Truck Company Operations: Maximizing Firefighter Safety

BY JOHN MITTENDORF

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It is an accepted fact that fireground operations consist of two viewpoints—fire attack and logistical operations. Yet, these viewpoints are interrelated from the perspective of safety and the timely mitigation of an incident. Although water extinguishes fires, logistical operations determine how a fire will be extinguished and also ensure that a fire stays extinguished and there is a minimal loss to property and personal belongings. The importance of truck company operations (or logistical operations) cannot be overstated because it is vital to operate from a foundation of operational effectiveness and fireground safety.

Many facets collectively combine to form the perspective that a truck company could be perceived as an efficient fireground logistical company. Interestingly, most fireground problems or actions that are prime contributors to fireground inefficiency, injury, or death are commonly the result of fireground personnel’s violating basic safety principles—safety principles with which most of them are familiar! As an example, you can often divide fireground problems into mistakes and dumb mistakes. You can define fireground mistakes as “you knowingly violate a basic safety principle and get away with it.” Although every firefighter is familiar with this definition, the end result is normally placed under the heading of “no harm, no foul.” This means that if there are no resultant injuries, there are generally no changes to standard operating procedures (SOPs). Conversely, dumb fireground mistakes can be defined as “you knowingly violate a basic safety principle, and it bites you.” Obviously, these types of mistakes can

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**Educational Objectives**

On completion of this course, students will

1. Define the five basic rules of fireground safety.
2. Understand the importance of reading the environment and understanding the fireground clock.
3. Recommend a method for prioritizing fireground considerations from a truck company perspective.
4. Define the three major concerns when ensuring the viability of an escape route.

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(1) This fire extended into the fascia on the front of the building and presented a significant collapse hazard to the personnel with hoselines who are within the collapse zone. [Photo courtesy of the Los Angeles (CA) Fire Department; other photos by author unless otherwise noted.]

(2) The scabbard allows you to carry an ax easily while leaving both hands free to accomplish other tasks.
result in serious consequences. These simple, yet relevant, definitions underscore the need for every fireground firefighter to be fully aware of the basics and to practice them continually.

**FIVE RULES OF FIREGROUND SAFETY**

Let’s review five basic rules of fireground safety that apply equally to every fireground firefighter, regardless of rank or company assignment.

1. **Falling debris always has the right-of-way.** This simple, yet basic, rule has not changed since the advent of the fire service. However, it has never been more applicable than today because of the alternative building materials (and methods) commonly used in residential and commercial buildings, which do not offer the structural integrity of those of yesterday. Therefore, it is vitally important that modern firefighters be continually aware of where they are in relation to a fire (photo 1).

   When this perspective is applied to modern lightweight truss construction, firefighters should reevaluate their intended operation and location when fire is known or is suspected to be above or below their location. If it is not safe enough to stand on it, it also is not safe enough to stand below it.

2. **Equipment on your apparatus in the street is unusable on the fireground.** Practically applied to fireground operations, a firefighter should always have a tool in his possession, and the more versatile the tool, the better. A pickhead ax and a scabbard are classic examples (photo 2). A pickhead ax is one of the most versatile tools in the fire service, yet it is often found mounted on fire apparatus parked in front of an incident when it should be ready for immediate use on the fireground. Always try to maximize your fireground flexibility; “empty-handed” firefighters often have to go back to an apparatus to retrieve a tool to complete a specific task, or they suddenly wish they had a tool to save their life.

3. **If the fire is in range, so are you.** The closer you are to a fire, the closer you are to a potential structural collapse. Although this rule applies to any type of construction, it noticeably applies to lightweight construction from three perspectives. One, a noteworthy number of modern residential and commercial buildings are constructed with a fascia on at least the front portion of the building. Most fascias are constructed with lightweight trusses, are common to the attic of the building, are not sprinklered, and project over the front portion of the building. If fire has extended into a fascia, it suddenly becomes a potential collapse hazard over the entry and exit point (normally the front door) of the structure (photo 3). Where do most firefighters enter a structure for suppression operations? The front door.

   Second, it is a known fact that lightweight trusses can collapse in about five minutes when exposed to fire. If fire is overhead (attic, interstitial space) of advancing firefighters, they can be in the wrong place at the wrong time unless the fire is quickly extinguished. This is a good reason for initial entry personnel to carry the two basic tools—a hoseline and a pike pole.

   Third, truck company firefighters who have been in the fire service for a number of years will readily admit that when applied to roof ventilation operations, the axiom “If a conventional roof feels strong, it probably is” was used as a basic roof safety rule. However, this rule does not apply to roof ventilation operations on lightweight truss roofs (metal or wood) if the fire is under your location. Roof ventilation is not a feasible operation over fires that are exposing lightweight roofs.

