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PERSPECTIVES

Fireplace & Chimney Fires: Types, Causes, Liability, Recalls & Safety

Our perspectives feature the viewpoints of our subject matter experts on current topics and emerging trends.

INTRODUCTION

Home heating equipment is the leading cause of U.S. home fires during the months of December, January, and February, when nearly half (48 percent) of all U.S. home heating equipment fires occur. January is the leading month for home heating fires; one-fifth (20 percent) of all home heating fires happen during this month.

According to NFPA's latest heating equipment statistics, there was an annual average of 48,530 home heating fires between 2014 and 2018, resulting in an estimated 500 civilian deaths, 1,350 civilian injuries, and $1.1 billion in direct property damage. During the coldest months of the year, when we see the largest share of home heating fires, it's critical that people understand when and where home heating fires tend to happen so that they can take the needed steps to minimize those risks.

Contributing to almost half of these fires are household fireplaces and the associated chimneys. Fireplaces have been used for centuries and are a great way to add warmth and ambiance to any home, but there will always be special considerations when using an open flame to create heat.
The purpose of this paper is to discuss household fires caused by chimneys and fireplaces and to cover key points of understanding, to include:

- How chimney and fireplace fires occur, and who may be liable
- Types of fireplaces by design and construction
- How factory-built fireplaces are regulated
- Common installation errors
- Recalls on fireplace inserts
- General fireplace safety

HOW AND WHERE DO ACCIDENTAL FIREPLACE & CHIMNEY FIRES OCCUR?

Most fires associated with fireplaces occur in the chimney, not in the firebox. Of these chimney fires, there are primarily three common causes. The first is creosote accumulation on the chimney wall. Creosote is created by the unburnt fuel from the smoke as it passes through the chimney. While the hot smoke passes through the chimney, it condenses on the wall of the chimney due to a difference in temperature and creates a layer of unwanted fuel-load. The creosote is a dark, tar like substance that is very susceptible to ignition.

Creosote is highly combustible and is well known for its fire threat in chimneys of wood-burning fireplaces. Creosote's flash point (the lowest temperature at which vapors will ignite when given an ignition source like a spark or flame) in a liquid form has been reported to be as low as 165 degrees Fahrenheit (F). A spark, burning ember, or flame that raises the liquid creosote temperature to 165 degrees F can ignite the creosote in a chimney. The auto-ignition temperature of dry creosote has been reported to be 451 degrees F, which is the same as paper.

A second possible cause is from a defect in the chimney wall or pipe due to improper installation or a design flaw. It does not matter if the chimney is constructed of brick, stone, or metal; if there is a way for direct or indirect heat or flame impingement on combustibles, a fire may occur.

The third common cause of fire losses involving chimneys involves the release of embers or sparks from the chimney to surrounding combustibles inside a structure or outside, such as a roof. All combustible material (furnishings, etc.) should be at least three feet away from the opening of a fireplace.

WHO IS LIABLE FOR ACCIDENTAL FIREPLACE & CHIMNEY FIRES?

Below are some of the potential parties that may be responsible for fireplace fires:

- **Manufacturers** – Due to improper design or assembly instructions.
- **Fireplace Installers** – Due to improper installation of the firebox or chimney pipe.
- **Brick Masons** – Due to improper or faulty masonry construction of chimney and firebox.
- **Insulation Installers** – Due to placement of insulation on or in close proximity to a chimney pipe.
- **Architects** – Due to improper design or placement of fireplaces and chimneys.
- **General Contractors, Framers, Gas Component Installers,** or **Electricians** – Due to improper

supervision, installation, or repair of a fireplace or chimney.

Others with a professional responsibility that requires due diligence include:

- **Chimney Sweeps, Fireplace Inspectors, or Home Inspectors** – In the case of improper or inadequate cleaning or failure to detect/address an obvious hazard.

TYPES OF FIREPLACES

Most fireplaces are likely either masonry built or zero clearance. Masonry built fireplaces are usually constructed of brick or stone with fireboxes made of the same material, creating a solid barrier between the fireplace and construction materials. Typically, the firebox on masonry fireplaces has little to no metal and may or may not have doors. Zero clearance fireplaces, on the other hand, are manufactured fireboxes that are fire-rated so that no (zero) clearance is required between the firebox and construction materials like wood framing and sheetrock.

Zero clearance fireplaces are factory-built units made from sheet metal or cast iron. They are also known as prefabricated fireplaces because they come ready to install. Zero clearance fireplaces are so named because they are sufficiently insulated to be installed within close range of combustible materials, such as walls or wood framework, without requiring a masonry foundation. Many apartment and condominium complexes are constructed with a zero clearance fireplace. Some include glass doors, and some only have spark arrestor screens.

