

RDA NEWS

Romualdi, Davidson & Associates, Inc.

Volume 4 Issue 1

www.rdaweb.com

OCTOBER 2004

Fire Investigations

A comprehensive investigation of a fire can involve multiple tasks and multiple engineering and scientific disciplines. The initial investigation of a fire is usually concentrated on a determination of the "cause and origin." These investigations are typically performed by a certified fire and explosion investigator (CFEI). However, on many occasions, the results of the cause and origin investigation lead to a secondary investigation(s). For instance, examination by an engineer of appliances, furnaces, wiring, or other equipment that was believed to be the source of the ignition is appropriate. Similarly, many times it is appropriate to have an engineer examine equipment, structures, and other items/facilities to access the severity of damage. In some cases, secondary investigations are necessary to evaluate whether or not defects in design, workmanship, construction, or manufacture of a piece of equipment, building, or consumer product caused a fire. The scope of services offered by Romualdi, Davidson & Associates, Inc. includes comprehensive investigations of fires to determine cause and origin.

Cause and Origin Investigations

The "Guide for Fire and Explosion Investigations" defines the *cause* as the circumstances, conditions, or agencies that resulted in the fire or explosion incident, damage to property from the fire or explosion, or bodily injury or loss of life from a fire or explosion. *Origin* is defined as the exact physical location where a heat source and fuel came into contact and a fire begins. A

systematic approach to gather and analyze facts and evidence, and apply experience, knowledge and science is necessary to determine the cause and origin of a fire. Key elements of a systematic investigation will typically include:

Inspection of Fire Scene. An inspection of a fire scene should be conducted as soon after the event as possible. The fire scene should be secured to control access to the scene, to identify hazards, and to protect/preserve physical evidence. Investigators should document the scene through notes, sketches, diagrams, charts, photographs, and videotape. Physical evidence should be collected and stored properly to prevent spoliation.

Determining the Origin of the Fire: In general, the origin of a fire must be identified before the cause can be determined. The origin of a fire is determined by evaluating physical evidence (fire patterns) at the scene, reviewing statements and interviewing witnesses, evaluating severity of damage, and applying a working knowledge of the physics and chemistry of fire development and growth. Techniques that the investigator might use include, but are not limited to, heat and flame vector diagrams, depth-of-char grids, and electrical arc mapping.

Determining the Cause of the Fire: The investigation will identify the factors that were necessary for the fire to have occurred. This evaluation requires an understanding of the ignition temperature of the materials present as well as an understanding of the ignition source and ignition sequence.



Fires of Electrical Origin

Many fires that occur in residential and commercial buildings have electrical origins. In the case of residential properties, electrical appliances, extension cords, and wiring defects can result in fires which cause severe damage. Similarly, in commercial or industrial facilities, improper wiring and defects in machinery or other equipment can result in costly fire damage.

An investigation of a fire in a residential or a commercial/industrial building often identifies an electrical wiring circuit or electrical appliances/equipment as the origin of the fire. Determination of the cause of an electrical fire requires knowledge of the National Electric Safety Code and electrical engineering principles and practice. When electrical appliances or equipment are identified as the origin of a fire, an engineering investigation may be necessary to establish the precise cause. For example, a design

(Continued on page 2)

and/or manufacturing defect in the appliance or equipment may be found to be the ignition source. In such instances, products liability litigation against the manufacturer of the appliance/equipment often arises.



Boiler and Furnace Fires

Residential, commercial and industrial fire losses also results from boiler or furnace related fires. Burn patterns can lead investigators to identify the origin of a fire as the furnace or boiler room. Design or installation defects can result in boiler or furnace fires. Improper service, misadjustment or malfunction of controls, and fuel leaks can result in destructive structure fires. Detailed examination of a boiler or furnace may reveal a mechanical or electrical condition as the cause of a fire. A thorough understanding of the design and operation of heating systems (as well as electrical systems) is required to investigate fires that are

potentially related to boiler or furnace systems.

Vehicle Fires

Fires also occur in passenger and commercial vehicles. Electrical and/or fuel system defects or malfunctions can provide ignition and fuel sources for motor vehicles. Burn patterns and evidence of fire intensity can often be utilized to identify the location of the origin of a fire. Electrical components and wiring in the area of the origin are examined. The fuel system, power steering and braking systems can leak and supply fluids that are combustible. Often vehicle fires result from improper service or maintenance of a vehicle, but design and manufacturing defects can also occur which cause abnormally high frequencies of fires in a particular make or model vehicle. Investigation of vehicle fires requires an in-depth knowledge of fire investigation methodology and of the mechanical and electrical systems for motor vehicles.



Personnel

Employees and Associated Consultants of Romualdi, Davidson & Associates, Inc., offer comprehensive expertise and experience in fire investigations. Mr. Mark A. White is an industrial engineer and is a certified fire and explosion investigator (CFEI). Mr. White focuses on origin and cause analysis. Mr. James W. Warren is also a certified fire investigator (CFEI) and a registered professional engineer. He specializes in investigations of fires of electrical origin. Dr. Bert N. Davis is a certified fire investigator (CFEI) and is registered in the City of Pittsburgh as an Electrician and Mechanical Contractor. Dr. Davis specializes in origin and cause investigations of fires involving boilers and furnaces. Mr. Robert N. Nocivelli is a Master Mechanic with extensive knowledge and expertise in the investigation of motor vehicle fires.

Romualdi, Davidson & Associates, Inc.

385 East Waterfront Drive
Homestead, PA 15120-5005

