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ROBSON FORENSIC PRESENTS

# Product Safety: Appliances

Building systems and appliances are designed to provide safety, comfort and convenience to those who use them. From clean air to clean clothes. From climate control to fire protection. From warm bath water to hot coffee. These are complex products, and when improperly designed, installed, maintained, or used can cause devastating injuries and property loss.

Our mechanical engineers and building systems experts investigate incidents involving commercial and consumer appliances: heaters, stoves, boilers, furnaces, dryers, water heaters and more. Our product engineers evaluate product design, and the dangerous conditions created by the use and misuse of products. And our fire and explosion investigators accurately determine the origin, ignition source and materials first ignited in incidents where appliances are thought to be the cause of a fire.

Inside you'll find highlights of investigations where **injuries resulted from appliances** as well as information on some of our world class experts.

Contact us at one of our offices listed on the reverse of this piece, or visit [www.robsonforensic.com](http://www.robsonforensic.com).

## Robson Forensic

Engineers, Architects, Scientists & Fire Investigators

# Product Safety: Appliances

## **Our Expertise in Appliances:**

- ◆ Origin and Cause Investigations
- ◆ Fire Science
- ◆ Product Design and Development
- ◆ Product Manufacturing and Distribution
- ◆ Mechanical Engineering
- ◆ Electrical Engineering
- ◆ Building Systems Engineering
- ◆ Human Factors: Warnings/Labeling
- ◆ Materials Science

## **Other Expert Areas:**

- ◆ Construction
- ◆ Professional Liability
- ◆ Biomechanics
- ◆ Agriculture / Food Safety
- ◆ Dram Shop / Liquor Liability
- ◆ Medical
- ◆ Sports and Recreation
- ◆ Motor Vehicles
- ◆ Premises Liability
- ◆ Environmental Health and Safety
- ◆ e-Discovery
- ◆ Meteorology
- ◆ Transportation
- ◆ Workplace Safety
- ◆ Admiralty

**Robson Forensic**

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# Recent Case Highlights

## **Man dies of carbon monoxide poisoning**

A man died of carbon monoxide (CO) poisoning while on a weekend trip to the family's cabin. The source of the CO was the cabin's propane-fired heater. Robson Forensic was retained to determine if the installation of the heater was the cause of the incident.

Shortly after arriving for the weekend, the man started the heater. The heater's pilot light had been burning for a long period of time while the cabin was vacant. The burning pilot light, combined with the cold climate, caused flue gas to condense within the heat exchanger. As a result, moisture built up and froze, creating a blockage in the heat exchanger preventing combustion gas flow through the heater into the chimney. Without proper combustion gas flow through the heater, the burning propane gas produced high levels of carbon monoxide, which flowed into the cabin.

Our mechanical engineers found the propane gas systems, including the tank, piping, and regulators, had been properly installed and met the appropriate standard of care. The heater had been vented properly and the venting system was in accordance with the appropriate national standards. Neither the installation of the system nor the heater's usage contributed to the man's death.

Since it was reasonably foreseeable that condensation could form in the heat exchanger under certain conditions, the product should have been designed to allow drainage before condensation and freezing occurred. Additionally, the product should have included adequate warnings against leaving a pilot light on in cold climates for long periods of time.

This claim settled favorable for the carrier.

## **Disabled man scalded in shower**

A physically disabled man was seriously burned by his bath water. He was sitting on the edge of the tub preparing to bathe, when suddenly and without warning the water became scalding hot. Robson Forensic was retained to determine the cause of the excessively hot water.

Our investigation of the water heater found the high limit control was in the open position, indicating the temperature of the water at the time of the incident was in excess of 160°F. The operating thermostat was not set excessively high, and was within industry standards. We found that corrosion and lime build-up on one of the heating elements had caused the element to fail in a way that allowed it to continue heating the water in the tank even though the setpoint of the operating thermostat had been reached. We demonstrated that a primary cause of the man's injury was the defective design of the water heater controls: had electrical current to both poles of the heating element been switched off when the operating thermostat was satisfied, the water temperature would not have reached dangerous levels.

The man had previously complained to his apartment complex that his water was insufficiently hot. The water heater was subsequently serviced by the maintenance department, who reported that the water heater was old and showed evidence of lime build-up and significant corrosion on the heating elements. To provide hotter water to the man's apartment, they replaced the elements, and turned up the thermostat. The maintenance department had serviced the water heater, and should have foreseen and prevented the injury.

