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Backdraft and flashover, what is the difference?

What is a backdraft explosion and how does differ from a flashover? Explosions kill and injure firefighters in several ways. The blast can blow a firefighter across a street; flying glass and shrapnel can decapitate a firefighter; flame accompanying the explosion can cause serious burns and an explosion can collapse walls, partitions and iron shutters, crushing firefighters beneath them.

A backdraft is one type of explosion that occurs at fires. A backdraft is a smoke explosion. Smoke is the fuel in the fire triangle of a backdraft. The explosive smoke is carbon monoxide (CO). CO has an explosive range of 12 to 74 percent when mixed with air. Fire protection engineers classify explosions into two broad categories: physical explosions such as a BLEVE (Boiling Liquid Expanding Vapor Explosion) and chemical explosions such as a combustion explosion. A backdraft would be classified as a chemical explosion. The same chemical reaction and explosive ingredients are present in a backdraft, as are in any ordinary combustion

explosion: fuel, oxygen and heat. The fuel in a combustion engine explosion driving an automobile is gasoline; the fuel in a backdraft explosion is smoke.

Fire protection engineers define the term explosion as an "effect" produced by a sudden violent expansion of gases. Some "effects" of an explosion are shock waves, which can shatter windows, blow down firefighters and collapse walls.

Differences

Firefighters sometimes confuse the terms backdraft and flashover. These two dangerous violent events are different and knowing these differences helps us understand each one better. There are four main differences. First of all, backdrafts do not happen often at fires. You may experience only one or two during your entire career. Flashover - sudden full room involvement in flame - happens often. You will probably see one at your next fire.

A second difference is that a backdraft is an explosion; a flashover is not. There will be shock waves during a backdraft that will break the confining structure around the explosion. Windows may break blasts of smoke and flame may blow out a doorway or a part of the structure may collapse. Flashover is rapid fire development, but it stops short of an explosion's speed of chemical reaction.

A third difference is the triggering or cause of a backdraft. Air sets off the backdraft explosion. As firefighters enter a confined smoke filled area and bring fresh air with them, sometimes a backdraft or smoke explosion happens. The trigger or cause of a flashover is heat, not air. The theory of flashover is that heat, which is re-radiated back into a burning room from the ceiling and upper walls, raises the gases and furnishings in the room to the auto-ignition temperature and triggers a flashover.

The final difference between a backdraft and flashover is the stage of fire growth in which they occur. There are three stages to a fire: the growth stage, the fully developed stage and the decay stage. Backdraft explosions occur when there is smoke in a confined space that is during the first and third stage of a fire. During the growth and decay stages, smoldering can take place and generate explosive CO gas. Flashover, on the other hand, only occurs in the growth stage of a fire and signals the end of the growth stage.

Investigation of Explosions

The term backdraft is used too frequently by the fire service. It is usually used to describe any explosion that occurs at a fire; when actually a backdraft is only one type of explosion and it does not happen that often. In fact, most explosions are not backdrafts. They are explosions caused by leaking gas piping, meters or cylinders, or they are BLEVES of gas cylinders or

containers or they are explosions caused by flammable vapors leftover from an arsonist's accelerant. Before a fire investigator declares an explosion at a fire to be a backdraft-smoke explosion, a post-fire analysis must rule out all other possibilities. . If the gas piping is intact, if there are no ruptured containers found and there are no traces of an accelerant residue, then the explosion is a backdraft.

There are two important facts which firefighters should know about backdrafts or any other type of explosion. One is that a room or fire area requires only 25 percent of its space to contain the explosive mixture for the entire area to explode. If the explosive mixture concentration of CO and heat are in one corner of a large, smoke filled room, the entire area could explode when firefighters enter to search and allow fresh air to enter with them. The other fact firefighters should know is that it does not take much explosive pressure in a confined space for an explosion to cause destruction and death. Listed below are the destructive effects caused by explosion pressures:

Effect of Explosion	**Destructive Peak Pressure**
Glass shattering	0-5 psi
Firefighter knock down	1 psi
Wood partition collapse	1-2 psi
Cinder block wall collapse	2-3 psi
Brick wall collapse	7-8 psi
Firefighter lung damage	15 psi
Threshold for fatalities	35 psi
50% fatalities	50 psi
99% fatalities	65 psi

Preventing Death and Injury

After firefighters understand what a backdraft is, they must know how to prevent death and injury from such an explosion. There are three tactics that can reduce the chances of getting caught in a backdraft: venting, quenching and flanking.

