SCBA Cylinder Hydrostatic Testing – Quick Tips

Cylinders that provide air for breathing are most commonly used in National Fire Protection Association (NFPA)-compliant and industrial self-contained breathing apparatus (SCBA). The Department of Transportation (DOT) requires periodic hydrostatic testing of these breathing air cylinders. The NFPA recognizes the DOT's testing requirements in their standard on SCBA selection, care and maintenance (NFPA 1852). A hydrostatic test is a method to validate the structural integrity and safety of a cylinder throughout its service live. The material of the SCBA cylinder (i.e. steel, aluminum, composite) dictates both the required frequency of testing and the overall service life of the cylinder.

Under 49 Code of Federal Regulations (CFR) Part 180.205, the DOT addresses their re-testing, or "requalification," requirements for SCBA cylinders as well as other cylinders used for the transportation of hazardous materials. While not referring to hydrostatic testing by name, Part 180.205 addresses both the performance and the frequency requirements for "pressure testing" steel and aluminum SCBA cylinders. A hydrostatic test is commonly used for testing the SCBA cylinders because it meets all of the DOT's pressure test performance requirements.

During a hydrostatic test, an SCBA cylinder is examined to ensure it can safely hold its rated pressure. This regular testing is crucial because SCBA cylinders, or any compressed gas cylinder for that matter, can rupture if there's degradation in structural integrity. A hydrostatic test consists of filling the cylinder with a nearly incompressible liquid, in most cases water, pressurizing the cylinder and examining it for leaks or permanent changes in shape.

In conjunction with the hydrostatic test, Part 180.205 also specifies that a visual inspection be performed each time a cylinder goes through the pressure testing process. It states the cylinder "must be given an internal and external inspection," and

references various Compressed Gas Association (CGA) pamphlets for the visual inspection performance guidelines. The CGA pamphlets that are referenced are unique to specific cylinder types.

An additional step to the requalification procedure is required for DOT-3AL cylinders that are manufactured from 6351-T6 aluminum alloy. Under 49 CFR Part 180.209, these cylinders are required to complete an “eddy current” test. An eddy current test uses electromagnetic induction to detect tiny cracks that may not be visible. Although it rarely occurs, under certain conditions, cylinders constructed from 6351-T6 aluminum alloy are prone to this type of cracking. Details of conducting the eddy current test are located within Appendix C 49 CFR Part 180.

Frequency of Requalification and Cylinder Service Life

When it comes to the frequency of hydrostatic testing and services lives for SCBA cylinders, not all of the answers are found within DOT’s 49 CFR guidelines. Under Part 180.205(c), it states, “Each cylinder bearing a DOT specification marking must be requalified and marked as specified in the Requalification Table in this subpart. Each cylinder bearing a DOT special permit number must be requalified and marked in conformance with this section and the terms of the applicable special permit.”

Steel and aluminum SCBA cylinders that are DOT specification cylinders are marked as “3AA” for steel and “3AL” for aluminum. For these cylinders, the DOT requires requalification every five years. Details on the periodic qualification of cylinders (cylinder specification, minimum test pressure and the requalification period) are given in 49 CFR 180.209. The DOT does not specify a service life for steel and aluminum cylinders, but the CGA allows for their reuse indefinitely as long as they continue to pass their hydrostatic and visual inspections every five years.

For other commonly used SCBA cylinder materials like fiberglass composites and carbon composites, the answers to requalification frequency and service life are linked to the “special permit number” referenced in Part 180.205(c). The special permit numbers

were once known as “exemption numbers.” The special permit or exemption (terms are used interchangeably) contains the requalification and service life requirements for the respective cylinder in question. If the special permit/exemption documentation is not readily available, the manufacturer of the SCBA should be consulted for direction and to obtain the missing documentation.

According to Luxfer Gas Cylinders, one of the largest manufacturers of SCBA cylinders, some common requalification and service life periods for non-steel and non-aluminum cylinders are:

- Hoop-wrapped cylinders should be tested every three years and have a 15-year service life.
- Fully-wrapped fiberglass cylinders should be tested every three years and have a 15-year service life.
- Fully-wrapped Kevlar® cylinders should be tested every three years and have a 15-year service life.
- Fully-wrapped carbon fiber cylinders should be tested every five years and have a 15-year service life.

These are some of the most common requalification and service lifetime frames found on special permits. It’s the responsibility of the SCBA owner to follow the requirements specific to their cylinder’s special permit. To view official copies of current and, due to numerous inquiries, several expired special permits, visit the Pipeline and Hazardous Materials Safety Administration (PHMSA) Special Permits Search.

Commonly Asked Questions

Q: How do I know when the last time a hydrostatic test was performed on my cylinder?

A: According to 49 CFR 180.213 the cylinders should be clearly and permanently marked on the metal of the cylinder with the date the cylinder was manufactured and the date(s) of subsequent hydrostatic tests. Fully wrapped composite cylinders will have a label applied near the original test date marking. It is very important to check for valid re-test dates before refilling

cylinders.

Q: Where can I get my SCBA cylinder requalified?

A: Two good resources for this are your local fire department or, if you have one locally, a SCUBA dive shop. If they cannot assist, they should be able to point you in the right direction. The manufacturer or supplier of the SCBA can help as well. A person must meet the requirements of 49 CFR Sections 107.805, 180.211, and 180.212 to be approved to inspect, test, certify, repair, or rebuild a cylinder in accordance with a DOT specification or under the terms of a special permit. The Cylinder Requalification Locator at https://portal.phmsa.dot.gov/rinlocator allows you to search for an approved cylinder requalifier. By entering a city/state or zip code, this tool will provide a list of approved cylinder requalifiers including address, contact information, and the authorized testing methods and cylinder specifications for the approved entity.

Sources

49 CFR 180.205

49 CFR 180.209

PHMSA Special Permits Search

PHMSA Cylinder Requalifiers

NFPA 1852: Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA)

NIOSH Respirator Use Notice

Luxfer Cylinder Care and Maintenance

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