4. **What you see may not be what you get.** Modern building construction is very adept at making new buildings look like old buildings. Why? Because older buildings normally took more time to construct because of the size and shape of the building materials and the fact that older buildings used more decorative materials or styles to enhance the building’s exterior. Today, these methods and techniques are not cost effective. Several examples of how the exterior appearance of modern buildings can be deceiving are the following: (1) brick veneer attached to the outside of a building to give the building a substantial masonry look, (2) exposed 2- × 6-inch rafter tails attached to 2- × 4-inch rafters within the building, and (3) foam cornices attached to the exterior of a building with adhesives and then covered with plaster-type materials (photo 4). These are common examples of...
modern construction attempting to make a building look like what it is not. The general theme of modern building construction is to construct a building as fast and as cheaply as possible, which ultimately saves construction costs but also has dramatically changed the true nature of the modern building behind the attractive exterior façade.

Your fireground time is slowly being minimized. Modern building materials and the widespread use of plastics in residential and commercial buildings have changed the way modern fires burn. Lightweight truss construction has been around since 1960, so there is no excuse for a firefighter's being unaware of the fast failure rate of lightweight trusses when exposed to fire or high heat. Now it appears the building industry is preparing to adopt the widespread use of glued lightweight trusses that will continue to erode fireground time.

Additionally, plastics (or petrochemical-based compounds) are readily found in residential and commercial buildings. They cause fires to burn two to three times hotter and faster than the fires of the 1960s and 1970s, and flashover is a common fireground problem with which most modern firefighters are familiar. As the building industry continues to adopt and use building materials that are smaller in size, geometry instead of mass for strength, adhesives instead of nails, and oil-based synthetic compounds for furnishings, the fireground will continue to offer less time before structural collapse or flashover conditions, potentially leaving insufficient time for firefighters to safely extinguish a routine structural fire or to exit a structure in a timely manner.

10 COMMANDMENTS OF TRUCK COMPANY OPERATIONS

Using the preceding fireground safety rules as a foundation, let's review 10 common fireground considerations from a truck company perspective. The list is not all-inclusive and focuses on firefighter safety. Hopefully, it will be a starting point for thought and discussion as fireground logistical considerations are slowly being diluted because of reduced staffing levels and increased constraints such as the two-in/two-out rule, rapid intervention teams (RITs), and other perceived priorities.

1 Don't forget your primary mission. Structural fireground operations consist of two basic procedures—fire attack and logistical operations. However, virtually all firefighters joined the fire service so they could “put the wet stuff on the red stuff.” This fact becomes even more amusing when an engine company can beat another engine company into that company's district and put first water on the other company’s fire. However, the best attack company on this planet is worthless if it cannot get to a fire or extinguish a fire in a safe and timely manner. As an example, forcible entry is normally required at most structural incidents (photo 5) before fireground personnel can enter a structure. This perspective is the primary responsibility of logistical operations (or support operations) designed to ensure that ladders, forcible entry, forcible exit, and ventilation operations allow an attack company to put the wet stuff on the red stuff in a safe and timely manner. This basic concept is the focal point of truck company operations and implies that the first priority of truck company personnel is to support attack operations, not to stretch an initial or additional hoseline.

2 It's the basics before arriving on-scene. Without a doubt, company efficiency and firefighter safety begin long before a truck company responds to an incident. It is crucial that you preplan your district.

Although the term “preplanning” can apply to numerous viewpoints, it specifically applies to successfully operating within your “fireground office” with a truck company. What is the definition of your fireground office when applied to a truck company? It is the sum total of the buildings, related hazards, and the ability to effectively use your truck apparatus within the various constraints of your district. Every member should review his apparatus at the start of each tour of duty; that includes the cleanliness and readiness of tools and equipment, particularly those items for which each member is primarily responsible. That is one reason predesignated assignments (or riding positions) can be beneficial. One specific precheck factor to consider is the readiness of your self-contained breathing apparatus bottle. Is it full, clean, and ready for immediate use? Volunteer or smaller paid companies that do not have a daily or regular change (or rotation) of personnel should have an SOP for the constant review of the readiness of their apparatus and equipment.

Company personnel should also be familiar with the various types of buildings within their district and the specific hazards that can be attributed to specific buildings. Forcible entry problems, minimal space constraints for portable ladders, floor plans that defy recognition from the exterior of a building, considerations within a structure (such as overcrowding conditions, poor exit possibilities for occupants), and a host of other considerations should not be classified as “surprises” when you are operating on the fireground.

Additionally, remember that most truck apparatus are
significantly heavier and larger than other types of apparatus. Therefore, evaluate common response routes for applicable hazards, and evaluate any spotting constraints to buildings within a district to which the truck normally responds for any alternate options you can use (photo 6).

