



LUXFER
GAS CYLINDERS

Giving you more safety information

LUXFER ECLIPSE™ VISUAL INSPECTION QUICK-GUIDE

CYLINDER DAMAGE CRITERIA

The acceptance/rejection criteria given in this quick-guide are the manufacturer's recommendations and do not replace or supersede any criteria required by ISO 11623.

Damage to composite overwrapping can take a number of forms, examples of which are described in the following sections.

Luxfer recommends the use of three categories of damage in accordance with ISO 11623.

Level 1 damage: Minor damage, considered normal wear-and-tear and that has no adverse effects on the integrity or safety of a cylinder. Cylinders with Level 1 damage can continue in service.

Level 2 damage: Is greater than Level 1, but less than Level 3. Level 2 damage can be repaired.

Level 3 damage: Is sufficiently severe that the cylinder must be rejected. Level 3 damage cannot be repaired.

ABRASION DAMAGE

Abrasion damage is caused by the wearing, grinding or rubbing away of material by friction.



Level 1 abrasion damage: Consists of small abrasions to the outer gel coating and surface carbon fibre that will not require repair unless the area is large enough to cause unraveling of fibres.

Level 2 abrasion damage: Any abrasion less than 1.0in² and is between 0.02"-0.03" deep. Pressure test a cylinder after the repair and reinspect the cylinder before filling.

Level 3 abrasion damage: Any abrasion that causes the unraveling of the fibres or if any abrasion is greater than 0.02" and is greater than 1.0in² in area, the cylinder must be rejected.

CUT DAMAGE

This type of damage consists of cuts caused by contact with sharp objects that penetrate into the composite material, effectively reducing its thickness. This damage is similar to abrasion damage. The ECLIPSE range has a fibreglass layer on the sidewall of the cylinder to enable labels to be protected. You can see the glass as a grey layer whereas the domes are black from the carbon fibre.



Level 1 cut damage: Consists of cuts to the outer gel coating or resin or cuts into the carbon fiber or glass fibre layer of less than 0.02" deep.

Level 2 cut damage: Cuts that are between 0.02" and 0.03" deep.

Level 3 cut damage: Cuts that are over 0.03" deep.

IMPACT DAMAGE

Impact damage may appear as cracks in the resin, as delamination or as cuts in the overwrap. All cylinders that show evidence of impact damage must be visually inspected for evidence of indentation of the internal surface of the metal liner. Two levels of impact damage are recognized: Level 1 and Level 3 (there is no Level 2).

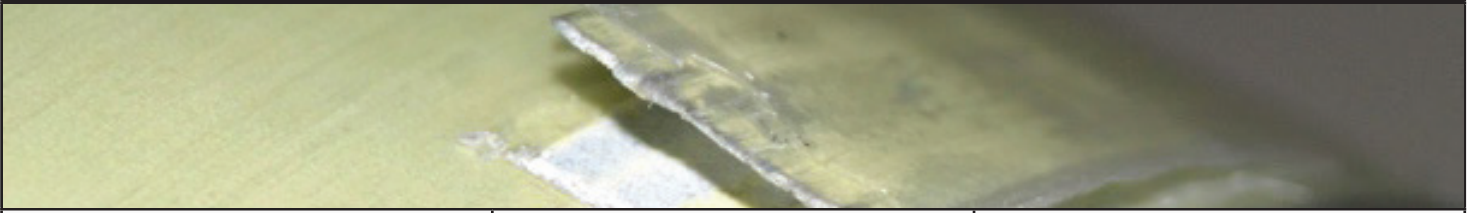


Level 1 damage: Light damage, such scuffs and gelcoat chipping do not require repair. The cylinder may be returned to service.

Level 3 damage: The cylinder must be rejected if impact damage causes a large area of frosting, delamination of fibres or other such readily noticeable structural damage.

DELAMINATION DAMAGE

Delamination is a separation of composite overwrap layers or strands. It may also appear as a whitish patch, such as a blister or an air space beneath the surface. Delamination is usually a result of an impact, cut or exposure to temperatures of more than 200°F.



Level 1 damage: Light damage, such as a small area where the carbon fibre is frosted, does not require repair (see "Level 1 impact," previous page). The cylinder may be returned to service.

Level 2 damage: If any defect does not exceed a width of 2 inches (50 mm), the cylinder may be repaired and returned to service.

Level 3 damage: Delamination damage greater than Level 2 requires the cylinder to be **rejected**.

HEAT OR FIRE DAMAGE

A composite cylinder is not intended for prolonged use in any environment that would result in composite overwrap temperatures in excess of 180°F. However, temporary short-term exposure to air temperatures in excess of 180°F in a firefighting environment is not cause for cylinder condemnation. As extensive field experience has shown, a composite cylinder used within a self-contained breathing apparatus (SCBA) carried by a firefighter can withstand limited exposure to elevated temperatures without damage.

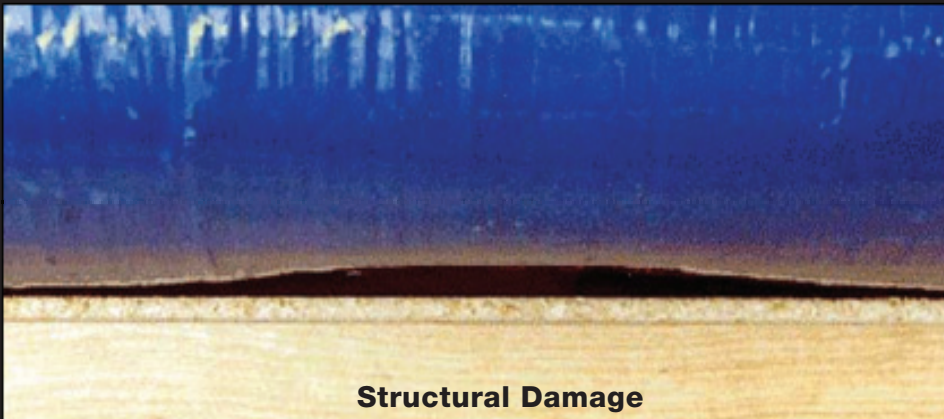


Level 1 damage: Occurs when the surface of the clear gel coat, paint or composite is soiled from smoke or other contaminants but is intact underneath with no evidence that the resin has been burned. In this case, a cylinder can be returned to service after cleaning.

Level 3 damage: Cylinders showing excessive heat damage must be rejected. Cylinders known to have been left unattended in a fire and exhibiting any evidence of heat damage must be rejected. Evidence of heat damage includes charring or melting of the composite or any attachments, valve components, protective layers, stickers or paint.

STRUCTURAL OR CHEMICAL ATTACK DAMAGE

Chemicals can dissolve, corrode, soften, remove or ruin cylinder composite materials. They can also cause bubbling, pitting or extreme dulling of the resin; cause deterioration of the resin or protective paint layer; or create multiple fractures transverse to the direction of the fibre. Sometimes solvents can cause the cylinder to become sticky to the touch. Cylinders with evidence of such damage must be rejected.



Structural Damage



Chemical Attack Damage

For more information please refer to **Luxfer Carbon Composite Cylinders Inspection Manual Part 3: A Guide to the use, maintenance and periodic inspection of Luxfer ECLIPSE carbon composite cylinders in Europe.**

Available at www.luxfercylinders.com

Luxfer Gas Cylinders | +44 (0)115 980 3800 | www.luxfercylinders.com



MLS113REV01JUL2020