

The Impact of Building Construction on Fire Investigation

A fire investigator is required to have a diverse educational background, both formal and informal, to be qualified to conduct a fire investigation. This includes both formal education in subjects such as physics, chemistry, fire dynamics and thermodynamics. A good fire investigator is also knowledgeable in building codes, electrical systems and wiring, plumbing systems and heating/cooling systems. This technical knowledge is necessary to conduct a fire investigation in accordance with the scientific method, as outlined in NFPA 921. The value of the more informal topics such as building codes may not be as obvious, but they play an important part in understanding the complex phenomenon of fire.

Familiarity with building codes and building practices related to current construction is an obvious area a fire investigator must be familiar. The impact of current construction practices such as engineered beams, laminated beams and modular construction on fire development and progression are important factors to evaluate in a fire investigation. Not all buildings that experience a fire loss are built to current standards and practices.

The buildings that a fire investigator comes across can be residential, commercial or industrial structures. Further, the buildings can be anywhere from new builds to over 100 years old and everything in between. Construction practices from the early 20th century were different than current practices and these differences can have a significant impact on fire progression.

A current residential building practice that can impact a fire investigation is the use of engineered floor joists. In traditional residential construction dimensional lumber (e.g., 2x12, 2x10) is used for the joists that a floor is built upon. In a fire, these joists can confine a fire to within the joist space and also have much longer fire exposure times before they fail. This can concentrate fire patterns that have the potential to make the fire investigation easier.

There are 2 main types of engineered joists: I-beam and web. I-beam joists typically use a 2x4 top and bottom chord, with plywood or oriented strand board (OSB) vertically oriented, filling the gap. Web beams use dimensional lumber, typically held together with metal fasteners, to create a joist that looks like the metal roof joists one sees in commercial construction. The advantage of engineered joists is that they allow for longer spans than can be designed using dimensional lumber joists. In a fire, the engineered joists behave very differently than their dimensional lumber counterparts. Web joists, due to their open web design, provide no barriers to horizontal fire spread; this can lead to significant spread of a fire. Both types of engineered joists have a significantly lower time to failure in a fire as compared to their dimensional lumber counterparts. One needs to take these construction practices into account when evaluating a fire scene.

An older building practice (1880s – 1930s) is called balloon construction. In balloon construction the exterior walls are constructed using continuous studs from the basement to the attic. This contrasts with the current practice of platform construction, where the exterior walls have a sill

plate and header for each floor of the building. Further, in balloon construction there are typically no horizontal members, also known as firestops, within the wall cavities. Thus, each stud space is effectively a chimney from the basement to the attic. This type of construction can have a significant impact on fire patterns and fire progression. What may appear to be an attic fire may in reality be a basement fire. The fire in the basement travels up an open stud space and then progresses throughout the attic. If one is not aware of this type of construction and what to look for to identify this type of construction, an incorrect opinion on the origin of a fire may be reached.

As the above examples show, fire investigation is a complex endeavor involving science, engineering and the knowledge of practical subjects such as construction practices, etc. At Pyro-Technical Investigation we have extensive experience with all types of construction practices involving residential, commercial and industrial buildings. It is this combination of formal and practical knowledge and experience that ensures that your fire investigation is handled properly and professionally. We are prepared to support our investigation conclusions throughout the litigation process should the claim go that far.

Please feel free to contact us (phone – 800.377.1352; email info@ptiforensic.com) to discuss any situations you are dealing with or to submit an assignment. We look forward to serving you.