



Photo by Warren Fuchs “Da Brooklyn dispatcher # 120”

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Firefighter’s Death and Injury

What exactly do they mean when they say "firefighter caught and trapped" or "in contact with"? What do these statistical categories mean to a firefighter? Actually, they are vague terms used by those who compile death and injury surveys of the fire service. They only serve the

statistician's need to fit our firefighting tragedies neatly into a single column. The following are understandable, comprehensible causes of firefighter death and injury. Read them and weep!

Auto-exposure is the spread of flames on the outside of a building from one floor to the floor above. Flames can be sucked up to the floor above from window to window. Firefighters entering a window on the floor above a fire from a ladder or fire escape can have their escape path back to the window cut off by auto-exposure flame spread.

A backdraft is an explosion caused by the rapid ignition of smoke and fire gases occurring in a tightly sealed burning room. The trigger for a backdraft explosion is the fresh air that enters during firefighters' initial search and entry. The fire produces combustion gases and high heat temperatures and, since little or no air flows into the sealed room, consumes most of the room's oxygen. When a door to the superheated room is opened, air is introduced and completes the fire triangle necessary for a sudden rapid explosion. Firefighters performing search and rescue operations are some-times killed and injured by the blast of a backdraft.

A blasting agent is an explosive material widely used at construction sites for demolition. It consists primarily of ammonium nitrate and a fuel such as No. 2 fuel oil. The danger of a blasting agent is often underestimated when compared with other explosives - a deadly error in judgment. A blasting agent requires a stronger heat or shock source for detonation than a high explosive such as dynamite; however, when it does explode, the blasting agent is just as powerful as dynamite. Firefighters must realize the danger and treat the blasting agent in the same manner as high explosives. The flames of a fire are certainly enough to detonate a blasting agent. A tragedy several years ago in Kansas City in which six firefighters were killed when a blasting agent exploded during a truck fire is a grim reminder of that hazard.

A BLEVE (boiling liquid expanding vapor explosion) occurs when a container of any liquid, but usually liquefied petroleum gas, ruptures. The BLEVE may result in a fireball created by the ignition of the suddenly released vaporizing liquids, in rocketing pieces of steel shrapnel flying through the air and in shock waves from the blast all of which can kill firefighters. Deaths from burns have occurred to firefighters positioned 250 feet away from large liquefied-petroleum containers; deaths from flying pieces of shrapnel at 800 feet away.

A boil-over is the sudden eruption of hot oil over the top of a large, burning crude-oil storage tank. A boil-over could occur after water from hose streams sinks to the bottom of the burning oil and is heated to its boiling temperature, expanding 1,700 times as it turns to steam

and violently forces the oil out of the tank. A boil-over could spray boiling-hot oil over firefighters operating hose lines near burning tanks.

Carbon monoxide, a colorless, odor-less, explosive gas, is a toxic product of incomplete combustion. During a structural fire, there is usually insufficient oxygen for complete combustion to take place. The uncontrolled smoldering of a fire generates carbon monoxide. There may be gases in a fire area more toxic than carbon monoxide, but it is produced in large quantities that could be deadly. When mixed with air at low concentrations, 10,000 parts of carbon monoxide per million of air can cause death when inhaled for one minute.

A cellar is a below-grade floor level in a building. Firefighters die in cellars from carbon monoxide accumulation due to incomplete combustion, from oxygen depletion due to flash fires, from drowning in water-filled cellars, from breathing heavier-than-air gases that accumulate there and from flammable gas explosions during fire. Some cellars are more dangerous than others are. A cellar that's completely below grade without windows is more dangerous than a cellar that's only partially below grade or one that has windows to provide ventilation. Cellars in high-rise buildings do not have windows. Sub-cellars, the most dangerous type of below-grade area, have no windows and are two stories below the street level, directly below the cellar. A cellar becomes more dangerous after the fire has been extinguished. Smoldering embers generate carbon monoxide. Always ventilate and wear masks during cellar overhaul to prevent death from carbon monoxide inhalation.

