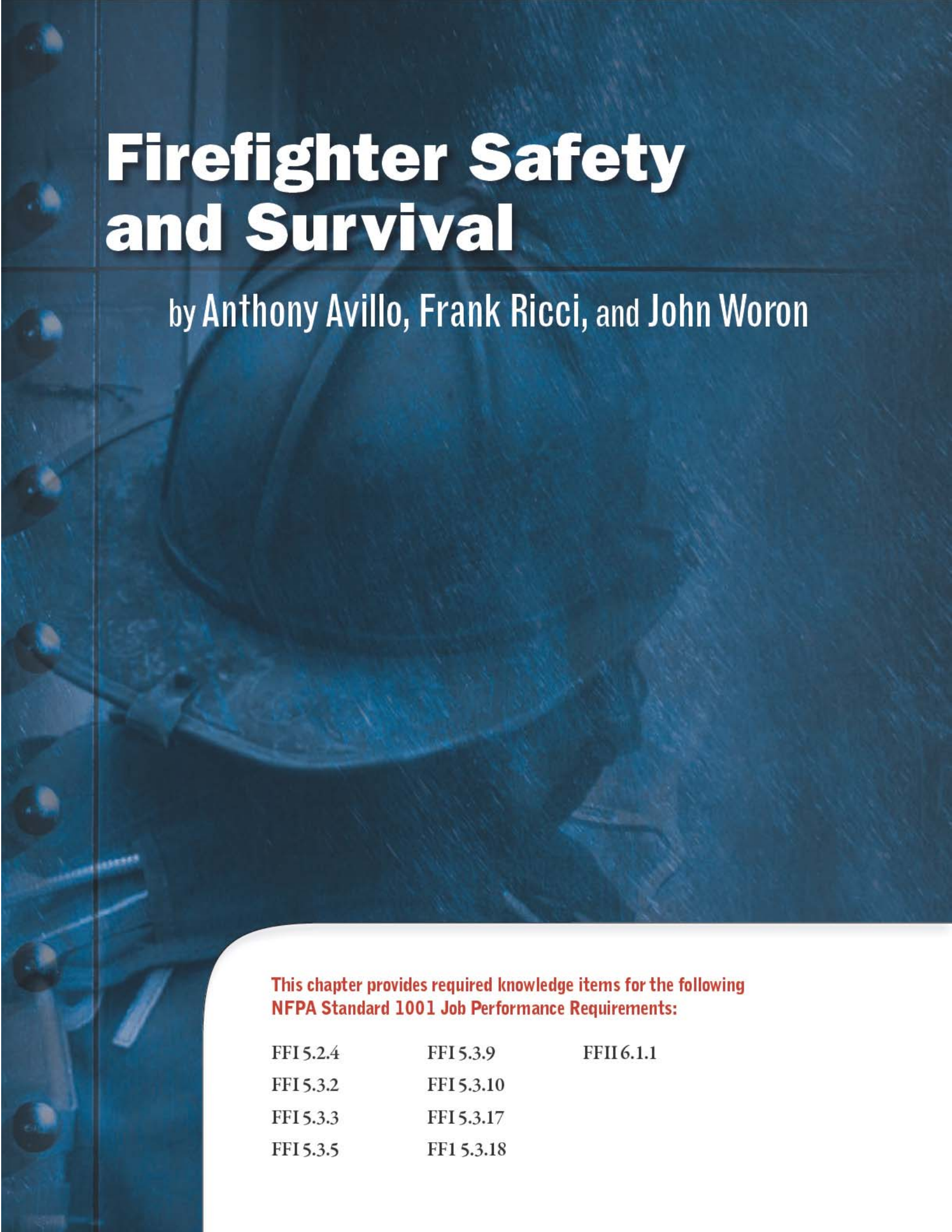


Firefighter Safety and Survival

by Anthony Avillo, Frank Ricci, and John Woron

This chapter provides required knowledge items for the following NFPA Standard 1001 Job Performance Requirements:

FFI 5.2.4	FFI 5.3.9	FFII 6.1.1
FFI 5.3.2	FFI 5.3.10	
FFI 5.3.3	FFI 5.3.17	
FFI 5.3.5	FFI 5.3.18	

This chapter contains Skill Drills. When you see this icon, refer to your Skill Drill book for step-by-step instructions.

OBJECTIVES

Upon completion of this chapter, you should be able to do the following:

- Identify the reasons for and preventative measures for firefighter injuries and fatalities
- Describe the importance of injury reporting
- Describe the importance of Fire/EMS Safety, Health, and Survival Week
- List the 10 rules of engagement for structural firefighting
- List the four basic components of a fire department PER plan
- Describe the need for a fire department safety committee
- List the responsibilities of a incident safety officer
- Define the terms *accountability officer*, *fireground rehabilitation*, and *on-deck air management*
- Describe the purpose of a fire department wellness program
- Describe methods of limiting injuries to firefighters during response and return form emergency incidents
- Describe the role that the Occupational Safety and Health Administration (OSHA) plays in firefighter safety
- Describe the role staffing plays in firefighter safety
- Describe the role the National Fire Protection Agency (NFPA) Standards 1710 and 1720 plays in fire department staffing
- List at least five tactical mistakes made at an emergency incident that impact firefighter safety
- Differentiate between "top-down" emergency transmission and "bottom-up" emergency transmission
- List the required tools for a rapid intervention team (RIT)
- List the on-scene actions of a RIT
- Describe the proper procedures for packaging and removing a downed firefighter for a hazardous environment
- List 10 factors relating to poor air management at an emergency incident
- List five types of drags and carries for removing a firefighter from a hazardous situation

INTRODUCTION

The day will start like any other, with thoughts of the weekend or an upcoming vacation with the family. You are dispatched to a working fire, and everything seems routine: light smoke is showing, and *all hands* are working. Then, in a tenth of a second, everything goes wrong and your life is ended or the course of it is changed forever.

Due to the inherent dangers of this job, most firefighters will be injured over the course of their career. Each year more than 100 firefighters are killed in the line of duty, with an additional 81,000 injured. We work in a hostile and dynamic environment that can change rapidly (fig. 17–1).

We must control what we know by using safe practices and preparing ourselves for the unknown. On a routine basis, life-and-death decisions will be made based on imperfect information adapted to fit the circumstances at hand. Simple, almost meaningless actions or habits that we should strive to achieve will serve to minimize the risks we all face. Although some failures at fires will be catastrophic, most will happen incrementally until the sum is greater than the parts, resulting in an injury or death. This is commonly known as **drifting into failure**. It is your responsibility to keep yourself safe and to look out for your fellow firefighters. You are no longer an individual. You are a member of a team, and your attitude toward safety will have an impact on that team. By following your department's standard operating procedures (SOPs), training regularly, and developing proper habits, you will strive to become proficient. Almost all the skills that you learn will incorporate safety into the lessons. It is critical to realize that these skills are perishable and must be practiced, always keeping the safety aspect of the task in the forefront. The goal is to operate safely, effectively, and efficiently.

There is no greater priority on the fireground than that of firefighter safety and survival. In fact, firefighter safety must be the common thread that runs through three general priorities of fireground operations: life safety, incident stabilization, and property conservation. If we cannot make an operation safe, we must seriously consider whether that operation should be conducted at all. This is called **risk versus gain**. If the risk to be taken is not worth the gain to be accomplished, then alternative courses of action may need to be considered. For example, a building that is fully involved in fire does not typically receive a primary search. This is because the likelihood of finding any live victims in this fiery environment is extremely remote, if not impossible (fig. 17–2).

Fig. 17–1. Fire conditions and fire buildings must be constantly monitored for clues to changing conditions. Ignition of heavy smoke may cause firefighters to become trapped and buildings to become unstable. Failure to recognize changes in conditions can be fatal. (Courtesy of Ron Jeffers)

FIREGROUND NOTE

Safety is the overriding concern of *all* fireground operations, firefighter training, and station activities.

Fig. 17–2. Buildings that are fully involved or in danger of collapse present a risk to all responders. The risk \taken by entering such buildings far outweighs what could be gained. No one survives this. (Courtesy of John D'Atilio Jr.)

These decisions should not be made by the probationary firefighter or even a 3-year firefighter (a rookie by most accounts), but must be carefully considered by more seasoned veterans of the fireground. There is an old adage in the fire service: "If you cannot make things better, at least make them safe." According to Phoenix Fire Chief Alan Brunacini (ret.), there is another saying that addresses the same concept and deals with the same risk versus gain issues: "Risk a lot to save a lot, risk a little to save a little, risk nothing to save nothing."

Firefighter safety is rooted in training and awareness. It is the responsibility of all department members, and the department as a whole. Safety is an attitude. It starts with the chief of department and must permeate all ranks right down to the probationary firefighter. Unsafe conditions or actions are absolutely unacceptable and must not be tolerated at any level. To this end, the chief and company officers, as well as senior firefighters, have the responsibility to set the example with regard to safe operations and actions on the fireground and beyond. No one is tougher than a fire.

This chapter will cover the four critical principles:

- Safety
- Prevention
- Self-rescue
- Intervention

Survival is predicated on training, knowledge, and experience coupled with safe staffing, **situational awareness**, and tactics that occur in unison to and with each other. This chapter will address common tactical mistakes, driver safety, scene safety, and actions to take to avoid getting jammed up in the first place, while recognizing that even when operations are conducted right, things can still go wrong. It will take the student through tactics to effect self-rescue and provide an understanding of the roles and responsibilities of the rapid intervention team (RIT). Ideally, the RIT should be made up of experienced, well-trained firefighters, but in reality a recruit may be assigned to intervention on his or her first fire. By no means are these the only methods or evolutions for firefighter removal. It is important to establish a "foundation of safety" during Firefighter I and II training. That foundation must be built upon for the rest of a firefighter's career. By incorporating a safety mind-set and reinforcing it continuously, we can reduce the number of firefighter deaths and injuries.

Statistics

Firefighter fatality and injury statistics. To properly take the steps toward firefighter fatality and injury prevention, we must first analyze the causes of death and injury. On average, there are approximately 105 firefighter **line-of-duty deaths (LODD)** per year in the United States. This is more than two per week! None is acceptable. All are preventable. There is no such thing as an acceptable loss in the fire service (fig. 17–3).

Fire doesn't care whether we are firefighters or civilians. Fires do not discriminate between career and volunteer firefighters, old or young firefighters, or superior officers or subordinate firefighters. Fire kills and injures at every opportunity. With that in mind, all fire department personnel need to understand the ways in which our brothers and sisters are becoming casualties so we can begin to take the steps of injury and fatality prevention.

Firefighter fatalities and prevention. According to provisional statistics from the National Fire Protection Association (NFPA), there were 64 on-duty firefighter fatalities in the United States in the year 2012. That is an approximate 5% increase from the previous year when 61 firefighters made the supreme sacrifice during the execution of their duties. There were four multiple fatality incidents. Of the total number, 24 fatalities were career firefighters while 30 were volunteer firefighters. The ages of those who died ranged from 21 to over 70.

Fig. 17–3. This sight is all too common in the fire service. Prevention of casualties must be the number one priority of all fire departments. (Courtesy of Ron Jeffers)

Of these fatalities, the three most prevalent duty types were during fireground operations, while responding to or returning from alarms, and training. Fireground operations accounted for 21 deaths, with 12 occurring at structure fires. This was reported as the lowest number of structure fire deaths ever. In one study done by the

United States Fire Administration (USFA), interior firefighting operations (advancing hoselines) accounted for 13 firefighter fatalities in 2012.

The NFPA further reports that there were 19 fatalities that occurred while responding to or returning from alarms. These fatalities included 8 from crashes, 7 attributed to sudden cardiac deaths or stroke, and 2 separate incidents of firefighters struck by falling trees en route to or returning from a response. Of these, 16 of the 19 were volunteer firefighters. Incredibly, 8 deaths occurred during training activities, an environment that is supposed to be strictly controlled and supervised.

Causes of the fatalities were as follows:

1. Exertion and stress: 32 fatalities—27 were due to sudden cardiac death.
2. Struck by an object or contact with an object: 24 fatalities—19 were motor vehicle-related.
3. Caught or trapped: 6 fatalities—1 was a result of rapid fire development.

Included in these figures are 4 fatalities that were collapse-related or a result of firefighters getting lost and running out of air in a structure.

Exertion and stress: Sudden cardiac death. Sudden cardiac death, most often as a result of heart attacks, is a leading cause of death for firefighters, accounting for close to half of the LODD per year. Many of the victims have had some type of prior condition.

FFI 5.1.1 Firefighters who follow a proper diet and exercise **regimen** and are part of a department **wellness program** are less likely to fall victim to exertion and stress fatalities. In addition, regular physical fitness checkups, including stress tests, will assist in proactively identifying potential cardiac concerns. No-smoking policies and **smoke cessation programs** for department members are also part of a healthy wellness programs. Departments who practice regular relief and rotation of the fireground, including limiting firefighter work time in immediately dangerous to life and health (IDLH) atmospheres will put less work-related stress and exertion on its members. Fatigued firefighters rapidly become injured and possibly dead firefighters.

Struck by an object or contact with an object. Motor vehicle–related injuries are the second leading killer of firefighters. This category also includes firefighters that have been killed by falling objects such as collapsed walls and roofs. It also includes contact with live electrical equipment. A portion of vehicle fatalities occurs in the wildland environment where terrain is less than conducive to safe driving. In addition, of 25 fatal crashes that were reported, 11 of the victims were not wearing seat belts, and 7 of the deaths were in crashes where excessive speed was a factor.

Caught or trapped. This is usually the result of either 1) a rapid fire development such as a flashover or backdraft or 2) firefighters losing their orientation with their surroundings, losing contact with their partner or team, or both, and running out of air. Building collapse is also included in this category, as firefighters fall through collapsed floors or are trapped under collapsing ceilings or roofs. Another overlooked issue when firefighters are categorized as being "caught" is when their personal protective equipment (PPE) is not worn properly and becomes a liability, causing them to get caught up on an object, become trapped, and subsequently run out of air. One item that is often ignored as an important piece of gear is the self-contained breathing apparatus (SCBA) waist strap. Failure to properly fasten the waist strap has cost firefighter lives when the straps become hung up on something inside a building.

Prevention

Driver safety. Departments should actively engage members in driver safety courses and driver evaluations on at least a yearly basis. Training should be in accordance with NFPA 1002, *Fire Apparatus Driver/Operator Professional Qualifications*, and NFPA 1421, *Standard for a Fire Service Vehicle Operations Training Program.* Departments must have driver safety SOPs in place and enforced at all times, for both apparatus response and volunteer response from home in privately owned vehicles (POVs). In addition, seat belt regulations should be equally enforced with a zero-tolerance policy, and all accidents must be both investigated and documented. Departments should also see that apparatus maintenance is proactively pursued and there is a mechanism in place to address issues regarding same.

Collapse safety. A comprehensive training program regarding building construction and collapse, as well as a hazardous building marking system and building familiarization program, should be in place. Buildings that are dangerous should be brought to the attention of all department members via department safety bulletins and computer-aided dispatch (CAD) print-outs. On the fireground, emergency transmission protocols should be in place to warn firefighters of dangerous building conditions. Proactive reconnaissance, ongoing awareness, and

FIREGROUND NOTE

On the average, there are approximately 105 firefighter line-of-duty deaths (LODDs) per year in the United States.

None is acceptable.

timely communications should be the cornerstone of the fireground safety plan.

Electrical safety. Departments should conduct joint training sessions with local utility companies. In addition, electrical safety SOPs should be in place, and members should be trained to give all electrical equipment a wide berth. Operations such as overhaul should not be initiated without power shutdown in affected areas (fig. 17–4).

Fig. 17–4. All equipment should be kept at least 10 feet from power lines. Operations here show a reprehensible disregard for safety. (Courtesy of Ron Jeffers)

Fire behavior safety. The need to train firefighters in fire behavior and to further train them to recognize and properly react to deteriorating fire conditions cannot be underestimated. Enforcing the proper wearing of turnout gear may save a firefighter from laziness and apathy. Strictly enforced **mandatory mask rules** for SCBA use, as well as training firefighters in proper air management and awareness, is a must for safe interior firefighting. Many times, firefighters become lost and disoriented because they are operating outside of the established attack plan; in essence, **freelancing** (described later in this chapter). Structured command and control along with disciplined officers and firefighters operating under the parameters of effective scene assignment SOPs are the best accountability system and the backbone of firefighter freelance prevention. Ongoing training in Mayday policies and rapid intervention procedures also helps prevent casualties.

Firefighter injury statistics and prevention. FFI 5.3.10 Firefighter injuries often occur for some of the same reasons that fatalities occur; sometimes we are just lucky that we only got hurt instead of killed. Overexertion, lack of awareness (not paying attention), failure to properly wear protective clothing, freelancing and lack of discipline, and just plain lack of common sense all contribute to firefighter injury.

Injury statistics from the NFPA show that there were over 83,000 firefighter injuries in the year 2006. Over half (53%) occurred on the fireground, that is, more than 44,000 injuries. The leading types of injuries during fireground operations are strains, sprains, and muscular pain (46.7%), followed by wounds, cuts, bleeding, and bruising (17.3%). Next are burns (5.9%) and smoke or gas inhalation (5.6%). Of all nonfireground injuries, strains, sprains, and muscular pain account for more than half the reported injuries (56.7%). Overexertion and strain were the leading causes for injury (25.5%), and falls, slips, and jumps (23.9%) were the second highest cause (fig. 17–5).

Other estimates for injuries include almost 12,000 exposures to **infectious disease** (HIV, hepatitis, meningitis, methicillin-resistant ***Staphylococcus aureus*** [MRSA], etc.) and over 23,500 exposures to hazardous materials and conditions such as asbestos, radioactive materials, chemicals, and fumes.

The study also shows that although both fires and injuries have been on the rise in the past 5 years, the number of injuries has decreased steadily over the previous 20 years, and so, in an almost parallel decrease, has the incidence of fire. The Northeast has the highest fireground injury rate, over twice that of the rest of the country.

Fig. 17–5. Fireground injuries account for more than half of all reported injuries. Injury prevention must be a main priority of all fire departments. This injury occurred when an aerial device was accidentally retracted on a captain's leg. (Courtesy of Ron Jeffers)

Summary of firefighter fatalities and injury statistics. Even a statistic that represents 1% of the fatality totals is significant. Remember that 1% represents someone who left behind a family and friends and whose department and community are no longer recipients of that individual's service, dedication, and talent. Statistics exist for one reason—so that you don't become one.

Types of injuries and exposures

In all cases, the best ways to prevent injuries are proper training and supervision, adopting a proper safety attitude, having a philosophy of continuous vigilance and awareness (paying attention to your surroundings), promoting and enforcing anti-freelance policies, maintaining the proper relief and rotation of companies, and wearing PPE properly. A safety-conscious department will experience fewer injuries than one that allows safety violations on a routine basis; thus, as was mentioned earlier in this chapter, safety of personnel begins at the top and must permeate the entire departmental structure. Unsafe actions must be subject to a zero-tolerance policy at all times.

Strains, sprains, and muscular pain prevention. A progressive program in muscular and cardiovascular fitness can minimize strains, sprains, and muscular pain. There are many parallels between firefighting and athletic competition; however, unlike athletic competition, our opponent is not human. Instead, it is fire, smoke, buildings, blood, and other nonhuman hazards. Although we cannot warm up as an athlete does for a game, we can ensure that we use common sense in physical endeavors, such as not overextending ourselves or attempting something alone that we should get help with. Proper relief and rotation is the key to injury prevention, especially in extremes of weather.

Falls, slips, and jumps. Falls, slips, and jumps are also often the result of fatigue. Therefore, proper relief is a key to prevention of not only these but all injuries. In addition, providing proper lighting at night and in reduced visibility conditions will help prevent falls. To prevent slips on ice, all apparatus should carry ice-melting compounds such as rock salt during the winter months. These compounds should be spread around the fireground, on the steps of the fire building, and around the pump panel. There are also traction devices available that fit on firefighting boots to help prevent slips and falls.

Falls from heights have severely injured and killed many firefighters. The severity of a fall is often a function of the height of the fall and how properly the firefighter wore the turnouts. Chinstrap policies are ignored in many departments. Firefighters have fallen from heights as low as 10 ft and have been killed when their helmets fell off on the way down. On the other hand, firefighters have been spared from death because their helmets stayed in place during the fall by virtue of a properly fastened chinstrap.

Conditions that cause firefighters to jump out of a window can come about as a result of a failed size-up, a failure to secure a secondary means of egress, or some type of uncoordinated fire operation. An equally unacceptable failure in recognition of rapid fire development signs has also led to many jumps from buildings. Jumps occur when all other methods of self-preservation have failed. A firefighter jumping out of a building or leaving a building by way of an emergency bailout represents a failure at every level of the fireground organization, from the firefighter who jumps or bails out to the incident commander (IC) and other commanding officers to the department as a whole. Mechanisms such as effective and enforced scene assignment SOPs, a proper accountability system, disciplined communications, and ongoing departmental training in bailout prevention are all remedies to the jump (and fall) dilemma. Gravity never takes a day off.

LESSON FROM THE TRAINING GROUND

In one case, a fire instructor fell approximately 30 ft during a training evolution at a fire academy after the wind blew the ladder over that he was working on. His helmet cracked in half on impact, but stayed on his head on the way down as his chinstrap was properly fastened. The severity of his other injuries, a broken jaw, a cracked cheekbone and orbital, as well as shoulder and hip injuries suggests a more severe head injury would have been suffered had the helmet fallen off on the way down.

LESSONS LEARNED

1. Always wear your gear properly, especially during training evolutions.
2. Just because you are an instructor doesn't entitle you to forego safe PPE practices.
3. Ladders should be properly tied off or footed at all times. This ladder was tied off. The fall occurred as the instructor disconnected the chain that was securing the ladder to the building.

Responding and returning injuries. Responding to calls and returning to the firehouse together are the second leading cause of firefighter deaths and are also a major cause of injuries, accounting for nearly 5,000 injuries. There were over 16,000 fire apparatus accidents in 2006. This number does not include accidents involving firefighters' personal vehicles, which accounted for over 1,000 additional collisions and more than 200 injuries (figs. 17–6 and 17–7).

As mentioned earlier in response to motor vehicle-related fatalities, training, awareness, and enforced driver safety SOPs will help prevent these occurrences. Firefighters must understand that they do not have the right to circumvent motor vehicle laws such as speed limits and right-of-way just because they have a big truck and make a lot of noise (or they have a personal vehicle with a flashing light on it). Firefighters have been judged to be liable for violations of motor vehicle laws and in some cases have been prosecuted, convicted, and jailed for the same.

Injuries during nonfire emergency calls. Nonfire emergency calls include responses to nonfireground rescue situations, hazardous calls such as spills, and disaster responses. Often the cause of the injury is directly related to incident awareness (or lack thereof) when conducting operations that personnel are not adequately trained for or equipped to handle. When responding to these incidents, firefighters must choose caution over aggression and not get involved in an issue they were not trained to handle. Statistics have shown that in many of these types of incidents, over half of victims are would-be rescuers—many times firefighters who got too close to the problem before they realized the magnitude of the consequences. This issue boils down to discipline. Disciplined firefighters are safe firefighters.

Figs. 17–6 and 17–7. Seven firefighters were injured in this squad company versus rescue company versus building collision en route to a reported fire. Seat belts saved their lives. (Courtesy of Ron Jeffers)

Weather-related injuries. Injuries such as frostbite and heat exhaustion that occur in weather extremes are

best minimized by proper relief of personnel, medical monitoring, and providing shelter and other comfort measures based on the weather. For example, getting firefighters out of turnouts, ensuring proper hydration (in all seasons!), and providing cooling equipment like misters and tents will help reduce the effects of heat and humidity on personnel. Speaking of hydration, once you are feeling parched, it is probably too late to sufficiently rehydrate quickly enough to avoid the consequences. When the weather is hot and humid, firefighters should prehydrate all day long and stay away from caffeine and heavy foods.

On the opposite extreme, in cold weather, providing shelter, urging firefighters to carry additional dry clothing, and providing early and regular rotation and relief all help minimize the effects of cold on firefighting personnel. In all cases, the answer to proper rotation is to summon additional personnel. In weather extremes, a one-alarm fire may require a three-alarm response to ensure proper relief and rest for weather-fatigued firefighters (fig. 17–8).

Fire departments can be proactive in injury prevention by conducting training on recognition and prevention of heat-related injuries in the spring and cold-related injuries in the fall before the onset of the extreme weather. Training for recognition of symptoms is extremely important because the victim of these injuries is usually unaware that he or she is being affected until it is too late. Thus, early recognition by observant colleagues can be a lifesaver in many cases.

Fig. 17–8. This rehabilitation and care (RAC) unit is a converted passenger bus. It was modified and reequipped to serve as a rehab unit.

Exposures to infectious disease. The department must conduct annual training on the dangers and prevention of bloodborne contamination occurrences. Training must be documented. In addition, there must be in place a comprehensive and enforced SOP regarding operations where bloodborne pathogens may be encountered. Recognition of the potential for exposure and contamination is the first step in safeguarding personnel. Once the potential is recognized, proper body substance isolation (BSI) protection should be available and worn. Policies should be in place for decontamination of personnel and equipment. Departments must have **disinfection** equipment available dedicated to simple decontamination operations of tools and other equipment, as well as procedures for the proper isolation and disposition of contaminated clothing and turnout gear. In addition, as will be mentioned in the next section, all exposures to bloodborne pathogens must begin with a process that includes a trip to the hospital for medical evaluation as well as documentation.

