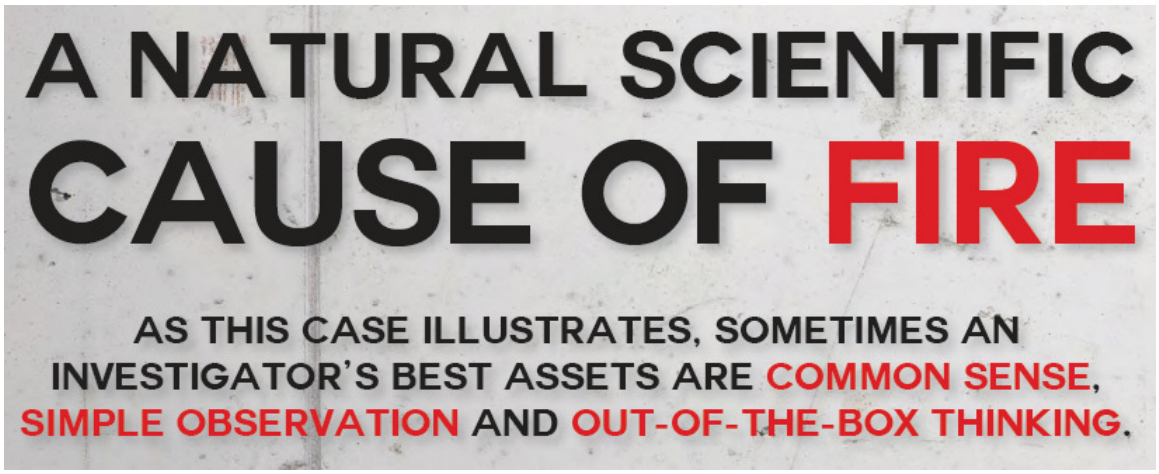

A Natural Scientific Cause of Fire

As this case illustrates, sometimes an investigator's best assets are common sense, simple observation and out-of-the-box thinking.

In the early 1990s, a major insurance company hired me on behalf of one of its clients, a chain of fast-food restaurants, which I'll refer to as "Burger Patty House." Typically, with commercial businesses or even your own home, an insurance company insures the premises for risks associated with business or personal possessions and liability. My involvement was to investigate the origin and cause of a fire that developed within the restaurant, which resulted in a total loss, requiring building demolition and reconstruction. Eyewitness accounts by employees and patrons indicated a fire burning through the structure's roof.

Mass-produced throughout the world, "Burger Patty House" restaurants have similar design and layout and are often built by contractors or vendors for the restaurant corporation. Many of these buildings, in particular the ones investigated and referenced within this case study, were of a single-story height and had an overall dimension of approximately 100 feet by 50 feet. They are designed with a front retail and dining area, as well as a service counter and the rear portion of the structure utilized kitchen equipment, appliances, bathrooms and refrigeration equipment.

This particular chain can operate on a 24-hour basis or at least a 15- to 18-hour operation period. Within months, there were several other fires that developed in the same type of building structures with similar design issues. There were a total of four independent fires that originated within the restaurant facilities, all of which had originated within a concealed area above the ceiling of the first floor and below the ultimate roof structure. In all cases, no evidence suggested fire development within the first floor dining area, service area or kitchen. All accounts reported the smell of smoke and visual signs of smoke and fire propagation throughout the entire roof.

Fire Scene

The first of the four fires was located in an upstate New York community. Upon arrival, interviews and the collection of data, and the assessment of the fire scene and follow-up with local authorities were performed.

After conducting their investigation, the local authorities declared the fire of “undetermined cause.” Since local authorities often do not have the time and financial obligations to conduct an extremely detailed investigation and use engineers or scientists to examine or test many components, they work in conjunction with professionals, such as a firm like mine.

A careful examination and detailed inspection of the building revealed that the fire, in fact, originated within the concealed area above the first floor location. There was no total access to this area under normal circumstances (pre-fire). However, in this case, due to the fire damage, I was able to evaluate and inspect all potential ignition sources that could be responsible for the cause of the fire and ultimately the propagation and damage.

Using proper standards and guidelines for fire and explosion investigators, and engaging my mechanical and electrical engineers, we inspected over several days. Full evaluation of all fire and heat patterns was conducted to determine the area of fire origin and its subsequent spread. Methods would also include the consideration of melting temperatures, depth of char to wooden materials, consumption of building materials, and a detailed mechanical and electrical analysis of equipment.

Predominately this concealed area or roof structure utilized the location of hood and exhaust equipment, which is part of the cooking apparatus from the kitchen through the roof to the exterior environment. There also was a large amount of electrical wiring mounted to wood studding, which ultimately supplied kitchen equipment, fixtures, receptacles, lighting, etc. The forensic evaluation of the equipment did not uncover any signs or physical evidence that a potential accidental source for the development of a fire existed.

Normally there are indicators such electrical activity, overheating, severe melting or other mechanical or electrical failures that could be leads to the cause of a fire. Ultimately further engineering analysis or laboratory inspection would be performed to confirm or deny its involvement as an ignition source or the cause of the fire.