A collapsing structure is defined as any portion of a burning structure that collapses due to fire damage. Firefighters out-side of burning buildings as well as those inside are killed by structural collapses. Unlike the other leading causes of fire-fighter deaths, when a building collapses during a fire, large numbers of firefighters die in a single event. Chicago lost 21 firefighters at a single structural wall collapse during a fire; Philadelphia lost 14 in a floor-and-wall collapse; Brockton, MA, lost 13 firefighters in a movie theater truss roof collapse; New York City lost 12 fire-fighters in a drug store floor collapse; in Boston nine firefighters died in a floor-and-wall collapse when a 100-year-old hotel under renovation suddenly fell; in Hackensack, NJ, five firefighters died when a truss roof collapsed during a fire in an auto dealership fire; in Seattle a floor collapse killed five firefighters; Lake Worth, TX, lost three firefighters at a lightweight truss collapse in a church; and in Houston two firefighters were killed in a lightweight roof collapse during a restaurant fire.

A collapse danger zone is the most deadly area on the fireground. Once collapse is anticipated and a danger zone defined, no firefighter should enter it. A collapse danger zone is the ground area over which bricks from a collapsing wall will fall. It's the distance away from the unstable wall equal to the height of the wall. When a brick or wood wall collapses in a 90-degree-angle collapse, it will kill any firefighter operating within the collapse danger zone; that is; a 20-foot-high wall collapsing at a 90-degree-angle will kill firefighters operating within 20 feet of the wall.

A commercial building fire - in a store, office or warehouse - is more dangerous than a residence building fire. The number of firefighter deaths and injuries in residence fires is greater than those in commercial structure fires, but that's only because there are many more residence fires. Actually, the percentage of firefighters killed per incident is greater for commercial fires. Firefighters should take extra precautions when responding to commercial building fires. Additional dangers are pre-sent that are not found in residence buildings: dangerous industrial processes using chemicals and flammable liquids, dangerous machinery, unusual floor layouts, heavy floor loads, large floor areas, high ceilings and greater fuel loads.

Convection currents, the upward movement of heat by flame and heated smoke, are a dangerous type of heat transfer at a structural fire. They trap and kill firefighters operating on the floor above a fire and in cellars. Firefighters searching the floor above a fire can be cut off by flame and superheated smoke or gases flowing up an interior stairway they will not be able to retreat back down stairs filled with the rising convection currents of heat from the fire below them. Firefighters crouching as they battle a stubborn blaze in a cellar for a long time may not detect the heat and flame building up over their heads. If the convection currents of heat and flame fill the stairway or flow up the stairs to the street level and suddenly ignite, firefighters could be trapped in the cellar without a means of escape.

Disorientation is the loss of direction firefighters experience when searching a smoke-filled room. It happens primarily when firefighters fail to use an organized search technique when moving around the smoky room and prevents firefighters from returning to the safety of the door or window of entry. Disoriented firefighters often are killed by flashover or die from asphyxiation in smoke after their masks run out of air. And it doesn't take a large space for disorientation to occur: the bodies of firefighters have been found next to doors and windows in 10-by-10-foot rooms that had been filled with thick smoke.

Electric shock can be fatal. Electricity passing through the body may bring about violent muscular contractions of the heart; interrupt the breathing process or burn vital internal organs in the path of the electric current. Most firefighters who are killed or injured by electricity come in contact with overhead utility wires when climbing ladders or operating in aerial platforms. Consider all electrical wires and equipment live and dangerous.

An elevator must be considered a death trap during a fire in a high-rise building. Fire, water and heat can cause an elevator to operate in unpredictable ways, often with fatal results. The elevator may be called to a floor above the fire or to a fire floor that's fully involved with fire, trapping firefighters in the car. If an elevator unexpectedly becomes stuck between floors above the fire and rising heat and smoke turn the elevator shaft into a chimney flue, the trapped fire-fighters will die. Firefighters searching in smoke-filled hallways have walked into open elevator doorways and fallen down shafts to their deaths.

An explosion is a violent combustion reaction of fuel, oxygen and heat that creates rapid expansion of gases strong enough to collapse an enclosing structure or create shock waves that break glass windows or knock down nearby firefighters. There are many types of fireground explosions; BLEVEs, backdrafts, flammable gas and natural gas are classified as causes of explosions.

Explosives are materials, usually solids that undergo rapid decomposition when subject to shock, heat or pressure. This violent decomposition is a possibility when explosives are exposed to fire. Explosives are classified into the following categories:

- Primary high explosives (mercury fulminate) - mild shock or heat detonator. Secondary high explosives (dynamite and nitroglycerin) - more powerful than primary high explosives; detonated by shock from a primary explosive.
- Low explosives (black powder, smokeless powder, and rocket fuels) - fire constitutes the greatest hazard to these explosives.