Venting a roof skylight over a burning store is one of the most effective methods of protecting firefighters from the blast of a backdraft. When roof conditions permit, the quick removal of a glass skylight by firefighters can vent a smoke filled store and break up an explosive mixture. Even if the smoke explosion occurs, the blast will be diverted upward out of the roof vent opening away from the firefighters advancing the hose-line.

Quenching the superheated confined fire area is another safety and survival tactic firefighters can use to prevent backdrafts. Before a room is entered, charged hose-line should be positioned near the entrance. Firefighters in full protective equipment should immediately discharge a hose stream into a fire area when it is opened up. This water can cool a potentially explosive atmosphere. Before the air and searching firefighters enter a burning, confined, potentially explosive fire area, the stream of a powerful water discharge might break up the explosive atmosphere. This is not as effective as roof venting, but sometimes it is the only alternative.

Flanking

When there can be no venting and the quenching of a quick dash of a hose stream is not possible, firefighters can protect themselves from a backdraft explosion in some instances by flanking a doorway to a burning room operating hose-lines. The officer in command can order two hose-lines into position, one on each side of a door or window of a burning store, which is suspected, of exploding. After the hose lines are charged with water and firefighters are in full protective equipment, the front store glass door or window is broken. Both flanking hose lines, safely out of the path of any potential explosive blast coming out of the opening, can be directed into the burning store.

Lessons Learned

Warning signs of backdraft explosions must be taught to firefighters. They are, reversal of air pulling smoke back into a smoke filled doorway, black smoke pushing out around a closed door or window frames and glass windows, stained with smoke condensation and pulsating from the pressure of the fire. These warning signs are important to know, but even more important, firefighters must know that explosions happen fast, sometimes even too fast for firefighters to take cover and protect themselves. The only real protection from the blast of a backdraft or a flashover is full protective gear: helmets, hoods, gloves, boots, bunker pants, coat and face mask. Protective fire gear may be hot, cumbersome and slow you down, but if you are caught in an explosion, it will determine whether you survive the blast and how serious your burns will be.

Questions:

1. Which one is not a difference between a backdraft and flashover?
   A. Backdraft explosions do not happen as freqently
   B. The trigger for a backdraft explosion is heat

C. The backdraft is an explosion, flashover is not
D. Backdraft explosions can occur during the first or third stage of a fire

Answer_____

2. Before an explosion at a fire is called a backdraft a post fire investigation must be made and other causes of explosion eliminated. Which one is an untrue statement?.

A. There can be no broken natural gas piping or gas meter

B. There can be no flammable liquid residue from an arsonist accelerant

C. There can be no ruptured vessel indicating a BLEVE

D. There can be no destruction to the building such as broken windows

Answer_____

3. True or False

There are two important facts that fire chiefs and firefighters should know about backdraft explosions. One is a fire area only requires 25% of its space to contain the explosive mixture for the entire area to explode; and the other is explosions do not take much explosive pressure to cause destruction and death.

Answer_____

4. Which is not one of the three firefighting tactics that can reduce destructive effects of a backdraft explosion?

A. Venting

B. Quenching

C. Flanking

D. Searching

Answer_____

5.Which one is not a warning sign of a potential backdraft explosion?

A. Reversal of air pulling smoke back into a doorway

B. Black smoke pushing out around a doorway

C. Glass window stained with smoke pulsating

D. A lack of smoke and active flaming

Answer_____

Answers: 1.B; 2.D; 3.True; 4.D; 5.D