Additionally there are other factors such as reviewing of design issues, installation and fabrication of materials as well as evaluating specifications for equipment or even blueprints that assist in the investigator's documentation of the scene.

In some cases I am not able to make a determination as to the cause of a fire. Severe building damage due to the fire or even fire suppression efforts can result in damage beyond recognition. After the extensive and detailed inspection of this fire scene, I reported to my client, the insurance company for the structure and the corporation as well as the chain's corporate engineers, that I was unable to render an opinion or conclusively determine the origin and cause of this fire.


Nesting material on fixture

Ongoing Fires & Investigations

As mentioned earlier, there were three other fires for this chain within the United States that had identical circumstances as described in the first scenario. The same investigative techniques were performed. Through the course of this later investigation and meeting with engineers for the corporation I was once again confronted with undetermined fire causes for all of the structures. Not being able to make a determination after four investigations was frustrating. It was troubling that the cause of these fires could continue to pose the potential of personal injury to employees, occupants and firefighters, as well as involve loss of business revenue and reconstruction costs, and damage the chain's reputation.

Unexpected Cause

Approximately one month after investigating the fourth fire I was driving in Long Island, New York, after investigating another fire loss site unrelated to this particular client or the restaurant chain. It was mid-afternoon and having been on site for several hours I stopped at the "Burger Patty House" identical to the previous investigated sites. Pleased to see a good-standing structure that was fully operational, I proceeded to use the bathroom then placed my order to go. I sat in my car and visually pondered the structure, puzzling over what could possibly be eluding me as to the cause of the fires within the identical architecturally designed buildings.

Halfway through my meal I observed a bird entering through a small hole in the siding supporting the soffit above the walkway that surrounds the building. Thinking nothing of it at the time, I then witnessed a second or the same bird entering the same small hole within the soffit, this time carrying what appeared to be straw or grass in its beak.

Soffit and light fixture

I realized that the material within the bird's beak is typically used for nesting practices. While not thinking it relevant to my past investigations, I was curious, Getting out of the car, I observed a small space, approximately a ½ inch by 1 inch, with an opening in the siding adjacent to the soffit. The bird was able to squeeze its way into this opening and make a nest within the concealed area.

I evaluated the soffit and determined that there was recessed lighting, commonly referred to as a high-hat lighting fixture, mounted within the soffit. The bulb and the faceplate exited the soffit and illuminated the walkway below.

Recessed lighting fixture

Having conducted fires in other environments I knew that this type of recessed lighting could produce temperatures within hundreds of degrees. These fixtures are designed in such a way that they can rise approximately three to four inches in height from the bulb location and produce extreme temperatures. For that reason the manufacturer stresses the need for proper clearances surrounding the fixture so that the high temperature cannot ignite combustible materials or melt installation on wiring that can lead to the potential of an ignition source and a fire.

In previous investigations I found no evidence to suggest that installation or clearances were an issue. In fact, located on the fixture itself there are warnings and cautions for the contractor to not place combustibles within several inches of the fixture to eliminate this potential hazard.

At that point I realized that birds might have been utilizing the dry grass for nests around the recessed lighting fixtures. What would be better for a bird than a warm environment generated by the light fixtures when they were activated at dawn?

Nesting material on fixture

Typically dry grass and fire tinder will dry quickly because of high exposure to wind; this makes them ideal for fire making. The bundling and the dried goods, grass and twigs were further dried out through contact to the light fixtures. This resulted in ignition and open flame causing the incipient stage of the fire.

Immediately after realizing that here was the likely answer to what had been eluding my investigative team and me, I contacted my client, who conferenced the chain's corporate engineers, who proceeded to perform an invasive inspection of the soffit. Upon inspection at least two bundled nests were found adjacent to the recessed or high-hat lighting fixtures and, in one case, there was evidence of slight char to the dried bundled material.

Charred nesting material on fixture

This investigation was finally solved due to a hunger pain and the observation of what is believed to have been a bird entering the hole of a soffit to make a home for his new family.

Flammability and ignition of nesting material

The previous investigations had ruled out all other potential sources, which led me to provide an opinion as to an undetermined fire cause.

In closing, the corporate engineers for “Burger Patty House” had immediately notified all of their restaurants of similar design to inspect, remove and redesign the soffits to eliminate this potential exposure and risk to the restaurants, employees and customers.

Since that time exterior lighting below the soffit is now being used in many of the applications throughout the world to further eliminate the potential of high temperature fixtures igniting combustible materials.

A fire investigation is a complex endeavor involving skill, technology, knowledge and science. The compilation of factual data, as well as an analysis of those facts, should be accomplished objectively and truthfully. The basic methodology of the fire investigation should rely on the use of a systematic approach and attention to all relevant details. The use of a systematic approach often will uncover new factual data for analysis, which may require previous conclusions to be reevaluated.

Yet, ironically, in these particular investigations, despite modern technology I solved the unsolvable due to a hunger pain and a curiosity over bird nesting. Simple observation and imagination were critical factors in solving this previously unsolvable origin and cause dilemma.

But in the end, the answer was elementary, my dear readers, elementary.

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