The U.S. Department of Transportation (DOT) divides explosives into four main classifications for transportation purposes:

- Class A explosives - maximum-hazard explosives that include dynamite, nitro-glycerin, mercury fulminate, black powder and blasting caps.
- Class B explosives - a high-flammable hazard; includes most propellant materials.
- Class C explosives - fire-works, explosive rivets and detonating cord.

- **Blasting agents** – The most stable explosive materials; however, once detonated, they are as deadly as a class an explosive. Firefighting should never be attempted when the flames have reached any explosive. People and firefighters withdrawn rapidly to a distance of at least 2,000 feet from the burning explosive.

Falling objects are a leading cause of deaths on the fireground. They are any materials that fall from, are thrown out of, or break off of a fire structure or exposed structure during a fire. They may be smoldering pieces of furniture thrown out of windows during overhauling; falling tools that have slipped out of the hands of fire-fighters overhauling window frames; broken glass from windows vented from inside a burning building; and even people jumping out of buildings to escape flames. The most likely place to be struck by a falling object is the perimeter of a burning building. To avoid injury by falling objects, get inside the building or stay away from the perimeter.

Falling is another leading cause of firefighter deaths. The most deadly falls firefighters suffer are from elevations, roofs of burning buildings and fire department ladders, but most injuries from falls on the fireground occur at ground level. Firefighters working under stress and sometimes in darkness trip over objects slip on ice- or snow-covered surfaces when carrying tools.

Flame is the luminous zone of combustion when one gas burns in another. Flame temperatures are between 2,500 and 3,500 degrees Fahrenheit. Along with gases, heat and smoke, burns are a leading cause of fireground death. The best protection a firefighter has against flame is water from an attack hose stream. The insulation of protective firefighting gear and mask will protect a firefighter from more serious injury when exposed to the flame of flashover, flash fire or reflash fire, but nothing can protect a firefighter from prolonged exposure to flame. Flame is the most deadly and most common hazardous material a firefighter will ever encounter.

A flammable-vapor explosion is caused by the instant ignition of flammable vapors and gases mixed in air. Flammable-vapor explosions often occur during arson fires in which flammable liquids are used to speed the spread of fire. "Unexplainable" explosions during fires are often flammable-vapor explosions. When an explosion or flash fire occurs in an adjoining room or occupancy next to the area of fire origin or a flammable-vapor explosion is caused by a flammable liquid, arson should be suspected. This happens often in such adjoining areas to a fire.

Flammable vapors can drift into the adjoining occupancy and explode even after the main fire has been extinguished; all it requires is a spark from the main fire.

A flameover is a flash fire that occurs over the surface of a wall, ceiling or floor caused by the sudden ignition of flammable vapors produced by heating the surface. Combustible surface coatings such as polyurethane and other flammable finishes often result in a flameover fire. Flameover fires trap firefighters searching for fires and advancing hoselines down hallways. Wood-paneled walls, school desks, theater scenery, and decorative wall and ceiling coverings are likely causes of flameover fires.

A flare-up is the sudden explosive flaming of a brush-fire caused by a strong wind gust or change in wind direction. Firefighters working in high, dense brush have been trapped and killed by flare-ups when fighting wildfires. A flare-up is also the sudden, rapid ignition and then immediate self-extinguishment of a room filled with a flammable atmosphere. It's caused by a pocket of flammable gas, vapor or dust that suddenly comes in contact with an ignition source. However, because the flammable vapor, gas or finely divided dust is insufficient in quantity, the fire self-extinguishes usually when a material just reaches its flash point.

A flashover is the rapid ignition of heated fire gases and smoke that have built up in a burning room. It's caused by thermal radiation feedback (sometimes called re-radiation) from the ceilings and upper walls, which have been heated by the fire growing in the room. When all the combustibles in the space have been heated to their ignition temperatures, simultaneous ignition of the room occurs. Flashover is full-room involvement with fire. It occurs during the growth stage of a fire. Civilians and firefighters in the room will not survive. After flashover occurs, all searching stops because the fire is too severe; an attack hoseline is now required for extinguishment, and there is a possibility of collapse.

