



Engineering Sciences Section - 2015

D42 Sometimes Deficient Electrical Installations Result in a Fire

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After attending this presentation, attendees will understand that electrical deficiencies are frequently missed by inspectors and that it sometimes takes several years for these deficiencies to cause a fire. Three fire cases will be utilized to show what basic visual inspection would have revealed. In addition, the use of burn patterns (damage caused by heat) to determine the point of fire origin and cause of the fire will be demonstrated.

This presentation will impact the forensic science community by illustrating that many electrical installations are not sufficiently inspected.

A fire occurred in a fast-food restaurant located on the 1st floor of a large building in the downtown area of a resort community. The burn patterns on the building and in the restaurant indicated that the fire originated in the basement. Minimal fire damage was found on the 1st floor of the building but the 2nd floor of the building was completely destroyed. The entire building was condemned and had to be demolished. Examination of the burn patterns in the basement indicated that the fire originated at a ceiling joist where an electrical cable was located. The cable supplied power to a toasting oven located in the fast-food restaurant. It had been installed three years prior to the fire by a contractor renovating the facility from an ice cream parlor to a fast-food restaurant. An architect had been retained for the renovation; however, the contractor had used an undersized electrical cable and did not install it in an electrical conduit (metal pipe) as specified by the architect. In addition, the local electrical code required the cable to be installed within a thermally protected wall. A visual inspection of the basement ceiling would have revealed the electrical deficiency.

Another fire occurred in a retirement condominium community. The burn patterns in the fire building indicated that the fire originated in a common wall between the kitchen of an apartment and a shower stall of another unit. The point of fire origin was an electrical junction box in the wall for the oven located in the kitchen unit which sustained minimal fire damage. Aluminum wiring from the apartment's electrical panelboard was spliced to stranded copper wiring from the oven in the electrical junction box. This is a violation of the National Electrical Code which requires that conductors of dissimilar metals shall not be intermixed in a terminal or splicing connector where physical contact occurs between the dissimilar conductors such as copper and aluminum. This condominium complex had a reputation for having problems with aluminum/copper wiring and over the years several electrical renovations had been conducted without resolving all of the problems.

The third case study is a wildfire which is a large destructive fire that spreads quickly over woodland or brush. Inspection of the burn patterns on the terrain and vegetation indicated that the fire originated near a highway advertising billboard. The billboard had been damaged by high-velocity winds in the area. The electrical conduit (metal pipe) supplying power to the billboard's lighting system was damaged and broken apart. A metal detector revealed the presence of metal on the ground beneath the billboard. The high-velocity winds had caused the electrical wiring in the conduit to short-circuit and drop molten metal onto dry brush on the ground thus initiating this fire. The billboard's conduit was Electrical Metallic Tubing (EMT) which is thinner than rigid electrical conduit. In addition, EMT is simply pushed together whereas rigid electrical conduit is threaded together and sturdily mounted. The local electrical utility requires rigid electrical conduit to be used and the billboard has been inspected on a yearly basis for more than 20 years.

Burn Patterns, Conduit, Copper/Aluminum