Vigilance toward safety when driving apparatus is important when responding to an incident, but it is also important when returning to quarters. Accidents involving fire apparatus are the third highest cause of firefighter injuries and deaths. You cannot mitigate an incident until you safely arrive on-scene and properly place or spot your apparatus. Therefore, the officer and driver are solely responsible for the delivery and safe operation of apparatus and personnel. It is common knowledge that civilians and motorists do not expect an apparatus responding “emergency” to an incident, and the addition of cell phones and modern vehicles with advanced sound-proofing and superior sound systems does not enhance civilian drivers’ ability to recognize and make allowances for responding emergency apparatus. Additionally, the excitement of driving “emergency” and using your lights and sirens to attempt to clear traffic does not make allowances for a fire apparatus driver who is exceeding a reasonable speed.

Determine available fireground time. The ability to determine fireground time is a key consideration when estimating how much time a firefighter has to accomplish an intended task. This applies equally to interior and exterior operations. As an example, how much time does a roof ventilation team have to complete an intended roof ventilation operation on new construction, and how much time does a search team have to complete a search before the environment develops flashover conditions? Determining the available fireground time is derived from a combination of the following three factors:

• Building construction. Building construction progressed from a heavy style of construction until about 1935, a moderate style of construction from 1935 to 1960, and a lightweight style of construction from 1960 until several years ago. Although this progression of style and size of structural members has undergone numerous changes from heavy timber to the common lightweight truss of today, it potentially is about to take a giant leap backward with lightweight trusses that are glued together instead of being held by nails or gang-nail plates. This is a classic example of the building construction industry’s constantly employing alternative materials and methods to construct buildings higher and more quickly than yesterday (photo 7). Stated from another viewpoint, modern buildings are constantly reducing fireground time for every firefighter in this country.

When conducting a size-up at a structure fire, you must evaluate the following: (1) the amount of fire, (2) how long it has been burning, (3) where it is going, and (4) what it is burning. As an example, there is a significant difference among fires in a concrete building, in a conventionally constructed building, and in a building constructed primarily of lightweight trusses. The following baseline has proved fairly accurate in determining how much time the two basic types of construction, lightweight and conventional, will allow before collapse:

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(8) Heavy, dark smoke greatly decreases interior visibility, which dramatically slows interior operations and increases the potential for a flashover. [Photo courtesy of the Los Angeles (CA) Fire Department.]

(1) If fire is exposing lightweight truss construction for more than five minutes, reevaluate your intended operation; and (2) if fire is exposing conventional construction for more than 20 minutes, reevaluate your intended operation.

* Reading the environment. In concert with reading the type or method of building construction, reading the environment from outside and inside a building can provide a useful guideline for estimating how much time the incident will allow you to conduct your intended operations. When arriving on-scene, initially evaluate the environment from the exterior. As an example, is there light smoke with moderate interior visibility, or is there heavy dark smoke with a lack of interior visibility? Heavier or darker smoke will result in minimal or no interior visibility (photo 8), which will dramatically slow your interior operations and can also present conditions that are more favorable to a flashover. Additionally, when evaluating the environment, be sure to think about the fire from the perspective of containment vs. extension; if extension is a reality, then what is the degree of extension, and where is it going?

Personnel engaged in interior operations must also read the interior environment with the intent of gauging the length of time the environment will allow suppression operations until extinguishment or ventilation operations begin to improve the environment. As previously mentioned, hot dark smoke will increase the time needed to accomplish your intended tasks and can also present the possibility of a flashover. Remember that truck company personnel are often conducting interior operations (i.e., search) without the presence of a hoseline (which can be an effective source of protection). Therefore, under these circumstances, it is vitally important for truck company personnel to constantly monitor or evaluate the interior environment to which they are committed.

* Evaluating the fireground clock. When the term “fireground clock” is mentioned, some of the initial factors that come to mind are the following: How long has the fire been burning? How long did it take someone to become aware of the fire and report it? What was the dispatch time? What was the length of time for response? Although these factors are certainly applicable to fireground operations, there is another fireground clock that is also applicable to fireground operations. That clock is defined as “once personnel arrive on-scene, how long will it take to make a visible impact on the fire?” Notice this definition did not focus on the extinguishment of fire but the time it will take personnel to exit the apparatus, make sure their complete personal protective equipment (PPE) is ready, select the appropriate tools and equipment, force entry into the building, and so on, until the fire begins to be extinguished. This definition is significantly different from the first definition that focused on the time that elapsed prior to companies’ arriving on-scene, but it is as relevant to all fireground operations, since extinguishment and logistical operations are part of the total fireground mitigation process. Obviously, the time it will take to make a visible impact on a fire will vary from incident to incident, but it will give a general idea of how much time is available to accomplish an intended operation.