FIREGROUND NOTE

Red lights, sirens, or blue lights should not be a signal to the public that says, "Watch out for me. I am about to do something stupid."

Exposure to hazardous conditions. Annual refresher training, along with solid and enforced SOPs outlining the parameters of personnel involvement when hazardous materials and conditions are encountered, must be in place. Documentation is also mandatory, especially the completion of department exposure forms whenever any member is exposed to a harmful chemical or agent, including chemicals used by firefighters in the fire station and from equipment at an emergency scene.

Preventing injuries

Preventing training injuries. A good majority of injuries occur during training sessions. Recall that training is often the third highest category of fatalities and injuries. In 2006, there were over 7,600 documented training injuries. As such, training sessions should be well planned with safety as the overriding concern. The area where the training will occur should be safe and checked out in advance, especially if a dedicated building is being used. Many states prohibit burning except in a dedicated burn building at a fire academy. For those states that do allow live burning of structures, strict compliance with NFPA 1403, *Standard on Live Fire Training Evolutions*,

LESSON FROM THE FIREGROUND

At a structure fire in a residential occupancy, a captain and his crew were trapped above a fire. This occurred because the attack teams two floors below in the basement did not know they were up there. When the order to evacuate the building was given by command, the lines were withdrawn, allowing the fire to roar out of the basement and block the stairwell, their main egress point. They realized they were trapped, and they began making their way to the rear and a secondary means of egress. Visibility was extremely poor, and as a result the captain tripped over a footstool and crashed headfirst out a second floor window and into a *light shaft*. He landed on his head. His chinstrap was in place. Like the fire instructor in the previous lessons learned, his helmet cracked in half on impact, but had it come off on the way down, he would have been killed. His injuries were enough for him to leave the fire service on a disability pension.

LESSONS LEARNED

1. You cannot trip when you are crawling. If you can't see your feet, you need to crawl.
2. Our turnout gear is our first line of defense and is meant to be used as a system. Don't ever compromise that system by cutting corners.
3. Always let someone know when you are going above the fire without a hoseline.
4. Inadequate firefighter management systems and accountability controls often lead to loss of coordination on the fireground.

must be followed. Even when not burning a structure, the parameters of the drill should be explained and an area familiarization should be conducted for the participants. This should include any considerations regarding the dangers associated with the particular operation being trained. A safety officer (SO) should always be assigned, and the span of control of instructor(s) to trainees should be maintained.

Preventing nonfireground injuries. These injuries are classified by the NFPA as "other on-duty" activities. Nonfireground injuries are those injuries that occur at the station, during fire prevention and maintenance duties, while exercising, and during everyday routine activities. All of these injuries are preventable and many times directly attributed to lack of communication, not cleaning up after oneself, and basically not doing the right thing. The following is an excerpt from North Hudson, New Jersey, Regional Fire and Rescue's *Safety Matters* bulletin. It was put together as a result of a plethora of nonfire duty injuries and is titled, "There's No Fire, But We're Still Getting Injured."

Don't be a slip-and-fall guy. Preventive maintenance prevents injuries.

- Report broken steps, cracked sidewalks, leaks, etc.
- If you spill it, clean it.
- If you notice it, see above rule.
- "I" = ownership.
- "I saw it" = "I will take care of it."
- Don't touch things twice: When you are done with something, put it away. (Your mother does not work here!)
- If it's wet, icy, oily, you will slip—unless you dry it, clean it, de-ice it.

Details should not equal disaster.

- Be aware of your surroundings at all times.
- Don't just check out the rig, check out the house.
- Use the same caution, care, and common sense in a different firehouse as you would on a fireground.

- House duties, routine maintenance, meal preparation areas, and work-out equipment and areas differ from house to house—familiarize yourself before using.
- House and apparatus familiarization should be ongoing.
- Check with the "normal" crew about idiosyncrasies before you discover them by "accident."

All rigs are not created equal.

- Doors and compartments open and are secured in different manners—be aware that some also don't secure well at all—and some are as insecure as a first-day probie!
- Warning devices may not be the same as your "home" rig.
- Watch your step: Heights, footholds, and hand grips for mounting and dismounting apparatus can vary.
- Check what's above your head before you step up; ditto for stepping down.
- Overlooking small details can cause big injuries.

Don't be a tool—Let your equipment work for you.

- Some items may have shifted during travel, so use caution when opening overhead compartments.
- Nothing ever falls up, and gravity never takes a day off.
- If it falls out once, straighten it out; if it falls out twice, you need straightening out.
- It's a scientific fact that what you don't secure today will hit you or someone else on the foot or head tomorrow.
- Securing devices need attention too: If you don't check to see that they are doing their job, you are not doing yours.

Respect your back, or you'll wind up on it.

- If it looks heavy, it probably is, so get help.
- We are in a team sport all the time, not just on the fireground.
- When lifting, remember that your knees bend for a reason—bend your knees, not your back.
- Giving someone a hand doesn't mean clapping for him or her—everyone pitches in.
- Try to keep the object you are lifting close to your body.
- The extent of the injury is often in direct proportion to the haphazardly hasty manner in which it is performed. If you are looking to get done quickly, take your time, think it out, do it safely.

Summary

- Pass information on—chances are someone knew about an unsafe condition before it hit you in the head.
- Set the example—don't be the example.
- Your personal safety is your own responsibility.
- Accident prevention is rooted in awareness and begins with you. Although in some circumstances ignorance may be bliss, in the fire service it can be deadly—be aware!
- If you can't make it better, at least make it safe.

Injury management and reporting

Injury reporting is a vital part of the injury prevention cycle. An injury properly analyzed and accurately reported may be an injury prevented in the future. Departments must have a protocol in place for the reporting and management of injuries. It is generally the responsibility of the immediate supervisor to report and document injuries. Other individuals may also be involved, such as the department safety officer (SO) or the department health officer. Regardless of who is responsible for documentation of an injury, one thing must be made clear to all department personnel: All injuries must be reported and properly documented no matter how minor they may seem.

As an example of improper injury reporting that has played out many times in fire departments, suppose Firefighter Jones twists his ankle as he is getting off the apparatus after a run. After the initial pain, he feels it is OK, and he will walk it off. He declines a request from his officer to seek medical attention, and the incident goes undocumented. Two days later, Firefighter Jones's ankle has swollen considerably, and he decides to go to his own doctor to have it checked. It turns out that there is a fracture. Firefighter Jones calls on injury leave. The department has no record of the injury and places Firefighter Jones on sick leave instead. Firefighter Jones now has to expend six weeks of sick time, which comes out of his sick bank and affects his payout at separation

FIREGROUND NOTE

Statistics exist for one reason—so that you don't become one.

of service. Because the department has no record of the injury being documented, it is treated as if it did not happen while on duty. In addition, in order for a firefighter to receive workers' compensation for an on-duty injury, he or she has to go to the department's doctors, usually at the time of the injury. Firefighter Jones went to his own doctor, which, if he wants to make an issue of this being an on-duty injury, probably violates department policy in regard to medical treatment for on-duty injuries. This may also result in disciplinary charges for Firefighter Jones and his officer for not following the departmental injury policy. Most departments' insurance policies do not recognize any diagnosis other than that of their own doctors for on-duty injuries. All this hassle, disciplinary charges, and lost benefit potential for Firefighter Jones occurred because of improper documentation of an injury. Document everything!

Injury management and documentation create a paper trail that will follow an individual through the treatment and recovery process, and beyond. Documentation should begin as soon as the injury occurs. Even jotting some notes down on a notepad is better than trying to remember the details of what happened later on: The palest ink is better than the sharpest memory. Fire departments are required by law to retain personnel documentation for many years after an individual terminates service with the department. Litigation might surface years later from an injury that occurred today, and the department has the responsibility not only to protect the individual but also to protect itself.

Injury management begins as soon as the injury is reported. If the injury requires care at a medical facility, prompt notification of emergency medical services (EMS) should be made. A department representative should accompany the injured member to the medical facility and act as a liaison between the medical authorities and the department. This includes updates, further documentation, and arrangements made for travel back to the department once the individual is released. We cannot just send our injured firefighters to a medical facility and then forget about them! Decisions and notifications may have to be made on the injured person's behalf while at the medical facility. It is a departmental responsibility to provide a representative to accompany and support that member from the beginning of treatment to release from the medical facility. Once the individual is released, the department must follow up on recovery orders and monitor the recovery (fig. 17–9).

Causes of all injuries must also be investigated. Departments should have forms to document this information, and supervisory personnel should be thoroughly trained in proper completion of these forms. The injured member, his or her superior, and anyone who witnessed the injury should be directed by department protocol to submit reports documenting the incident. Information regarding the illness and injury should also be entered into the company's house journal or logbook. Failure to properly document an injury can have severe consequences at a later time, which could result in monetary loss for the department and the individual, caused by either litigation in the case of the department and its officers and proper compensation in the case of the individual.

Fig. 17–9. Injured firefighters must be cared for properly. Assigning a department representative to accompany the injured firefighter to the hospital is part of that care. (Courtesy of Ron Jeffers)

Another critical area for documentation that is often overlooked is when department members are exposed to hazards during or after an incident. Such exposures may be to bloodborne pathogens, hazardous materials, or other potentially contaminating substances. The department must also document these exposures on the proper reports and ensure that medical attention is made available as required. In the case of bloodborne pathogen exposure, department members exposed to blood or bodily fluids must be transported to a medical facility, and their contaminated gear or clothing must be bagged, properly tagged (documented), and dealt with according

to department policies for bloodborne exposure. Follow-up treatment and testing must be performed in accordance with the department's bloodborne policy, which is mandated by OSHA (fig. 17–10).

In regard to exposure to an atmospheric contaminant, or a hazardous material or substance, many times it is not clear what the individual was exposed to, such as in the case of a fire where toxic smoke (all smoke is toxic!) has blanketed the area. In these cases, it is prudent to have the air monitored, but even more important to document an actual or possible exposure. There have been cases where firefighters have been exposed to toxins such as carcinogens at some time during their career and later developed cancer, emphysema, or other diseases, but because the exposure was never documented, no compensation was awarded.

Fig. 17–10. Hazardous exposures are not just limited to blood. At this fire in a live produce store, firefighters were exposed to runoff that contained animal waste. A decontamination station was established and exposure forms completed to document this exposure. (Courtesy of Ron Jeffers)

Fire/EMS Safety, Health, and Survival Week. Formerly called the National Firefighter Safety Stand Down, Fire/EMS Safety, Health, and Survival Week was initiated by the International Association of Fire Chiefs (IAFC) in 2005. That year, an estimated 10,000-plus fire departments participated in the event. Safety, Health, and Survival Week usually takes place during the third week of June and is announced on the IAFC Web site (www.iafc.org). Safety, Health, and Survival Week raises awareness and calls national attention to the unacceptable number of firefighter LODD. Information specific to the year's theme and suggested activities can also be downloaded from the site. Each year, a different focus is highlighted. In 2007, the theme was *Ready to Respond* and focused on proper training, preparation, and equipage before a call. The theme promoted the idea that all members can respond to, work at, and return home safely from the emergency. In 2008, the focus reflected on the need for organizational action that supports and encourages a safety culture. Three key areas were incorporated into this theme: to fully implement NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, especially sections addressing PPE, fully implementing the Wellness-Fitness Initiative, and implementing an emergency vehicle policy. The IAFC recognizes that safety initiatives and policies must be instituted at the organizational and administrative levels and filtered down and enforced through the chain of command. If the uppermost levels of the department do not think safety is important and do not create and enforce policy that addresses these issues, it will never be important to the department's members or become a reality on the fireground, on the training ground, or in the firehouse.

The rules of engagement for structural firefighting. The IAFC created and adopted the 10 Rules of Engagement for Structural Firefighting. They are relatively simple and straightforward, but failure to abide by them has led to both injury and LODD on the fireground. The rules are split into two categories: the acceptability of risk and risk assessment.

The acceptability of risk

1. *No building or property is worth the life of a firefighter.* Often, our ability to keep out of harm's way is directly proportional to how well we abide by this all-important rule. Although this does not mean we will operate in a defensive manner and let all buildings burn down once everyone is evacuated, it means that the risk to personnel must be properly managed if we are going to continue to operate inside a structure. It also means, if in doubt, see rule number one.
2. *All interior firefighting involves an inherent risk.* These risks can be minimized by the use of SOPs, accountability systems, and the recognition of hazards that comes about through training and reinforcement of areas such as fire behavior and building construction. Further, a structured command system and disciplined operations assist in minimizing the risks inherent in interior firefighting (fig. 17–11).
3. *Some risk is acceptable in a measured and controlled manner.* Whatever the risk that is taken, it must be tempered by the consideration of the unintended consequences of that risk. For example, using a hoseline in the area of a propane tank fire may extinguish the flames issuing from the tank. This increases the potential for an explosion because of

Fig. 17–11. Accountability systems assist in minimizing risk on the fireground by allowing command to keep track of assignments. (Courtesy of Ron Jeffers)

the resultant accumulation of unburned propane, which could be reignited. This measured and controlled risk must be supported by a continuous evaluation and monitoring of that risk to determine the operational tenability of the action. In other words, keep your eye on the operation to determine if it is still worth the risk.

4. *No level of risk is acceptable where there is no potential to save lives or property.* Fully involved buildings are not the place where live victims will be found. Direct intervention, including attempted entry and/or operating inside the collapse zone, is an unacceptable display of recklessness.

5. *Firefighters shall not be committed to interior offensive firefighting operations in abandoned or derelict buildings.* According to the NFPA, during the years 1996–2000, over 18 firefighters per 100,000 incidents were killed in vacant building fires. That was four times more than were killed fighting fires in residential dwellings. Thankfully, from 2001 to 2005, that figure dropped to nine firefighter fatalities per 100,000 vacant building fires. It is still way too many. Although we must always consider the presence of squatters in vacant buildings, this must be decided on a case-by-case basis. Safety support systems such as CADS information and hazardous vacant building marking (HVB) systems will assist responding personnel in minimizing the amount of unknown hazards in the building. Fire personnel must think twice, choosing caution over aggression when confronted with incidents in these dangerous buildings.

Risk assessment

6. *All feasible measures shall be taken to limit or avoid risks through risk assessment by a qualified officer.* All officers and firefighters must make safety their business. This philosophy must permeate the entire department at every level. Unsafe actions and unsafe conditions are absolutely unacceptable.

7. *It is the responsibility of the IC to evaluate the level of risk in every situation.* The IC's decision-making process is only as good as the information being received from operational areas around the fireground by virtue of delegation and decentralization. Informed decisions are safer decisions. To this end, the IC must depend on eyes and ears of chief and company officers.

8. *Risk assessment is a continuous process for the entire duration of the incident.* Risk assessment is basically a size-up followed up by an analysis of the perceived threats to safety, a continuous evaluation of all fireground concerns and activities. It is best for all personnel to consider the fireground extremely hazardous from dispatch to return. Practicing this philosophy will prevent anyone's guard from being down at any time, especially once the fire is under control, one of the most injury- and freelance-prone times on the fireground.

9. *If conditions change and risk increases, change strategy and tactics.* Fire personnel must always be on the alert for changing conditions and be prepared to react to those conditions without hesitation. As stated in the previous rules, reports to command regarding changing conditions should be issued without delay. Command cannot wait to change the strategy. It can always be changed back, but being out of the danger area 5 minutes early, whether it is a building or other area, is better than 5 seconds too late.

10. *No building or property is worth the life of a firefighter.* This is reiterated here just in case you missed it

the first time. It is interesting that the first rule is repeated as the 10th. This is because complacency kills. Experience on the fireground is a great teacher, but it can also be a contributor to tragedy as personnel who have "seen it all" let their guard down and wind up paying for it (or someone else pays for it). No one in this business is tougher than a fire. The best thing to pay on the fireground is attention.

FIREGROUND NOTE

Get 'em in safe
Work 'em safe
Get 'em out safe

Risk management personnel

Risk management and casualty prevention begins well before any fire department personnel even set foot near the incident or on the fireground. One of the best ways for a department to prevent an injury or LODD is to be proactive in its approach to the conditions and actions that lead to these events. Dealing with identified hazards by minimizing the chance of injury is called risk management. Fire departments must have an official, written risk management plan in place according to NFPA 1500. This program must cover all fire department policies and procedures including the following areas:

- Administration
- Facilities
- Training
- Vehicle operations
- Personal protective equipment (PPE)
- Operations at emergency incidents
- Operations at nonemergency incidents

Addressing risk management should be thought of as a cycle that repeats itself over and over as new information is discovered, analyzed, and resolved. It will follow four basic components of the risk management plan:

1. Risk identification
2. Risk evaluation
3. Risk control techniques
4. Risk management monitoring and follow-up (fig. 17–12)

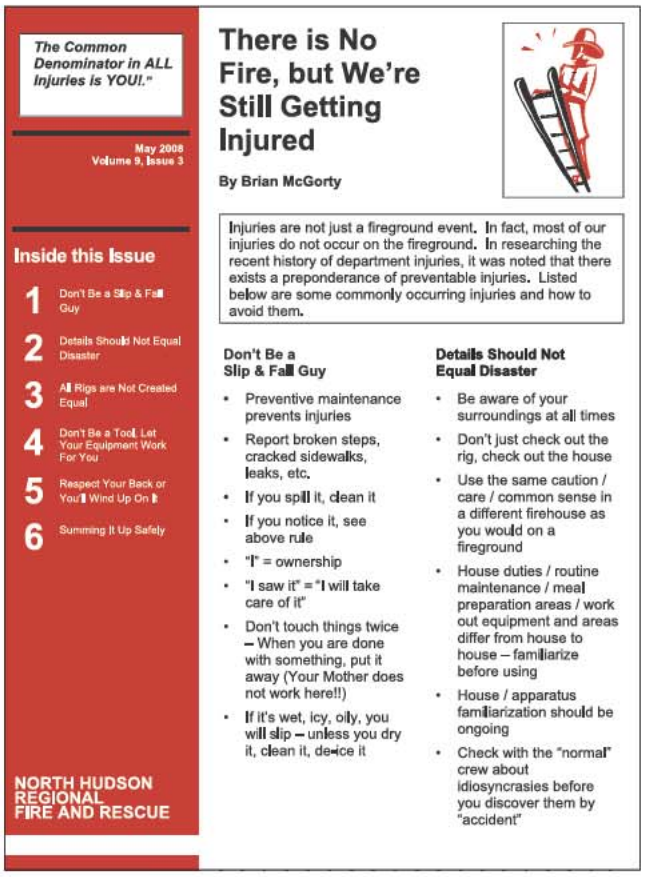
Fig. 17–12. This collapse occurred several hours after fire operations ended. Fire watch was still on scene. The risk was evaluated, and control measures were taken by cordoning off the area, which kept personnel away from the danger. No one was injured.

Department safety committees. A valuable tool the department has in its quest to reduce injuries and fatalities consists of its own members. Who better than the major stakeholders to address and correct safety concerns? To this end, many departments have developed departmental safety committees to address risks and identify methods and controls to inform department members of safety concerns and give members an active voice and participation in addressing these concerns. A departmental safety committee should be represented by department members of all ranks and provide an alternate avenue outside of the chain of command to advocate for safety. The committee should be a mechanism by which concerns can be addressed and fixed, thereby preventing unsafe actions and unsafe conditions. The department chief and the administrative staff must also be active members of this committee. In a career department, members of the collective bargaining unit may also be represented on the committee. The members of the safety committee usually meet once a month and discuss issues, both old and new, that have been brought to their attention. Some areas that may be addressed include PPE, station concerns such as diesel exhaust and maintenance issues, and apparatus concerns. Through cooperative efforts, many problems can be addressed and solved when they are small rather than serious problems, causing injury or worse. This committee can also be effective in bringing about change in a progressive manner

and potentially saving the department millions of dollars in legal fees by prevention of, rather than reaction to, unsafe conditions or actions. The committee works to ensure compliance with a myriad of OSHA and safety regulations and fosters a positive relationship between labor and management. We all benefit when labor and management work together to increase safety.

The committee can also keep department members informed with newsletters and bulletins, reminding members of safety issues and giving important information about current safety concerns, both at the department and at state and federal levels.

One effective information tool used by the North Hudson (NJ) Regional Fire and Rescue is a newsletter focusing on a specific safety topic, either a current trend in the fire service or one that has affected the department recently. The bimonthly newsletter is called *Safety Matters*. It is written by the platoon SOs on a rotating basis. Anyone, however, can submit information for a topic or for inclusion into a specific portion of the newsletter (fig. 17–13).



The Common Denominator in ALL Injuries is YOU!."

May 2008
Volume 9, Issue 3

Inside this Issue

1 Don't Be a Slip & Fall Guy
2 Details Should Not Equal Disaster
3 All Rigs are Not Created Equal
4 Don't Be a Tool. Let Your Equipment Work For You
5 Respect Your Back or You'll Wind Up On It
6 Summing It Up Safely

NORTH HUDSON REGIONAL FIRE AND RESCUE

There is No Fire, but We're Still Getting Injured

By Brian McGorty

Injuries are not just a fireground event. In fact, most of our injuries do not occur on the fireground. In researching the recent history of department injuries, it was noted that there exists a preponderance of preventable injuries. Listed below are some commonly occurring injuries and how to avoid them.

Don't Be a Slip & Fall Guy

- Preventive maintenance prevents injuries
- Report broken steps, cracked sidewalks, leaks, etc.
- If you spill it, clean it
- If you notice it, see above rule
- "I" = ownership
- "I saw it" = "I will take care of it"
- Don't touch things twice – When you are done with something, put it away (Your Mother does not work here!!)
- If it's wet, icy, oily, you will slip – unless you dry it, clean it, de-ice it

Details Should Not Equal Disaster

- Be aware of your surroundings at all times
- Don't just check out the rig, check out the house
- Use the same caution / care / common sense in a different firehouse as you would on a fireground
- House duties / routine maintenance / meal preparation areas / work out equipment and areas differ from house to house – familiarize before using
- House / apparatus familiarization should be ongoing
- Check with the "normal" crew about idiosyncrasies before you discover them by "accident"

Fig. 17–13. Safety always matters.

The fireground scene safety officer. SOs monitor and assess safety hazards and unsafe situations, and develop measures for ensuring personnel safety. SOs have the emergency authority to alter, suspend, or terminate any operation they deem hazardous to the operating personnel. On the fireground, the authority of the SO is on par with the IC. Because the IC has the responsibility for everyone and everything that happens on the fireground, it is critical that the department or the IC assign someone who is reliable, safety conscious, and rich in fireground knowledge. The IC can delegate the authority for the SO to operate, but the IC must retain the responsibility for any actions of the SO.

The department should adopt SOPs that address the duties, responsibilities, and the authority of SOs so that no ambiguity exists regarding the scope of their duties. The scope of these roles is addressed in NFPA 1521, *Standard for Fire Department Safety Officer*. These are outlined in a course called Incident Safety Officer, developed by the National Fire Academy.

Proper deployment of the SO can assist the IC in running a controlled, safe, and informed fireground. The SO should not be shackled to the command post, but rather assigned as the eyes and ears of the IC. Orders and directives that come from the SO carry the weight of the IC, and personnel should be directed to follow them as such. The SO should be mobile, going where the areas of concern are and furnishing reports back to command, either face-to-face or via radio. This concept, sort of a "roving recon," puts an arm of the IC where it is needed most at all times. Basically, the SO becomes another division supervisor, one with the flexibility to check on all areas of the fireground as the need arises (fig. 17–14).

Fig. 17–14. The safety officer should be in full protective clothing and operate as an arm of command, alternating between areas of concern and the command post. (Courtesy of Ron Jeffers)

Many departments have the luxury of a dedicated SO on duty at all times. Others must assign this at the scene. The position may be assigned to a company or a chief officer.

Regardless of who or how the SO is assigned, upon arrival to the scene, the SO reports to the command post to check in with the command. Once checked in, the SO should immediately do a 360° tour of the fireground. After giving a face-to-face report to the command post—or via radio, if something critical arises—the SO begins to move to the areas of most concern to liaison with personnel assigned to that area. This officer provides support from the operational safety point of view and advises as required. Safety reports back to the command post are issued by the SO at regular intervals and are a vital part of command operational evaluation.

All personnel must understand that the role of the SO is not that of a safety cop. The SO should not have to micromanage a fire scene. This means that obvious safety actions, such as wearing PPE properly and operating within the parameters set forth by department SOPs, should not have to be addressed on the fireground. Disciplined officers supervising disciplined firefighters will make the SO's job easier, which in turn enables the SO to focus on greater safety issues, making the fireground an overall safer place. In contrast, how could an SO, who had to spend most of the time telling personnel to get dressed properly, watch for signs of building failure or other dangerous conditions? It would be a crime if the SO was telling a company to put their masks on while the building was collapsing on personnel in another area of the fireground.

In technical rescue situations such as confined space, trench rescue, and high-angle incidents—as well as at hazardous materials incidents—the resources designed to handle these exotic incidents usually entail an SO being on hand who has an equal level of expertise in the area of concern as those who are being requested to handle mitigation. In this instance, there would be assigned a hazardous materials safety officer (HMSO) or a technical rescue safety officer (TRSO), depending on the incident. This specialized SO oversees the safety of the immediate incident hot zone, while the department SO usually addresses the perimeter and overall scene safety. Just as it is unsafe for personnel, it is not a good idea to assign SOs to an operation that they have not been trained for. Often in these cases, the mark of the true professional is the ability to recognize that the incident is best handled by someone else.

