



Coffee Break Training - Fire Investigation Series

Building Construction: Part 2: Fire Investigations: Building Loads and Fire Spread

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Learning Objective: The student shall be able to recognize various types of construction and materials, building “loads,” and fire spread as related to fire investigation and the safety of personnel on scene.

Building loads of concern to investigators include **dead load**—the weight of the building and any permanently attached equipment, **live load**—which is produced by use and occupancy of the building, and **impact load**—which could be created by an investigator jumping onto a floor.

A load-bearing wall is a wall that supports a vertical load, such as a floor or roof, in addition to its own weight. Failure in walls and other components can depend upon the composition material or materials. Combustible construction will burn, reducing mass and load-carrying capacity. Steel begins to weaken at about 600 °F (316 °C). It is estimated that at approximately 1,100 °F (593 °C), steel will lose about 60 percent of its load-carrying ability.



This single-family dwelling fire occurs in typical wood-frame construction.

Concrete is noncombustible and typically is strong in compression but weak in tension. It may be plain or reinforced. Plain walls include unreinforced brick where the effects of fire and fire suppression may cause failures. Reinforced walls can also fail, especially if the reinforcing elements become exposed to the effects of fire.

Lightweight construction can be composed of many materials and is often found in modern noncombustible, ordinary, and wood-frame construction types. The most common materials are steel and wood. Component examples are wood trusses composed of relatively small dimension lumber, steel bar-joist trusses, and wood I-joists. Fire effects can cause lightweight construction to be weakened and/or fail, and often after only a very short exposure time.

Fire spread and extension can occur room-to-room, floor-to-floor, and building-to-building. The method of extension directly relates to the building construction, building layout, fuel load, built-in fire protection, air-handling systems, and fire department ventilation efforts. Fire may spread through voids created by curtain walls, particularly in fire-resistive and noncombustible construction. Combustible concealed spaces may be found in a number of types of construction, but especially in ordinary, heavy timber, and wood-frame. Penetrations for utilities and plumbing can exist in all types. Fire may spread through the continuous vertical void space found in older balloon-frame construction.

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