



## D30 Electrical Fire or Arson Crime?

*Helmut G. Brosz, BASc\*, Forensic Science International Group, Markham, ON L3P 3P2, CANADA*

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**Learning Overview:** After attending this presentation, attendees will recognize that forensic electrical and metallurgical engineers can play an important role in analyzing a suspected arson scene. Electrical and metallurgical engineers can assist criminalists in determining if a fire could have been a criminal act, accidental, or unintentional. The manual sifting through screens of fire debris can yield valuable evidence from fire scenes when combined with metallurgical and electrical tests.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by contributing to an improved performance of criminalists and others involved in an investigation of a suspected criminal arson fire by availing themselves of forensic electrical and metallurgical engineering expertise.

This case study covers a fire in a manufacturing facility that puzzled a number of fire investigators. Some investigators opined the cause as arson, others opined the fire as accidental not involving human intervention, and others could not conclude a cause with a sufficient degree of engineering certainty.

The origin of the fire was agreed to be at a work station inside the factory floor open area that consisted of a wooden desk, computer on the floor, monitor, a 500VA Uninterruptable Power Supply (UPS) on the floor, extension cords on the floor, plastic waste basket, and a metal filing cabinet adjacent to flammable, cloth-covered metal screen walls close to the side of the building and next to another work station.

The fire occurred during the middle of a Saturday night when the plant was not in production. A worker had worked at the subject workstation earlier on Saturday morning. No accelerants were found in the vicinity of the workstation. No sign of a break-in or unauthorized entry was found.

Fortunately, all fire debris on the floor was swept up and kept in bags by the initial insurance investigators. cursory examination by investigators found no evidence in the debris that would point to a cause for the fire.

Detailed sifting of the fire debris from the floor, which was stored in bags, through fine screens produced important artifact evidence. Missing brass bus bar pieces and wiring from the 120-volt UPS were found. These artifacts allowed one to reconstruct the electrical bus bar system of this UPS that was heavily damaged by fire. One of the bus bars showed that the brass had been consumed/melted at a solder joint. Other adjacent solder joint locations **did not** exhibit such consumption/melting.

Metallurgical examination revealed that the brass adjacent to the missing brass reached temperatures in excess of 900°C (the melting point of brass). The plastic case material of the UPS was flammable and would ignite at this temperature. A new identical UPS was obtained, disassembled, and the brass bus bar system and its solder joints were compared. Electrical tests and research revealed that low current (less than one ampere of current) can cause overheating and arcing sufficient to initiate a fire under the right circumstances within a flammable material enclosure.

The conclusions reached were that the defective solder joint arced, consumed the brass, some of the copper conductor, ignited the case, and initiated the fire. Arson was ruled out.

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### Electrical, Arson, Fire