The accountability officer. The accountability officer serves to coordinate the flow of personnel into and out of the fire area with the IC. The accountability officer should use a command board to track the location and assignments of resources. This officer should also carry a riding list of all personnel on duty for a career department, or of all personnel on scene in a volunteer department. To best do the job, the accountability officer should be at the command post. Mobile human command boards do not work on the fireground (fig. 17–15).

Further responsibilities of the accountability officer are to continually monitor the radio and to liaison with command about deployment and tactical reserve. A headset is helpful to use in these duties. Some departments also give the duty of the personnel accountability report (PAR) to the accountability officer. Others give that duty to dispatch and require that the accountability officer use the roll call to update the command board and ensure that companies are where they should be.

To support the accountability officer, the department should have a strong personnel accountability SOP in place and enforce it at all incidents. Operational safety starts with accountability, and it is everyone's responsibility.

Fig. 17–15. The accountability officer should use a command board to track movement and assignment of companies. A headset will assist in the distraction-free monitoring of communications. (Courtesy of Ron Jeffers)

Risk management programs

Fireground rehabilitation. FFI 5.1.1 Firefighter rehabilitation is vital to the well-being of personnel as well as the continuity of the operation. Policies need to be established and enforced to rotate crews from IDLH areas. Firefighters need to be properly rehydrated and replenish their caloric intake, have their turnout gear removed, have their vital signs monitored, and either be returned to service or removed from service. Improper rehabilitation not only affects air management but also leads to cardiac events, which are one of the top killers of the members of the American fire service. Fire departments must ensure that when members are removed from the IDLH environment, they report to fireground rehab and are properly cared for, as just described.

A rehab division with supplies appropriate for the season should be present at every major fire, and should be at all fires when the weather is extreme. All apparatus should carry water coolers so that personnel can constantly rehydrate themselves during an incident, no matter what season it is or how minor the incident. The water should be changed every day. In addition, ICs must see to it that shelter is provided in the extremes of weather. A warm shelter in the winter where firefighters can change into dry clothes is a necessity. Firefighters should be urged during all seasons to carry extra clothes and especially gloves on the apparatus. In cold weather, while the firefight is continuing, one tends not to feel the cold. But after the fire is knocked down and it is time to pick up equipment, or when faced with a long, drawn-out defensive battle, cold-related injury can occur, especially if the firefighter is wet. In the summer months, provide shade and fans for relief. Large fan-driven misters are excellent for cooling down firefighters during the battle. Cooling towels worn around the neck also provide welcome relief from the heat. ICs who do not provide for their firefighters are not meeting the most important fireground priority, that of providing for firefighter safety (figs. 17–16, 17–17, and 17–18).

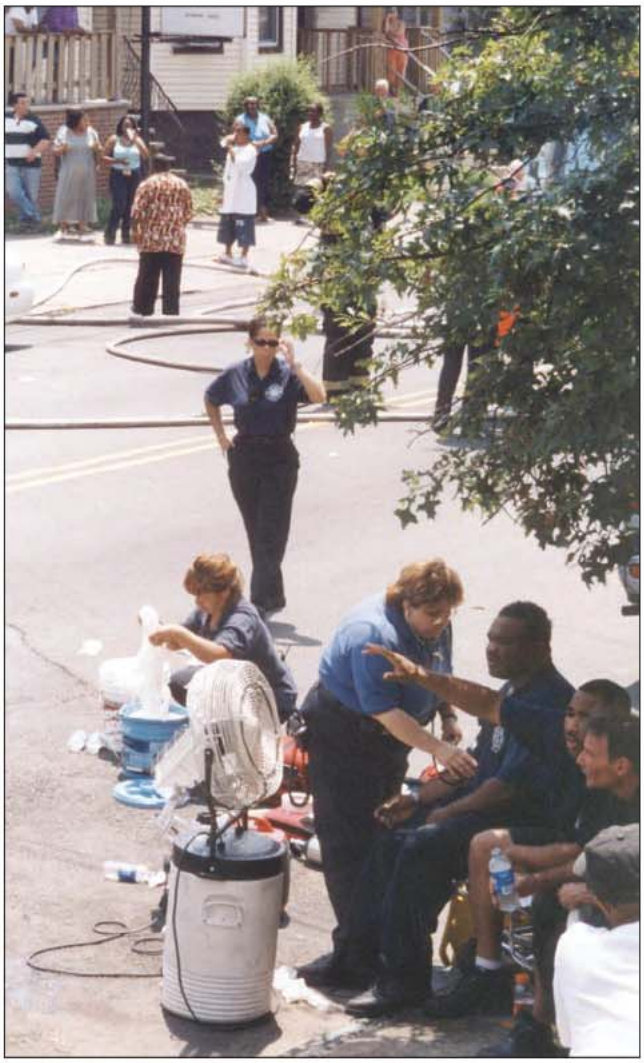


Fig. 17–16. Rehabilitation is a critical element of the fireground safety profile of the incident. Rehab equipment appropriate for the season should be available. (Courtesy of Ron Jeffers)

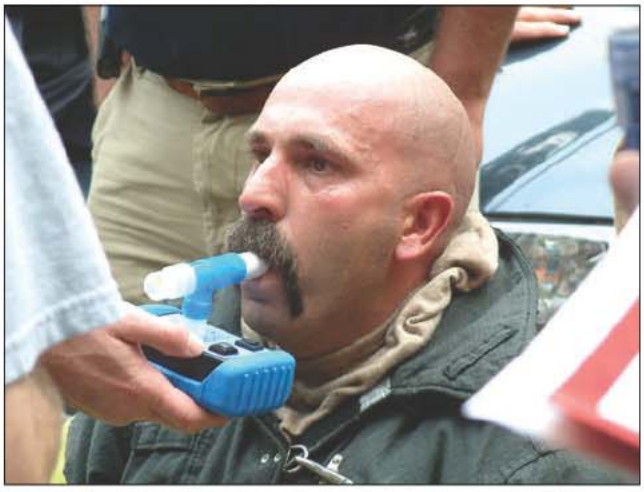


Fig. 17–17. Firefighters should be evaluated for exposure to carbon monoxide as part of the rehabilitation process. (Courtesy of Nancy Ricci)

Fig. 17–18. Cooling towels used at a fire scene during a hot day. (Courtesy of Tim Olk)

On-deck air management. On-deck air management refers to having on hand properly staffed companies ready to relieve crews that are nearing their one-fourth reserve air and meeting them inside the structure to give the exiting crews ample time to remove themselves. Many fire departments are utilizing the on-deck system developed by the Phoenix, AZ, Fire Department. This allows the operations section to monitor air consumption levels of the crews electronically. As the crew nears their one-fourth reserve air level, an on-deck crew is sent in to relieve them. This system allows them to exit the IDLH before they begin to consume their reserve air. Once outside the structure, they get a bottle change and are put back on deck. Based on factors such as available personnel, weather conditions, and fireground operational status, when a crew has used two bottles of air, they are sent to rehab for medical evaluation, hydration, caloric intake, and cooling or heating as needed. If conditions just stated limit working time, one bottle may be the limit before being assigned to rehab. Through personnel management, the initial attack crews once released from the rehabilitation division are returned to quarters to clean up, change clothes, and be put back into service. Refer to chapter 10 for more information on air management.

Fire department wellness programs. Wellness programs improve the overall health and well-being of our firefighters. The better we take care of ourselves, the better we can take care of each other and the public we are sworn to serve. To this end, firefighters should take advantage of every opportunity to incorporate and bolster their own health and fitness, both physically and mentally. Wellness programs include annual physicals; fitness programs including dietary, flexibility, and exercise programs; rehabilitation of injuries; critical incident stress management (CISM) programs; and employee assistance programs (EAPs). The most important part of any department-sponsored program is willing participation by its members and the support of the department administration.

Fire department physicals. A firefighter first entering the service should have a physical used as a baseline. Physicals should follow on an annual basis after that. Annual physicals are of the utmost importance to firefighters. When one considers the frequency with which cardiac sudden death takes the lives of firefighters, it is vital that this be a part of a comprehensive fitness and wellness program. We can relate fire prevention and fire suppression to illness and injury prevention. Our main job is to prevent fires. Only when that prevention fails do we need to suppress fires. In regard to health, we should focus on illness and injury prevention as an alternative to medical intervention once our poor habits have caused a bodily malfunction. To this end, many departments offer incentives for firefighters who pass their annual physicals, and still more offer comprehensive physical checkups to firefighters free of charge. Stress tests, blood testing for cholesterol levels and prostate screening, lung capacity testing, calcium screening to determine the extent of arterial plaque buildup, and electrocardiograms (EKGs) are all ways that firefighters can determine disease potential in a proactive manner and thus begin to take steps to prevent serious illness or injury.

In New Jersey, there is a program called "A Gift from Captain Buscio," which has been endorsed by the unions and the departments alike. It was started by the wife of a captain from Jersey City who died at a very young age of a cardiac sudden death. The program, which is offered to firefighters across the state, consists of a strictly confidential, comprehensive medical evaluation with no out-of-pocket expense to firefighters. The program is also offered to immediate family members as well. All firefighters must take advantage of opportunities regarding fitness and medical evaluations, not just for themselves, but for the loved ones they might leave behind (fig. 17–19).

FIREGROUND NOTE

Firefighters should focus on illness and injury prevention as an alternative to medical intervention.

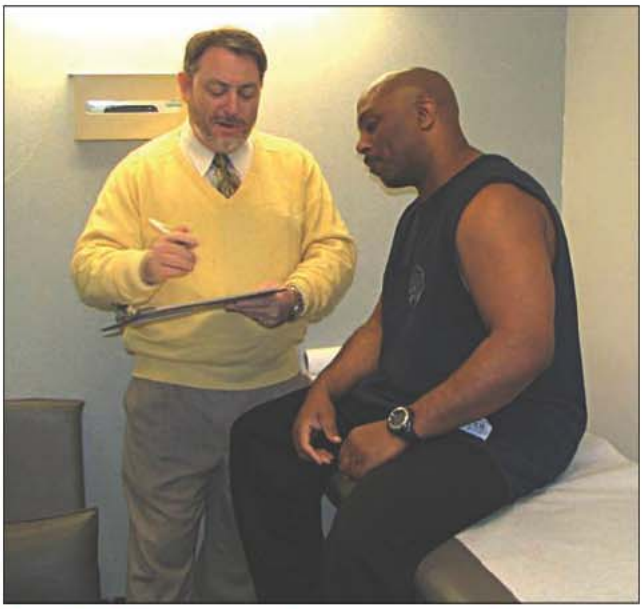


Fig. 17–19. Medical evaluations provide a baseline in case of a future work-related illness or injury. (Courtesy of Christine Ricci)

Firefighter fitness. Firefighting is one of the most demanding occupations in the world, both physically and mentally. Firefighters in top physical condition can perform their jobs with more efficiency and less risk of injury than those firefighters who do not regularly practice cardiovascular and strength/endurance/flexibility conditioning. At a moment's notice, firefighters can be thrust into a veritable pressure cooker of stress, strength-depleting manual labor, and split-second, life-or-death situations. These demands on the body and mind require that firefighters be in top physical shape. This includes not only cardiovascular and strength/endurance conditioning but also a major emphasis on flexibility conditioning. Since sprains and strains are the most predominant injury in the fire service, stretching should be part of the pre-and postexercise routine. In addition, a healthy diet must also be part of the regimen for all firefighters (fig. 17–20).

Fig. 17–20. Firefighters must be prepared both mentally and physically for the many challenges of the profession. This bus versus light rail train created additional hazards such as electricity, unstable vehicles, jagged metal, multiple injuries, and bloodborne pathogens. (Courtesy of Ron Jeffers)

Departments should have exercise rooms and encourage personnel to use them during the course of the day. In fact, many departments are mandating exercise and setting aside time so that firefighters can engage in some sort of aerobic exercise, as well as strength/endurance conditioning as part of the daily duties. A note of caution: When in the station's exercise room, never work out alone. Be sure to use a spotter when lifting weights, and consult a certified trainer before starting a workout program. Remember to inspect all equipment beforehand, and after use, put all equipment where it belongs to prevent a trip hazard. Clean the equipment with an approved disinfectant. Fire personnel should also be encouraged to prepare healthy meals at the station. In addition, many departments consult with or employ nutritionists, health specialists, and physical trainers to assist their members in developing and maintaining physical fitness and dietary regimens. This is one way for a department to protect and support its greatest resource: its members.

Injury rehabilitation. For years, many firefighters have felt forgotten when they received an injury. Today, many departments have comprehensive programs to aid the firefighters in their return to work. Firefighters who are not ready but return to duty anyway not only endanger themselves but also place their team and the citizens at risk. The Injury Rehabilitation Initiative of New Haven, CT, focuses on three components:

- Clinical pathway training: This training takes doctors and physical therapists through a fire department orientation period that includes riding

with the fire department and participating in a full day of hands-on training.

- Physical therapy that is geared to our essential job functions.
- Practical evolutions that allow the firefighter to build strength and confidence.

Departments have found that these programs reduce secondary injury and reduce the number of lost days from work (fig. 17–21).

Fig. 17–21. An occupational therapist guides a firefighter through a practical evolution so that he can aid the doctor in making better return-to-duty decisions. (Courtesy of Mike Cianciulli)

Critical incident stress management (CISM). Behavioral health is just as important as mental and physical health. All fire department personnel, at some point in their career, will be exposed to the more gruesome aspects of the profession, and most, if not all, will experience some effects of critical incident stress. As firefighters, you must be prepared to witness and participate in emotionally disturbing events. Although you may be affected by these events, you must keep your composure and conduct yourself professionally on scene. The severity of such effects will vary from person to person and from event to event. Some people will not be affected by a certain event, while others will be. Sometimes a later incident may trigger a reaction that was buried after a traumatic event months earlier. There is no abnormal reaction (fig. 17–22).

Fig. 17–22. The events of September 11, 2001, exposed not only firefighters to critical incident stress but also the entire nation, who were witnesses to the tragic events that day. Countless emergency responders and their families have sought counseling as a result of this incident. (Courtesy of Ron Jeffers)

Critical incident stress evolves from normal reactions to abnormal situations and events. When the effects of these reactions begin to affect the individual's life to the point where lifestyle, family and peer relationships, and job performance are affected, intervention in the form of peer-focused counseling and possibly further professional counseling may be necessary. Symptoms of critical incident stress can vary in not only severity and scope but also in time. Sometimes, symptoms may not surface until weeks or months after the traumatic event occurred.

Although the effects of critical incident stress cannot be prevented completely, they can be reduced by the establishment and maintenance of a department support mechanism. Written policies should be in place, and mental health care facilities should be partnered with to provide the best stress management program for department members. Department members, especially supervisory personnel, must be trained in the recognition of symptoms of critical incident stress.

Some of the signs members should be on the alert for include, but are not limited to: head and body ache and tremors, difficulty making decisions and concentrating, memory loss (especially of the incident), anxiety, guilt, fear, feelings of abandonment and isolation, emotional

outbursts, withdrawal from others, and any significant change in behavior.

Some departments have their own CISM team, and others rely on hospital-sponsored teams or regional teams. In several states, there are teams that respond based on which geographical region the incident occurred in. To best use their services, CISM teams should be requested as soon as the potential for exposure to a critical incident is suspected.

CISM teams usually consist of health care professionals, fire personnel from different departments (peer support), and other support personnel trained in addressing the concerns of those in need. On the fire end of it, many times the members of the team are fire personnel who have been through traumatic events and are now taking an active role assisting others in need. Working with peers who have "been through it" and can empathize with those who are experiencing critical incident stress offers great benefits in the way of support and reduction of the effects brought on by the incident. Contact information for these teams should be kept available and current. Dispatch may be required, at the request of the IC or designee, to request the CISM team while personnel are still at the scene of an incident.

CISM, in the initial stages, usually takes the form of a defusing or debriefing. Especially at incidents where an emotionally charged environment exists, it is best, if personnel permit, to relieve all on-scene companies and send them to a designated CISM area away from the scene. Medical personnel should also be available in this area. Debriefings are aimed at getting people to talk, although speaking is not mandatory. Some people feel better just listening and identifying with other members' feelings. Intervention by the team is focused on both listening and offering helpful ways in which members can relieve the stress they are experiencing and get on with their lives. There may also be a further and more comprehensive debriefing a few days later, sometimes on the next shift, where all members are invited to participate and continue the process of discussion and healing. It is a very effective process. If further counseling is required, it is usually channeled through the CISM team and network.

Employee assistance programs. Employee assistance programs (EAPs) exist for both the physical and mental welfare of firefighters. They exist to help a department member and/or family to get through troubling times and returning their lives to normalcy. Departments should have written policies outlining the parameters of this assistance as well as the steps involved in accessing and utilizing the available programs. Departments need not have an exclusive program available, but must provide access to a program. Some larger departments have a fully staffed employee assistance division, while most other departments offer this service through their health care provider. The programs offered by EAPs encompass a wide variety of help, including smoking cessation programs, weight control programs, family and marital counseling, substance abuse programs, and stress counseling programs, to name a few. Some also offer financial counseling and legal counseling, such as living will documentation. There may also be affiliations with larger, well-known national counseling groups such as Narcotics and Alcoholics Anonymous, which have vast resources in confronting and conquering both mental and physical problems. These programs are confidential and are usually offered to not only the employee, but also the members of the immediate family.

There may be times, especially in the case of substance abuse, where completion of a program through the EAP is the criterion to retain the job of firefighter. Absent that condition, neither the department nor its supervisors can intervene in the private lives of their members unless job performance has been affected. They can, however, if the members allow, offer counseling as a way to assist the members in addressing a troublesome concern in their lives.

Personal risk management

SKILL DRILL

Personal responsibility. The key to the safety mind-set starts with everyday actions and attitude toward work, self, and others. You should embark on this path with the goal of always doing a little more than required. This goes for housework, equipment maintenance, and fireground operations. Laziness and complacency contribute to injuries in the firehouse and on the fireground.

Firehouse and personal safety. Many preventable injures can occur at the stations. The remedy for most unsafe conditions is proper and diligent house work. Make sure that paths to apparatus are clear and wet floors are clearly marked. When cooking, ensure the stove is turned off before responding to an alarm. Fire poles should be safeguarded, and sliding a pole when wet is not recommended. Cleaning supplies should be properly marked and stored in a designated area. Material safety data sheets (MSDS) should be kept in a highly visible place and updated whenever a potential

hazardous product is brought into the station or taken out (figs. 17–23 and 17–24).

Fig. 17–23. This right-to-know station on the apparatus floor is clearly marked MSDS.

Fig. 17–24. Safety postings throughout the station serve as constant reminders to be vigilant. (Courtesy of Jim Duffy)

FFI 5.3.2 Horseplay can also lead to injuries. Although jokes are part of the fire service, there are several lines that must never be crossed. Any practical joke that contains references to race, sex, or religion, or that involves any safety equipment, has no place in the fire service. These inappropriate actions can lead to a breakdown in the team and have a direct impact on safety as well as invite litigation. Treat others as you would like to be treated. You are now part of a family that must work together (fig. 17–25).

Fig. 17–25. The kitchen table is a great place to learn, and it brings the company closer together. (Courtesy of Nick Ricci)

Responding and returning safety. Responding to and returning from an alarm is the second leading cause of firefighter LODD in the United States. It is also a leading cause of firefighter injury. Driver safety SOPs, seat belt policies, and annual driver evaluations are some of the tools that can lower this figure. Probably the biggest reason the casualty rate is so high is that the rules are not enforced. Also, if a company that arrives before us transmits a report of a working fire, we tend to want to speed the response up. This is counterproductive and contrary to safe response actions. In almost all cases, the first thing that must be changed is our attitude. Once that is on track, we can begin to address these totally preventable tragedies. The issue to be aware of is that if we don't get there safely, we can't help anyone (fig. 17–26).

Fig. 17–26. Response to an obvious working fire is not justification to jeopardize the safety of personnel and civilians alike by driving in an unsafe manner. Arrive safely first, then address the situation. (Courtesy of Ron Jeffers)

Maintenance. Most day-to-day operations will work toward the goal of ensuring operational readiness. When the alarm comes in, there is no time to find out that something doesn't work. Preventive maintenance

programs should be incorporated into every firefighter's day. They can be broken down into three sections:

- Apparatus
- Hand tools
- Power tools

Firefighters are often charged with assisting the driver in completing the morning apparatus checks. In volunteer departments, apparatus checks are generally done on a weekly basis. This will include the Department of Motor Vehicles pre-trip. A pre-trip is a systematical check of the vehicle inside and out. Too many firefighters have paid with the lives so we could learn this lesson. Brakes, fluids, gauges, and tires are just a few of the critical items that must be inspected. The pre-trip inspection should be logged in the company log book (fig. 17–27).

Fig. 17–27. A firefighter conducts a pre-trip inspection at the start of his shift to ensure the safety of his crew.

These added responsibilities will be in addition to your position checks. Often, riding assignments will direct what equipment a firefighter is responsible to check. This firefighter must go over the inventory and conduct an in-depth inspection of the tools assigned to that position. If you are assigned on an engine company to the nozzle, your responsibility may be to take the nozzles off, check for debris and any other abnormality that may affect proper operation, and make sure there is water in the booster tank. On author Frank Ricci's first-time assignment to the nozzle ("pipe"), he took off the nozzle to find parts of a plastic bag lodged in the ball valve. Know where all the equipment is located on each apparatus and verify that all is in working order. External equipment must be securely mounted.

When checking hand tools, make sure they are clear of rust, properly marked, and free of damage. Power tools should be started regularly and run till the motor heats up. For a saw, this is usually 3–5 minutes. This will run the fuel through the system. Make sure that blades, chains, and disks are free of damage. If a chain is missing three teeth in a row or a total of five teeth, notify the officer and take the chain out of service. The chain should be sharp and be under enough tension so that if you lifted it out of the track with two fingers it should snap right back into place.

Having a piece of equipment fail on the fireground often leads to unnecessary delays. Because time is a constant factor, safety precautions may tend to be overlooked. If a problem is suspected with your tools or apparatus, it is your responsibility to report it to the driver and officer. There are no time-outs or do-overs on the fireground. The only way we can be sure that our apparatus and equipment will perform properly is by developing good habits and conducting proper maintenance.

Seat belts. Fire departments must have SOPs in place for the use of seat belts for each occupant of any department vehicle. Seat belts must be fastened at all times. It is the responsibility of both the apparatus operator and officer, or senior firefighter if no officer is assigned, to ensure that all personnel are safely on board and belted before the apparatus begins to move. It is also a responsibility of each and every individual on the apparatus.

Firefighters should don the proper level of PPE for the response prior to the vehicle responding. Drivers should be permitted to wear PPE that does not restrict their driving. At no time should personnel be allowed to remove their seat belts to don PPE or SCBA. If they cannot properly sit in their seats with their SCBA on and use their seat belts, they must wait until they arrive and remove their seat belts to don the SCBA.

Firefighters not riding in enclosed cabs should wear head, eye, and hearing protection. In addition, a ManSaver™ safety bar should be used in conjunction with a seat belt. Tail board riding must be prohibited at all times. In this day and age, it should not even have to be mentioned.

Mounting and dismounting apparatus. FFI 5.3.2
Firefighters should always use the handrails and steps while mounting and dismounting the apparatus. Use of handrails reduces the chances of falling or slipping. Firefighters should always try to maintain three points of contact with the apparatus. They should face the apparatus when mounting or dismounting. This allows a safe check of traffic or hazards in each direction. It is recommended that if the apparatus comes into contact with live electrical lines, the firefighter should stay on the

apparatus until the power company removes the power. In an extreme case where you would have to dismount from the apparatus, you must make sure to jump clear of the apparatus and not touch it and the ground at the same time to avoid electrocution.

Firefighters should also not stand or attempt to dismount the apparatus while the vehicle is still in motion, including when the vehicle arrives at the emergency scene. Trying to save a few seconds by dismounting as the vehicle pulls up is extremely dangerous. One slip can result in a fall that lands you in the path of the rear tires. The best way to ensure that this does not happen is to wait until the apparatus has stopped before unbuckling your seat belt.

Safety and the Emergency Scene

SKILL DRILL

Traffic and scene control

FFI 5.3.3 One of the biggest dangers firefighters will be exposed to occurs in the streets in which they respond and operate. Firefighters have been killed or severely injured when stepping off apparatus at scenes where traffic has not been controlled. Firefighters have been struck by civilian vehicles, police and EMS vehicles, and even other fire apparatus. Night is a particularly dangerous time. Hit-and-run accidents, civilian vehicles crashing into stopped fire apparatus, and (even more prevalent, though almost never reported) near-misses all take their toll on firefighter well-being, the ability of apparatus to respond, and the general feeling of security when operating. Firefighters must be vigilant at all times and take early preventive actions to safeguard themselves and other firefighters on the scene from becoming victims. Traffic scene control can be accomplished in many ways by utilizing any and all of the following:

- **Local or state police** should block roads and secure the fireground perimeter.
- **Volunteer fire department fire police** (typically older, retired members who direct traffic at a fire scene) can take proactive steps to assist in establishing a perimeter.
- **Fire department personnel** can perform traffic control duties if no police or fire police are on the scene, until police agencies arrive.
- **Traffic cones** should be carried by all apparatus to identify perimeters.
- **Road flares** can be used at night to alert motorists, but should be used judiciously, because they present an ignition source that might not be desirable at some incidents.
- **Fire apparatus** should be positioned to block traffic, especially for highway incidents.
- **Traffic-diverting warning lights** on apparatus should be turned on at all times when companies are operating where traffic is still moving past.
- **Reflective trim on apparatus** assists in making apparatus more visible at night or in visibility-obscured areas.
- **Reflective trim on turnout gear** helps denote presence of emergency responders, but reflective trim will only work if it is kept clean and serviceable, not worn out.
- **Reflective Department of Transportation (DOT) Class II vests** can be worn in addition to or in lieu of (if not in danger zone) turnout gear.