As an example, assume the truck you are assigned to is the first truck (along with an engine company) to stop in front of a recently constructed two-story residential structure attached to a single-story residential structure (photo 9), which is typical of some residential structures in your district. Additionally, assume your initial size-up indicates some visible fire from the second floor of the two-story structure has extended into the attic and has resulted in heavy smoke and some fire visible from several attic vents, as seen in the photo. Because you
are familiar with this type of structure, you feel that the fire in the attic is consuming lightweight truss construction. Additionally, you are aware that fire is not static but dynamic (it keeps burning until you put it out). Applying our fireground clock definition, you assume that it will take you approximately four minutes to get off your apparatus, get your PPE ready to go, and accomplish basic logistical considerations of forcible entry-exit and ventilation and that it will also take your partner engine company personnel four minutes to get off their apparatus, get their PPE ready to go, and stretch an initial attack line into the structure.

At this point, direct your undivided attention to the following three considerations: (1) The four minutes to start attack and logistical operations just spotted the fire an additional four minutes. (2) The four minutes given to this fire also means four minutes have elapsed without mitigating the fire (which will continue to burn and weaken the structure). (3) The national average for the collapse of lightweight trusses when exposed to fire is around five minutes. Therefore, does this simple scenario give you adequate time to enter the structure and extinguish the fire before the lightweight trusses collapse? Probably not. Additionally, remember that if fire is showing on your arrival, you should consider how long the fire was burning before your arrival and add that to your fireground clock implementation time.

Prioritize fireground considerations. This commandment is potentially the most important consideration for truck company personnel, as each incident is unique and always requires evaluating and prioritizing fireground operations. Most importantly, how are fireground operations prioritized? Although fireground priorities are developed during an initial size-up and during an incident (continuing size-up), there is a subtle factor that still influences the process of prioritizing fireground operations that begins in the initial portion of a firefighter’s career. Firefighters are commonly taught from their first days in a training academy that they can use several popular acronyms such as “RECEO,” “LOUVERS,” “LOVERS U,” and “AL-VES-SCoup” as a baseline for determining fireground priorities. Although an initial size-up still formulates and confirms the order of priorities, this decision-making process is still often based on a foundation of fireground acronyms such as RECEO, which virtually every firefighter has memorized. Fireground acronyms can be a starting point and can be a recall technique, but they do not adequately address modern fireground priorities.

As an example, let’s look at the most popular acronym, RECEO, which stands for Rescue, Exposures, Confine-ment, Extinguishment, and Overhaul. To dissect this acronym and apply it to modern fireground priorities, let’s first ask a basic question, “What is the most important fireground priority?” A common answer is “rescue” (which RECEO indicates is a first priority); without a doubt, rescue is an important fireground priority, particularly when you know someone is trapped in a building.

Fire attack and ventilation operations are other common answers. An interesting viewpoint on this question was in the Roundtable column (Fire Engineering, March 2008). The question was, “What primary fireground function does your (or your closest) truck company perform?” Of the 28 respondents, the majority answered “rescue”; ventilation was a close second in priority.

- Firefighter safety. Despite the fact that each incident determines fireground priorities, one priority is a constant at every incident including fireground operations, and that is firefighter safety. There are no one-way tickets in the fire service: Every apparatus that responds to an incident should focus on two basic priorities: (1) returning to quarters with the same number of personnel who responded to the incident, and (2) not adding an additional problem to an existing problem. RECEO and the other popular acronyms do not address firefighter safety (go back to RECEO or LOUVERS and see if you can find firefighter safety listed), although some will say that rescue addresses firefighter safety. However, most firefighters view rescue as conducting a search inside a building for trapped occupants or possible trapped occupants.

If firefighter safety is the top fireground priority, what is the second most important fireground priority? Some will quickly answer rescue, ventilation, or fire attack, as each of these priorities can be extremely important and, depending on the conditions encountered, can be top priorities (after firefighter safety). Based on operations that are frequently conducted at structural incidents, forcible entry and ventilation should be the next most important fireground priorities.

- Forcible entry. Before a search is conducted and water is put on a fire, forcible entry is normally required before interior operations are initiated. Therefore, if forcible entry is a common requirement before interior operations, then forcible exit should be the next most important fireground priority based on the principle: “If it is important to get into a building, it should be as important, if not more important, to be able to get out of
When the fireground operations are focused on elevating the priority list. To summarize the preceding thoughts on forcible entry-exit and forcible exit. Therefore, in the interest of firefighter safety, consider ventilation as an equal priority with forcible entry and forcible exit.

Once firefighter safety has been maximized by ensuring that firefighters can enter and exit a structure in a timely manner, visibility has been improved, and the potential of flashover has been minimized, search, fire attack, and other interior operations would be next on your priority list. To summarize the preceding thoughts on forcible entry, forcible exit, and ventilation operations: If current fireground operations focused on elevating the order of search, fire attack operations: If current fireground operations focused on elevating the priority of forcible entry, forcible exit, and ventilation operations prior to interior operations, firefighter injuries and deaths would be significantly reduced. What makes this statement so providential is that in a high percentage of fireground operations, search and fire attack operations currently are placed ahead of taking the appropriate time to ensure the safety of fireground personnel with logistical priorities.

