Forensics Lesson 10

Arson Investigation

Quiz Date:

Vocabulary



**Fire Investigation Terms**

* **Fire -** Produced when a substance undergoes rapid oxidation involving heat and light.
* **Fire Triangle** – Shows the three elements needed to produce and sustain a fire.
* **Flash Point** – The lowest temperature to which a substance must be heated in order for the substance to give off vapors which will burn when exposed to a flame or ignition source.
* **Point of Origin** – The location where the fire started.
* **Burn patterns** –Noticeable patterns created by the fire as it burns.
* **Accelerants** – Substances, such as gasoline, paint thinner, and alcohol, that accelerate the burning process.
* **Arson** – A fire started deliberately

**Fuel + Oxygen + Heat = Fire**

* The **FIRE TRIANGLE** represents the **three** elements
needed for fire to occur: heat, fuel, and oxygen.
* **Fuel** can be any **combustible material** in **any state of matter** - solid, liquid, or gas.  Most solids and liquids become a **vapor or gas** before they will burn.
* The air we breathe is about **21% oxygen**.  Fire requires an atmosphere with at least **16% oxygen**.
* **Heat** is the energy necessary to **increase the temperature of the fuel** to a point where sufficient vapors are given off for **ignition** to occur.

**Fire Clues**

* **Point of Origin –** Burn patterns and other damage can help determine the point of origin, or the location where the fire started.
* **Char Patterns** – Created by very hot fires that burn very quickly and move fast along its path, so that there can be sharp lines between what is burned and what isn't.
	+ A char pattern on a door would help an investigator determine which side of the door the fire was on.
	+ A char pattern on the floor would help investigators determine the use of an accelerant and its path.
* **V-Patterns** - Fire burns up, in a V-shaped pattern, so a fire that starts at an outlet against a wall leaves a char pattern that points to the origin.
	+ A very narrow V-shape might indicate a fire that was hotter than normal, such as one helped along by an accelerant.
	+ A wide V-shape might indicate a fire that was slow burning.
	+ A U-shape could indicate that there was a "pool of origin" rather than a point of origin, such as might be caused by, say, a puddle of gasoline.
* **Heat Shadows** - Occur when heavy furniture shields part of a wall; can help determine the origin point.
* **Glass -** Glass fragments, windows, and light bulbs can provide clues to a fire.
	+ Light bulbs tend to melt toward the heat source, so the "direction of melt" can indicate the direction of the fire.
	+ The shattered or cracked glass of the windows can provide indications as to how a fire burned.
	+ A dark soot layer on the glass could indicate a slow, smoldering fire.
	+ Clear glass with an abnormal pattern of cracking could imply a very hot fire, possibly due to an accelerant.
* **Chimney Effect** - Since fire burns upwards, there can be a "chimney effect" where the fire ignites at a point, the superheated gases rise upward and form a fireball, which continues straight up to burn a hole in the ceiling.
* If the roof is not entirely burnt, and the fire investigator finds such a hole, the origin of the fire could be directly underneath.
* **Color of smoke** – Determine what type material was burning
* **Color of flames** – Indicates at what temperature the fire was burning.

**Fire Investigation Basics**

* Work from the least damaged areas to the most heavily damaged areas.
* Document with notes, photographs, and videos.
* Collect evidence (accelerant samples, fire items, and other crime scene evidence.)
* Interview witnesses
* Determine the point of origin.
* Determine the heat source(s).
* Hypothesize the reasons for the fire.

**Accident or Arson?**

* **Accidental Nature**
	+ Heating System
	+ Electrical appliances
	+ Lightning
	+ Children playing with matches
	+ Smoking
* **Non-Accident**
	+ Odors – Gas, kerosene, or other accelerants
	+ Furnishing – Removal of personal objects and valuables
	+ Clothing – Check debris for buttons, zippers, etc
	+ Locked windows, blocked doors
	+ Two or more points of origin
	+ Look for inverted v-patterns (can be a sign that an accelerant was used)
	+ Floors charred –Can indicate use of an accelerant
	+ Trailers that lead the fire from one place to another

**Arson Facts in America**

* According to the FBI Crime Index, juvenile and adult arson cause an annual average of 560,000 fires, 750 deaths, 3,700 injuries, and $1.5 billion in property loss.
* 55% of all arson arrests in the US are children under 18.

**What are Common Motives for Arson?**

* **Crime concealment**: To conceal another crime such as murder, burglary, or vehicle.
* **Revenge or spite**: To get back at someone for a perceived injustice.
* **Monetary Gain**: Arson-for-Profit fires are set to burn a building, vehicle, or some other object in order to gain profit from the fire. The profit may come in several forms; from insurance coverage on the property, or from putting a competitor out of business.
* **Malicious Vandalism**: Fire set to someone’s property, just to destroy it. Malicious vandalism fires account for the largest percentage of arson fires. These fires are frequently set by juveniles.
* **Mentally Disturbed**: Some persons have been found to have an irresistible impulse to set fires.