The bottom line is that if motorists, including other apparatus drivers, can't see you, they can't stop in time or get out of the way. All illuminating devices and equipment should be used as a first action when arriving at incidents at night or when visibility is obscured or expected to be obscured (fig. 17–28).

Fig. 17–28. Safety vests provide optimal visibility for oncoming traffic when working on the road. (Courtesy of firegroundimages.com)

Roadway emergencies and traffic hazards. Roadway emergencies include car fires, motor vehicle accidents, and hazardous materials responses. These incidents pose many potential problems for responders, including stopped traffic, which can cause a delay in response. When confronted with this concern, compa-

nies should relay their predicament to dispatch. They can suggest alternative routes for other responding companies and advise dispatch to alert other responding companies to avoid congested area. Additional concerns involve access problems and long distances between exits and turnarounds or jug-handles. In these cases, if communications are timely, companies can be directed into an emergency scene in the most efficient manner, avoiding traffic tie-ups and response delays. Failure to communicate properly can cause a delay in scene arrival and loss of operational coordination.

There may be times, especially on a highway, where companies may need to respond against normal traffic flow. This is not recommended unless communications are properly transmitted and the police are on the scene to prevent accidents. This operation must be strictly controlled.

When arriving, fire apparatus must slow down to walking speed and turn off audible warning devices. If backing in, always use personnel as guides. Never back up without personnel in the street guiding you. This rule goes for return to quarters as well. Apparatus illumination and warning lights should stay on to warn others that an emergency operation is in progress.

When on scene, especially an accident scene on a highway, it is critical that at least one lane be closed in addition to the lane the accident is in. This will provide a buffer for personnel operating. This practice is also recommended at other incidents such as structure fires, provided it does not block the movement of apparatus into and out of the scene. For the purposes of safety, additional lanes can be closed. If this is the case, it would be wise to coordinate with local or state police agencies or highway personnel.

For personnel safety, it is a good idea, especially if police are not yet on scene, to use apparatus as a shield from oncoming traffic. Place the apparatus between the scene and the normal flow of traffic. Do not get between apparatus and traffic; firefighters have had their turnout gear snagged by vehicles that passed too close and then dragged them. It is best to place apparatus at a 45° angle with the hosebed in the area furthest from the traffic. This is especially important when packing hose. This is usually the time when the police agencies want to reopen as many traffic lanes as possible. It is critical to maintain this one-lane buffer during this time until you are ready to leave the scene.

When leaving the scene, turn off warning lights so as not to confuse civilian motorists who may think you are on a response. This can cause panic on their part, irrational actions, and further accidents (fig. 17–29).

Fig . 17–29. Apparatus blocking an accident scene with its wheels turned away from personnel working on scene. (Courtesy of firegroundimages.com)

Traffic control devices. Section 61 of the 2003 edition of the Federal Highway Administration's *Manual On Uniform Traffic Control Devices* (MUTCD) addresses the control of traffic through incident management areas. The guidelines in MUTCD are federal laws, not standards, and thus are required to be followed. They apply to all areas on or near roadways that firefighters will encounter. These laws were established to improve responder safety at incident scenes, keep traffic moving as smoothly as possible, and prevent the occurrence of secondary crashes. There are five main points of section 61 in MUTCD.

Section 1 contains general clauses outlining requirements for interagency coordination, training, visibility, estimating incident scope and length, ETC sign colors, and use of initial devices such as road flares and cones.

Section 2 addresses major traffic incidents. These are incidents whose duration will exceed 2 hours. If the incident will exceed 24 hours, full MUTCD work zone requirements will need to be implemented.

Section 3 covers intermediate traffic incidents. These incidents range from 30 minutes to 2 hours in duration. They typically require lane closures. Typical vehicle collisions with injuries fall into this category.

Section 4 covers minor traffic incidents. These incidents are those whose duration is less than 30 minutes. Simple actions such as the use of initial control devices will be sufficient to handle the incident. Minor non-injury collisions and stalled vehicles are examples of minor traffic incidents.

Section 5 covers use of emergency vehicle lighting and provides direction on appropriate types of lighting for use at nighttime roadway incidents.

Size-up at a roadway incident scene. Fire responders must size up the scope and severity of the incident

within 15 minutes of scene arrival. First responders should determine:

- The magnitude of the incident (number of vehicles, injuries, etc.)
- Proper apparatus placement
- The estimated duration that roadway will be blocked or affected
- The expected length of the vehicle **queue** (a backup line of vehicles) that will occur as a result of the incident

FIREGROUND NOTE

Regarding traffic tie-ups at the incident scene, as far as the fire department is concerned, the overriding concern is safety, not congestion.

For every 1 minute a lane of traffic is blocked, 4 minutes of backup can occur. Regarding traffic tie-ups at the incident scene, as far as the fire department is concerned, the overriding issue is safety, not congestion.

Traffic incident management area (TIMA). According to MUTCD, the traffic incident management area (TIMA) includes four main parts:

1. The advance warning area that tells motorists of the situation ahead
2. The transition area where lane changes or closures are made
3. The activity area where responders are operating
4. The incident termination area where normal flow of traffic resumes

The distances for the advance warning and transition areas will differ depending on the speed limit in the area of the incident. Higher speed limit areas will require longer advance warning and transition areas. The MUTCD contains charts that detail the appropriate length based on the speed limit in the area.

Emergency vehicle lighting at roadway incident scenes. The use of emergency lighting at roadway incidents is essential. This lighting is intended for the safety of both responders and civilian motorists. Emergency lighting provides warning but no traffic control, and it may be confusing or blinding to motorists, especially at night.

According to MUTCD, emergency lighting may be reduced if proper emergency traffic control procedures are being used. It is safer to divert traffic with advance placement of signs and cones rather than relying on warning lights and vehicles alone. Reduce lighting at the scene as much as possible, without compromising the safety of responders.

Responders should turn off all forward lighting, such as headlights that might blind on-coming drivers. Many departments turn off all warning lights, except for selected amber lights, especially at night. Some apparatus are designed so that all lights except amber turn off when the apparatus is parked. An override switch will allow all lights to be turned off when the apparatus is parked. The override switch also allows all lights to be turned on if necessary.

Apparatus operators are urged to use caution in the deployment of floodlights at nighttime roadway scenes. Floodlights must be raised and deployed in a manner so as not to blind motorists driving past the incident scene. When floodlights are used, they must be raised to a height that allows the light to be diverted down onto the scene.

Protective clothing for roadway incidents. The reflective trim that is found on most firefighter turnout clothing is insufficient for providing adequate safety on the roadway. MUTCD states that reflective trim must be supplemented with additional garments that make the firefighter more visible. SOPs must clearly dictate that all personnel wear appropriate reflective vests when operating on the roadway. All personnel must police themselves and their fellow firefighters to ensure that all are following this policy.

Reflective vests must be used to increase worker visibility regardless of the use of turnout gear. The vests must have both retroreflective and florescent properties. **Retroreflective** material returns most of the light from the light source back to the observer. Florescent material absorbs ultraviolet light of a certain wavelength and regenerates it into visual energy. ANSI/ISEA Standard 107–19999, *American National Standard for High Visibility Safety Apparel*, specifies the minimum amount of fabric and reflective materials to be placed onto safety garments that are worn by workers near vehicular traffic.

Lighting the incident scene

SKILL DRILL

Many emergency incidents require emergency power or lighting. If the incident location has poor lighting or the incident happens in the dark, firefighters must be aware of and have the knowledge to properly set up and use the required equipment to light the emergency scene. Lighting is often brought into a building after the fire has been knocked down. The key to lighting is to make sure all areas are covered, including lighting specific hazards both inside and outside the building.

Power plants. Fire apparatus and other emergency service vehicles utilize several different methods of power generation, including inverters and generators.

Inverters. An inverter is a device that converts the vehicle's 12 or 24 volt DC (VDC) current into 110 or 220 volt AC (VAC) current. Inverters are usually used when small amounts of power are needed. These systems are advantageous for fuel consumption and initial cost, but the amount of power they can produce is very limited.

Generators. Generators are the most common type of power source used to provide emergency power. These systems can be either vehicle mounted or portable equipment.

Portable generators. Portable generators are usually powered by gasoline or diesel fuel (fig. 17–30). They typically have a power output of 110 or 220 V. Smaller systems can be carried by small groups of firefighters, whereas larger units are usually equipped with wheels and handles to transport them. A portable system is essential for areas that a fixed system on a vehicle cannot access. The disadvantage of a portable system is the limited power that can be produced by the unit.

Fig. 17–30. A gas powered portable generator. (Courtesy of Lou Tibor)

Vehicle-mounted. Vehicle-mounted generator systems usually provide greater power capacity than the portable units. Vehicle-mounted units can be used to power vehicle-mounted lighting equipment along with providing outlets for portable lighting, power cords, or electrical powered equipment. The vehicle-mounted systems can be powered by any of the following:

- Gasoline
- Diesel fuel
- Propane
- Hydraulic oil
- Power takeoff (PTO) systems

These systems have power outlets of 100 or 220 V with capabilities up to 60 kilowatts (kW). Some vehicle-mounted systems are very noisy and require the vehicle's motor to be running to power them. This can cause noise pollution near the apparatus.

Lighting equipment. Lighting equipment falls into two categories: portable and fixed.

Portable lights. Portable lights are used at night or dark emergency scenes to provide a safe working environment (fig. 17–31). Adequate interior and exterior lighting makes fireground operations safer for everyone involved. Portable lighting is important to illuminate the incident scene for investigation as well as providing visibility for salvage and overhaul. Apparatus floodlights and light towers provide visibility for exterior operations. For the interior, portable lights allow firefighters visibility to enter and exit the structure safely, as well as perform overhaul operations.

FFI 5.3.17 These lights are constructed in many different ways, and they can range from 500 to 1,500 W. These portable lights can be supplied by either a fixed-vehicle or portable power plant. They are usually attached to a power cord. Portable lighting can be set up as string lights nailed to walls or other supports. Some portable lights are mounted on tripods or telescoping poles. For centralized lighting, an A-frame ladder can set up in the center of a room as a tripod to mount portable lighting. Try not to string lights along the floor if at all possible, so that firefighters will not step on fixtures or trip over lighting cords.

When using portable lighting equipment and power generators on the scene, remember the following safety practices:

- Keep electrical equipment and power cords dry, and position off the ground or away from areas of standing water.
- Inspect electrical cords for damage or fraying before connecting to a power source. Re-inspect cords and equipment for damage after use.
- Keep power cord, string lights, and other equipment out of traffic paths inside the structure or around the fire scene.
- Make sure portable generators and other electrical equipment are properly grounded with ground fault indicators.
- Always make sure the amp requirements for lighting devices match the rated amps of the generator and power lines or junction boxes.

Generators create carbon monoxide and should only be used in well-ventilated areas.

Fig. 17–31. A portable light. (Courtesy of Ken Nolan)

Fixed lights. Fixed lights are mounted permanently on the apparatus (fig. 17–32). They can provide immediate lighting around and under the vehicle. They are wired so that they may be turned on by a breaker panel or switches in the cab of the apparatus. When it is dark out, these lights should be switched on as soon as the company arrives on scene. If a generator is used to power the lights that are operated by the cab switches, they should be turned on during the response. On many apparatus, they too are usually operated from a switch inside the cab.

Another popular configuration is the fold-up or telescoping light mast. This device can contain multiple banks of lights. The system of lights can be rotated and tilted up and down to get the desired effect. A typical bank of lights ranges from 500 to 3,000 watts per light. These systems, along with other anticipated electrical loads, are matched to the vehicle's fixed generator capacity.

FIREGROUND NOTE

Overhead lighting works well for major incidents. Light mast and tower ladders will make it look like daytime.

Fig. 17–32. A fixed light on an apparatus

Auxiliary electrical equipment. Auxiliary electrical equipment constitutes many different devices that can be used in conjunction with power cords, lights, and generation systems to help provide emergency power. This equipment should meet NFPA 70E, *Standard for Electrical Safety Requirements for Employee Work Places.*

Electrical cords. Electrical cords can be rated at 15, 20, or 25 amps, and they come in different lengths. Most fire departments will carry a combination of electrical cords

that terminate with twist lock and conventional plugs. This allows a department to have multiple options.

Twist locks and regular adaptors. Most fire department electrical cords have either twist-lock connectors or standard two- prong and ground plug male and female connections (figs. 17–33, 17–34, and 17–35). Twist-lock connectors require the same amperage rating for the male and female connections. You cannot mate a 15-amp connector with a 20-amp connector.

Fig. 17–33. A twist-lock connector. (Courtesy of Lou Tibor)

Fig. 17–34. A three-prong connector. (Courtesy of Lou Tibor)

Fig. 17–35. A two-prong connector. (Courtesy of Ken Nolan)

Electrical cord reels. Electrical cord reels can be either vehicle-mounted or portable units. They are designed to carry a specific amount of electrical cord. The advantage to a portable unit is it can be brought to wherever it is needed. The fixed unit is typically hard-wired to the apparatus and cannot be easily removed. Fixed units hold more cord.

Junction or gang boxes. Junction or gang boxes may be used when multiple outlets are needed (fig. 17–36). They are supplied by one connection back to the power source. They can provide multiple connections for twist-lock or conventional plugs, or a combination of both. The advantage to this device is that multiple cords can be powered from the same location. A variety of electrical adaptors should also be carried to make sure all electrical cords and equipment can be used for maximum efficiency. All electrical equipment should also be equipped with ground fault interruption (GFI) capabilities to eliminate the possibility of electrical shock for the users.

Fig. 17–36. A gang box. (Courtesy of Ken Nolan)

Controlling utilities

SKILL DRILL

Electricity. If an emergency incident warrants that the electrical power to a structure be turned off, the local utility should be immediately requested by the IC. In the short term, it may be necessary for firefighting personnel to locate the electrical panel or fuse box and disconnect the main switch (figs. 17–37 and 17–38). Many times, these disconnect areas are in the basement on the wall directly below where the electrical service enters the building. Firefighters should make a mental note if a breaker that they turned off was tripped. This must be documented and reported to command and the fire marshal. Pulling the electrical meter from the socket on the structure is not an acceptable method. This should only be done by qualified electrical personnel. Improper removal of an electrical meter can cause serious injuries or even death.

In some commercial occupancies, it may be required to leave the power energized for certain processes or electrical-sensitive systems. The fire department officer must check with plant personnel before randomly cutting the power to a building. Buildings, whether they are commercial or residential, may also have auxiliary power supplies or be fed with

electrical power from two sources. This information must be ascertained beforehand.

FFI 5.3.18 Utility disconnections should be handled in accordance with the safety procedures of your department and any guidelines or training required by the local utility companies for the specific systems.

Gas. If it becomes necessary to shut off gas utilities to a building, the local gas utility or propane company should be notified by command. Natural gas utilities usually can be shut off on the street side of the gas meter (fig. 17–39). This can be accomplished by turning the gas cock one-quarter turn into the off position (fig. 17–40). Individual gas appliances should also have an inline shutoff with a one-quarter-turn valve. In rare instances, the gas may have to be controlled by turning off a valve in the street. If the gas cannot be controlled by the fire department, firefighters must take a defensive position until the utility crew arrives. This means protection of exposures while letting the gas burn. Extinguishing the gas flame may cause a gas buildup inside a structure, which can lead to an explosion.

FFI 5.3.18 Once the gas is shut off at the meter, it should not be turned back on until the system undergoes a safety inspection by the utility company personnel or another qualified professional. Only after inspection should gas service be restored and pilot lights re-lit.

Personal protective equipment should always be worn when working with live utility systems in the event of electrical shock or gas explosion

Fig. 17–37. An electrical panel with circuit breakers

Fig. 17–38. A fuse box

Fig. 17–39. A gas meter with a gas cock

Fig. 17–40. A tool closing a gas cock (perpendicular to flow)

Most propane systems have shutoff valves on the top of the tank and also inline shutoff valves at the appliances (fig. 17–41). Once the gas supply is shut off, the area should be metered to verify the reduction of gas vapors. It is not recommended that the fire department turn the gas back on at the end of the incident.

FFI 5.3.18 Personal protective equipment should always be worn when working with live utility systems in the event of electrical shock or gas explosion.

Fig. 17–41. The valve on a propane tank. (Courtesy of Lou Tibor)

Water. Most water utilities can be controlled by closing the valve where the water enters the structure. Most water utility companies recommend shutting the valves on the building side of the meter, not the street side. If the fire department encounters difficulty finding or shutting down the water service to a facility, they should contact the local water company. At times it may be necessary to have the water shut off in the street. In multiple occupancies or large buildings, there may be multiple water services that need to be controlled.

PERSONNEL SAFETY

Personal protective equipment

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, under requirement 7.1.3, states, "Structural fire fighting clothing shall be cleaned at least every six months as specified in NFPA 1851." (See fig. 17–42.) Chapter 7 of the NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Firefighting and Proximity Fire Fighting*, addresses the cleaning and drying of turnout gear ensembles. Wet and unclean turnout gear is an important health and safety issue. Wet turnout gear is thermally unstable. Section A.7.4.3(6) of NFPA 1851 states, "Ensembles and ensemble elements should be completely dry before reuse to avoid the potential for steam burns caused by moisture remaining in the layers of the ensemble." Moreover, the storage of wet or moist turnout ensembles can affect the strength of some materials and promotes the growth of mildew and bacteria, some of which can lead to serious medical conditions. Gear that is not cleaned can also contain toxic products of combustion that can result in an exposure. Volunteers should not keep gear in the passenger compartment of their personal vehicle, and they should be sure that gear is stored out of direct sunlight. Also, wet turnout gear can place further stress on the firefighter. It is recommended that a firefighter be issued two sets of gear. Further details on protective clothing is found in chapter 9, Personal Protective Equipment.

FIREGROUND NOTE

If your gear gets saturated during training, it will not provide the same protection as dry gear, and live fire evolutions should stop!

Fig. 17–42. Ideally, gear should be dried in a nontumble-style dryer with a forced-air dryer around 100°F (38°C). (Courtesy of Williams Direct Dryers)

Hearing protection. As firefighters, we can be exposed to noise levels above 115 decibels on the fireground. NFPA 1500 and OSHA *Standard on Occupational Noise Exposure* 1910.95 both require that firefighters be provided with hearing protection when charted levels exceed 90 decibels. The standards further state that fire departments shall establish hearing conservation programs. Personal responsibility plays a large role in ensuring that the provided hearing protection is used when responding to alarms and windows are kept closed to minimize the noise from the sirens. It has been well established that when responding to alarms, you will be exposed to over 90 decibels. OSHA does recognize that it is impractical to use hearing protection once on scene because it could interfere with other life-saving equipment. Many departments, however, urge firefighters operating power equipment such as saws and jackhammers to use hearing protection (fig. 17–43).

Fig. 17–43. Hearing protection is recommended, although not always practical on the fire scene. (Courtesy of Lou Tibor)

Occupational Safety and Health Administration (OSHA)

FFII 6.1.1 OSHA standards are federal regulations that mandate minimum training standards, equipment performance, administration, and operations. It is important to realize that the fire service is unique in the way we are regulated because of the type of work we must perform. For example, the fire service has no fall protection standard for the fireground. Although it may sound counterproductive, the time it would take to set up protection on a roof would place firefighters at greater risk of falling through the roof. All departments should strive to exceed all OSHA (or state) standards. That can only happen if you commit yourself to safety.

Staffing and safety

FFII 6.1.1 Lack of proper staffing is a leading contributor to firefighter injures and death. The tactics that you have learned cannot occur incrementally. They must take place in unison with each other to allow us to control the building and safely mitigate the incident. At a structure fire, tasks are time sensitive. NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression, Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, mandates that the first-arriving company shall be staffed with four personnel and arrive in less than 4 minutes (fig. 17–44).

Fig. 17–44. Company staffed with four personnel. (Courtesy of Dave Esposito)

The standard goes on to say that the entire first-alarm assignment of 15–17 should arrive in 8 minutes. These requirements are based on a 2,000-sq-ft (186-sq-m) house with no exposures. Numerous studies have found a definitive link between injures and crew size. The International Association of Fire Fighters (IAFF) report, "Analysis of Fire Fighter Injuries and Minimum Staffing per Piece of Apparatus in Cities with Populations of 150,000 or More" (December 1991), found that crews smaller than four almost doubled their percentage rate for injuries when compared with crews of four or more firefighters.

A study by the Providence (RI) Fire Department, analyzed in an applied research project submitted to the National Fire Academy as part of the Executive Fire Officer Program by Curtis Varone (1994), found that "four-person staffing led to a 23.8% reduction in injuries, a 25% reduction in time lost injuries and a 71% decrease in time lost due to injury when compared to three-person staffing." Inadequate staffing contributes to companies having to play catch-up. This increases risk to firefighters and contributes to firefighters taking shortcuts that lead to injures.

Safe staffing requires ESP:

- *Education and emotion:* Be passionate about your job. Take classes, read trade magazines, and continue your education. Take advantage of educational opportunities. At fire prevention talks, explain the role of all the different companies on scene. Participate or conduct the Fire Operations 101 program developed by the IAFF. This program takes elected officials through an orientation program and educates them on the dangers of firefighting. Fire Operations 101 gives them a firsthand view of how difficult fire operations are with limited personnel and builds lasting relationships with officials.
- *Standards and statistics:* You should be well-versed in standards such as NFPA 1710 and the OSHA Two-in, Two-Out Rule (discussed in a later section). Read reports from the National Institute of Occupational Safety and Health (NIOSH), NFPA, and the U.S. Fire Administration to stay informed on safety and current trends.
- *Politeness and political action:* Get involved in your department and your community. Standing up for appropriate staffing is protected speech because it is a legitimate matter of public concern. Note that until you are off probation, you are not entitled to an opinion, so be quiet and learn. You have two ears, two eyes, but only one mouth for a reason.

Volunteers and staffing. The majority of fire departments are made up of volunteers. Commitments to work and family and many members working out of town have placed a strain on many volunteer departments to respond during daytime hours. NFPA 1720, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Volunteer Fire Departments*, applies to volunteer fire departments.

Many departments have instituted innovative approaches to increase staffing. Rockville, MD, started a college live-in program in which students receive room and board in return for service to the department. Other departments have started duty nights in which the members commit to staffing the station during a predetermined night. This builds camaraderie and provides many of the benefits of career departments. Departments have also established Fire Explorer programs or Junior Firefighter programs to increase interest in the fire service from younger members of the community. This is a valuable tool that many career and volunteer fire departments have benefited from. Volunteer departments in Long Island, NY, assign members to cover certain types of calls to limit the impact on their family and encourage greater participation. For example, five or six members may be assigned to cover single engine calls for a particular night for such responses as activated alarms and car fires.

FIREGROUND NOTE

The Washington Post Theory:

Conduct yourself so that if your actions were to be published on the front page of the Washington Post, you would be proud.

—Captain Michael Abrashoff
U.S. Navy

Staffing, you, and the budget. You may be asking yourself, "I am new to the fire service. How can I have an impact on achieving or maintaining safe staffing?" As a new firefighter, you can play a key role by interacting with our "customers." Take time to ensure that you treat all citizens with respect and go out of your way to make their interaction with the fire department a positive one. Be friendly; talk to the elderly a little longer; and at the completion of a call, show the kids the fire truck. It is always a good idea, during the conversation or when the children are playing, to mention fire prevention issues (fig. 17–45).

Your department's reputation will play a direct role in the budget process. The budget, whether career or volunteer, has a direct impact on the training funds, equipment repairs, protective clothing, and staffing. Your actions in the field may determine if the community supports funding newer apparatus or if they stand with you when need to save a neighborhood firehouse from being closed.

Fig. 17–45. Firefighters taking time to interact with the community. (Courtesy of Jacqueline Bender)

Personnel accountability systems. FFI 5.1.1
Ensure that you have read and understood your department's SOP on accountability. Accountability is everyone's responsibility and must be strictly adhered to. Accountability systems make tracking personnel and crews more manageable. First and foremost, they establish who is on scene and what companies those personnel are assigned to. Departments use many different tag systems, boards, or written logs to track crews on scene (fig. 17–46).

Fig. 17–46. An example of a tag system. Firefighters clip their tag into a ring on the apparatus when they report for duty. (Courtesy of firegroundimages.com)

Whatever system is used, it must address the following:

1. Who is on scene
2. What company they are assigned to
3. Where they are operating

Tracking dynamic crews is difficult and requires the human factor to continually update the locations of companies. Manufacturers are working to establish electronic accountability using radio waves and other technology (fig. 17–47).

