



# UNITED STATES DEPARTMENT OF LABOR

## OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION

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## Hydrostatic Testing

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A visual inspection alone cannot insure that a portable fire extinguisher is safe or will operate properly when needed. Over time, normal handling or workplace conditions can impact the structural integrity of the extinguisher and cause it to malfunction or burst. To prevent this from happening, all portable fire extinguishers are required to be inspected and pressure tested by a qualified individual using the proper equipment and facilities [[29 CFR 1910.157\(f\)\(1\)](#)].

Hydrostatic testing is the method used to pressure test an extinguisher's critical components (cylinder, shell, hose assembly, etc.) for leaks and structural flaws by pressurizing them with a liquid. This section is intended to help you understand what you need to do to comply with OSHA's requirements for "Hydrostatic Testing" [[29 CFR 1910.157\(f\)](#)].



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### How does hydrostatic testing work?

To understand how hydrostatic testing is used to check a cylinder and/or hose assembly for leaks or flaws, let's take a look at the procedure.

First, the extinguisher valve is removed and the threads and interior of the cylinder are checked for corrosion, pitting, and any other abnormalities [[29 CFR 1910.157\(f\)\(3\)](#)]. If the cylinder passes the visual inspection, it is placed into a steel chamber, which is then filled with water at normal pressure. A glass burette attached to the side of the steel chamber will read zero, indicating normal or zero pressure of the chamber water. Water is then applied at high pressure to the interior of the



extinguisher's cylinder. As the pressure increases, the cylinder will expand and push water from the steel chamber through a small hole and into the glass burette. After the pressure is released, the cylinder will contract and the water will move from the burette back to the steel chamber. Depending on the results, the tester will either pass or fail the cylinder. The cylinder is normally considered unsafe and will fail if:

- The water level in the burette continues to rise while the specified pressure is applied. This could be due to a leak from the inside cylinder to the water in the steel chamber, or to a continual expansion of the walls of the cylinder, both of which would be a reasonable cause to fail the cylinder.
- The cylinder stretched and with the pressure released does not return to its original size (or close to it), it would mean the metal of the cylinder is not resilient enough to be considered safe for use. The burette can not have more than 10 percent of the displaced water remaining after the pressure is released. For example, if the expansion displaced 100 milliliters (mL) of water, after it contracts it must have a reading of 10 mL or less to pass the test.

### Types of hydrostatic tests

The hydrostatic test described above is called the water jacket type because the cylinder is enclosed and surrounded by water during the testing process. All compressed gas type cylinders (CO<sub>2</sub>, dry chemical, etc.) must be hydrostatically tested using this method. They must also have an expansion indicator that operates with an accuracy within one percent of the total expansion or .1cc (.1mL) of liquid [29 CFR 1910.157(f)(15)(i)]

For all non-compressed gas type cylinders, you can use a manual or powered hydrostatic test pump as long as it meets the following requirements: [29 CFR 1910.157(f)(15)(ii)]



- It must be capable of producing at least 150 percent of the test pressure, and include the appropriate check valves and fittings [29 CFR 1910.157(f)(15)(ii)(A)];
- It must have a flexible connection for attachment to the test pump and necessary fittings to test through the extinguisher nozzle, test bonnet, or hose outlet, as applicable; and [29 CFR 1910.157(f)(15)(ii)(B)]
- Personnel must be physically protected during use by a cage or barrier designed to allow visual observation of the extinguisher during the test [29 CFR 1910.157(f)(15)(ii)(C)].

**Note:** Do not use air or gas pressure for hydrostatic testing because it compresses and expands many more times than water, which makes it very dangerous [29 CFR 1910.157(f)(13)].

### When do portable extinguishers need to be hydrostatically tested?

To ensure that your extinguisher will operate effectively and safely, you are required to have them hydrostatically tested:

1. At the intervals listed in [Table L-1](#), which are either every five or 12 years, depending on the type of extinguisher [29 CFR 1910.157(f)(2)].
2. Whenever they show new evidence of corrosion or mechanical injury [29 CFR 1910.157(f)(4)].



It is **illegal** and **dangerous** to perform a hydrostatic test on any cylinder or shell without first doing a visual external and internal examination. If any component exhibits at least one of the following conditions, it must be removed from service immediately [[29 CFR 1910.157\(c\)\(5\)](#)];

- All soldered or riveted shell self-generating soda acid or
- Self-generating foam or gas cartridge water type portable extinguisher which you must invert to rupture the cartridge to activate it or to initiate an uncontrollable pressure generating chemical reaction to expel the agent.

