

BURN PATTERNS AND HOLES IN FLOORS - BE CAREFUL!

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Fire Investigators should approach holes in floors and other potential burn patterns “with an inquisitive” approach to the physical evidence at hand. Time honored theories related to such observations often led to a conclusion that the failed floor system or “low burn” was present as proof positive that a liquid accelerant was present and thus the fire was incendiary.

The operative word here is CAUTION IN INVESTIGATING HOLES IN FLOORS. Fire investigators should be aware of “flashover” and radiant: heat as concepts in the evaluation of every fire. Consideration Should always be given to the two events. Most important, there should be a clear understanding of the two events.

There is no question that isolated holes in a floor can be caused by the introduction of a liquid accelerant. However, what was once taken as “gospel” now requires a more thoughtful approach both the interest of justice and science.

Flashover* typically burns all combustible items to floor level. Flashover is a transitional stage of a fire from growth to its fully developed stage. It involves the ignition of all items in the compartment including carpeting and all furniture. It is known that once flashover takes place the fire will spread rapidly via doors, airshafts, stairways, plumbing and electrical service areas. Some studies published by the National Institute of Justice* suggest that the burn patterns from the introduction of liquid accelerant do remain after a flashover. That suggestion, in our experience, may be correct in particular situations. The problem appears to come into play when there is full room involvement and ultimate collapse of the compartment being examined and no positive lab samples.

There are several factors that cause holes to develop in floors and for floors to fail completely. First and foremost, has been the introduction of lightweight, wooden building construction materials. The introduction of light-weight wood trusses, structural wooden I-beams and Oriented Strand Board (OSB) sheeting as flooring components have eliminated old theories regarding “burn through”, pour patterns and levels of destruction being greater near the source of ignition. The source of ignition may have nothing to do with the hole in the floor.

OSB is being used widely throughout the United States in places where 15 years ago, plywood sheeting or solid board would have been utilized. OSB is made up of dried strands of wood that are mixed with wax and adhesive and hot pressed into panels/sheets. Resins and adhesives within the OSB have now been introduced into the fire propagation scenario and resulting burn patterns. Additionally, the introduction of a liquid onto OSB will absorb and react differently than when poured onto plywood sheeting.

Holes in floors can be caused by radiated heat from furniture that is burning above an area or where the ceiling has been breached. Examples of that might be bedding that is now hanging from above or has fallen partially down and is burning. It is critical for a fire investigator to make inquiry as to the various items both on the floor and in the area above. Then they should critically analyze the potentials for a decision as to the cause of the hole in the floor. That would put the fire investigator directly in line with the “scientific method” and the deductive reasoning in proving one’s conclusions as noted in NFPA 921*. A hypothesis is then developed and tested. In theory the basis of your opinion can be tested and reviewed by others.

Investigators must be aware of the effects of radiant heat. Floors can be charred when exposed to heat fluxes above 20 KW/m² even if no fuel is on fire in the immediate vicinity *. Post flashover fires, depending on their duration, can cause substantial floor damage. If the room has not gone to flashover, the characteristic burn pattern indicators may be present. High temperatures in a compartment will cause low burns. They should be examined carefully and chemical samples taken from the area.

Fire investigators must be able to document both the various airways and penetrations in a room during their on scene fire investigation. Failure to carefully document specific items will make it impossible for anyone to duplicate your research and investigation at a later date. Additionally, the construction of the room, the various furniture configurations and the sundry other items that make up a room should be documented completely. When examining a couch or bed seek information as to what items were on the couch. This becomes important with regard to the fire load and the amount of energy produced in particular areas of the compartment being studied. Remember the dynamics of a fire often depend on the construction of the compartment and the amount of energy produced. Both are obtainable items.

NFPA 921 is not very clear on the reasons for holes in the floor. In fact it leaves the investigator with a variety of causes. A fire investigator looking for an easy way out via 921 should look elsewhere. 921 gives a framework but no definitive answers.

The same caution given to holes in floors can also be addressed with regard to “burn patterns”. Some burn patterns are clearly the result of liquid accelerant and there is no other plausible explanation. However, some burn patterns look like something that raises suspicion. Obviously the easiest way to make a clear determination is to take lab samples. A positive lab sample for gasoline on a living room floor could be a clear example of the introduction of an accelerant. In some areas of the country however, we have come across individuals who store their chain saws in the living room. That aside, in most cases it is clear that gasoline does not belong on a living room floor.

Our collective experience in various venues in which we have been a part of experiments in and research on burn patterns with various research groups tells us that the best evidence is a positive lab sample from the appropriate agency early in the investigation. “Miracle finds” of “traces of an accelerant” a week after the fire took place is cause for some serious thought.

The point is clearly that the investigation of a fire requires numerous specialties and a willingness of the investigator to seek answers based on science and not mere suspicion.

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* DRYSDALE, **An Introduction to Fire Dynamics,1985, p. 60.**

* Flammable and Combustible liquid Spill/Burn Patterns, NIJ Report 604-00.

* NATIONAL FIRE PROTECTION ASSOCIATION, GUIDE FOR FIRE INVESTIGATIONS.

* KIRK, INTRODUCTION TO FIRE INVESTIGATIONS, FOURTH EDITION, P. 32.