



Pathology/Biology Section - 2016

H52 Fatality During Servicing of a Fire Extinguisher: A Case Study

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After attending this presentation, attendees will be able to evaluate a fatality caused by a fire extinguisher brought in for service by maintenance personnel.

This presentation will impact the forensic science community by creating awareness that there is the very real possibility that a cartridge-operated fire extinguisher that hasn't been properly maintained could explode upon activation, causing serious injury to the operator or bystanders. This presentation highlights the fact that such fire extinguisher cylinders do explode and can cause fatal injuries.

A fire extinguisher, or extinguisher, is an active fire protection device used to extinguish or control small fires. Usually, a fire extinguisher consists of a hand-held cylindrical pressure vessel containing an agent which can be discharged to extinguish a fire. The two main types of fire extinguishers are stored pressure and cartridge-operated. In stored pressure units, the expellant is stored in the same chamber as the fire-fighting agent itself. A cartridge-operated extinguisher consists of a cylinder filled with the extinguishant (water, foam, powder, etc.) and a gas cartridge containing highly pressurized Carbon Dioxide (CO₂). The pressure in the cylinder is only released from the cartridge once the handle is squeezed and pierces the cartridge, which will drive the extinguishant out of the cylinder via the hose.

Stored pressure extinguishers consist of a cylinder containing the extinguishing agent (water, powder, foam, etc.) and are permanently pressurized with either dry air or oxygen-free nitrogen. On activation by squeezing the handle, the valve of extinguisher inside releases and the pressure pushes the extinguishing agent out through the hose. Cartridge-operated extinguishers have an advantage over their stored pressure counterparts in that their outer cylinder can be pierced without the extinguisher exploding. If a stored pressure extinguisher cylinder is pierced, it would release the pressure explosively.

During basic maintenance service on a cartridge-operated extinguisher, most of the steps are the same as those taken when servicing a stored pressure extinguisher. The additional steps involve: (1) carefully unscrewing the extinguisher's head cap (as sometimes the cartridge may have been pierced or leaked inside the cylinder); (2) removing and examining the cartridge, which includes weighing the cartridge to ensure it has not lost more than 10% of its original weight; (3) checking to ensure it is still within its ten-year lifespan from date of manufacture; (4) checking the head cap mechanism to ensure that when the handle is squeezed, the sharp spike that should pierce the cartridge is in good condition and functional; (5) pouring out the extinguishing agent (in the case of water-based agents such as water and foam; the powder extinguishing agent is checked by covering the neck of the cylinder and inverting it to ensure the content moves freely); and, (6) examining the interior of the cylinder to ensure there is no corrosion or flaking of the cylinder's Polyvinyl Chloride (PVC) coating (for water and foam).

The rationale for these additional steps is to ensure that the cylinder is capable of absorbing an instant violent pressurization such as occurs when the CO₂ cartridge is pierced as the extinguisher is being used on a fire. A weak cylinder could be catastrophic if it could not maintain integrity due to corrosion or any other internal damage and could explode upon activation, causing serious injury to the operator or bystanders.

Human Fatality, Fire Extinguisher, Investigation