Hydrostatically test portable extinguishers at the intervals listed in [Table L-1](#), except under any of the following conditions:

- When there have been repairs made by soldering, welding, brazing, or with patching compounds [[29 CFR 1910.157\(f\)\(2\)\(i\)](#)];
- When the cylinder or shell threads are damaged [[29 CFR 1910.157\(f\)\(2\)\(ii\)](#)];
- When there are signs of corrosion that has caused pitting, including corrosion under removable nameplate band assemblies [[29 CFR 1910.157\(f\)\(2\)\(iii\)](#)];
- When the extinguisher has been burned in a fire [[29 CFR 1910.157\(f\)\(2\)\(iv\)](#)]. Some signs of exposure to heat and fire are:
  - Charring, blistering, or discoloration of the cylinder paint or labels;
  - Distortion of the cylinder body;
  - Melting of any components (such as the valve knob, the carrying handle, etc.); or,
  - Activation of the valve pressure relief device.
- When a calcium chloride extinguishing agent has been used in a stainless steel shell [[29 CFR 1910.157\(f\)\(2\)\(v\)](#)];

### Hydrostatic Test Intervals

Depending on the type(s) of extinguishers you have, they must be emptied and hydrostatically tested at the intervals specified in Table L-1. Extinguisher shells, cylinders, or cartridges that fail a hydrostatic pressure test, or which are not fit for testing, shall be removed from service and the workplace [[29 CFR 1910.157\(f\)\(14\)](#)].

Testing Intervals (Table L-1)		
Type of Extinguishers	Special Requirements	Test Interval (years)
Foam (soldered brass shells)		Must be removed from service
Soda acid (soldered brass shells)		
*Soda acid (stainless steel shell)	<b>Note:</b> Test self-generating type soda acid and foam extinguishers at 350 psi (2,410 kPa) [ <a href="#">29 CFR 1910.157(f)(12)</a> ].	5 Years
Foam (stainless steel shell)		

*Cartridge operated water and/or antifreeze		5 Years
Stored pressure water and/or antifreeze		
Wetting agent		
Aqueous Film Forming Foam (AFFF)		
Loaded stream		
Dry chemical with stainless steel		
Carbon Dioxide	<b>Note:</b> (CO2 extinguishers that have a hose assembly equipped with a shut-off nozzle must be tested at 1,250 psi (8,620 kPa) [29 CFR 1910.157(f)(6)]. Hose assemblies must also be tested within a protective cage device [29 CFR 1910.157(f)(9)].	5 Years
Dry chemical, stored pressure, with mild steel, brazed brass or aluminum shells	<b>Note:</b> Dry chemical and dry powder hose assemblies equipped with a shutoff nozzle must be hydrostatically tested at 300 psi (2,070 kPa) [29 CFR 1910.157(f)(7)].	12 Years
Dry chemical, cartridge or cylinder operated, with mild steel shells		
Dry powder, cartridge or cylinder operated with mild steel shells		
Halon 1211	<b>Note:</b> Halon 1211 and all stored pressure extinguishers must be hydrostatically tested at the factory test pressure, not to exceed two times the normal operating pressure [29 CFR 1910.157(f)(11)].	12 Years
Halon 1301		
<b>Note:</b> All hose assemblies must be hydrostatically tested at the same interval as the extinguisher if it is equipped with a shutoff nozzle at the discharge end [29 CFR 1910.157(f)(5)]. Hose assemblies passing a hydrostatic test do not require any type of recording or stamping [29 CFR 1910.157(f)(8)].		
<b>*Although still included in Table L- 1, 29 CFR 1910.157, Soda acid (stainless steel shell) and Cartridge operated water and/or antifreeze extinguishers are now obsolete.</b>		

What records am I required to maintain?

## Recordkeeping

For each extinguisher in the workplace you must keep a record that includes:

- The name of the person or agency who performed the last hydrostatic test, and the test date;
- The signature of the person who performed the test;
- The serial number or other identifier of the fire extinguisher that was tested.

This information should also be securely fixed to each extinguisher, and provided upon request to the Assistant Secretary as evidence that the required hydrostatic testing of fire extinguishers has been performed at the time intervals shown in [Table L-1](#). These records must be kept until the extinguisher is hydrostatically re-tested at the time interval specified in [Table L-1](#) or until the extinguisher is taken out of service, whichever comes first [[29 CFR 1910.157\(f\)\(16\)](#)].

- Test carbon dioxide extinguishers and nitrogen or carbon dioxide cylinders used with wheeled extinguishers every five years at 5/3 of the service pressure as stamped into the cylinder. Nitrogen cylinders that comply with 49 CFR 173.34(e)(15) may be hydrostatically tested every 10 years [[29 CFR 1910.157\(f\)\(10\)](#)].
  - **Note:** 49 CFR 173.34(e)(15) has been revised by [Hazardous Materials: Requirements for UN Cylinders](#). OSHA Federal Register Final Rules 71:33894, (2006, June 12).
  - Further revision is also proposed by [Hazardous Materials: Miscellaneous Amendments](#). OSHA Federal Register Proposed Rules 71:55757-55773, (2006, September 25).

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