For a moment, let’s step on thin ice and ask a pertinent question, “Has search been overemphasized in this country at the expense of firefighter safety?” The answer is yes when search is placed ahead of firefighter safety or when firefighters are lost while searching for occupants who may be in a structure (instead of are known to be in a structure) and before the safety of firefighters has been enhanced. To carry this question one step further, let’s consider an additional perspective: The words “avoidable” and “needless” should be applied to nearly all injuries or deaths that occur to firefighters engaged in search operations for persons who might be in a structure, and prior to ensuring that firefighters can get out of the structure in a timely manner and minimizing the potential of a flashover. Notice this perspective focuses on the word “might” instead of the words “are known to be.” There should be a significant difference between the two when establishing fireground priorities.

To summarize the preceding thoughts on creating priorities based on firefighter safety, the following fireground priority list is recommended as a long overdue replacement for RECEO and similar acronyms:

1. Firefighter safety.
2a. Forcible entry.
2b. Forcible exit.
2c. Ventilation. Note: Determine the order of priority for forcible entry, forcible exit, and ventilation by conditions you encounter at each incident.
3. Fire attack and/or search. Note: The order of search and/or fire attack would also be determined by conditions encountered at each incident.
4. Other necessary priorities.

Notice that the preceding recommended order of priorities focuses on starting with ensuring the safety of interior personnel and does not initially include a RIT. Do not implement a RIT at the expense of the basic staffing necessary to mitigate a fire—and, specifically, not from an initial truck company. The basics are defined as an attack line, a backup line, ventilation, search, and forcible entry-exit.

Vincent Dunn, retired deputy chief, Fire Department of New York, has questioned whether the fire service has oversold the abilities of the RIT concept in view of the results of tests Phoenix (AZ) State University conducted with Phoenix firefighters in which it was determined that it would take a RIT an average of 18 to 27 minutes to find and rescue a firefighter who transmits a Mayday. The Los Angeles (CA) Fire Department also conducted similar tests and found the rescue times to be virtually identical.

Do these tests mean that RITs should not be implemented at structure fires? No. However, these tests indicate that RITs may not be as effective as some articles and current emphasis suggest. If a RIT can accomplish exterior logistical operations such as ventilation and forcible exit, then the RIT can be a beneficial addition to fireground operations. However, a RIT should not be implemented at the expense of the basic staffing necessary to mitigate a fire (again, the basics are defined as an attack line, a backup line, ventilation, search, and forcible entry-exit) and, specifically, RITs should not be assigned from an initial truck company until that truck company has finished with the essential logistical priorities. In all
cases, remember that if a RIT is responsible for exterior logistical operations and is assigned to another operation without completing the logistical operations, the exterior logistical operations still need to be finished. RITs are an adjunct to fireground operations; they are not primarily responsible for the extinguishment of fires or logistical operations.

Using the previous discussion on developing fireground priorities, let’s apply a general priority list to initial truck company operations as follows:

1. Firefighter safety.
2. Ladders. Generally, the best time to raise ladders, if necessary, is when a truck first arrives on-scene, as this is likely the only time that all truck personnel are together. If ladders are not raised initially, they likely will not be raised, or one will be raised, which falls short of the two ladders-minimum-to-a-structure rule.
3. Forcible entry, forcible exit.
4. Ventilation.
5. Other logistical operations as necessary.

When you apply this priority list to a common truck company, it should be easy to see that three of the top five initial priorities (forcible entry-exit, ladders, and ventilation) are designed to maximize the safety of fireground personnel committed to interior operations. Also notice that search is not initially listed. If conditions warrant the need for ventilation, forcible entry-exit, and a search, what operation would you do first? If a structure fire needs to be ventilated or if the building is not easy to exit from the interior, attempting a search without completing these tasks has the potential to make you a national statistic.

5 Become a “tool time” expert. Truck companies carry a wide range of tools and equipment that allow company personnel to perform numerous tasks such as forcible entry, search, ventilation, control of utilities, salvage, overhaul, ladders, confined space rescue, vehicular extrication—the list goes on. Although it can be debated that some engine companies can also be responsible for most of these same tasks, it is a fact that engine companies are normally focused on the implementation of hoselines. However, the term “focus” becomes more diversified when it is applied to logistical operations, and, often, minimal staffing constraints. Therefore, it is imperative that truck company personnel become proficient (and maintain that proficiency) in all aspects of their particular truck company.