A hazardous material is any chemical, biological or nuclear substance that can cause death or disabling injury during or after personnel exposure. However, the most common hazardous materials that a firefighter will encounter are the byproducts of ordinary structural fires. Combustion byproducts kill more firefighters than any other known hazardous materials.

The head of a wildfire is the fast-moving, leading edge along which a grass fire, brushfire or treetop fire (crown fire) is advancing. It's the most dangerous area of the fireground. Firefighters have been trapped and killed by the rapid spread of flame at the head of a wildfire.

Heat, one of the products of combustion, is associated with the natural motion of molecules: the faster the molecules in a material move, the hotter the material becomes. A firefighter's protective clothing and breathing equipment cannot protect him from the heat of a fire. Dry-air temperatures above 280F or 320F will cause extreme pain to unprotected skin. An exposure to a temperature of 160F for 60 seconds will cause a second-degree burn; 180F for 30 seconds and 212F for 15 seconds will do the same.

Hyperthermia is a cause of death that may occur if your body absorbs heat faster than it can be dissipated by evaporation of surface moisture.

High ceilings of more than 10 feet above floor level are a danger to firefighters. A high ceiling in a commercial building provides space for dangerous heat and flame buildup above the heads of firefighters searching in smoke. In a smoke-filled room in a residence building with a ceiling between eight and 10 feet above floor level, a firefighter sizes up the flashover danger by how low he or she must crouch to crawl under the heat banking down from the ceiling. In a commercial building with 15- to 20-foot ceilings, however, this conventional fore-caster of flashover danger is insufficient; the flashover danger may exist well before the heat reaches the firefighters. Failure to recognize this could be a fatal error in judgment. To size up flashover danger, look for sporadic flaming in the smoke or communicate with members above the fire floor to find out if they feel heat where they are operating.

Large-area occupancy is an enclosure greater than 25 by 50 feet without any interior enclosing partitions. Search and rescue in large-area occupancy (such as a warehouse, theater, church or store) can be extremely dangerous. If the occupancy becomes filled with dense smoke, there's a good chance of firefighters becoming disoriented and lost under such conditions. They will be unable to find their way safely back to the entrance, in which case they run the risk of asphyxiating after their air supply runs out or being caught in rapidly extending fire. Firefighters should use a search rope when searching in a large -area occupancy. Tie one end of the rope to the entrance door or to a fixed object near the door and play out the other end as you search the interior of the occupancy. The search rope will guide you back to safety when smoke reduces visibility.

A **master stream** is a ground-based or aerial nozzle with a fog or straight stream capable of delivering more than 300 gpm to a fire. A master stream delivering three or four tons of water through a straight-stream nozzle at 100 feet per second can collapse part of a building on top of

firefighters. When improperly directed, master streams - particularly aerial straight streams - have collapsed brick chimneys, lifted roofs from wood buildings, and exploded razor-sharp shingles and bricks from rooftops. As a general rule, do not carry out firefighting in areas where powerful master streams are directed.

A mushrooming effect describes the horizontal flow at ceiling level and subsequent banking down to floor level of smoke and heat generated by a fire in a confined space. The rapid "mushrooming" of smoke and heat traps and disorients firefighters during search and rescue operations. It occurs more rapidly in small rooms. Venting roof skylights, stairways and windows can delay or eliminate mushrooming of smoke and heat in confined spaces during a fire.

The number 4 printed on a hazmat placard (NFPA 704) is a vital piece of response information. Failure to note or understand its meaning could be a fatal mistake for the firefighter. The number 4 printed in any one of the spaces of a hazardous material diamond - health hazard, flammability hazard, explosive hazard, or special information space - tells us the hazard in the room or container is too dangerous to approach. Withdraw immediately from the area and obtain expert advice about the hazard. There should be no firefighting.

Overhauling is the firefighting operation undertaken after a fire is under control and is intended to prevent the rekindle of a fire after the department leaves the scene. Its dangers often are underestimated, but many firefighters have been killed and injured during this stage. Building collapses; falls into open shaft ways, carbon monoxide accumulation in below-grade areas, electrocution, and stress from the physical exertion of pulling down ceilings to examine for hidden fire and gas explosions are some common hazards during overhaul.