Fig. 17–47. Accountability officer tracks location of crews on an accountability board. (Courtesy of firegroundimages.com)

Personnel accountability report. The personnel accountability report (PAR) provides a roll call to ensure that all personnel are accounted for. A PAR can be called at anytime by the IC. An accountability officer may be designated to track crews. Some departments require the dispatcher to notify them at predetermined intervals (e.g., every 15 minutes) as a way to mark time for command and ensure that PARs are conducted. PARs can also be given after each radio transmission. PARs are usually called for after an evacuation order or a catastrophic event. They should be requested once the fire is declared under control.

Diagramming the fire. All firefighters should have a radio, but not everybody should talk on the radio. Think before you speak. Ask yourself, "**D**oes **I**t **M**atter **W**hat **I**'m **T**ransmitting?" (DIMWIT). Radio discipline leaves radio channels available for necessary transmissions.

All members must listen to the radio. Time and time again, Mayday calls are being missed. Radio transmission is one of the ways in which operating crews are tracked. Officers and firefighters should give their location with every radio transmission when inside a hazard area.

For example: "Truck 4 to command: Second floor kitchen, we have fire running the stud spaces with possible extension to the attic, Truck 4 has PAR."

This information is not only beneficial for command, but it also allows the RIT and other companies that haven't arrived to track crews. If a Mayday is given that is missing all the necessary information, it allows for a starting point to locate the member(s) in trouble. Fire department personnel who are not on the alarm should monitor the radio and try to track crews on a board. This helps develop listening skills and gives multiple ears the task of listening to the radio.

Evacuation order. This is the one order that can never be questioned. As firefighters involved at the task level, you are only seeing part of the picture. Command is basing their decision to evacuate a structure or area on the totality of the incident. They are positioned to see visual cues such as collapse and are receiving input from other officers. If ordered out, get out with your crew! Most departments will issue an order and have the closest fire apparatus blast their air horns three times in case a radio message is missed. Emergency fireground transmissions such as withdrawal orders will be discussed later in this chapter.

Crew integrity and hazard area exit. Complete fireground accountability can only be effective with 100% commitment to the team concept. Firefighters should not work alone. If you are separated from your crew, you must immediately call for help. At times, you will lose your crew or get mixed into the wrong crew. If this occurs, notify your commanding officer that you are separated and identify what company you are from. If one member must exit the hazard area, he or she should exit with another team member. When exiting the hazard area and vision is obscured, you must crawl. If you are following a guide line that is taut, grasp the line and slide your hand on the rope. If you are exiting on a slacked line, one method is to kneel on the line and grasp the line with a closed hand, then slide your hand on the rope. Next, move your knee and repeat the process (figs. 17–48 and 17–49). Hoselines may also be used to guide you to the outside by using the hose coupling lugs.

Furniture should not be moved during fire operations. When exiting, the location of furniture will help keep you oriented to your location. Even when using a **thermal imaging camera (TIC)**, move along the walls in a systematic fashion. This method has worked for rats for hundreds of years, and, as with any technology, the camera can fail. When crawling, keep a low center of gravity and always check for the floor. When we crawl, we need to move quickly, but we must also ensure that we will be able to pull back if a weak floor or shaft is found (fig. 17–50). Make an effort to look up and check conditions above you. Periodically stop and listen, as you might be able to hear the fire above you.

Fig. 17–48. This method is slower than crawling along the line, but it ensures you will not get turned in the wrong direction if the guide line crosses over itself. (Courtesy of Kris Sundwall)

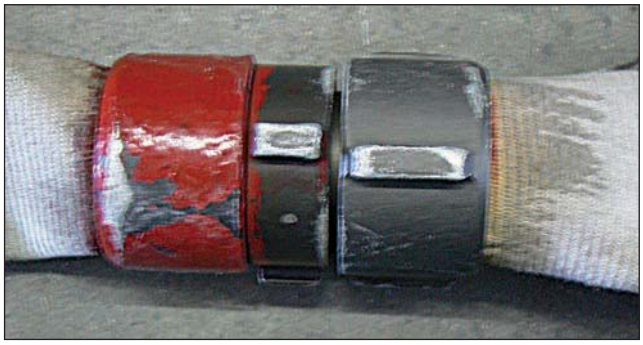


Fig. 17–49. If you are lost and you find a hoseline, remember the phrase "bumps to the pumps" as a guide. Move in the direction of the hose coupling lugs. Couplings that are painted identify particular engine companies. (Courtesy of Maureen Duffy)

Fig. 17–50. Photo of the shaft that author Frank Ricci fell into when searching for a trapped security guard. Make sure that if you encounter a shaft, you can pull yourself back up.

TACTICAL MISTAKES

This section will cover predicable and preventable events that the fire service has paid the highest price to learn. If you are on the RIT and are activated, it is a clear indication of failures on multiple levels. If you look at the NIOSH LODD reports as a random report card of our service, we are failing in many areas. This is mentioned with the disclaimer that mistakes will be made at every fire. It is not the mistake that you make, it is how you recover from it and the fact that you recognize it, share it, and learn from it. It takes a balance between experience, training, and knowledge to be safe and successful in this field. Experience is not enough. When we develop unsafe habits and they are reinforced with positive experiences, they become the norm and contribute to greater failures later that will culminate with an injury or death. Although most of these things are covered in other chapters, the seriousness of failing to heed these warnings can cause serious injury or death. Let's take a look at some of these failures.

Command and control

Failure to properly size up the situation. Improper size-up costs lives. Taking a couple of extra seconds to analyze a situation can save you minutes and maybe your life. The New York City Fire Department came up with the acronym, COAL WAS WEALTH (construction, occupancy, apparatus and staffing, life hazard, water supply, auxiliary appliances and aids, street conditions, weather, exposures, area, location and extent, time, and height), to standardize size-up. This is an effective method, but experience has shown that new firefighters often miss the very basic points due to adrenaline. You need to first concentrate on the task at hand. If hooking up the hydrant, then focus on this task and accomplish it first. When you are performing any task that will put you inside or around the building, at least five points should come into your mind:

1. Construction
2. Occupancy
3. Layout
4. Where the fire is located
5. Where the fire is going

This will give you a foundation to build on as your experience increases. Take advantage of routine calls to size up homes and buildings in your district. You will find similarities that will aid you in size-up of other similar occupancies.

Combining offensive and defensive attacks. This action pushes heat and fire back inside, causing burns and deteriorating conditions. If you are ordered to extinguish fire that is coming out of a window, and you know that crews are operating inside, direct the line at the eaves of the house or above the window. This will allow the water to cascade down the house and stop the fire from enveloping the exterior of the structure. This action will also prevent the fire from being pushed on the members inside. Once the interior hoseline is working the fire, shut the exterior line down. It must never enter the window of fire, or heat will be pushed at members on the interior. The exterior hoseline always wins in these cases.

Uncoordinated fireground operations. Another major tactical error, one that has caused countless firefighter injuries and LODDs, is uncoordinated fireground operations. There are three crucial fireground operations that must go hand in hand to keep the operation as safe as possible. These are fire attack, search and rescue, and ventilation, represented by the fireground coordination triangle (fig. 17–51). If any one of these three principles of the fireground coordination triangle is out of sync with, missing, or unsupported by the operation, the triangle, like a truss, will collapse. A complete triangle will support the center of the triangle—fireground safety.

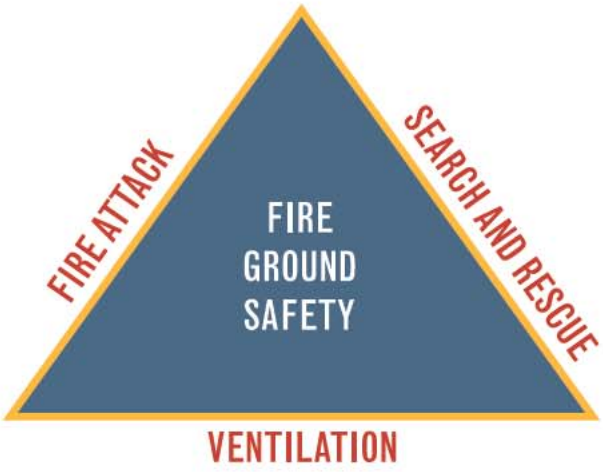


Fig. 17–51. Fire coordination triangle

Failure to recognize when your incident is beyond the scope of your training. Incidents such as technical rescues, biological and hazardous materials incidents, and major utility failure incidents like ruptured gas mains require intervention by specially trained personnel, sometimes from agencies other than the fire department. Firefighters should understand that they are limited by their training and the capability of their equipment. Fire personnel may still operate in a support posture, providing such assistance as evacuation of exposed areas, conducting decontamination operations, and operating exposure lines. They should not get directly involved in these incidents, meaning hands off the problem. The mark of the true professional is the ability to recognize that your incident may be best handled by someone else (fig. 17–52).

Fig. 17–52. Technical rescue operations such as this trench rescue require expertise beyond most first responders' capabilities. Firefighters must know their limitations in regard to operational capability. (Courtesy of Ron Jeffers)

Failure to pay attention to your surroundings. It has been mentioned several times in this chapter that complacency is a killer. A large proportion of firefighters who become casualties are usually not brand new firefighters, but seasoned veterans who have been allowed by lack of leadership and supervision to become too comfortable in their settings. There is no firefighter tougher than the fire. When working near or above the fire, failure to pay attention to the location of the fire, as well as paths that it can spread to has cost many firefighters their lives. In addition, firefighters who become too complacent may fail to recognize such dangers as overhead power lines, dangerous vacant buildings and their hazards, signs of rapid fire development and collapse, and traffic hazards. There is also no firefighter tougher than electricity, a falling building, or a moving vehicle. The fireground should be treated as extremely hazardous from arrival to termination. Firefighters should be continuously watching out for hazards and for each other. Casualties can be prevented by identifying hazards and taking appropriate action (fig. 17–53).

FIREGROUND NOTE

Combining offensive and defensive attacks is like ordering artillery on yourself.

—Alan Brunacini

Fig. 17–53. The truss above this firefighter's head is clearly involved in fire. This is a tragedy waiting to happen. (Courtesy of BC Mike Oriente NHRFR)

Failure to request early assistance. Fires and other emergency incidents are mitigated by people. Not having enough people on scene is a major case of incident escalation and firefighter casualties. Additional personnel are required for relief purposes, for reinforcement of operational areas, and to address those little surprises that often pop up on the fireground. When there are enough personnel on scene to address them, small concerns stay small. When you are behind the eight ball in the personnel game, small concerns become big problems and may affect both the strategy and the safety of personnel. As a firefighter, based on department protocols, you may be detailed some day as an acting company officer. If this is the case, you might wind up as the initial IC. The decision to strike an additional alarm upon arrival may be your decision to make. The need for this might not be apparent when you arrive and everyone goes to work. If all personnel are working, and there is no one waiting in the street to go to work, the tactical reserve profile is at zero. The dilemma will emerge when the first-alarm companies begin to exhaust their first SCBA cylinders, when they become fatigued, when someone calls for additional help in an operational area, or when an unexpected concern surfaces. If there is no tactical reserve on the sidelines to put into the game, the game will either be lost or the fatigued firefighters will have to overextend themselves to continue the operation, risking injury. When in doubt, ensure there are enough personnel on scene or ordered to maintain the operation, especially in extreme weather. If you don't need them, you can always send them back.

Water supply and fire attack

Failure to charge hoseline before descending to a below-grade fire. FFI 5.3.10 The water is your only protection. If a member vents early, before you are at the bottom of the stairs, you may be caught on the stairs by a rapid fire progression and will have no water to protect yourself. When ventilating horizontally (for fire), wait until the line is charged before breaking out any windows. Remember also that the basement stairs may end away from the wall. Bring an extra light to mark the bottom of the stairs as a reference.

Fig. 17–54. When descending basement stairs, go feet first with your weight to the sides, and ensure you have enough hose to clear the stairs. (Courtesy of Chris Saraceno)

FIREGROUND NOTE

Resources: Better to look at them than look for them.

—Fire Instructor Tom Gavin

Failure to chock an entry door as the hoseline is being stretched. Chocking doors is fundamental. The cheapest and simplest piece of equipment, a block of wood, is often the most important. There is a misconception that if a line charges under an inward-opening door, you will be able to open it easily. This is not true. Having a line charged under a door will block your egress and interrupt the flow of water. Any door that a line goes through should be chocked open (fig. 17–55).

Fig. 17–55. Any door that a hoseline goes through must be chocked open.

FFI 5.3.5 When members are searching without a hoseline, just the opposite is true. Once inside, the door must be closed to provide your team an **area of refuge** (also referred to as **safe haven**) while you search. This is a place that is isolated from the main hazard, where a firefighter can retreat in event of a fireground emergency. By creating an area of refuge you can reduce the flow path and buy time for the fire to be controlled. Having a contingency plan of where to go if something goes wrong is critical.

Horizontally venting the windows, provided you are not in the fire area, will have no effect on the fire. This action will increase visibility and decrease the toxic environment. If the engine loses water or the fire extends to your location, you will have time to react. When your search has been completed and you are back at the door, be sure to check conditions before moving to the next room. If you are searching the fire room without a hoseline, do not go any farther than 5 ft (1.5 m) into the room. If the room flashes over, you will not be able to retreat fast enough. One safety tactic is to hook your foot around the door frame and sweep with a tool. Once the sweep is complete, close the door and move to an area of refuge (fig. 17–56).

Fig. 17–56. Flashover also indicates signals that the structure itself is under attack from fire.

Stretching too many hoselines through one opening. Hoseline management, as a rule, should provide that no more than two lines are deployed through any one opening. There have been numerous cases where firefighters have become disoriented because the hoseline they were following out of a building was tangled with other lines (fig. 17–57).

Fig. 17–57. Stretching more than two lines through one opening makes the lines difficult to advance and manage. (Courtesy of Tim Olk)

Failure to stretch the appropriate hoseline to match the present or potential fire conditions. Improper line size for the volume of fire encountered has resulted in numerous deaths. In some situations the firefighter will have to determine the size of the hoseline to pull. Understand that proper water volume puts out fires, and fire volume is based on potential fire load. This having been established, stretching a hoseline that is too small and therefore delivers a less than adequate supply of water will not only put all members in the fire building in jeopardy, it will not put the fire out.

Large area buildings, commercial structures, and below-grade areas are no places for anything smaller than a 2½-in. (65-mm) hoseline. Attack teams have been outflanked by fire, burned, killed, caught in collapses, and have caused casualties to other firefighters in the area because small-diameter hoselines have been stretched into buildings that are showing heavy fire or have a fire load conducive to rapid fire spread. Staffing should not be an issue here. If it takes two companies to get the first line in place, then that is what will have to done if the fire or occupancy demands it. The time to stretch the 2½-in. (64-mm) hoseline is with light smoke when it is easier to facilitate a clean stretch. In a commercial building you will need the reach and sufficient gallons per minute to overpower the fire.

Booster lines should never be used inside a building. They are meant for trash fires only. Small-diameter, 1½-in. (38-mm) lines are similar in effectiveness. They don't belong in structures and are not even particularly effective on car fires. Residential structures require at least a line of 1¾-in. (44-mm) diameter, and high-rises should have at least a line of 2 in. The mantra of "big fire, big water" always applies. If in doubt, stretch the big line. If it is not needed, a smaller line can be stretched, or the larger line can be reduced to a smaller diameter. Attack crews who stretch lines that are too small can be outgunned and overrun by a fire with staggering speed (fig. 17–58).

Fig. 17–58. Firefighters stretching the wrong size hoseline at a commercial structure increase property damage and places firefighters in jeopardy. (Courtesy of Tim Hunt)

Failure to properly flake out the hoseline. Ensuring that the hoselines are properly flaked out is everyone's job. Kinks in a hoseline can reduce water volume up to 50%. One kink can jeopardize the entire fireground. Remember that the hoseline not only extinguishes fire but also protects the primary search team and egress points for both victims and firefighters. Firefighters should never pass a kink (fig. 17–59).

Fig. 17–59. Hoseline management must be a top priority. Water equals protection for everyone. No one should ever pass a kink. (Courtesy of Ron Jeffers)

Failure to back up attack lines. Firefighters searching above the fire and operating in stairwells have been killed when initial attack lines have failed to control the fire or have burst and there was no hoseline in place to reinforce the attack. All attack lines should be backed up by additional lines of equal or larger diameter. The second

hoseline should go to the same position as the first. If the first line is controlling the fire, this second line can then cover adjacent areas and/or the floor above, but only if the first line is sufficient for fire control. Hoselines that are stretched elsewhere in the building rather than as a backup line may be of little use, and their personnel will be endangered if the initial hoseline fails.

Fire attack: the right way

- Must protect the primary search
- Must protect the main areas of egress
- Must occur between the fire and any victims
- Must be properly supported by and coordinated with timely ventilation

Search and rescue

Failure to create barriers during a search operation. This is especially true when searching private dwellings where open interior stairs are present and the building is relatively small. Openings such as those used for vent, enter, and search operations are essentially vent points and create paths of least resistance for fire spread. It is critical that the first action after entering the room via a window is to close the door to the room. This also holds true for any other type of occupancy, including multiple dwellings. If the fire is nearby, it will move rapidly toward the firefighter-created vent path. It may move even faster if there is water being applied to it.

In the Lessons from the Fireground case where the captain and his crew were trapped above the fire (where the captain fell through the shaft window), the main reason the firefighters made it out alive was because they closed the door when they entered the second-floor apartment. They made their way to the door for exit when the withdrawal was sounded over the radio. When the door was opened by one of the firefighters, he stated later that there were flames in the stairwell and that the heat knocked him immediately to the ground. He struggled but was able to close the door again, most likely because it was an inward-swinging door and all he had to do was push it closed. Had the door swung the other way, he would never have been able to reclose it. Had that apartment door not been closed, they almost certainly would have been overrun by the fire (fig. 17–60).

Fig. 17–60. Fire roaring up the stairs from the cellar trapped firefighters searching above the fire. Only a closed apartment door protected them from burning to death. In private dwellings, this apartment door is not available.

Especially for cellar or basement fires in private dwellings, if you are going to search the upper floor before a hoseline is in place, ensure not only the door to the cellar is closed before you go up, but the door to the area you will be searching must be closed too. Again, it is worth mentioning that some type of notification must be made before personnel go above the fire (fig. 17–61).

Crowding the hall or stairs. These are paths of egress and should not be blocked. If an evacuation is ordered, it will be difficult to get out or down. If loss of water occurs, a door burns through, or a wind-driven fire is encountered, your escape can be blocked by a parade of firefighters. If you find this condition when entering, don't add to it—find another way. Wouldn't it be great if we had ladders and actually used them! Resist the urge to crowd the hall. Getting trapped in a center hall with no windows is one of the most dangerous positions in a structure (figs. 17–62 and 17–63).

Fig. 17–61. Basement fires have limited ventilation points and offer the greatest chance for extension through voids. (Courtesy of Chris Saraceno)

Fig. 17–62. Keep the hallway and stairs clear for a quick egress if things go bad. (Courtesy of Dan Nocera)

Fig. 17–63. Firefighters standing on stairs create an unsafe condition.

Failure to use a lifeline for search. There have been too many cases of firefighters getting lost, then dying because they ran out of air inside large buildings. They usually run out of air because they cannot find their way out of the building. Commercial buildings, below-grade areas such as cellars or basements, and any large area structures such as townhouses or estate homes should only be searched with a lifeline. In any of these areas, any firefighter not on a hoseline should be on a lifeline. A thermal imaging camera (TIC) is also a necessity, but overreliance on new technology, which can malfunction, could leave a team of searching firefighters disoriented in a large area. A **lifeline** does not malfunction nor does it need batteries.

Failure to identify and establish a secondary means of egress. Firefighters entering a building to search should take note of areas of egress before they enter. Egress-friendly areas such as porch roofs and fire escapes must be noted. The same should be practiced for roof access. If you have gotten into a building or onto a roof, you should know at least two ways out. RIT operations should include laddering all sides of the building and the roof for additional means of egress. These locations should be announced over the radio by command as soon as they are established, as personnel already inside the building will not be aware of the existence and location of these egress points. Failure to establish additional means of egress leads to an unacceptable alternative: the bailout.

Failure to identify the signs of rapid fire development. To survive rapid fire development, firefighters must be trained in the recognition of the signs leading to these developments. This recognition comes in the form of using the senses to detect these signs. This can be either from visual signs such as the reading of smoke for the signs of a flashover or backdraft, or reading the building. Reading and understanding the building and its inherent construction will give clues as to where the paths of least resistance for fire travel will be and where areas of danger from rapid fire development might exist. Rapid fire development signs can come from the sense of hearing as in the case of a fire crackling in the overhead in a smoke-obscured room or above a drop ceiling or in a cockloft. Hearing will also be the sense used when the cues of impending fire development or loss of control of the fire is transmitted over the radio. It can also come from the sense of touch as the heat conditions in a room begin to rapidly increase. This points to one basic need: Be alert at all times (fig. 17–64).

Search and rescue: the right way

- Must be protected by the attack lines
- Will be infinitely more effective with and benefit from proper and timely ventilation (fig. 17–65)

Fig. 17–64. Firefighters must be constantly aware of cues of rapid fire development. Heavy, pressurized smoke is one of those indicators. Things are not getting better when you see smoke like this. (Courtesy of Ron Jeffers)

Fig. 17–65. A hoseline is stretched through the front door to cut off fire and protect interior stairs. (Courtesy of Kurt Tiedeman)

Ventilation

Improper ventilation. Improper ventilation contributes to our failure to control the building and plays a large role in fire progression. Whether you use positive pressure or roof ventilation, it must be coordinated for firefighter safety. When venting for fire, vent as close to the fire as possible and make sure that you are venting ahead of the line. We are seeing more and more fires where the fire is venting out a window, but further size-up shows that heavy black to brown smoke is pushing down the hall and out the door. This is an indication that more ventilation is needed. The first priority is to increase ventilation close to fire and have personnel enter with a charged hoseline. If conditions dictate, cool the ceiling as you advance to push back the fire and cool the overhead. The old teaching of not placing water on smoke does not hold true anymore if the smoke is hot and pushing over you (fig. 17–66).

Fig. 17–66. With smoke pushing out the front door, crews could be caught in the hall by rapid fire progression. This is an indication of the need for more ventilation close to or over the fire. (Courtesy of Chris Saraceno)

FIREGROUND NOTE

It is not the mistake that you make, it is how you recover, recognize, share, and learn from it.

The rate of heat release experienced in today's simple house fire results in flashover much more quickly than in the past. Most furniture is made of synthetic materials. Always be aware of your surroundings. The warning signs of rollover, fire propagation down the wall, and everything going dark quickly may all be masked by thick black smoke. The only reliable sign will be rapid heat buildup or high heat. In buildings with high ceilings or drop ceilings, smoke can ignite, changing conditions rapidly.

Failure to sound the floor or roof. Not sounding the floor or roof can result in ending up at the bottom of a shaft or falling through the roof. Entering through a window onto a weakened floor will have a devastating effect. A hidden hazard consists of windows in two-story foyers that access ledges that homeowners place decorations on. When a firefighter enters, the floor or ledge will be sound, but then, about 2–3 ft (0.6–1 m) in, there is a 15-ft (4.6-m) or more drop to the first floor. When working on the roof, if you cannot see, you must crawl. Beware of light shafts and high parapets. For a commercial building, try to cross in the front where the storefronts line up (fig. 17–67). In multistory multiple dwellings, the shafts can be anywhere, and although their location may be uniform from one building to the next when built in a row, they may not be.

Fig. 17–67. Store depths will vary, making it easy to walk off the roof. Try to cross in the front where they are usually even with the street and sidewalk.

One note of caution when sounding floors: Victims who cannot get to doors often fall victim beneath windows, their next choice for egress. Before bashing your tool onto the floor to see if there is a substantial place in which to enter, sweep first to determine if a victim is below the window. In this way, you will not turn a rescue into a recovery. Blasts to the head with a Halligan tool or axe are not conducive to rescue operations.

Failure to recognize the presence of truss construction. This size-up failure has contributed and continues to contribute to firefighter deaths each year. Truss roofs should be located during preplanning. A building's occupancy will also clue you in to the potential presence of truss construction. Occupancies of suspicion include bowling alleys, auto dealerships, warehouses and "big box" stores, and fast food restaurants. When confronted with any business where a large open space is present or any new construction, especially in commercial or residential occupancies, assume that a truss is present until ruled out. In New Jersey, a system enforced by state law is in place that denotes the presence of a truss. A triangle on the building with an "R" inside it indicates that a truss roof is present. The same triangle with an "F" inside it indicates that a truss floor is present. If both a truss floor and roof are present, an "RF" will be inside the triangle (fig. 17–68). This provides safety warning at a glance. New York State and Florida have recently adopted similar guidelines for truss buildings.

Fig. 17–68. Triangle markings indicating the presence of trusses

A truss assembly can fail in 5–8 minutes under flame impingement. When using a TIC, confirm roof construction and report to command. You also will feel the difference when walking on a lightweight wood truss roof versus conventional construction. The truss roof will have more bounce when you walk. You should not operate above or below a truss roof with fire in the roof space (fig. 17–69).

Ventilation: the right way

- Must be conducted in a coordinated manner with the fire attack to help locate, confine, and exhaust the products of combustion in the proper direction
- Will increase visibility, enhancing the safety and expediency of the primary search (fig. 17–70)

Fig. 17–69. This truss roof in Hamden, CT, failed 6 minutes after the fire department would have arrived on scene.