***Figure 1** - View of typical "zero clearance" fireplace, red arrows show stand off brackets which is minimum distance to combustible material (wood framing) above the fireplace firebox.*

HOW ARE FACTORY-BUILT FIREPLACES REGULATED?

Factory-built fireplaces are tested and listed by organizations like Underwriters Laboratories (UL) and Canadian Standards Association (CSA). UL 127 covers the requirements for factory-built fireplaces. This includes the fire chamber, chimney, roof assembly, and other related parts. The National Fire Protection Association (NFPA) also regulates fireplaces via NFPA Standard for Chimneys, Fireplaces, Vents, and Solid-Fuel Burning Appliances in NFPA 211 as well as a section covering fixed blowers and other electrical accessories covered under the National Electric Code, NFPA 70.

NFPA 211 Standard for Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances states the following:

- 14.2 Annual Inspection. Chimneys, fireplaces and vents shall be inspected at least once a year in accordance with the requirements of section 15.2
- 14.2.1 Cleaning, maintenance, and repairs shall be done if necessary
- 15.2 Type of Inspection. The scope of the inspection, the areas of the chimney examined, and the degree of invasiveness of the inspection shall be appropriate for the conditions giving rise to the inspection.
- 15.3.2.4 The inspection shall include verification that the flue being inspected is free of combustible deposits (creosote) and blockage or obstruction.
- 15.3.2.7 Internal surfaces of fireplaces and smoke chambers shall be examined for damage and deterioration, combustible deposits, and evidence of operating malfunction

The International Code Council (ICC) also has regulations for building codes under several of the code books including Building, Residential, Existing, Fire, and Mechanical.

The ICC Building and Residential Books devote Chapter 10 to Chimneys and Fireplaces and include a section on factory-built fireplaces. The Mechanical Code covers chimneys in Chapter 8 and governs the installation, maintenance, repair, and approval of chimneys, chimney liners, and connectors. Gas-fired appliances are covered in the code book for International Fuel Gas Code. The Fire Code has definitions in Chapter 2 and covers chimneys in Chapter 603.2:

> **603.2 Chimneys.** Masonry chimneys shall be constructed in accordance with the International Building Code. Factory-built chimneys shall be installed in accordance with the International Mechanical Code. Metal chimneys shall be constructed and installed in accordance with NFPA 211.

The CSIA (Chimney Safety Institute of America) states that homeowners should inspect fireplaces and chimneys and should be cleaned when one eighth of an inch of sooty buildup is evident or visible inside the chimney and flue system. It also states that the chimney and fireplace should be cleaned with less than one eighth of an inch of sooty building if any glaze is visible in the firebox or chimney.

COMMON FIREPLACE INSTALLATION ERRORS

While improper design and lack of maintenance are often the causes of fires, an often-overlooked cause is improper installation, including common errors such as:

- **Framing** – Combustible materials can catch fire if they are placed too close to the fireplace, which violates both building codes and manufacturers' installation requirements. The protection of adjacent combustible material must allow for the fact that wood and other combustible materials suffer from decreased resistance to ignition after exposure to continual heating at even moderate temperatures. When wood is exposed to heat over a period of time, it undergoes a gradual change in its molecular structure through a process called pyrolysis. The complex organic molecules of which wood is composed are slowly broken apart, and much of the original weight and structural integrity of the wood is lost. As this process continues, the material left behind is charcoal, which is also known by the more ominous sounding and technically correct term pyrophoric carbon. Pyrophoric carbon is different from wood and has different properties. It has a significantly lower ignition temperature than that of the original wood. Various studies have fixed this temperature at 200 to 250 degrees Fahrenheit. Concealed areas such as floor/ceiling assemblies and wall penetrations are particularly vulnerable, and the on-off pattern of heating from chimneys probably contributes to the problem. Wood exposed under these circumstances is converted to pyrophoric carbon and is "primed and ready" to burn. Often an unusual incident such as accidental overfiring provides the occasion for ignition. The temperature produced by the chimney need not become extremely high. A rise into the 200 degrees F range, together with the self-heating properties of the carbon, may be sufficient to initiate the combustion process.

- **Mantel** – If installed too low or too close to the top of the firebox, the mantel can catch fire.

- **Finish materials** – Combustible materials are often used in areas that require non-combustibles. The paper facing on drywall, for instance, can be a combustible material.

