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Newsletter by Vincent Dunn-July 2000

Flashover

Flashover! It is the most dangerous time of a fire. When the room bursts into flame, flashover has occurred. The scientific definition of flashover states it is caused by the radiation feedback of heat. Heat from the growing fire is absorbed into the upper walls and contents of the room, heating up the combustible gases and furnishings to their auto-ignition temperature. This build up of heat in the room triggers flashover.

Flashover signals several major changes in a fire and is the end of an effective search and rescue in a room; It means the death of any person trapped in the blazing room - either civilians or firefighters. It signals the end of using a portable extinguisher to extinguish the fire; an attack hose-line is required after flashover occurs. It signals the end of the growth stage and that the fire is in the second stage of combustion - the fully developed stage. Finally, flashover signals the change from a contents to a structure fire. This is the beginning of the collapse danger.

When operating at a fire, Chiefs and firefighters want to delay flashover inside a burning room. By delaying flashover you can "buy" several minutes which may be critical. For example, you may want to delay flashover to make a search and rescue of the burning room or allow a firefighter to go above a fire to make a rescue of a trapped victim. Or, you may want to delay flashover to gain several minutes when there is a delay in the placement of the first attack hose-line.

Three ways to delay flashover:

venting: By venting windows of a burning room you release the build up of heat in the room. This slows down flashover in addition to improving visibility in a smoke-filled room.

not venting- by not venting and instead closing the door to the burning room, you can also delay flashover. By not venting, you starve the fire of oxygen, which slows down the combustion rate, which slows down the build up of heat in the room. (See chart on page 24 for when to vent and when not to vent.) This may be done when there is a delay in stretching a hose-line and all persons are out of the burning room.

portable extinguisher: The discharge of a portable extinguisher can cool the heat down in a burning room temporarily and delay flashover.

To avoid getting trapped by flashover, firefighters must know the warning signs of flashover.

Warning signs of flashover

There are two warning signs, which may signal the danger of flashover: heat mixed with smoke and "rollover."

Heat: When heat mixes with smoke, it forces a firefighter to crouch down on hands and knees to enter a room to perform search and rescue. This must be considered a warning sign that flashover may occur. Heat is the triggering event for flashover. If the heat in the smoke filled room causes us to crouch down near the floor, we must consider the danger of flashover.

Rollover: Rollover is defined, as sporadic flashes of flame mixed with smoke at ceiling level. Rollover is caused by heated combustible gases in smoke, which ignites into flashes of flame when mixed with oxygen in the air. Rollover precedes flashover. Rollover is another warning sign of flashover, which may be seen in the smoke coming out of the tops of doorways or window openings of burning rooms before flashover occurs.

When searching for the location of a fire and there is no discernible heat in the smoke or signs of rollover, firefighters may enter and proceed for some distance into a fire area. However,

If one of these warning signs is discovered and a flashover danger exists, defensive search procedures must be used by firefighters. Standard tactics and procedures must be curtailed and defensive search and rescue procedures substituted when there is a danger of flashover.

Defensive search proceduresThere are two defensive search procedures that can reduce the risk of death and injury from flashover:

At a doorway: A firefighter should check behind the door for the victim, then enter the hallway or room not more than five feet, sweep the floor, look for unconscious persons, call out and listen for a response. If no response is forthcoming, close the door and wait for the hose-line. As the attack hose-line advances, conduct a search and rescue behind the line, searching room and space outward from the hose-line.

At a window: When climbing a ladder placed at a window and the window breaks from either the heat of the fire or because it is opened by the firefighters at the top of the ladder, and

smoke and signs of rollover are seen in the smoke, the firefighter should not enter the burning window. Instead the firefighter should crouch down below the heat and sweep the area below the windowsill with a tool. In some instances a person may collapse at the window and fall right below the sill. If a victim is found, a firefighter on the ladder might be able to crouch below the heated smoke and flashes of flames mixed with smoke coming out the window and pull the victim to safety on the ladder.

Point of no return

After a flashover occurs, firefighters may have past the point of no return. The point of no return is a distance inside a burning room beyond which a searching firefighter will not escape and will not reach the door or window entered. How far inside a burning room can a firefighter be and still escape back out the door alive and not suffer serious bums after a flashover occurs? How far into the burning room that appears about to flashover should a firefighter go?

Five feet is the point of no return after the room explodes into a flashover. We can figure this distance out by putting together several facts. For example, tests conducted in 1960 in California discovered that fire temperatures of 280'-320' F cause intense pain and damage to exposed skin. Also the average temperature in a room that flashes over is 1000' to 1500' F. And, time and motion tests in the Handbook of Fire Protection reveal that the average person moves 2-1/2-feet per second when walking. Now, the question is how long can a firefighter take 1000'-1500' F on the neck, ears, wrists and any other exposed portion of the body? I say two seconds. If there is 1000' F flame in a burning room that has just flashed over and a firefighter is five feet inside the room, and crawls back to the doorway at 2-1/2-feet per second, he will feel 1000'-1500' F on exposed portions of skin not covered by fire gear for two seconds. If you say you can enter 10 feet into a room about to flashover and it does, and you try to escape you will experience 1000' -1500' F on the exposed portions of your body for four seconds. Think about it.

Lessons learned

Firefighters should know the definition of flashover. They should know the warning signs of this danger heat in smoke and rollover. Also firefighters must know how to delay flashover - a room bursting into flames. And most important for firefighters' safety and survival, they must know defensive firefighting procedures - how to search and stay alive.

Firefighting questions
True or False
Flashover is the most dangerous phase of a fireís growth.
Answer_____

According to fire protection engineers flashover is caused by which one of the following?
Radiation heat
Radiation feedback heat
Conduction heat
None of the above
Answer_____

3.Flashover signals major changes at a fire, which one of the following is not one of them?
The end of the search and entry
The end of using a portable extinguisher to fully extinguish the blaze
The end of the growth stage of fire
The end of the collapse danger
Answer_____

4.Which one of the following is not a method used by firefighters to delay flashover?
Venting to release heat
Not venting to starve the fire of oxygen and thus slow down heat generation
Use a portable extinguisher on the fire to cool it down
Remove combustible from the fire area
Answer_____

5.Which one of the following is not a warning sign of flashover?
Heat in smoke
Rollover-flashes of flame mixed with smoke
Black smoke
Answer_____

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Answers: Flashover

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