Fire Nuggets

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WHY FIRES ARE MORE DANGEROUS TODAY

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For several years now we have been told that fires are more dangerous — hotter, less predictable — than they were 50 or even 25 years ago. The primary reason given for this is the ever-expanding use of plastics in our homes and businesses. Others have countered that this is simply not true, because it is the available oxygen that regulates the heat produced by any compartment (room) fire. For each cubic foot of oxygen "consumed" in the combustion process — regardless of the fuel involved — a fairly uniform 535 BTU's of heat is produced. Since all interior fires are oxygen- or ventilation-regulated, in theory, the heat produced by burning a one-pound block of polystyrene will be almost exactly the same as the heat produced by burning a one-pound block of oak. The problem with this explanation, however, and one of the reasons why fires are more dangerous today, is that it ignores differences in the heat release rates of plastics and "traditional" or cellulosic fuels. Plastics, in general, have much higher heat release rates.

Early in the development of a compartment fire, it is not the oxygen available for consumption that controls the burning rate, but the characteristics of the fuel itself. If the materials burning have higher rates of heat release, we can expect a more rapid build up of heat within the fire area and a reduced time frame until a flashover or other "rapid fire development" event occurs. As Tom Brennan points out: fires may be fewer today (compared to the peak fire activity years of the 1970s), but the incidence of flashover is greater. The dangers posed to firefighters operating in this volatile environment are very real. But an increasing number of flashovers is only part of the story. Smoke conditions have worsened as well. The dark, choking smoke characteristic of fires involving petrochemicals has become a signature of the modern structure fire as petrochemical derivatives (plastics) now represent the single greatest portion of residential and commercial fire loads. One of the dangers posed by volumes of dense smoke is the ease with which a firefighter or team of firefighters can become disoriented and lost. Incidences of firefighters becoming lost in the smoke and subsequently dying from asphyxiation or from burns caused by rapid fire spread have become tragically common. In some cases, the firefighters had a charged handline with them when they entered the burning structure, but somehow became separated from the line and subsequently died. In other cases, firefighters have been severely burned while clinging to the handline, and the reason for this phenomenon requires a closer look at smoke and its makeup.

Smoke is made up of solid particulates and aerosols carried along by convected air and carbon monoxide gas. When you ask firefighters about carbon monoxide (CO) and its attendant hazards, most will reply by rote that it's colorless, odorless, and tasteless. While these characteristics are important, there are three others that cause death and injury to operating firefighters: CO is highly flammable; it has a wide explosive range (12.5% to 74%); it ignites at about 1,128 degrees Fahrenheit (a temperature quickly attained in many room fires). Although the lower explosive limit (LEL) of CO is high when compared to other flammable gases, once the LEL is achieved, CO remains within its flammable limits over a wide range of fireground conditions. When pockets of CO ignite, firefighters performing searches and even those advancing handlines are often burned. Insulated by modern bunker gear and protective hoods from the heat radiating downward from the smoke above them and blinded to rollover by the dark smoke that surrounds them, the critical warning signs of impending flashover go unnoticed. Even “state of the art” turnout clothing cannot protect against burns caused by flashover. Remember too that a charged handline can't offer protection if it isn’t in operation. Perhaps opening the nozzle on smoke, despite what we have been taught, is something we should consider in some cases. If we can reduce the volatility of the smoke, we can prevent burn injuries. Fires involving commercial occupancies, cellars, and confined spaces should be considered prime candidates for applying “water on smoke.”

Still another issue involves the types of buildings and structures we fight fires in today. Void spaces are commonplace in new construction. Voids have also become a problem in buildings that are renovated using “lightweight” components and assemblies. Voids create ideal places for CO to collect and build-up dangerous temperatures and pressures that often result in collapse, smoke explosions or other rapid fire progress events. Buildings are also more insulated today and smoke and heat seepage to the outside is often eliminated. Without benefit of a fire that has “self-vented” prior to the arrival of the first due fire companies, firefighters are frequently subjected to extreme punishment while performing primary search duties and advancing the initial attack handline.

So it is true — fires are more dangerous today. Unfortunately, both human evolution and fireground tactics haven’t kept pace with changes in the modern fireground environment and advances in modern turnout gear. Firefighters still get burned at the same temperatures today as generation ago. Although modern protective clothing has reduced the incidence of many types of burns, when firefighters do get burned, the severity is often very high. Aggressive interior fire attack is the hallmark of a good fire department, yet in an increasing number of instances, it is incompatible with the volatile, well- insulated, lightweight fireground of today. What then, is the answer? It is not one answer, but several. Here are five to start with:

• First, let's restore firefighting to its proper place at the head of the fire department table. Service diversity has in many cases created mediocrity on the fireground.
• Second, lets utilize our protective equipment wisely and gain a better understanding of its limitations — physical, physiological, and psychological.
• Third, lets train more realistically. Use acquired structures whenever possible and forget the propane simulators and “theater” smoke.

• Fourth, make sure we know how much water we're flowing on our fires. The only way to do this is to measure it and make sure we are achieving minimum flows and reach with manageable nozzle reaction burdens.

• Fifth, increase staffing. As retired FDNY Deputy Chief Vincent Dunn has pointed out, we often have most of our too-few personnel on the fireground assigned to every task imaginable except stretching and operating the life-saving first handline. Amen for NFPA 1710. The road just ahead may be a little rocky, but the long-term benefits will be tremendous.