



Engineering Sciences Section - 2015

D41 Forensic Engineering Investigation of Burn Injuries in a Defective Spa Pool Light Installation

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After attending this presentation, attendees will understand the need for a complete forensic engineering investigation and evaluation.

This presentation will impact the forensic science community by explaining the need for a thorough forensic engineering investigation, which systematically evaluates the injury evidence, the mechanism of injury, the type and properties of the light, the methods of installation, the electrical codes that are applicable, and the methodology of verifying laboratory tests in the field.

A middle-aged woman who was paralyzed below the waist enjoyed the benefits of a spa pool at a major national chain hotel. As a disabled person, she was particularly grateful that she had full access to the hotel hot tub and spa pool facility. She was assisted by her caretaker who helped her wheelchair to the pool and helped her into the water, using the handrail and steps provided.

After she left the pool, it became apparent that she had suffered third-degree burns along her back, which required hospitalization and significant treatment. She had been burned by a light that was installed in a defective manner and in fact that same light had the further potential to cause serious harm to others.

This presentation reconstructs the events and factors leading up to the injury event and concludes in the final and site inspection which corroborated the initial testing, along with some unexpected surprises. Attendees will benefit from this presentation by gaining an understanding of the need for a thorough forensic engineering investigation, which systematically evaluates the injury evidence, the mechanism of injury, the type and properties of the light, the methods of installation, the electrical codes that are applicable, and the methodology of verifying laboratory tests in the field.

The light at issue was a halogen bulb mounted in a watertight enclosure, manufactured for use in a pool; however, in this case, the light was mounted in the second step of a stair section that allowed persons to enter the spa pool. By mounting this light in the stair “kicker,” the vertical wall between adjacent stairs, this light was not submerged as would be the case in the manufacturer’s intended installation, but rather was adjacent to users as they entered the pool or sat on the steps. In this case, as the plaintiff sat on the step she was unaware that her body was in contact with an exceedingly hot surface.

A halogen light exemplar was examined in the laboratory and fitted in an underwater test fixture. A test device, an instrumented sponge, was developed to measure the temperature-over-time relationship, resulting in surface contact temperatures of 195°F in a matter of just a few minutes. Photos and graphs of this measurement process will be presented. Furthermore, a pork surrogate was developed to corroborate the burn patterns and depth of thermal penetration observed in the medical reports of the injuries to the plaintiff.

These findings were then taken to the site investigation. Actual tests in the hotel spa pool confirmed the lab results. This site testing was performed in the presence of 16 attorneys, experts, and unidentified participants in the case. Some of these individuals actually placed their hands against the hot light and subjectively confirmed the nearly instantaneous pain. This was a somewhat unusual event that seldom occurs in site inspections and will be further discussed.

As a follow-on to the inspection, the electrical circuit was inspected, which required the partial dismantling of the spa wooden deck covering. Several more surprises were discovered as it turned out that the installation was defective, the Ground Fault Interrupter (GFI) circuit was deficient, and the entire installation posed a real electrocution risk to anyone using the facility.

The case was settled, but a letter was sent to the city and the hotel chain advising them of the critical safety issues discovered during the site inspection. This was done as part of the code of responsibility of the Professional Engineering License in that state.

Spa Pool, Thermal Burn, Halogen Light