Fig. 17–70. Firefighter wearing full PPE while cutting a hole in roof. (Courtesy of the Middletown, CT, Fire Department)

Accountability and safety

Failure to establish and maintain a collapse zone. Not establishing and maintaining a collapse zone can have catastrophic results. Collapse zones can be increased at an incident to fit the situation. However, collapse zones do not get smaller, and buildings that are determined to be a collapse hazard do not get safer. Firefighters must not be affected by the moth-to-the-flame syndrome, where they are inclined to move their hoseline inside of the collapse zone or out of a flanking position, thereby putting themselves in harm's way (fig. 17–71).

Fig. 17–71. Even partial building collapses can result in catastrophe, injuring or killing firefighters. (Photo by firegroundimages.com)

Failure to recognize hazardous exposure potential. Not all deaths are as dramatic as building collapses. As we get older, we are plagued by the cumulative effects of breathing toxic gases that can cause heart attacks, strokes, and even cancer. Although it is impossible to completely limit exposure to all the products of combustion, soot on your skin or a shift in the wind can result in a direct exposure. We must do everything in our power to minimize exposure. We often drop our guard at the wrong time.

Overhaul and minor fires pose many hidden hazards. Firefighters should wear breathing apparatus until the environment is metered for the presence of carbon monoxide and hydrogen cyanide. If these gases are present, they will not be found by themselves. Relying on permissible threshold limits will provide a false sense of security. Although at this time it is not practical to meter for all the products of combustion, using these two gases as a benchmark will provide a margin of safety. Masks should not be removed until the atmosphere reads zero. If, after your mask is off, you start to experience watery eyes, it is likely that you are being exposed to acrolein or hydrogen chloride. Place your mask back on or exit the area. Other strategies for limiting exposure include washing gear and taking a shower after a fire (fig. 17–72).

Fig. 17–72. Firefighters should meter the atmosphere before removing SCBA. Remember that the consequences of exposure may, in the long term, result in stroke, heart attack, and cancer.

Freelancing. The most critical tactical mistake is **freelancing**, which means wandering off to perform tasks on your own without an assignment. Maintaining company integrity and keeping personnel accounted for is the most important duty of the company officer, and maintaining self-discipline is the most important duty of each and every firefighter. Freelancing is always a mistake, and departments must have a zero-tolerance policy in regard to this dangerous issue. A simple company accountability model explains this very nicely. According to this model, there are only four places a company should be assigned on the fireground:

- At the command post awaiting an assignment
- In staging
- Operating in an assigned area
- In the rehabilitation division

The keyword here is *assigned*. The only time a company deploys without direct orders is when they are one of the first-arriving companies and their actions are being guided by scene assignment SOPs. For example, according to a department's initial scene assignment SOP, suppose the first-arriving engine company is responsible for attack and water supply (and command if they arrive before a chief), the second engine is responsible for a backup line and a second water supply and the first-arriving ladder company is assigned forcible entry, primary search, reconnaissance, and ventilation duties. Unless something out of the ordinary is going on, that is where they should be and what they should be doing. If a later-arriving company self-deploys without orders from command, they are freelancing. This is usually more prevalent with later-arriving companies and additional alarm companies. The moral: *Do not go to work without orders!*

Emergency bailouts. FFI 5.2.4 An emergency bailout is an absolute failure of the fireground at every level of the game. Firefighting personnel who exit a building any way other than where they entered it have more than likely become disoriented and are often exiting by sheer luck. Emergency bailouts are usually a result of a combination of factors that may include, but are not limited to, the following:

- Failed size-up
- Freelancing
- Failure to properly wear PPE and SCBA
- Communications failure
- Failed command and control
- Failure to follow SOPs and the action plan
- Failure to coordinate fire operations
- Improper and uncoordinated ventilation
- Failure by firefighters to confine the fire
- Failure by firefighters without hoselines to create barriers between themselves and the fire, and/or passing fire with no known exit
- Undisciplined hoseline operations
- Fire streams applied from the wrong place
- Opposing hose streams
- Complacency

Training on the proper procedures to execute an emergency bailout is absolutely necessary, but training in the prevention of the points of failure mentioned in the last sentence are more important and will serve as bailout prevention measures.

Company accountability model: the right way

Step 1. Companies report to the command post as a unit.

Step 2. Companies are assigned to an operational area, reporting to a division supervisor.

Step 3. Companies operate *only* in assigned division.

Step 4. When relieved, companies report as a unit back to the command post.

Step 5. If reassigned, go back to Step 2.

Step 6. If sent to rehab when complete, go back to Step 1.

Note that with each assignment and reassignment, including the order to take-up, the company officer must ensure that the accountability officer is aware of that assignment and where that company will be operating. Note also that they always report back to the command post once an assignment is complete, whether it is in a fire building or in the rehab division. The command post should be like an organizational manifold. All activities must pass through it. Anything or anyone who goes around it is freelancing (fig. 17–73).

Fig. 17–73. Companies must report as a unit, receive orders as a unit, and operate as a unit. Freelancing is unacceptable. (Courtesy of Ron Jeffers)

FIREGROUND NOTE

Many firefighters fail to focus on size-up but allow adrenaline to take over.

Prevention, not intervention

Tactics are the building blocks that make up our overall strategic objectives of life safety, incident stabilization, and property conservation. It is commitment to the basics—safe staffing and company excellence—that will prevent most tragedies. If we increased physical fitness, healthier lifestyles, and quality training for all ranks, there would be little need for intervention. However, we must acknowledge that we can do everything right and still find ourselves in dangerous situations on this job. Prevention of fatalities and injuries is difficult at best given the places we must conduct operations. We must do our best, and then some, to prepare for working in dangerous buildings through activities such as **prefire planning** and building inspections. Departments must also actively engage in and encourage information exchange between personnel and between shifts. To take this a step further, information exchange is also a concept that mutual aid groups should embrace. How many departments fight large fires alone, especially in large and dangerous buildings? Information exchange as well as interagency drills with neighboring departments lay the groundwork for a safer, more cooperative fireground. To this end, the following sections outline some ways to share the information, both locally and regionally.

VACANT BUILDING MARKING SYSTEM

The purpose of vacant building marking systems is to alert responders at a glance to HVBs and their inherent dangers. Marking buildings with orange spray paint (the international color of hazard) is SOP-driven. Buildings are usually marked by the SO on orders of the IC at a fire scene or by the SO when notified by company members that they have come across a HVB, either on a response or on a building survey. The markings are placed in a conspicuous position so they are easily recognized by arriving personnel. This system should be adopted by entire mutual aid groups.

Level 1 vacant building: entry permitted

Vacant buildings that may be entered should be signified by a box painted on the exterior of the building's walls. The department's initials or other adopted distinguishing mark should be written below the box, as should be done with any building hazard notification symbol. This will alert members that the symbol is department-approved.

Level 2 vacant building: enter with extreme caution

Other buildings may be entered, but only with extreme caution. This condition is denoted by a box with one line

cutting diagonally across it (like a spare in bowling). This building may have suffered damage from previous fires, vandalism, and rot due to neglect. Firefighters should not take unnecessary risks in this building. Any attack should be carried out with extreme caution and with a pessimistic prediction of success. This and the no-entry symbol may be accompanied by another symbol, such as the ones that follow.

Level 3 vacant building: no entry

Vacant buildings that have undergone previous fire damage or other destructive forces or circumstances should be considered off-limits to all members at all times. A building that has hazards so severe that firefighters should not enter it under any circumstance should be denoted by a box with an X covering the whole box (like a strike in bowling).

Identifying unsafe building features

Some buildings may be safe to enter, but because of some safety concerns, firefighters should use extreme caution in the particular area denoted by the box. The boxes below show an example of a building with a dangerous fire escape on the left and dangerous stairs and/or landings on the right. Departments are not limited to these and may create their own symbols to address a particular hazard. If building owners object to the department putting spray paint on their building, tell them that the fire department objects to their unsafe building. The choice is with the owners: Fix the hazard or have their building marked up.

Structural damage (postfire)

Both primary (the damage done by the fire) and secondary damage (the damage done by firefighting) may leave the building in a dangerous condition. Firefighters from other shifts who may have another fire in the same building should be made aware of the hazards. Holes in the roof and/or the floors must be noted. The building should be marked to warn firefighters of these hazards. **Roof open** is denoted by the RO symbol, and **floor open** is denoted by the FO symbol. Floor hole notations should include the floor that is in question. A building with holes in both the floors and the roof may use two separate symbols or they may be placed in the same box. If there are multiple floors with holes, the FO-M symbol may be used. These symbols may be used in conjunction with limited or no-entry symbols.

If both the roof and the floor(s) are opened, the symbol may look like the following. In this case, there are multiple floors with holes as well as an open roof.

Establishing a building hazard awareness program is an effective way of informing responding personnel about unsafe building conditions. Any discovery of this type by any company should prompt the response of the SO or battalion commander. Other notifications may include the building department, fire prevention, or the health department.

Hazardous vacant building notification system

This system works hand in hand with and is the follow-up system to the vacant building marking system. It is an SOP-driven system, and once a building is identified as a HVB and marked (fig. 17–74), a paper trail and notification system is set into motion to ensure that all personnel are made aware of the building and its hazards. It begins with the completion of a form (fig. 17–75) that is then submitted through the chain of command where the information is duplicated and disseminated to the companies. The information also goes to dispatch to be included in the CAD system and to the building official of the city. At times, a memo is also distributed with photographs taken by the SO in order for personnel to see the hazards instead of just reading about them (fig. 17–76).

Fig. 17–74. Hazardous vacant building (HVB) markings on this building prohibit entry as well as bring attention to hazards created by an open roof and floor. This is a Level 3 hazardous vacant building. Marking systems such as this allow a fire department to alert its firefighters to the dangers before they enter a building.

FIREGROUND NOTE

Before you put paint on a house, make sure it is vacant!

NORTH HUDSON REGIONAL FIRE & RESCUE STANDARD OPERATING PROCEDURES

HVB NOTIFICATION FORM

Date:_____ Day of Week:_____

Platoon:_____ Safety Officer:_____

Address:_____

Municipality:_____

Owner:_____

Fire Building ☐ Vacant (Non-Fire) ☐

Permanent ☐ Temporary ☐

HVB LEVEL: Check One

☐ Level 1 Entry permitted _____

☒ Level 2 Caution Required _____

Additional Symbols Added: ____ _____ _____

☒ Level 3 Entry Prohibited _____

Is this an HVB Level / Occupancy Status Update? Yes_____ No_____

Comments:_____

Signature:_____

Fax to:
Deputy Chief
Battalion Chiefs
Headquarters (Chief of Safety)
Fire Control
Building Official of applicable jurisdiction

Hazardous Vacant Building Marking System

Fig. 17–75. Hazardous vacant building form

Office of the Platoon Commander

North Hudson Regional Fire & Rescue
11 Port Imperial Blvd.
West New York, NJ 07093

MEMO

DANGEROUS BUILDING CONDITION: 7301 RIVER ROAD
LEVEL 3 HVB


Side A – marked as level 3 HVB


Side B – note the sagging roof above the Roll-down gate

This splintered truss is beneath the sag. It is supported by a single T-shore
DO NOT OPEN THE ROLL-DOWN DOOR – IT WILL LIKELY COLLAPSE THE SHORE AND THE ROOF
DEFENSIVE OPS ONLY FROM OUTSIDE COLLAPSE ZONES

Fig. 17–76. Hazardous vacant building memo

RADIO OPERATIONS

Urgent call

When an **urgent call** is given on the radio, it is mandatory that all other nonemergency radio traffic stop until the urgent call is cleared by command. This transmission is given over the radio and repeated three times. Examples of situations where an urgent transmission may be required are an open shaft, localized collapse, and loss of water. The urgent call is an important message that usually will have an impact on tactics. These messages normally follow an unexpected event on the fireground. A proactive urgent transmission may very well avert a Mayday transmission later.

Mayday, Mayday, Mayday

Mayday is a distress call for help and an indication that you or a firefighter you are with is in grave danger of serious injury or death. Like the urgent transmission, this call is given over the radio and repeated three times. This allows all on the fireground to distinguish between the call for help and other units communicating about the Mayday. Although you must call the Mayday as soon as you realize you are in trouble, there will be times where you or your crew will have to take protective measures first. For example, suppose you and your crew are caught in a center hallway with a loss of water. There is fire rapidly progressing down the hall. In this case, you would need to get to an area of refuge first, such as going into a room and shutting the door, before transmitting the Mayday. Although the circumstances will dictate your actions, there are basic guidelines for when to call a Mayday.

- Medical emergency
- Trapped by fire
- Fall through floor or roof
- Building collapse
- Lost and can't find crew
- Lost one of your own crew
- Trapped by debris and can't free yourself on first attempt
- Low on air and not near an exit
- SCBA malfunction

Although this list is not all-inclusive, it all comes down to a simple catch-all rule of thumb: *If you think you are jammed up, you are! Call for help!* Help can always be turned back. We must keep in mind the **zero impact factor** (the amount of time it will take for a company to make an impact on your situation). Survival is predicated on your ability to remain calm. Don't wait to sound the Mayday. Every second delayed is 2 seconds (at least) that someone is not coming to help you.

FFI 5.2.4 Activate your personal alert safety system (PASS) device intermittently, but not when you are transmitting your call for help. Even if in contact with the RIT **sector officer**, periodically activate your PASS device. This will give the RIT a target to locate you. We recommend training using a modified version of the acronym LUNAR (location, unit, name and nature of problem, air supply and assignment, resources needed).

LUNAR

Location
Unit
Name and nature of problem
Air supply and assignment
Resources needed

Location. What is your location? This is where you are now or your last known location: what floor, what sector or division, front or back of the house or building. Can you describe something that will give a clue to where you are?

Unit. What company are you on? For example, Truck 4.

Name and nature of problem. Give your name. Your saving of your own life outweighs any privacy issues. There have been several incidents where the wrong firefighter has been accounted for, resulting in minutes being lost from the rescue. Your rescue will come down to seconds, not minutes. State the nature of the problem. This information may aid the RIT in getting to you quicker, having them take a different route, or other actions. Describe if you are lost, cut off by fire, or trapped in a collapse. Also, just because one member is in distress does not mean others are not with him or her. This may be the case when a team has fallen through a floor, but only one member is capable of transmitting the Mayday. Always ask the member if he or she is alone.

Air supply and assignment. How much air do you have left? If the emergency is that you are lost, time is your biggest concern. This is the hourglass nailed to the table—don't let time be a nail in your coffin. If your normal policy is to be out of the IDLH environment before your low air alarm activates (and you have followed it), you will have more time to find your way out or be located. Assignment will give clues to your likely locations.

Resources needed. What will be needed to extract you from you predicament?

Emergency fireground communication

FFI 5.2.4 It is imperative that all fire departments have an emergency fireground communications system in place, including the procedure for transmitting a Mayday message. It is best to develop joint procedures of this nature among those departments who work together on a routine basis. When buildings are falling and/or personnel are missing or in distress, SOP-driven control of the fireground will often make the difference between chaos and order.

There are two general types of emergency transmissions on the fireground:

- *Top-down* emergency transmissions (command to operating personnel)
- *Bottom-up* emergency transmissions (operating personnel to command)

Top-down emergency transmissions

There will be times during the operation where the IC needs to transmit a message of urgency to all operating personnel. It may be a warning about a dangerous building condition, a withdrawal from the building, or any other critical message that is essential to the fireground operation. It may even be an announcement regarding the location of secondary means of egress from the building or the roof. This is called a top-down emergency transmission and will usually be transmitted as an urgent message.

All firefighters should be aware of when this type message is about to be transmitted across the air. An emergency transmission should be initiated with a special radio tone dedicated for just that purpose alone. This tone should be tested every day at a specific time so that firefighters become conditioned to immediately stop what they are doing, listen up, and maintain radio silence when they hear it. An emergency transmission has absolute priority over all other transmissions.

In North Hudson Regional (NJ) Fire and Rescue, a system has been in place for about 10 years, and it has worked well. After the emergency transmission is initiated by someone on the fireground, usually the IC, dispatch transmits a series of distinct tones followed by a boilerplate (standardized) statement announcing the emergency transmission. After the boilerplate announcement, the emergency transmission is repeated several times. Here is an example of an emergency transmission and procedure: (starts with a series of tones) "Dispatch to all companies operating on the fireground, stand by for an emergency transmission. By order of Park Avenue command, all companies operating in the fire building evacuate the fire building immediately; companies operating in exposures B and D, hold your position. Repeat (tones again), by order of Park Avenue command, all companies operating in the fire building, evacuate the fire building immediately; companies operating in exposures B and D, hold your position. 1533 hours." This message is repeated several times.

FIREGROUND NOTE

It is better to be harassed at the kitchen table about calling for help than having everyone say what a great firefighter you were at your funeral.

—Jim Duffy,
Wallingford Fire Department

Bottom-up emergency transmissions

Just as command has a method for transmitting a top-down emergency transmission, personnel on the fireground and in the fire building must have a way of initiating a bottom-up emergency transmission. This is basically a Mayday transmission, but it can also be used for an urgent transmission. A firefighter who is lost, trapped, or in need of some type of assistance, or who needs to get some information to command or dispatch should have a system that is recognized by all personnel as an emergency transmission, which gets the same priority as a top-down emergency transmission.

FIREGROUND NOTE

A proactive urgent transmission may very well avert a Mayday transmission later.

Many departments have portable radios that have the capability to send an emergency transmission by pushing a button. Called a Mayday or emergency identification (EID) button, it sends a signal to dispatch or command, or both, and informs them by a readout exactly who is transmitting the emergency message. It also emits a distinctive tone over the all the radios except for the member who pushed the button. The drawback here is that if the button was pushed accidentally, the member who sent the transmission usually does not know it has been sent until someone comes looking for that individual. The button may be activated accidentally when the radio is inadvertently banged around while operating on the fireground—one very good reason why operating personnel should wear their radios under their coats, with only the collar microphone exposed. There have also been cases where the EID button was activated by getting it wet. This is discussed as a Lessons from the Fireground case study later in this chapter. In any case, it is a method by which firefighters can draw attention to an emergency situation.

In the fire service, there should always be a contingency plan for when something goes wrong or equipment unexpectedly fails. In North Hudson Regional Fire and Rescue, even though the portable radios have the EID button, a backup system has been adopted should the EID button fail. In fact, it is preferred that members in distress transmit an additional bottom-up emergency transmission to better ensure they can be heard amid the normal fireground radio chatter. This procedure is also tested daily over the air. The member who needs to send the message initiates the transmission in the following manner:

Step 1. The member manually activates his or her PASS device, causing the PASS alarm to sound.

Step 2. The portable radio is keyed for transmission.

Step 3. The keyed radio mike is placed next to the PASS device for a period of 10 seconds. The PASS tone is heard all over the fireground, signaling the initiation of a bottom-up emergency transmission.

Step 4. The PASS device is turned back to the arm position.

Step 5. The emergency message is broadcast using the following format:

> *Mayday, Mayday, Mayday, this is Firefighter* _____.
>
> *Mayday, Mayday, Mayday, this is Firefighter* _____.
>
> *(Message is then broadcast).*

If the emergency transmission is initiated to signal that an entire company is in distress, the company name is substituted for the individual firefighter.

The key to transmitting the bottom-up emergency transmission is to use an audible alarm such as the PASS device or the radio EID button. The aim is to get someone's attention. There have been two cases in North Hudson where Mayday messages went unheard initially because the person sounding the Mayday did not use the PASS device, and thus the Mayday transmission got lost in the fireground communication shuffle. This was before we had radios with the EID button capability. Even a muffled PASS device activation is better than a muffled Mayday transmission without the audible tones. Even though North Hudson Regional Fire and Rescue has new portable radios, each of which has an EID button that sends a tone to the command post and identifying who is giving the Mayday, we still test this procedure every day and urge firefighters to use the PASS device over the air as an additional bottom-up emergency transmission.

None of these methods is foolproof, but together they can form an established procedure to allow the IC (top-down) and an individual firefighter or officer (bottom-up) to let someone know that something extraordinary or unusual is occurring. It is hoped that these procedures are never used; however, to be of any use, they must be taken seriously, be no secret to anyone, and be practiced.

RAPID INTERVENTION TEAMS/CREWS

RIT activation—reacting to and managing the Mayday

RIT activation should not cause a crisis at the command post or on the fireground. The RIT operation must be a deliberate and procedure-driven operation that is carefully coordinated and properly carried out. The IC and the officers on scene, both chief and company, have to demonstrate leadership ability, and all firefighters must demonstrate self-discipline to avoid letting the emotional pressure of the situation drive the incident. To this end, whether one is a part of the RIT team, an aide to command, or in a company that is supporting the RIT operation by continuing to fight the fire, every firefighter should understand the process of the Mayday operation.

The first priority is to determine who is missing and their location. Any LUNAR information missing from the Mayday report must be ascertained to best determine where to start looking. If the identity of the members cannot be determined, a PAR will need to be conducted. If the identity is known, a PAR should still be conducted, but possibly on an alternate frequency so it does not tie up rescue communications. The IC needs to clear the air by using an emergency radio transmission. Dispatch may be the best tool in accomplishing this, utilizing a dedicated emergency transmission tone, as was discussed in earlier in this chapter. It is advantageous to switch the firefighting operation to another frequency to concentrate on the communication requirements of the rescue operation.

If the distressed firefighter has to contact dispatch or command on a different frequency, allow that member to continue to communicate on that frequency and direct the rescue to that frequency. It might also be wise to assign the firefighting operation to another chief officer and for the IC to step back to better manage the Mayday.

Organizationally, the rescue operation should also be delegated to a chief officer designated as the rescue group supervisor. The responsibility of this position is to directly supervise the rescue operations and keep command informed of progress and needs. The officer in charge of the rescue must also become like an air traffic controller and give direction to the officer or firefighter calling for help. An additional SO should be requested as well as additional chief officers. An officer should also be assigned to monitor fire conditions and structural conditions in the area. At least two additional alarms should be struck: one to support the rescue operation, and one for the firefighting effort. These companies should be sent to a Level 2 staging area.

It is critical that firefighting operations continue with a focus on keeping the fire from spreading to the area of the downed firefighter. If conditions require, an additional team may have to deploy a hoseline with the RIT to protect the rescue.

Additional resources must include an immediate request for an additional RIT. If possible, in the interim, one should be used from the tactical reserve for the incident so there is minimal time elapse for positioning a backup RIT. Even if this is possible, an additional RIT must still be summoned.

The original RIT is basically a recon team and should enter the building with minimum equipment to locate the downed or lost firefighter. There is no need to lug all of the RIT equipment in at this time because it will serve to slow down the team. Many departments have put together or purchased a RIT pack with all of the required tools in one easily transported bag (mentioned in the RIT tools section). If that is not available, at a minimum, a spare SCBA cylinder and mask, a ready-made rescue sling, hand lights, a lifeline, a TIC, and a set of irons (flat-head axe and Halligan tool) may be all that is needed for the initial RIT. After the firefighter is found and assessed, the equipment needs can be relayed back to the rescue group supervisor, where the second RIT can bring it in more quickly. At this point, all they have to do is follow the lifeline to the rescue area. The requirements of the rescue operation will depend greatly on the reports of the first RIT to reach the downed firefighter (fig. 17–77).

Fig. 17–77. RIT team removes a downed firefighter in training.

The IC must ensure that EMS (both basic life support [BLS] and advanced life support [ALS]) are summoned to the command post. They should be positioned in close proximity to the rescue group supervisor where the RIT has made entry. It might be best to have two medical teams standing by because RIT operations often cause injury to the rescuers. A liaison with the police should be established so that there is a lane open for the ambulance to get in and get out without delay. Arranging for and ensuring availability of a police escort may save valuable time during rush hour. If necessary, a **landing zone (LZ)** can be designated in case a **med-evac** is necessary. Med-evac protocols are usually set up in advance and may only require a phone call to be made by dispatch. Where to land the helicopter can be a concern, and the police can be of great help with that. Command should also have dispatch contact the hospital that the firefighter(s) will be taken to so the hospital personnel can make preparations prior to EMS arrival at the hospital.

After the Mayday situation has been stabilized, command should concentrate on further stabilizing the scene. Relief should be provided where needed and the troops kept focused. RIT personnel must stay disciplined, otherwise other firefighters and the public may be put in jeopardy.

All officers, including the SO, should be on the lookout for signs of critical incident stress and address it accordingly. To proactively address firefighter emotional needs, it might be a good idea to request a CISM team respond. Firefighters who were directly involved in the firefighter-down situation should be relieved. These firefighters should be sent to a common area away from the scene, such as a firehouse where CISM counselors are available for consultation and medical personnel are there to evaluate them.

Introduction to the intervention dilemma

The RIT dilemma, as we shall call it, plagues the fire service. The RIT response across the country is wide and varied. Some departments assign RIT as an engine company, while others use a squad company, a ladder company, or a rescue company. Some departments respond the RIT with the first-alarm companies, while others dispatch the RIT as soon as a working fire is confirmed. Although this is acceptable and meets most state statutes, other departments either respond with the RIT on the second alarm (which can be a deadly mistake—what if no one strikes a second alarm?), while others respond to it only on the request of the IC (an even more potentially lethal situation—what if the IC forgets?). Some RITs respond from neighboring jurisdictions. This may be an automatic response or it may have to be requested. Other RITs are formed by committee—that is when the IC or SO takes individual personnel as they arrive, and form them into a RIT. Still others designate the RIT on the fly, over the radio, during response.