A parapet wall is a freestanding wall that continues beyond an exterior wall above the roof level, waist high and encircling the roof. Decorative-front parapet walls suddenly collapse during fires. There are three classifications of brick walls: freestanding, nonbearing and bearing. The freestanding parapet wall is the least stable. A brick parapet wall extending over large display windows of a one-story commercial building is supported by steel I-beam. If the windows are vented during a fire and flames flow out, the heat can distort the steel I-beam, causing the brick parapet wall above it to collapse.

A peaked roof is a sloping roof supported at one end by a ridge rafter and at the other end by a bearing wall. Gabled, mansard, hip and gambrel roofs are examples of peaked roofs. A peaked roof is the most dangerous roof for firefighter operations. The two main reasons are:

- Collapse danger. Rafters may collapse, the roof deck may collapse, even if supporting rafters do not, and slate shingles may collapse on firefighter operations at ground level.
- Falls. There are no fixed stairs leading to a peaked roof, so fire department ladders are required for access. The surface of the peaked roof is uneven, which makes walking and operating on the roof more difficult. Peaked roofs do not have parapet walls to keep a firefighter from falling off.

Plastic is a material that contains one or more organic, polymeric substances of large molecular weight. Thousands of plastic products are used in furnishings, fabrics and building construction materials. While the flammability of a plastic product depends on its form, plastics generally create hotter fires and are therefore more dangerous to firefighters than burning wood, paper or cloth. One pound of polystyrene plastic can give off 18,000 Btu, whereas wood or paper will only give off 7,000 to 8,000 Btu. Furthermore, the smoke given off by plastics is dense and black, creating a greater obscuration hazard than wood or paper smoke. The rate of burning during a plastics fire is quite rapid, which can speed up the time it takes for a room to flash over. It all adds up to the firefighter's work environment - the burning room is becoming more dangerous over the past 30 years due to the increased use of plastics in the home.

The "point of no return" is the maximum distance a firefighter can crawl inside a superheated, smoke-filled room and still escape should a flashover occur. The point of no return inside a doorway is the point beyond which there is no escape if the room flashes over.

A reflash fire is the sudden ignition of flammable gases or smoke inside a smoldering, burned-out room that has just been extinguished by a portable extinguisher or hose stream. After a fire has been knocked down and the hose stream shut down, there still may be sufficient heated gases and smoldering embers in a room to suddenly reflash if oxygen enters the area. Reflash fires often trap firefighters making a quick primary search after the fire has been extinguished. Reflash fires often are caused by burning foam plastic mattress fires and fires involving fuel-oil burners in basements.

A residence building, specifically the one- and two-family house, is the occupancy where the most fires occur and the most firefighters are killed and injured. Wildfires and store and office fires are second and third on the list of incidents in which firefighter deaths occur.

Responding to and returning from alarms kills 25% of the firefighters who die each year in this country. Apparatus rollovers, intersection accidents and rear-end collisions are very real dangers of firefighting.

Rollover is the sporadic ignition of combustible gases at ceiling level during the growth stage of a fire. It precedes and is an indicator of possible flashover (in addition to high heat and smoke banking down to half the height. Firefighters without the protection of a hoseline should consider withdrawing from a smoke-filled room when rollover starts to occur. Rollover will be visible near ceiling level or, mixed with heat and smoke, flow out of the top portion of an open doorway or window.

Smoke is finely divided particles of soot and aerosols that accompany an uncontrolled fire. Smoke from incomplete combustion kills and injures firefighters in the following ways: it causes asphyxiation, explosions, reduced visibility, and disorientation and entrapment. To reduce the dangers of smoke during a fire, ventilate the smoke-filled area in a coordinated, controlled manner.

Smoke explosions (backdrafts) are caused by the random accumulation of combustible, smoke-filled atmospheres in confined spaces during a structure fire. They often occur in the main fire area during both the growth stage and the decay stage of a fire. A smoke explosion that occurs in the main fire area during the decay stage of a fire often is called a "backdraft explosion." A smoke explosion can occur in an adjoining room to a fire in the fully developed stage as well. For example, it can occur in a smoke-filled room on either side of or above the room that is actually burning. Smoke seeping from the main fire into adjoining spaces creates a combustible atmosphere. When searching firefighters open up adjoining combustible rooms, a smoke explosion occurs. The ignition source is the heat of the main fire area; the fuel is the combustible smoke that spreads to the adjoining spaces and creates a combustible atmosphere; the oxygen comes with the initial entry of the firefighter searching for fire victims and fire spread.