This challenge becomes appreciably more important when the diversity of truck company responsibilities can often result in the application of the adage, “Firefighters master many tools, but have they forgotten the basics?” A great truck company drill that can focus on the proficiency of the basics perspective is conducted as follows:

- First, pick a typical fireground operation (i.e., forcible entry, search, ventilation).
- Second, have each company member select a tool and explain how it would be used for the selected fireground operation.
- Repeat as necessary until all appropriate tools/equipment have been removed from the apparatus.

This drill can be significant from three perspectives:
1. Firefighters basically conduct the drill.
2. Firefighters have reinforced where the tools and equipment are located.
3. Firefighters have also reinforced how the tools and equipment can be used.

6 Become a “mental” general contractor. Construction crews put buildings together; conversely, buildings can come apart when exposed to fire’s destructive effects. Additionally, knowing how a building is constructed can assist in determining how it can fail but also in anticipating potential extension routes for fire and smoke. The following examples illustrate why it is important for every firefighter to study building construction and for firefighters familiar with building construction to take the time to tutor “younger” firefighters, particularly during overhaul operations and fire prevention inspections:

- If fire is within the attic of lightweight truss construction, the trusses exposed to fire can suddenly and totally collapse into a building. This collapse will
Normally consist of the ceiling joist (bottom chords), webbing, top chords, and roofing material. This type of collapse can present a severe danger to interior personnel (photo 11). Conversely, a fire within the attic of conventional construction (stick-frame construction) can often result in the jack-rafters, rafters, and roofing material collapsing onto the ceiling joists, which can prevent the material from collapsing into the building (photo 12). Obviously, this can be a significant safety benefit to interior personnel.

- Newer wood-frame buildings use platform construction, which restricts the vertical extension of fire within the walls and into the attic. Conversely, older wood-frame buildings used balloon-frame construction, which allows the rapid spread of fire up exposed walls and into the attic.
- When crown, base, window, and door moldings are exposed to fire, remove them during overhaul operations to check the gap behind the moldings for any remaining fire.
- In older structures with a two-wire electrical service, you will encounter knob-and-tube wiring, which is an ungrounded system that can present an electrical shock hazard to unsuspecting firefighters.
- In newer buildings with plastered cornices, the cornices normally are attached with an adhesive. This type of construction does not present a suitable location for an aerial device.
- You can easily identify unreinforced masonry construction by lintels over the windows, a king row of brick, rafter tie plates, and other unique features. These types of buildings can readily collapse outward when exposed to fire.

Use your PPE defensively, not offensively. Without a doubt, today’s PPE is far superior when compared with that of yesterday. Since the advent of hoods and high-tech materials, modern protective equipment does a remarkable job of protecting firefighters in a hazardous environment. However, this protection comes at a price that every person who wears it must understand. To analyze this statement, let’s briefly compare the PPE of yesterday with the PPE of today. Yesterday, PPE generally consisted of a helmet, breathing apparatus, gloves, turnout coat and pants, and boots. This left the wrists, neck, and ears unprotected. However, it was common practice for firefighters to use these unprotected areas to feel the heat and provide a warning when heat levels increased to noteworthy or unbearable levels. Today, modern PPE consists of the same elements plus wristlets and hoods, which fully encapsulate the person wearing the PPE.

Although the addition of wristlets and hoods may not seem like a large addition to the overall PPE package, it has resulted in the following drawbacks:
- Firefighters are now fully encapsulated, which makes it more difficult for the human body to ventilate itself. For ventilation, the body will sweat and the sweat will hopefully evaporate and provide an extra measure of cooling. This has led to a condition known as “sweat wetting,” which reduces the fluid level in the body and can result in decreased endurance levels and the ability to make sound decisions. These factors have caused some departments to place an increased emphasis on rehab operations at structure fires. This is also the reason company officers should monitor the length of time personnel have been inside a hazardous environment. As an example, some departments have adopted a “two-bottle in, minimum of 10 minutes out” rehab policy.
- Modern PPE also masks the environment around a firefighter. To state this condition another way, modern PPE makes it more difficult to monitor the external environment that surrounds personnel. Interestingly, when a firefighter at the floor level begins to detect that the temperature of an environment is “warm” or “very warm”—but still feels he can operate within that environment—the temperature is around 400°F to 450°F. Although this temperature does not seem high, consider that this is the temperature at the floor. What is the temperature at or near the ceiling of a typical single-family dwelling? The answer is, likely 800°F to 1,000°F, which is the approximate temperature range of the modern thermal layer.
- Currently, one of the more popular fire service books, Air Management for the Fire Service, outlines why the old fire service culture of “using your bottle until the low air warning device activates” is out of touch with modern safety considerations. This book also delineates how and why a firefighter should monitor his air supply and exit a building with a sufficient reserve of air.