The fact is that most firefighter rescue situations occur during the first few minutes of the incident when the situation is unfolding and the least amount of information about the building or the fire is available. This is the time when firefighters are actively seeking out the fire and searching for victims, sometimes without a hoseline available and doing it with less than adequate personnel, and usually without the immediate services of a RIT.

Personnel requirements are also wide and varied. Some RITs consist of two members, and some have three, four, or more. Some have officers assigned, and some do not. In New Jersey, the *Model Fire Department Standard Operating Guide* issued by the New Jersey Division of Fire Safety states that the **rapid intervention crew (RIC)** shall be a designated crew of at least two firefighters. This is hardly enough to raise a ground ladder, let alone pull off a firefighter search and rescue mission. It does not even mention that an officer should be assigned.

Another major mistake can occur when the incident is rapidly escalating, and the first thing the IC does when the RIT arrives on the scene is put them to work fighting the fire. This is the biggest mistake of them all. Firefighter safety is the number-one priority on the fireground. If a building or a whole block burns down, but no firefighters get hurt, lost in the building, or killed, we have met the top priority. Buildings can be rebuilt, firefighters cannot. A RIT is dedicated resource with one focus—firefighter rescue capability. That is all they do. That is all they ever do.

With all these variables, we can state with some validity that the rapid intervention issue in this country is not rapid at all, but often consists of a hodgepodge of directives and agreements between departments that do not always get followed and hopefully will never have to be used. It is a gamble.

To be effective, RITs should not have to be requested, but should be a standard part of the department's response. They should operate under an established set of guidelines as outlined in the department's RIT operation SOP. For operations in large buildings, high-rises, or when exterior defensive operations cover a large geographic area, two or more RITs can be requested and assigned. In a high-rise operations, the RIT should

LESSONS FROM THE FIREGROUND

A fully developed cellar fire burned through the floor and into a first floor apartment. Seeing the fire in the apartment, the engine company on the first floor protecting the cellar stairs applied water to stop the extension. In doing so, they unknowingly pushed the fire through an open door at the rear of the apartment where it roared up a rear stairwell. There was a ladder company in the stairwell, making their way to the top floor to search for a reported missing child. As the fire consumed the stairwell, three of the four members were able to evacuate into a rear yard. The fourth firefighter, who was ahead of them, did not realize what was happening until it was too late to get back down the stairs. The fire and heat were moving so fast up the stairwell that it chased him up to and across the third floor where he had no other choice but to bail out the window. As he was scrambling up the stairs, the force of the flames actually knocked him over and he lost his helmet (no chinstrap!). Already severely burned on his ears, face, and head, he hung onto the windowsill until his hands and wrist almost burned off and then fell three floors. He smashed through a plastic awning on the way down and landed right next to an upside down picnic table and washing machine. His burn injuries required extensive surgery and therapy. His ears were almost completely burned off and had to be replaced by surgery. He survived and is back on the job.

LESSONS LEARNED

1. Always wear your protective gear properly.
2. Create barriers between yourself and the fire, especially when going above the fire.
3. Communicate your position and assignment to the attack team when you may be opposite the attack.

respond to the operations division on the floor below the fire where, if needed, they can be rapidly deployed to the area of the distress signal. If they are staged in the lobby, the reflex time for rapid intervention will be unnecessarily increased (and not rapid at all).

Standards and regulations

OSHA 1910.134 is the *Respiratory Protection Standard* that guides fire departments in procedures regarding such areas as respirator (breathing apparatus) use, maintenance, storage, and repair; mask fit testing; record keeping related to breathing apparatus; and procedures for structural firefighting. It is in this last section that regulations regarding the OSHA **two-in, two-out standard** is outlined. This standard is federal law in most states, and all fire departments and fire service personnel should comply with it. The standard states that the employee (the department), during interior structural firefighting, shall ensure that at least two employees who enter the immediately dangerous to life and health (IDLH) atmosphere shall remain in visual or voice contact with one another at all times; that at least two employees are located outside the IDLH atmosphere; and that all employees engaged in interior structural firefighting use SCBA.

The standard also allows one of the two individuals located outside the IDLH atmosphere to be assigned to an additional role, such as the IC in charge of the emergency or the SO, so long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any firefighter working at the incident. The authors cannot think of a situation where using these personnel to conduct a rescue would not further jeopardize the safety and health of firefighters at the incident. Many jurisdictions will also count the two-out as including the pump operator. Basically what this means is that if there is an emergency situation and no one else is available, the IC (the one running the show) and the pump operator (the one controlling the water, which may be only thing keeping the fire away from the downed firefighters) could be used to enter the building and rescue the trapped firefighter.

The standard further states that "nothing in this section is meant to preclude firefighters from performing emergency rescue activities before an entire team has assembled"—which allows us to attempt rescue with inadequate personnel. Studies done by the Phoenix Fire Department have shown that during firefighter rescue operations, the number of personnel needed to accomplish these tasks safely is about 12, and that some of them will also get lost or injured in the process. Having

only two firefighters—never mind the fact that they may have further critical responsibilities for the incident engaged in the rescue operation—is hardly an acceptable number. It is the responsibility of the department to have a mechanism in place that addresses this in a safer and more efficient manner.

The other caveat of the standard is an actual dichotomy or contradiction of the intent. It allows for the situation when, if based on dispatch reports, scene reports, or size-up indicators, an imminent life-threatening situation exists where immediate rescue activities may prevent the loss of life or serious injury, the requirements of the two-in, two-out standard may be suspended and individual members or the team may enter to save lives. During the initial phase of the fire operation, we are always in the life safety or rescue mode. Unless the building is fully involved, we must always assume a life hazard exists. Once we determine that there are no victims or they have been removed, we enter the incident stabilization phase and the standard applies.

Although the mandate for the two-in, two-out is a step in the right direction for firefighter safety, other standards such as NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* and NFPA 1720, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments*, are the mechanisms by which fire departments can properly staff companies and should also be made law. At this time, these are only suggested standards, as are all NFPA standards not adopted by a state or jurisdiction, where they would then become law. As standards, they have no teeth and do not need to be complied with. It is ironic, though, that these same standards, when a firefighter casualty occurs or other legal issue arises, are the criteria used to show negligence and collect monetary damages from municipalities. Very few departments meet these staffing standards.

Self-rescue

SKILL DRILL

FFI 5.2.4 Although situational avoidance is clearly the best choice, when things do go wrong—and at some point in your career they will—past training, self-reliance, and a proactive approach will give you the best chance of survival. A variety of techniques that every firefighter should know will be described next. Whether you need to help your partner clear an entanglement or seek an area of refuge after a loss of water, you owe it to yourself and your fellow firefighters to be prepared.

Personal tools. Regardless of your position on the fireground, you should always carry tools. One of your hand tools should provide you with a way to breach a wall or force a door. The most practical and versatile tools are the Halligan tool and the flat-head axe. Beware: Never give up your tool. If you do, you will not have it when you need it. We have all seen a firefighter without a tool take the new firefighters' tool. This is unacceptable. For example, if a firefighter or officer grabs your hook or bar, hold onto it, and say, "Where would you like me to pull?" This will ensure that you maintain control of your tool. Smaller hand tools can play a role in clearing wire that you may get tangled in. You should carry a small pair of wire cutters in a pocket that is located opposite the air line on your SCBA. This will allow you to access your cutters without taking your hand off your air supply strap, so you can clear the entanglement even if you have to manipulate your SCBA to reach the wire.

Area of refuge. Having a contingency plan of where to go if something goes wrong is critical. Continual size-up of your location in the structure will aid you in planning for failure. When in a public hall in an apartment building, first force the door to the apartment next to the fire apartment. This will not only show you the likely layout of the fire apartment, but it will also give you a place to go if there is a wind-driven fire or a loss of water.

When moving down an interior hallway, map it out. Know where all the doors are, what are they constructed of, and which way they open. When inside the structure, a door that opens toward you will either be the closet or basement, which is a change in grade if you are on an upper floor or the way outside. In older buildings, and in some newer townhouses or estate homes, it may be an elevator door. Understanding the typical layouts of structures can aid you in your size-up.

As a member of a truck company, if you find the fire, you should close the door, ensure your area is safe, and call for a hoseline. If fire is coming down the hall, retreat into a room and close the door. This action should buy enough time for you to exit safely. By closing the door to the room, you may be able to prevent making a headfirst dive onto a ladder or bailing out on a rope. When seeking an area of refuge, never retreat into a bathroom. There may be no windows or only a small window high up on the wall, making escape impossible. Knowing where abutting roofs and porches are can also provide a safe haven. If there is no ladder there, you can exit the window, hook

Fig. 17–79. Wall breaching. (Courtesy of Local 825 president Patrick Egan)

your tool on the sill, using it as an improvised lifeline, and wait for a ladder below any venting fire and heat.

Bailout kits. Theoretically, bailout kits place a ladder at every window. They provide a way out in the most extreme conditions. Although seeking an area of refuge by closing a door may negate the need for such devices, there are circumstances where this will not be possible. You may find yourself in a living room, kitchen, or room without a door, and the bailout may be your only option. There are many different systems on the market. We recommend a device that has the ability to anchor at the window because it is unlikely that under deteriorating fire conditions that you will be able to tie off to a remote anchor. Several devices have the ability to stop you after you exit the window, so you can reposition yourself and then lower yourself to the ground (fig. 17–78).

Fig. 17–78. Bailout kits provide an exit at every window for the times when you cannot close the door. (Courtesy of Coda Ricci)

Wall breaching. FFI 5.3.9 Breaching a wall may be necessary to exit a hazardous environment or effect the rescue of a civilian or a trapped firefighter (fig. 17–79). Wall construction differs, and your size-up will determine if this is a practical option. Brick, concrete, and block walls are not practical for a firefighter to breach for self-rescue and may require special tools. Block walls can be effectively breached for firefighter rescue by employing a sledgehammer. This option is labor intensive, requires room to swing, and is usually performed from the outside in. For self-rescue, the walls most often breached will be lath and plaster, or gypsum board. Even with this type of construction, don't be surprised to find studs that are not conventional in their spacing or a chimney inside that makes breaching impossible. Wall studs are usually 16 in. (41 cm) apart, but this may differ based on factors such as the age of the building. If a wall breach is the action you must take, the Mayday should have already been called. Breaching a wall with a Halligan tool entails the following steps:

- Check for an outlet on the wall. If one exists, move to the next bay.
- Plunge the tool completely through wall about 3½ ft off floor to ensure that the back of wall is clear.

- If you hit something solid (maybe a refrigerator, dresser, or wall unit), move down a few bays.
- Pull the bar back through the wall, drop to bottom, and pull back toward yourself.
- Breach the rest of the wall by pushing the back of the wall down with the Halligan or kicking it out with both feet.
- If wires are present, knock them down with the Halligan.
- If time permits, hit a stud sideways at the bottom. This will provide a wider opening. You may then get through without manipulating your SCBA.

Detroit dive

- Breach the wall as previously described.
- Place back to hole.
- Lean back, to allow the SCBA bottle to clear the hole.
- Rotate slightly to allow one of your arms to be placed on the opposite side of the wall.
- Lean back and rotate on your side toward the arm that went through.
- Note: In all breaches, be sure to check the stability of the floor on the other side to ensure it is actually there and you will not be entering a shaft or two-story foyer.

This method is highly effective, but works best on a gypsum board wall (fig. 17–80). If going through lath and plaster, take an extra second to make sure the bay is completely cleared. In chapter 19, Search and Rescue, the section on "Mask Confidence and Emergency Procedures" covers the reduced profile maneuver and the disentanglement maneuver. Any method that requires you to manipulate your SCBA to self-rescue shall be cause to call the Mayday. If you must use one of these methods to get by an obstruction for fire attack, you should radio a message to command apprising them of the situation and make a careful risk-versus-gain assessment of the situation.

Fig. 17–80. The Detroit dive. (Courtesy of Local 825 president Patrick Egan)

Filter technology and smoke inhalation. Since the fire department adopted high-risk technology (e.g., SCBA) to make our work more effective and efficient, many civilian lives have been saved. Note that we didn't say *safer*. The leading cause of non–heart attack deaths inside structure fires each year has been smoke inhalation. Smoke inhalation injuries reported by NFPA in 2005 were as high as 3,390 in the United States. RITs have proven not to be the answer alone. Assistant Chief Kreis of Phoenix, Arizona, conducted a study of 200 drills and timed how long it takes a properly trained and staffed RIT to locate a downed firefighter. The average time was around 8 minutes. This was with blacked out masks and no heat. This shows that if we are going to reduce these deaths and injuries, it will take a commitment to air management, proper staffing, an early call for help, survival training, and embracing filter technology.

Filter technology provides the firefighter in trouble with a last chance of being rescued or exiting the structure (fig. 17–81).

Fig. 17–81. Firefighter exits IDLH atmosphere using filter technology. (Courtesy of FirefighterSafety.net)

Filter technology is not a way to extend your working time. It is only to be deployed when the firefighter is faced with no other option than to breathe an IDLH atmosphere. These filters protect the firefighter from acrolein, hydrogen chloride, hydrogen cyanide, and the most notable firefighter killer, carbon monoxide. These filters do not provide oxygen. Although OSHA defines an oxygen-deficient atmosphere as below 19.5%, the human body can survive in an environment below that percentage.

Study data from Yale and Harvard confirm that not all fires at the floor level will experience a drop in oxygen below 19.5%. The number of smoke inhalation injuries are also an indication that in every one of those fires, there was enough oxygen to support life. The real problem is the toxic gases that do not allow the body to process the available oxygen in the blood stream, resulting in asphyxiation. Case studies show that when a firefighter runs out of air, the first inclination is to rip off his or her mask. This makes a difficult situation worse because of the difficulty and time it will take the RIT to provide air to the firefighter. With a filter, the mask remains in place, allowing the RIT to simply change out the regulator. The survival sequence is the following:

- Call the Mayday.
- Activate immediately your PASS device.
- Seek an area of refuge.
- When completely out of air, change to the filter.
- Update the Mayday and get out!

Filters are rated to last for 15 minutes and are an essential component in any survival sequence.

PASS devices and preparing to be rescued. According to the National Institute of Standards and Technology (NIST), "Personal Alert Safety System (PASS) devices are designed to signal for aid via an audible alarm." Typically, PASS devices sense movement or lack of movement and activate a 95-decibel alarm signal if the lack of motion exceeds a specific time period. The loud alarm signal alerts other personnel that a firefighter has become incapacitated. The sound also helps to guide rescue personnel to the location of the incapacitated firefighter.

Although the current NFPA 1982 *Standard on Personal Alert Safety Systems (PASS)* requires only a motion detector, some manufacturers are beginning to incorporate thermal exposure sensors into each PASS device. Some PASS devices are also being integrated into fireground personnel accountability systems. Studies have shown that when PASS devices are not integrated, they may not be armed by the firefighter.

Your PASS device is a tool that should be manually activated when you are in distress. When preparing to be rescued, you should position yourself so if you were to become incapacitated, you would not muffle the alarm. As a general guideline, in a house, if you are lost or separated, call for help and keep moving along the wall to try to find a window or area of refuge. Remember to feel up high on the wall because if you keep feeling low, you may never feel the sill but keep passing below it on your way around the wall. Coming across a register in the floor or a radiator is a good indicator that you are probably near an outside wall. This will not be the case in a bathroom. Although making noise is recommended, every now and then stop and listen to your surroundings.

In a commercial structure, most instructors recommend moving until you find an area of refuge or some feature you can describe that can aid in your rescue. If you decide it is best to stay put, calm down and conserve air.

Breathing techniques. Air consumption rates vary between individuals. Factors will include lung capacity, physical fitness, level of exertion, and emotional state.

It is critical to conduct comparative testing to evaluate emergency and normal breathing techniques for each firefighter. This is accomplished by synchronizing SCBA bottles with a digital air gauge after the bottles have cooled down. Each bottle must be labeled for the firefighter being tested. Whatever method your department uses, it is not recommended to use skip-breathing or any method that requires you to hold your breath. Holding your breath causes carbon dioxide to build in your bloodstream, resulting in an increase in respirations.

Many firefighters try to breathe in through their nose and out through their mouth until their respirations demand that they take a full breath. You must find a method that works for you. Currently the air gauge works off pressure, not volume. You must be able to judge your available air supply from your pressure gauge, and that takes practice. The following factors should be considered:

- How far did it take you to get where you are?
- What is your level of exertion?
- How much experience and training have you had?
- What is your emotional state?

Far too often, new firefighters gauge their air supply based on the smokehouse they were trained in. If your first fire is in a commercial building, the smokehouse reference will do you little good. Firefighter I an II classes should be exposed to different buildings in class, and instructors are encouraged to conduct as many evolutions on air as possible.

Reilly emergency breathing technique. As with any method, the Reilly emergency breathing technique is predicated on remaining calm. With this technique, you hum out your breath. This is a low hum and usually cannot be heard over the low air alarm. A firefighter's normal breath cycle is around to 6 to 8 seconds. By extending your exhalations to between 12 and 15 seconds, you can compound the time to escape or wait for rescue. For example, if you had 50 breaths left, and you extended your breathing cycle by just 6 seconds, the compounded time would give you an additional 5 minutes of time on air. In tests, we found this method to also have a calming effect by giving the firefighter something to focus on. If you are moving, it is difficult to use any method. If you feel like you need to take a normal breath, do it, then go back to the technique. The more you use it, the more time you will buy (see fig. 17–82).

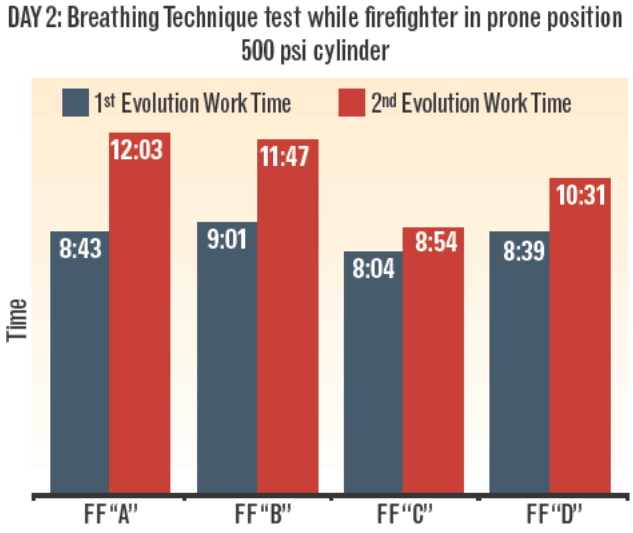


Fig. 17–82. Chart of prone test for breathing technique

Intervention teams

The rapid intervention team. Response of the RIT response is crucial for firefighter safety. At the very least, the RIT, also known as a rapid intervention crew (RIC) or firefighter assist and search team (FAST), should respond upon confirmation of a working fire. Second-alarm RITs are not acceptable and, in some states, illegal. History has shown that a good majority of firefighters get themselves into assistance-required trouble in the initial stages of the operation. If the department protocol calls for the RIT to be dispatched with the striking of the second alarm, they will not be on scene when needed most.

This team should also be dispatched on any special response that is out of the normal response realm, such as hazmat (hazardous materials) incidents, technical rescue incidents, and extrications, to name a few. RIT response and operation should be part of a departmental SOP, addressed in advance. The duties, responsibilities, and assigned equipment of this team should be addressed in the SOP.

At incidents where there is an unusually large commitment of personnel on the scene, command may consider requesting two or more RITs. RIT members may also be required to don 1-hour SCBA cylinders in a large-area building. The rationale here is that if the firefighters requiring rescue are wearing 30-minute cylinders, and they can't get out, how will the second team with the same cylinders get them out in time without falling victim to the same predicament?

FIREGROUND NOTE

The quick use of a defibrillator even before firefighter removal may make the difference between a rescue and a recovery.

RIT tools. RIT operations are based on the effective use of tools. An RIT without tools is next to useless. RIT packs and RIT tools, both hand and power, should be staged at the ready in an accessible but safe area.

RIT pack. The RIT pack includes but is not limited to:

- A 1-hour bottle
- RIT connections for your department's SCBA manufacturer
- Extra facepiece
- Regulator to RIT pack
- Multiple stand-alone PASS devices
- Wire cutters with reflective handles
- Tin snips with reflective handles
- Small wonder bar
- Two lengths of 15-ft loop webbing
- Two large carabiners
- Small anchor strap
- Two filters

Make sure that there is a way to secure the RIT pack to the firefighter. Firefighters should be trained on using all of the connections to **transfill** the downed member's bottle. Note that the downed member's bottle will equalize when transfilled and will not give the downed member all of the available air. If you are rescuing a lost company, you must bring more than one pack.

Hand tools. The following is a suggested list of tools that the RIT should carry and stage:

- Portable radios (headset radio for RIT Officer)
- Spare SCBA cylinder and mask
- Supplied air respirator with spare cylinders
- Automated external defibrillator (AED)
- Ready-made rescue sling
- Hand lights
- Rope-guided search equipment with carabiners
- Thermal imaging camera (TIC)
- Set of irons (flat-head axe and Halligan tool)
- Pike pole or Halligan hook
- Knife
- Target exit device
- Sledgehammer or maul

Based on the building construction and occupancy, other tools may be required. For example, for operations in a high-rise, a hydraulic forcible-entry tool (HFT), also known as a rabbit tool, should be a standard part of the RIT equipment.

Power tools. Power saw with both wood-cutting blade

- Power saw with steel-cutting blade
- Fire service chain saw
- Concrete blade available

Where concrete may be encountered, staging a saw with a concrete blade is recommended. Do not rule out of the use of hydraulic rescue tools as required by the building construction, especially when confronted with fire-resistive buildings.

Safe power saw operation. Power saws can easily end a firefighter's career in a split second. One manufacturer stated that the limb will be gone before you feel the pain. To this end, power saw and all power tool operations should be conducted with extreme caution. The following are some safety guidelines to observe when operating power saws:

- Respect the tool.
- Wear safety glasses or SCBA.
- Ensure all saws are started in a safe area, shut down, and then taken to the area of operation. For example, before going to the roof, start the saw on the ground.
- Always be aware of ignition sources when fueling and refueling.

- Be aware of the **circle of danger**—anyone you can reach and touch with the saw (or any tool) is in the circle of danger.
- Always plan the cut and inform others of that plan.
- Never pick up the saw to start it—always start it on the ground.
- Keep good balance, with your feet in a boxer's stance 18–24 in. (46–61 cm) apart.
- When operating a saw with a wood blade (carbide tip), rev the saw to its maximum rpm before sinking it into the work.
- When operating a saw with steel blade, set the saw in the place to be cut before revving the saw. Begin to rev the saw slowly, and when the saw has a bite in the material, then progressively increase the rpm and make the cut.
- Do not store composite blades with hydrocarbons, because this can cause catastrophic failure.
- Position your legs so the plume of sparks are not directly hitting your gear. Turnouts can burn.
- Never step on anything that has been cut.
- Use the **buddy system** when cutting. Always have a guide person behind the saw operator. The guide person keeps an eye on the area, while the saw operator concentrates on the cut.
- Use the "contact-go/no-contact-stop system." As long as the guide person has a hand on the saw operator's shoulder or back, the cutting continues. If the guide person breaks contact, the saw operator stops cutting (fig. 17–83).
- Always control the saw.
- Always be prepared to stop the cut and the saw.
- Never let the saw operate more than 6 in. (150 mm) away from the cut.
- Listen to the saw—it will clue you in when to add or take away pressure.
- When the cut is stopped, bury the blade in the roof to stop the blade from spinning.
- Make sure that when the job is finished the saw is cleaned, fueled, and checked for damage.

Fig. 17–83. Nonverbal communication systems eliminate guesswork during cutting operations. This allows the firefighter operating the saw to concentrate on the cut. (Courtesy of Bob Scollan)

FIREGROUND NOTE

There is no politician on scene who is telling command that they can't call for the resources they need to protect us!

RIT on-scene actions—proactive preparation

SKILL DRILL

Prior to standing by at the ready, the RIT can perform specific tasks aimed at increasing firefighter safety. In fact, the more preemptive action the RIT can take to help firefighters inside the building and on the roof help themselves out of danger areas, the safer the fireground will be. If a firefighter can get to an egress point that is already there and doesn't have to wait for one or create one by force, the job of the RIT is half done. Such actions include, but are not limited to the following:

- *Sizing up entry and exit points from the building.* The RIT should be identifying multiple ways in as

well as multiple ways out for all floors or areas of the building. This includes plans for the breaching of walls.

- *Staging building construction-specific tools for firefighter rescue applications.* Without proper tools, the RIT is useless. Some departments use canvas tarps called RIT tarps on which all RIT tools are staged. The essential tools required for basic rapid intervention operations are listed on these tarps. If the building construction or some other condition requires additional equipment, the RIT officer ensures this is secured (fig. 17–84).