This case settled favorably.

## **Double fatality in house fire**

A couple died when their oil-fired furnace ignited a fire in their mobile home. The couple had recently reported problems with their furnace, and contacted an oil company. A few days after service, the fire caused their deaths. Robson Forensic was retained to determine the origin and cause of the fire and to determine if the oil company or the furnace manufacturer contributed to it.

Our fire investigator determined that the fire originated on the floor of the heater closet, and that the furnace was the cause. Our mechanical engineer examined the heating system and the furnace itself. The fire started when the deteriorated combustion chamber and heat exchanger allowed dangerously hot combustion gasses to escape into the supply air duct under the furnace, igniting combustible wood framing near the duct. The furnace's high limit switch location upstream of the heat exchanger prevented it from detecting the dangerously hot air escaping the furnace— it was designed only to shut the furnace off as the result of a blower failure. Had the high limit switch been located at the furnace outlet, it would have activated and the fire would not have ignited.

We demonstrated that failure of the heat exchanger in this model was reasonably foreseeable, and the manufacturer should have provided a limit switch designed to detect the temperature of gasses leaving near the bottom of the furnace. This would have guarded against excessive temperature and would have prevented the fire. Failure to provide the appropriate limit switch was a design defect, and a responsibility of the manufacturer.

We also showed that the oil company contributed to the fire, by not properly inspecting the furnace during two prior service visits. Had they inspected the furnace combustion chamber and heat exchanger, they would have detected the deteriorated condition and prevented the fire.

This case favorably for the plaintiff.

# Featured Experts

## **David Caggiano, PE, LEED AP**

*MEP Equipment and Green Building Expert, Systems Mechanical Engineer*

Dave is an experienced and hands on mechanical engineer with expertise in building and mechanical systems, HVAC, plumbing, combustion, fire protection, electrical and manufacturing. He has both the fundamental knowledge and specialized skills to understand complex failures and injuries.

As the senior project engineer he acted as Commissioning Authority inspecting and testing MEP equipment and systems in commercial buildings, including schools, office buildings, and hospitals. He has also provided consulting for the LEED green building certification program initiated by the U.S. Green Building Council (USGBC). During his ten years as a product development engineer for the Burnham Corporation, he designed, prototyped, tested and operated gas and oil fired burners, boilers and combustion control systems. This included safety certification testing for UL and ETL.

Dave is a registered Professional Engineer in Pennsylvania and West Virginia and is a former Merchant Mariner. He is LEED accredited by the USGBC.

## **Harry Ehrlich**

*Product Safety Expert, Industrial Engineer*

Harry has worked as an Industrial Engineer since 1978. He has held positions of increasing responsibility within industry and has been responsible for the design and manufacture of consumer products, as well as commercial and industrial equipment. He has extensive experience in the area of compliance with safety standards and has worked closely with Underwriters Laboratories, Canadian Standards Association, as well as overseas safety agencies. Harry has been responsible for product development, product testing and Quality Control. His background includes Human Factors and he has worked in the development of warnings and safety instructions.

As an Industrial Engineer, Harry's manufacturing activities have required him to concentrate on factory floor safety. He has a broad background in machine guarding, industrial safeguards, personal protective equipment, training and supervision. Harry has carried out his responsibilities for industrial safety as directed by OSHA regulations.

## **Daryl J. Smith, PE**

*Building Systems Expert, Facilities Systems and Facilities Design Expert*

Daryl is a Mechanical Engineer with over 25 years of hands-on experience in facilities and building systems. He has held Senior Project/Engineering Manager positions within healthcare, educational and industrial facilities, where he has been responsible for capital project management, facilities design, construction management, maintenance/modification and buildings and grounds. He has particular expertise in specialized spaces: laboratories, data centers, pharmaceutical facilities, manufacturing, and product distribution facilities.

His expertise allows him to analyze overall building mechanical utility systems, and the individual components within, such as heating, ventilating and air conditioning systems, boilers, plumbing and piping systems, water heaters, fire protection, sprinkler and alarm systems, exhaust, utility and process piping systems, electrical and building automation systems, and more. Working within a variety of settings has also given him perspective on industrial troubleshooting, failure analysis, machine guarding and protection, scalds and workplace/construction safety.

Daryl is a Licensed Professional Engineer in New York and New Jersey and a Certified Project Management Professional.