

### No. 8: What Does The Smoke Tell Us? Part 1

#### Introduction

Over the years we see them come and we see them go. As the newer firefighters come onboard are they picking your brain for information? If not, why?

For some reason many new firefighters are fixated on running into the structures with little to no information. One thing that every firefighter should be doing is size-up. That smoke can be telling you something about the fire you are about to tackle. So, what does the smoke tell us?

#### Four Characteristics of Smoke

There are four basic characteristics we can use to assist us in determining the size, location, and the effectiveness of the advancing hose team. Additionally, we should be able to apply smoke conditions to determine the potential for a flashover or backdraft.

What are the four characteristics?

1. Volume
2. Density
3. Velocity (pressure)
4. Color

First let's explore smoke for a minute. Smoke is the product of incomplete combustion resulting in a buildup of carbon, hydrogen cyanide, hydrogen sulfide, carbon monoxide, and an assortment of other extremely flammable gases. Smoke has a direct impact on fire behavior within the structure as we will learn.

A key to having a successful operation is that of performing ventilation properly. Proper ventilation will also curb the potential for a backdraft, flashover, and in most cases, eliminate some of the roll-over fire conditions experienced on the inside by the hose team.

Volume will really tell us very little about the fire conditions within the structure but it benefits us by giving some indication as to the amount of fuel that is being consumed and producing this incomplete combustion. A free burning fire, which has sufficient oxygen, will produce very little if any smoke, due to the complete combustion being allowed by the supply of oxygen and ventilation.



Photo by Glen E. Ellman/FortWorthFire.com

On the other hand, a fire with limited or poor ventilation and having a minimum supply of oxygen begins to produce smoke as a direct result of incomplete combustion which is occurring. A fire that is developing and spreading quickly will produce a tremendous volume of smoke.

Density can be thought of as the thickness of the smoke and is a good indicator of incomplete combustion. Remember, this is also a sign of poor ventilation which causes the fire to consume the oxygen in the immediate area around the fire. This lack of oxygen slows the burning process and produces smoke. Smoke that is showing a very dense makeup is saturated with highly flammable gases just waiting for the proper fuel/air mixture to ignite. Sometimes this occurs violently!

Many of the items found in homes and offices today are made of synthetic materials or plastic. These materials generate a large quantity of dense smoke, even at relatively low temperatures. Even at these lower temperatures the smoke produced can be very explosive.

Generally, trapped victims will not survive a fire that has severely dense smoke condition.

-Prepared by Russell Merrick/Firehouse.com

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