Training:** Eddy current testing is included in the ASSET Cylinder Testers Course.

Notes:

Any suitable NDT unit specifically designed for crack detection in aluminium cylinders may be used.

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