- **Gas line entry** – The gas line entry must be properly sealed with a high-temperature sealant.

- **Flues** – The flue must be adequately sized; if offset, the flue's size is reduced.

- **Gas log sets** – If gas logs are too large or installed too forward, this can pose both a fire and burn hazard.

- **Chimney shrouds** – When using metal shrouds, they cannot be constructed around the termination cap unless authorized by the manufacturer.

- **Cellulose Insulation** - Blown cellulose insulation products should never be installed in direct contact with any combustion appliance chimney, vent or flue pipe, nor against or over any non-IC (Insulated Contact) rated recessed light housings or fixtures. Most fire codes mandate a minimum two-inch space between combustible materials and masonry chimneys, some types of triple-wall vent pipe. For single-wall vent pipe, these minimum clearances to combustible materials increase substantially to eighteen inches. For double-wall vents, these clearances are typically reduced to nine inches for 'Type L' oil and solid fuel vent, and six inches for gas 'B Vent'. (Always consult manufacturer's recommendations and regional building codes for specific usage and regulations requirements.)

FIREPLACE INSERT RECALLS

The United States Consumer Product Safety Commission (CPSC) has recalled the following fireplace inserts:

- **Jotul North America – 1200 Units**
  Jotul and Scan fireplace inserts were recalled due to the potential for wiring to come into contact with the metal rating plate on the insert, posing an electrical shock and burn hazard.

Figure 2 *- Jotul North America brand fireplace insert (Credit: www.cpsc.gov)*

- **Hussong Manufacturing and American Flame – 13,600 Units**
  Kozy Heat, Ambiance, and Stellar Hearth units were recalled due the main control module potentially allowing gas to release and build up in the burner area. This poses an explosion hazard.

Figure 3 *- Hussong Manufacturing/American Flame brand fireplace insert (Credit: www.cpsc.gov)*

- **Hearth and Home Technologies - 2,500 units**
  The Heat-N-Glo and Heatilator Corner Unit Series was recalled due to the back of the firebox potentially bowing outward, posing a fire hazard.

Figure 4 *- Hearth and Home Technologies brand fireplace insert (Credit: www.cpsc.gov)*

FIREPLACE SAFETY TIPS

Fortunately, most heating fires can be prevented by making sure heating equipment is in good working order and monitored carefully. NFPA offers these tips and guidelines for safely heating your home during winter:

- Heating equipment and chimneys should be cleaned and inspected every year by a qualified professional.
- Keep anything that can burn at least three feet (one meter) away from all heating equipment, including furnaces, fireplaces, wood stoves, and space heaters.
- Always use the right kind of fuel, as specified by the manufacturer, for fuel-burning space heaters.
- Create a three-foot (one meter) “kid-free zone” around open fires and space heaters.
- Fireplaces should have a sturdy screen to stop sparks from flying into the room. Ashes should be cool before putting them in a metal container, which should be placed outside at least ten feet away from your home.
- All fuel-burning equipment should be vented to the outside to avoid carbon monoxide (CO) poisoning.
- Make sure smoke and carbon monoxide alarms are located throughout the home; test them monthly to ensure that they’re working properly
- Always use well-seasoned wood, keep the fire burning hot, and make sure the size of the fire is appropriate to the fireplace.
- Avoid lengthy, smoldering fires to decrease creosote accumulation.

- Ensure you have the proper chimney cap installed and that it is serviceable. This will help prevent embers and sparks from escaping the chimney.

CONCLUSION

The easiest way to prevent fireplace and chimney fires, and the injuries and damages they may cause, is to adhere to basic safety practices. This includes being aware of potential defects and hazards and keeping a fire extinguisher in an easily accessible location (as well as replacing it according to the manufacturer's instructions).

Remember— while accidental fires caused by fireplaces, chimneys, and fireplace inserts can be caused by user carelessness, fires often stem from negligent installation or a faulty product. Should you incur losses due to such a fire, hiring the right expert early in the claims process will help protect the fire site from potential spoliation and support your ability to make a successful subrogation claim.

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Don Davis is a Senior Investigator in J.S. Held's Fire Origin & Cause Practice. Don specializes in fire and explosion scene investigations and is responsible for investigating fire and explosion incidents in commercial, residential, industrial facilities, automobiles, heavy equipment, and marine conveyances. He has more than 30 years in both public and private sectors conducting background and fire scene investigations and has testified or given depositions in Arkansas and Louisiana State Courts and Federal Court on both fire origin and cause, as well as fire code and fire spread related cases.

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