Speed kills firefighters. Acting hastily or too quickly on the fireground can cause you to make a serious, life-threatening error in judgment. Slow down! Pace yourself at a fire. Do not get caught up in the excitement of the fireground scene. Think about what you must accomplish at the fire and do it. Don't let the fire dictate your actions. You should have a pre-planned assignment before responding to the fire. Stick with the pre-plan and accomplish your assigned duty, even if others don't accomplish theirs.

Stress is the physical and psychological exertion and pressures caused by the demands and dangers of firefighting. Stress from firefighting can cause cardiac arrest, stroke or aneurysm. Firefighters between 46 and 51 years of age are those most often killed by the physical and psychological stress of firefighting.

Tunnel vision is a visual distortion that firefighters experience during stressful firefighting situations. While focusing on a spectacular or dangerous event, the fire-fighter may block out a nearby surrounding hazard or deadly peril. By concentrating on one point of the fire and not sizing up the entire fire area, a firefighter may block out an approaching danger. Tunnel vision and the hurried pace of firefighting cause accidents that could be avoided by a size-up of the entire fire and a slower pace.

A **truss** is a structure composed of wooden or steel members joined together in a group of triangles that are fastened together by metal bolts, sheet-metal surface fasteners or welds. Truss construction is a dangerous roof or floor design when exposed by fire. The large surface-to-mass ratio of the truss and many small, interconnecting members makes it vulnerable to early collapse. Wood truss roof collapses have killed 28 firefighters over the past three decades. Truss roofs kill firefighters working below the truss, on top of the truss, and outside the truss roof building. When a timber truss roof collapses, it can cause the collapse of an outside bearing wall.

An uncontrolled environment is a dangerous, smoke-filled, collapse-prone or explosive atmosphere area in which fire-fighters work. Combat soldiers and fire-fighters operate under the most dangerous, uncontrolled environments of any occupations. Coal miners must have lighting, fresh air and structural supports in the mine before they go to work; firefighters, when they crawl into a smoke-filled room, have no such safety guarantees. They must bring their safety equipment with them: flashlights, protective breathing equipment and a powerful hose stream.

Visibility reduction due to smoke and darkness at a fire is a major contributing cause of fireground death and injury. All firefighters should carry personal flash-lights. All departments should use spot-lights and floodlights to improve visibility at night. Firefighters should receive training on how to operate in areas of reduced visibility. Training exercises simulating a smoke-filled room should be given to all firefighters. Mask face pieces with eye lenses blacked out can give the firefighter some idea of how to operate in a smoke-filled room with reduced or zero visibility.

Winds that suddenly change direction or gust during a fire have killed and injured firefighters. A sudden gust of wind can cause a wildfire to flare up and trap a fire-fighter who is operating in high brush. Wind that suddenly changes direction and blows into a flaming window can drive fire and heat into the path of advancing firefighters who are searching or operating an attack hoseline. High winds can cause a treetop, "crown" fire to spread over the heads of firefighters operating in the woods. Firefighters always should attempt to take advantage of wind direction. The safest position is the upwind or windward side. If it is necessary to cut off a wind-driven fire, do so by attacking from flank positions. Do not attempt to attack a wind-blown fire head-on.

Quiz for firefighter death and injury newsletter:

1. Which one of the following is incorrect?
 - A. Disorientaton happens when firefighters fail to use organized search techniques in smoke filled rooms
 - B. Disorientation rarely occurs in a small smoke filled room
 - C. Disorientated firefighters are often killed by flashover or asphyxiatedn after their mask runs out.
 - D. Firefighters searching alone are oftn disoriented by smoke

Answer _____

1. The sudden rapid ingition and then immediate self extinguishment of an area filled with a flammable atmosphere is called?
 - A. Flashover
 - B. Flameover
 - C. Flash fire
 - D. Flare up.

Answer _____

1. Which is the most dangerous area of a wildfire?
 - A. Head
 - B. Rear
 - C. Flank

D. All of the other areas

Answer_____

1. True or false

A master stream is defined as a fog or straight stream capable of delivering more than 300 gallons per minute.

Answer_____

2. Of the total number of firefighter killed each year, what percentage occurs while responding or returning?

A. 0-10 %

B. 10-15%

C. 15-20%

D. 20-25%

Answer_____

Answers to quiz: 1.B; 2.C; 3.A; 4.True; 5. D