Modern PPE was primarily designed as a defensive weapon, to allow a firefighter an extra measure of safety while committed to a contaminated atmosphere. However, without proper training, it is relatively easy to use modern PPE as an offensive weapon that allows a firefighter to advance farther and faster into a hazardous atmosphere than ever before—and at a time when buildings are more prone to collapse and environments are flashing over with more frequency. Therefore, how do you use your PPE, and how do you monitor the environment around you?

Continuously evaluate your fireground environment. All firefighters are aware of the benefits of conducting an initial size-up when a structural incident comes into view. Considerations such as the type of building, the amount and extension of the fire, fireground priorities, and numerous other factors begin to set the stage for the mitigation of the incident. Conversely, another size-up that can be potentially more important is a continuing size-up that is ongoing until the incident has been mitigated. Although it can also include post-fire operations (overhaul, salvage), the focal point for this commandment is that interior personnel must continually evaluate and monitor their environment until the fire has been extinguished or the environment has been adequately ventilated.
However, the ability of PPE to shield a firefighter from the external environment has resulted in the need for all firefighters operating in a hazardous environment to constantly monitor the status of their environment. This is particularly important for truck company personnel operating within a structure, as they may not have a source of protection (a charged hoseline), or they may be operating alone. Therefore, when you enter a hazardous fireground environment, it is imperative that you set aside appropriate time to do the following:

• Initially, make a mental note of the conditions you encounter. This will allow you to formulate a baseline to use to compare (or evaluate) conditions you encounter as you advance into a hazardous environment.

• While you are in the structure, constantly evaluate the environment against the baseline you developed as you entered the structure. Are conditions improving or not improving? If conditions are improving, there is a good chance that suppression efforts are being effective. If conditions have not improved or are worsening, evaluate your degree of commitment.

• Are you encountering smoke with heat, or smoke with no heat? Smoke with heat is an excellent indicator of a fire that has the potential to create an environmental problem (i.e., flashover).

• Can you find your way out of the structure in an acceptable period of time? If you are going to extend yourself, be able to find your way out of the structure in a timely manner.

A point of interest is the British firefighter in photo 13. Notice the perforated area in the hood over his ear. This is a method British firefighters use to monitor their environment. The point is, what do you use to stay aware of your environment?

9 When in doubt, ventilate. Of all the fireground operations that deserve attention at a structure fire, ventilation can often be more of a top priority than in the past. This is an obvious statement from the perspective that what is burning today is significantly different from what was burning yesterday. Yesterday’s fires were comprised primarily of cellulose-based materials that burned slower and cooler, and often with a lighter smoke. Today’s fires routinely involve synthetic materials (petrochemical-based compounds) that burn hotter and faster and can produce a denser smoke. These factors not only more severely inhibit the visibility of interior personnel but also have resulted in a reduction of backdrafts and an increase of flashovers (photo 14), which can instantly produce a fatal environment to human life within the flashover area.

Therefore, when considering operations from the perspective of quickly developing fireground priorities, remember that forcible exit and ventilation collectively combine to significantly increase the safety of interior suppression personnel at most structure fires. This is not to imply that every structure fire requires that holes be cut in roofs, windows be broken, and positive-pressure blowers be implemented. As is true for other fireground tasks, you must coordinate ventilation with attack and search operations.

However, when ventilation is properly executed, four major benefits normally result:

• Visibility will improve.

• Interior temperatures will be reduced.

• Flashover conditions will be minimized.

• Carbon monoxide will decrease, and the percentage of oxygen will increase.
These four benefits are worth considering during the initial size-up at any structure fire. As a general rule, the earlier ventilation is started, the better.

10 **Ensure the viability of your escape route inside, topside, and outside.** Throughout this article, the terms “forcible entry” and “forcible exit” are synonymously used from the perspective of safety, in that if it is important to get into a structure, then it should be as important, if not more important, to be able to get out of a building. Unfortunately, firefighters routinely force entry into a structure but do not succeed in providing alternate, multiple, or timely exit points for interior personnel. Let’s look at three forcible exit considerations.

**Inside.** A fundamental rule in wildland firefighting operations states: “Personnel on a hill shall never let a fire fishhook below them.” This same rule can be applied to structural firefighting operations and can be stated as follows: “Interior personnel shall never let a fire above them (i.e., attic, etc.) get between them and their exit point.” From a simplistic perspective, always keep your primary entry and exit point available to facilitate your ability to exit a structure if necessary. In some cases, this dictates that you pull ceilings to verify the condition of an attic when fire is known or suspected to be above you. If fire collapses a ceiling between you and your exit point, exit options will be compromised.

**Topside.** When fireground personnel are assigned to roof ventilation operations, what is the minimum number of ladders that should be raised to the roof? Two. Although every firefighter is aware of the right answer, it is more than interesting when looking at pictures of fireground operations from around the country that it would seem that a single ladder is the common answer to this question (photo 15). So, let’s apply the 10th commandment of ensuring the viability of your escape route and raising at least two ladders to a roof when operating aboveground. The phrase “at least” means that if the number of personnel exceeds two, then the number of ladders raised should also exceed two. As an example, if four personnel are on a roof, there are two ladders to the roof, and it is suddenly necessary to exit the roof, what do firefighters 3 and 4 do while firefighters 1 and 2 are exiting the roof using the two ladders? Always take the time to enhance the safety of your aboveground operations.

**Outside.** Ensuring the viability of your escape route options from the interior of a building means that you should provide at least two ways to get out of a building. This is normally accomplished from the exterior of a building by forcing additional doors (other than the initial entry door), appropriate windows (and this means opening the entire window with all glass removed), and any other obstructions that could prevent or slow down exiting the building. Several examples of obstructions are security bars and plywood-oriented strand board panels over doors and windows on vacant or abandoned buildings (photo 16). In these cases, remove obstructing devices prior to or during the initial phases of interior operations. Maximize your ability to exit the building.

ENDNOTE


**JOHN MITTENDORF** was a 30-year veteran of the Los Angeles City (CA) Fire Department when he retired as a battalion chief. He has an associate degree in fire science and has nationally and internationally instructed in fireground operations for the past 25 years. He was the recipient of the Fire Engineering 2008 Lifetime Achievement Award.
1. What are the two basic viewpoints that comprise fireground operations?
   A. Fire attack and overhaul
   B. Search and rescue
   C. Ventilation and ladders
   D. Fire attack and logistics

2. When fire is exposing light trusses, they can readily collapse in what approximate time frame?
   A. 3 minutes
   B. 4 minutes
   C. 5 minutes
   D. 6 minutes

3. Today, fires burn faster and hotter as compared to the fires of yesterday as a primary result of what factor?
   A. Synthetic materials
   B. Tighter buildings
   C. Flammable adhesives
   D. Truss construction

4. What is the primary responsibility of a truck company?
   A. Assist in developing attack lines
   B. Support operations
   C. Forcible entry and ventilation
   D. Ladders, ventilation, and forcible exit

5. What is the definition of preplanning?
   A. Memorizing your district
   B. Being aware of applicable constraints
   C. Sum total of related hazards and being able to operate within those constraints
   D. Prefire planning the buildings within a district

6. Which of the following choices best describes responding with vigilance?
   A. Driving as fast as possible to reduce response time
   B. Not exceeding the posted speed limit
   C. Knowing the best response routes
   D. Safely driving to an incident and back to the fire station

7. To determine available fireground time, it is important to carefully evaluate which of the following factors?
   A. Building construction
   B. The environment
   C. Fireground clock
   D. All of the above

8. What best describes the fireground clock?
   A. How much time before collapse
   B. How much time to implement your resources
   C. Time necessary to make a visible impact on a fire
   D. Response time

9. What fireground operation is normally required prior to implementing interior attack operations?
   A. Forcible entry
   B. Ventilation
   C. Implementing a RIT team
   D. Conducting a search

10. What following operation is not a basic priority necessary to extinguish a structural fire?
    A. Ladders
    B. Rapid intervention team
    C. Backup line
    D. Forcible exit

11. What is the most important fireground priority?
    A. Search and rescue
    B. Fire attack
    C. Incident command system
    D. Firefighter safety

12. Normally, when is the best time to raise ladders?
    A. When personnel are available to do so
    B. After forcible entry and ventilation are accomplished
    C. When a truck first arrives on-scene
    D. After fire attack operations have been initiated
13. Which of the following operations is not considered an initial priority?
A. Forcible entry-exit
B. Ventilation
C. Search
D. Aerial operations

14. What following characteristic is not associated with unreinforced masonry construction?
A. Stability during a fire
B. lintels over windows
C. King row of brick
D. Inset windows

15. If a firefighter who is operating at floor level detects the surrounding temperature is warm or very warm, that temperature can likely be around what figure?
A. 250°F-300°F
B. 300°F-375°F
C. 400°F-450°F
D. 450°F-525°F

16. What is a continuing size-up?
A. It begins with arrival of initial companies
B. It continues throughout an incident
C. It begins at the conclusion of an incident
D. It begins when a fire is extinguished

17. Ventilation can be comprised of which of the following methods?
A. Vertical ventilation
B. Horizontal ventilation
C. Positive-pressure ventilation
D. All of the above

18. When personnel are operating aboveground, what is the minimum number of ladders that should be raised?
A. One
B. Two
C. Three
D. Depends on the number of personnel who are aboveground

19. Yesterday's fires were primarily comprised of what materials?
A. Cellulose
B. Conventional
C. Standard
D. Petrochemical

20. The term "Air Management for the Fire Service" can best be applied to which of the following choices?
A. Ensuring your bottle is full before use
B. Having enough air to exit a building
C. Being aware of how much air you consume during stressful conditions
D. All of the above
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