Fig. 17–84. RIT equipment should be gathered and staged in one place on the fireground. A dedicated RIT tarp is one way of organizing this equipment. Mandatory equipment can be listed on the tarp in permanent marker. (Courtesy of Ron Jeffers)

- *Ensuring the area is well lit.* Lighting on the fireground is a most basic safety issue. Most new fire apparatus can activate their powerful flood light systems with the flick of a switch. It should be part of the initial scene assignment duties for the ladder at the front of the building. The RIT, as required, can set up additional lighting to illuminate all sides of the fire building and possibly the roof. Illuminated operations are far safer than operations conducted in the dark. In addition, a lost firefighter may find the way to a window easier if the area outside it is lit up.
- *Raising ground ladders.* One of the main tasks of the RIT is to raise ground ladders around the building for secondary and tertiary egress from the upper floors and from the roof. In fact, they should not have to be told to do this. It should be done automatically (and directed by SOP). At one very smoky taxpayer fire, visibility was reduced to less than a foot in the street. When an evacuation of the building and roof was ordered by command, the roof team could not find the aerial in the smoke. Fortunately, the RIT had raised ground ladders to the roof on the C and B sides of the building. The ladder company got off safely without incident. It is a command responsibility to notify personnel inside the structure and on the roof of RIT-created secondary egress points as soon as they are in place. This can be done via emergency fireground transmission. If companies know the existence and location of additional egress points there before they need it, they are halfway out (fig. 17–85).

Fig. 17–85. One of the major duties of the RIT is to provide secondary egress routes. Here a RIT is raising a ground ladder for secondary egress from the roof. (Courtesy of Ron Jeffers)

- *Removing barriers (window gates).* The RIT should not wait until someone needing help shows up behind window gates. Barred windows hamper both egress and ventilation operations. The removal of bars and properly coordinated ventilation of windows is especially critical at first-floor and below-grade fires (figs. 17–86 and 17–87).
- *Assisting in the set up and monitoring of the command board.* Keeping an up-to-date profile of where personnel are operating allows the team to have a better idea of where to begin. This will include monitoring roll calls.

Fig. 17–86. Window bars on wood frame structures are easier to get off from the exterior than from the inside. The firefighter needing to get out may not have the time to remove them from inside the building. Remove them as soon as you see them to avoid critical situations later. (Courtesy of Ron Jeffers)

Fig. 17–87. Metal casement windows pose the same hazards as window bars. (Courtesy of Jim Duffy)

- *Monitoring radio reports.* Many Mayday notifications are made during initial fireground operations when companies are most unfamiliar with the building and the fire. At this communication-heavy time, Maydays are sometimes easy to miss. For this reason, RITs must be vigilant in radio awareness at all times. This includes during the response. Rapid intervention crews must pay close attention to the initial on-scene radio report as well as the assignment of companies. When on scene, they should report to the command post for a briefing and consult and work closely with the accountability officer. It is best that both the command technician (accountability officer) and RIT officer stand by at the command post with headphones on. This helps eliminate external noise and allows them to concentrate exclusively on fireground transmissions.
- *Forcing doors and other egress points not accessed by the initial entry team.* Providing egress helps those inside help themselves to get out faster and more easily. Egress includes rear and side doors, as well as cutting fences and releasing any fire escape drop ladders.
- *Making available a dedicated RIT hoseline and staging it in an easily accessible area.* It may be possible that fire is blocking a firefighter's egress. A quickly deployed hose stream may be all that is needed to allow a potentially trapped member get to safety.

Although these tasks are essential to ensuring the quickest ways of entry and egress are assured, the RIT must not get sidetracked and involved in firefighting. When these safety-oriented tasks are complete, the team must go back to the command post and stand by.

RIT activation considerations. When the RIT is activated, and the team members have a potential focus area to access, they should enter the building to find the firefighter and ascertain his or her medical condition. That entry area should be sufficiently illuminated. When found, one of the first things that should be relayed to command must be the status of the member and his or her predicament. They can also use the LUNAR method discussed earlier to provide the proper information. We must determine if the firefighter is conscious and assess the degree of entrapment, if any. If the victim is conscious and not trapped, a major concern will be if the victim can walk under his or her own power. If the answer is no and/or the firefighter is trapped, things will get more complicated as to how to get him or her out and transferred over to EMS. If the firefighter can walk, it may be that he just needs guidance out. If the firefighter was merely disoriented, that firefighter should still be medically evaluated and the entire company reassigned to rehab or released from the scene. Be aware that CISM may still be required and should be made available.

Height may also be an issue when a firefighter gets injured. If so, aerial devices may have to be used by the RIT for access and rescue. At one fire, a firefighter fell into an open scuttle hatch on the roof and dislocated his shoulder. The RIT was activated, and one of the aerials was dedicated to removal of the firefighter. He was helped down by his company on the roof and by the RIT working their way up from the turntable. The fact

that he was able to walk helped make his predicament of being in an elevated position less complicated.

Upon finding the firefighter, the RIT should turn off any activated PASS device. This serves two purposes. It will decrease the frenzy and allow rescuers to think better. It will also help determine if there is another PASS device going off that was previously not heard by rescuers.

At the very least, RIT personnel should be trained in the basics of firefighter assessment and rescue. They should know how to check for the ABC (airway, breathing, circulation), and place the firefighter on supplied air, devise various slings for removal, and know how to perform all these skills in the dark, the smoke, and the heat.

One note about the communications in these situations: Be aware of the feedback that is often created when personnel are communicating in close proximity to one another. Often all that is heard at the command post is feedback and squelch.

Air management. FFI 5.3.9 Poor air management has killed a number of firefighters each year, so it is important to review its implications before we discuss how to remove a downed firefighter. The following factors have contributed to these situations:

Physical limitations. All firefighters have differing amounts of air consumption. Factors include their weight, aerobic conditioning, age, respiratory capacity, condition, and weight of their PPE. Overexertion and stress are also major limitations to air consumption rates.

Environmental issues. High heat and other environmental stressors encountered will affect the firefighter's air consumption. Breathing elevated air temperatures, encountering thermal insult on the body through the facepiece, and retention of heat inside PPE will cause an increase in the core body temperature and an adverse impact on air management.

Physiological issues. Working in the certain conditions can cause physiological issues. These conditions include overexertion, issues of competence and/or trust in their equipment, and difficulty working in obscured or blacked-out conditions. These conditions lead to such physiological reactions as feelings of claustrophobia, panic, increased respirations, increased blood pressure, and critical incident stress.

Resistance to change. Change is a constant in the fire service and must not cause stress in the ranks. Resistance to change occurs through challenging of the norms set by peer pressure, traditions, and misinformation. One of the best ways to reduce the stress of change is let personnel know that change is coming and to involve those who will be affected by the change. Lack of involvement leads to resistance. Resistance leads to potential injury. Fire departments must be willing to train and enforce current practices and standards. Company officers must be willing to enforce and practice safe use of SCBAs and embrace air management techniques. It is the responsibility of Fire Department management and safety divisions, and all officers, to enforce rules and not overlook violations.

Disregarding low-air alarms. A common problem in the fire service is working under the assumption that it is acceptable to stay in an IDLH environment with your low-air alarm sounding. As mentioned in the NFPA 1404 Standard, "No firefighter will be allowed to operate with less that ¼ tank of reserve air in an IDLH environment." Fire crews must be trained to consistently monitor their remaining air and match it to the members of their crews.

Tunnel vision. Tunnel vision can cause companies to operate in an IDLH environment without being aware of the constantly changing conditions. This phenomenon, which can have (and has had) deadly repercussions, results from an individual firefighter's lack of training in situational awareness and a weak command structure that puts company-level crews in jeopardy. Some responsibility, however, must fall on the company commander. It is the company commander who, most of the time, is at the root of the issue and, coupled with the exterior size-up conducted by command, can round out critical information on conditions and potential safety concerns.

Lack of RIT. Air management emergencies are often mitigated by proper RIT actions. Problems result from fire departments not utilizing proper RIT, lack of or improper RIT training, or the RIT not being capable of performing an actual emergency deployment. Too many fire departments staff their RIT with any available firefighters. This group should have established minimum training standards. They should perform under established SOPs, and have the proper tools, equipment, and knowledge to provide adequate RIT services. In addition, the fire department command structure should have established procedures and training on how to manage a Mayday call.

Poor company-level tactics. There is a national trend of senior fire personnel and officers retiring, which has led to a new generation of younger fire officers and firefighters without the experience of operating in the ever-changing structural fire environment. This lack of experience translates to issues of improper air management that have spiked the number of close-call incidents. The answer here is more realistic and battle-ready training.

Standard operating procedures. Fire departments need to establish and enforce air management SOPs. They must ensure that all personnel are trained, practice, understand and use the procedures. The SOPs should be consistently enforced so a consistent behavior is maintained.

SCBA conversion. When a down firefighter is located, it is critical to convert his or her SCBA into a harness. This simple action will greatly assist in a rapid removal of the firefighter. Yes, it takes a few seconds to complete, but it will save you minutes when extracting the firefighter. The conversion can usually be completed while your partner is assessing the firefighter's air supply. A common mistake is for the RIT to try to convert the harness in a confined area. Although this may be necessary, size-up is the key. You will know the terrain from which you just came. If it is clear a few feet away, pull the firefighter out of the debris any way that you can, then convert the SCBA. This will help facilitate a more efficient transfer for the conversion and will ensure the firefighter has air or can be changed over to a supply of air. The following are the steps to a proper conversion:

- Extend the waist strap while it is still buckled.
- For a really large firefighter, loosen the shoulder straps and pull the SCBA bottle down.
- Lift one of the downed firefighter's legs over your shoulder.
- Grasp the straps, and never losing contact, move your hands around the firefighter's leg and buckle the straps so that they harness the firefighter's leg that is over your shoulder.

This conversion will allow the firefighter at the top to grab the shoulder straps and pull as a unit. You may choose to keep the leg over your shoulder and push while the firefighter is being pulled (fig. 17–88).

Fig. 17–88. Firefighter converting the SCBA into a harness. (Courtesy of Christopher McGuire)

Firefighter packaging and removal considerations. This section will cover likely RIT evolutions that you may have to face as a member of a RIT team or while helping one of the members out of a structure. These are not all inclusive, but will open your eyes to the necessity of safety and survival training. Pulling a firefighter out is more labor intensive than removing a victim. Case studies have shown that the team that locates the firefighter often will not be the team that completes the removal. It is important to bring in a lifeline that can be secured to an object to facilitate a quick exit and entrance path for egress, personnel, and resources. Discipline will also play a role. Too many hands can actually slow the removal. Officers will be needed to manage the rescue, not perform the tactics. This will fall to you. Make sure you are prepared!

FIREFIGHTER RESCUES AND DRAGS

2:1 Mechanical advantage system

SKILL DRILL

With the 2:1 mechanical advantage system, a rope and a carabiner is used to help remove an unconscious firefighter in a restricted or cluttered area.

1. One firefighter secures the rope to a substantial object out of the danger area and deploys the rope as he or she searches for the trapped firefighter.
2. Once the firefighter is located, attach the middle of the rope to the top of the SCBA harness, where the

shoulder straps are attached, with a large carabiner or snap hook. Make sure the SCBA waist strap is secured between the unconscious firefighter's legs so that the SCBA will not be pulled off.

3. The firefighter backs up in a straight line with the remaining rope, turns toward the unconscious firefighter in a seated position, and pulls the unconscious firefighter from the danger area (figs. 17–89 and 17–90).

Figs. 17–89 and 17–90. The rope is run through a carabiner attached to the downed firefighter's SCBA harness. The firefighter at the anchor point pulls the rope, bringing the firefighter toward him as he pulls. (Photos courtesy of NHRFR)

Drag rescue device (DRD)

SKILL DRILL

NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, outlines the guidelines that all new turnout coats must meet to be compliant. The standard requires a device that enables firefighters to be manually dragged horizontally for the purpose of a quick removal from a danger area. The drag rescue device (DRD) meets this compliance.

The DRD is simple to set up and deploy. It is tucked into the collar of all new turnout coats. The harness operates by forming loops that cinch themselves beneath the armpits. The device is a continuous loop, not unlike a rescue sling. It is positioned on the wearer between the exterior portion of the turnout coat (on the inside) and the thermal barrier portion (the shell). The device basically sits wrapped under the wearer's arms between the vapor barrier and the shell of the turnout coat. When deployed, the top loop is released by pulling up on a Velcro® tab on the collar and pulling the top of the device loop upward and outward, taking the slack out of the harness and tightening it around the wearer's armpits, making it ideal for dragging (fig. 17–91).

Fig. 17–91. The drag rescue device (DRD) deployed. (Photo by Jim Ricci, courtesy of Globe)

There are some firefighter-caused limitations with deployment. Firefighters are trained to carry the weight of their SCBA on their hips. This allows easy access to the DRD. If firefighters are carrying the weight of the

pack on their shoulders, it is harder to deploy. Some models of SCBA completely cover the DRD even when worn correctly (fig. 17–92).

Fig. 17–92. When SCBA is worn properly, it is easier to deploy. (Photo by Jim Ricci, courtesy of Globe)

The device comes with a user information guide, outlining the manufacturer's recommendations for the device. It is highly recommended that the wearer not only read but become familiar with the layout, setup, and deployment of the harness. After each deployment, the handle (pulling loop) must be reset on the back of the coat in accordance with the user guide instructions. It should also be periodically checked to ensure that it is properly installed and not damaged in any way.

According to the user information guide, the purpose of the firefighter DRD is to aid firefighters with the rescue of an incapacitated firefighter by dragging him or her along a horizontal plane. The DRD is intended to assist in pulling or dragging an incapacitated firefighter and is not designed nor tested for use in vertical rescue operations. The guide further states that the product is only for structural or proximity firefighting. The DRD is not an escape harness for lifting or lowering a person on a lifeline.

The handle or pull loop, once slack is pulled out of it, is big enough for two firefighters to grip it simultaneously. If the firefighter who is being rescued does not have his or her turnout coat closed all the way or the SCBA waist strap is not in place, the unsecured areas start to separate and the coat begins to ride up. In one case, it almost pulled off.

Belt or harness drag

For a horizontal drag with one firefighter we found this method to be the most effective and the least labor intensive (fig. 17–93). As the rescuer, you would convert your waist strap and send it through the loop of the DRD. This could also be accomplished by hooking into the DRD with the Class II harness. Once hooked in, straddle the downed firefighter, ensuring that you do not dislodge the firefighter's face mask. Now you can crawl with your tool on all fours. The downed firefighter is now dragged in line between your legs.

Fig. 17–93. This photo demonstrates the belt or harness drag; note that your waist strap must go through your legs. (Photo by Jim Duffy, courtesy of Globe)

FIREGROUND NOTE

Preferred firefighter and occupant removal

1. Interior stairs
2. Horizontal exits
3. Fire escape . . . (check condition)
4. Ladder
5. Rope

Stair drags

SKILL DRILL

The DRD is not recommended to be used to move a firefighter up or down stairs (figs. 17–94 a and b). The problem with using it alone is that when the SCBA gets stuck, it is difficult to turn the firefighter's body with the strap. Also, the length of the strap that makes it conducive for horizontal drags is a hindrance when pulling up, and forces you, if you are the firefighter on top, to pull with your arms instead of lifting with your legs. However, when the downed firefighter's SCBA is converted into a harness and the rescuers are trained to pull the DRD

LESSON FROM THE FIREGROUND

The fire was in a two-story wood frame vacant building. It was showing heavy fire and was exposing a wood frame, 2½-story, occupied dwelling on the D side, which was 3 ft (1 m) away. Flames were licking against the soffit of the exposure. The vinyl siding on the other exposure, approximately 20 ft (6 m) away, was already melting. Having been the scene of several previous fires, it was in a state of disrepair and was marked as a Level 3 hazardous vacant building. The first engine on the scene had stretched a line to the rear via an alley where most of the fire was concentrated to try to knock it down quickly. A second line was being used to wet down the exposure on the D side. As it was early in the fire and companies were still arriving or en route, no other extinguishing actions were being carried out. Additional lines would be stretched later to protect the D exposure from inside, protect the other exposed buildings, and extinguish the main body of fire. At this time, however, only two companies were operating.

As the ranking chief arrived and assumed command, it became clear that an EID button had been activated on the fireground. Dispatch confirmed which individual had activated the button. It was the officer of the first-arriving engine company. When contact was attempted over the radio with that individual, there was no answer. Since the second alarm had been struck by the first company on scene, the IC struck a third alarm to address the Mayday. An additional RIT was also requested. The dilemma at hand was that there was no RIT yet on scene. They were still responding and were still a few minutes out. They would still have to park, finish gearing up, and bring tools and equipment to the command post. There was not enough time if someone was in trouble. A battalion chief and a ladder company who had just arrived were sent to find the company. They had none of the RIT equipment that was carried by the dedicated squad companies that responded as RITs, and this meant that some other extinguishment and support functions would not get done, but there was no other choice at the time. All this time, the Mayday transmission was sounding over the radios, but there was no answer from the officer or his company. The firefighter and his company were found in the back of the building. They were operating a hoseline at the rear and were fine. They did not even know that the Mayday was sent. The radio of the officer in had gotten wet and malfunctioned, sending out the Mayday. His collar mike had been knocked loose from the shoulder strap and was not near his face, but was dangling near his knees.

LESSONS LEARNED

1. The person who activates the Mayday button may not know it has been activated.
2. The Mayday tones come out of all radios except the person who activated it. The officer whose Mayday button was activated was never aware of it.
3. Complacency can kill. There can be no such thing as a false Mayday when the tones or a PASS device is heard. All Mayday and PASS device activations must be treated as the real thing until proven otherwise. Waiting to determine the validity of the activation will waste precious time, which is our enemy during firefighter rescue operations.
4. In the early stages of the operation, command must be prepared to take whatever steps are necessary to address a Mayday, even if it means pressing non-RIT companies into service.
5. All companies should be trained in at least simple firefighter rescue procedures, whether they are assigned to dedicated RIT companies or not.
6. RITs should be responding from as close to the incident as possible. The farther away the RIT is responding from, the more the likelihood that on-the-spot, improvised firefighter rescue tactics will need to be implemented.

in opposite directions under both shoulder straps, the DRD will provide two short loops to grab, giving you both the leverage and control to manipulate the downed firefighter up the stairs. When trying to go down the stairs, the head is not supported and will tend to hit the stairs unless the strap is used as just described.

These are just a few of the ways in which the DRD can be used more efficiently in the rescue of an incapacitated firefighter. These are by no means the only ways to accomplish this objective. Like any tool, the skills must be practiced, or they will not be successful at the time they are needed the most.

One of the most valuable attributes that firefighters have is the ability to modify and adapt to overcome and make the job more efficient. That is part of who we are. An old chief once said, "You must adapt to be effective, you must invent to overcome, and you must create to compensate." Remember the time to find out if something works should not be at 3 a.m. when the building is on fire.

One other note about the DRD: In a recent safety and survival class, the strap deployed and got caught, trapping the firefighter as he tried to breach through a wall. Make sure it is repacked according to the manufacturer's guidelines.

Removal of a firefighter down a set of stairs. Convert the SCBA harness as described earlier.

- Place the firefighter on his or her side and grasp the shoulder straps.
- Pull and guide the firefighter down the stairs.

It is easier to remove a firefighter down the interior stairs than down a ladder. If the stairs are charged with smoke, ensure that the firefighter's air supply does not become dislodged.

Removal upstairs. Convert the SCBA harness as described earlier.

- The rescuer on top will grasp the shoulder straps and pull.
- As the firefighter on bottom, you will bury your head in the crotch of the downed member and place both of the downed member's legs over your shoulders. Your hands should grasp the downed member's buttocks and push the firefighter up.

Figs. 17–94 a, b. Both straps are pulled under the shoulder straps, producing two separate short loops. Figure 17–100b shows that after the SCBA waste strap is converted, the shorter loops allow for an safe, efficient and effective pull up the stairs. (Photo by Jim Duffy, courtesy of Globe)

Removal will take some coordination between the two rescuers. This process can be enhanced if additional resources become available. Without slowing down the removal, a 2:1 mechanical advantage system can be added to assist the two rescuers (fig. 17–95).

Fig. 17–95. Firefighter being moved upstairs to safety. (Courtesy of Christopher McGuire)

Removal out a window

Upon finding a downed firefighter, the following are several methods of removing the downed firefighter out a window:

- Window cutdown
- Firefighter assist
- Aerial ladder
- Tower ladder
- Ground ladder

As the firefighter is being brought to the window, cut down the window to the floor (basically making a door out of the window) so the firefighter can be removed at floor level. This will keep you from having to lift the firefighter into the window. This requires proper size-up of the inside wall. Once the window has been cut down, the downed firefighter can be removed via ground ladder, aerial ladder, or tower ladder. As the firefighter is removed from the window, he or she should be stripped of the SCBA to ease in moving through the window (fig. 17–96).

FIREGROUND NOTE

The RIT represents a trained, fresh company with full air. The RIT should work toward proactive safety while being ready to deploy.

Fig. 17–96. The window cutdown allows the downed member to be removed with little effort, but takes resources and time.

Denver drill

SKILL DRILL

The Denver drill allows an efficient method to remove a downed member from a confined area with a high window. The development of this technique was in response to a line-of-duty death. Although there are many variations to this drill, we will discuss one method that we have also found that can be used in an open area as well. The downed firefighter will be located under the window:

- Clear window of glass and drapery, blinds, and so forth.
- Rescuer 1 will sound the floor and climb over the downed firefighter.
- Rescuer 1 will roll the firefighter on their back and sit them up.
- Rescuer 2 will enter the window and manipulate their SCBA bottle so their back will be flat against the wall with Rescuer 2's knees bent.
- Rescuer 1 will lift the downed member and place on him Rescuer 2's knees.

- Rescuer 1 will place the member's legs over their shoulders and coordinate the lift with Rescuer 2 and the outside team.
- Rescuer 2 will push up on the member's bottle while Rescuer 1 pushes the member out the window (fig. 17–97).

Fig. 17–97. Firefighter removed by utilizing the Denver drill

The outside team should use the building as protection and reach in with the arm that is closest to the window. They will each use only one arm and will reach to grab the downed member. This action will allow the outside team to turn in as the member is pulled out, without switching hands, cradling the downed member, and pulling the member away from the window.

High-point removal

SKILL DRILL

A downed firefighter can be removed out of a window by using a high-point removal system. This can be accomplished by rigging a pulley or carabiner to an anchor strap above the window. A ladder can be used for the **high-point** with a life safety rope run through the pulley or carabiner. A figure eight on a bight with an extra large carabiner can be attached to the two SCBA shoulder straps on the rear of the downed firefighter and a rated webbing strap that is secured to the firefighter. The downed firefighter's SCBA waist strap should be converted as outlined previously in this chapter. Once connected, the downed firefighter can be assisted out the window and lowered to the ground or into the bucket of a tower ladder utilizing the rope system. The end of the rope will be run under a rung of the ladder to add friction at the bottom of the ladder being used as the high point. This system can also be deployed using a 2:1 system. When using pulleys, keep two rules in mind:

1. If the pulley doesn't move, it only changes the direction of rope travel.
2. If the pulley moves, it will create mechanical advantage (fig. 17–98).

Fig. 17–98. High-point removal creates friction through the lower rung. Pull in the direction of the building to ensure stability of ladder. (Courtesy of Christopher McGuire)

Firefighter through the floor

Removing a downed firefighter who has fallen through the floor is a high-risk operation. You will be working at the top of a chimney. The most likely situation you will encounter is a firefighter who has fallen into a basement. This complicates removal because of mechanicals (wires, pipes, and duct work) that run along the ceiling. The hole where the firefighter falls will be jagged, may present a secondary collapse area, and may require **shoring**. When making contact with the downed member, and for any pulling operations, work from the corners and size up any obstructions that will need to be cleared. This can also be accomplished by using rope with specific knots.

Utilizing a charged hand line

SKILL DRILL

1. The charged hoseline is pushed down through the opening in the floor. A team of firefighters controls one side of the hoseline, while another two rescue firefighters wrap their legs and arms around the hose and slide down it to find the downed firefighter.
2. Once located, the rescue firefighters must assess the air of downed member. Sit the firefighter up and place the charged hoseline across the victim's chest directly under the armpits. The rescue firefighter then opens the downed firefighter's waist strap and places it across the downed firefighter's upper arms (above the elbows) and tightens it.

3. The rescue firefighters pull the hose and downed firefighter up through the hole, working together as the victim comes up.
4. The hose is then pushed back down. The rescue firefighters put the hose across their chests and under their armpits and hold on. The team above then pulls them to safety. This can also be accomplished by standing in the loop and grasping the hose with your hands by crossing your arms (fig. 17–99).

Fig. 17–99. An unconscious firefighter is pulled to safety using a hoseline with no knots. It is unlikely for firefighters to use knots under hostile conditions.

POSTFIRE ANALYSIS

Something of value can be learned at every fire, and thus all fires should receive a critique or what can be better termed an incident evaluation. What is revealed and learned in the evaluation can be of value for the rest of a firefighter's career. The departments that do not hold incident evaluations because they have "seen it all" are usually the ones with the largest parking lots and casualty tolls. Each fire should be a learning experience that should go beyond the kitchen table or bar. The downside of evaluations is that by the time they are held, not everyone is there because of vacation, sick leave, or other commitments. Other members who are present may not remember exactly what happened. Sometimes the best lessons are forgotten forever.

How can the fire department effectively hold an incident evaluation where all the pertinent information is offered? Remembering that the palest ink is better than the sharpest memory, notes should be jotted down as soon as possible after the incident. This will make the evaluation more meaningful. An adapted form will work well and put everyone on the same page during the evaluation session. A form adapted by the North Hudson Regional Fire and Rescue is the After Action Report. The report is completed anytime a hoseline is charged at a structure fire. The forms are filled out as soon as the company returns to quarters and is forwarded to the battalion commander. That way, if the officer is off the next tour, his or her input will still be included in the incident evaluation. What is likely to happen in this instance is that the acting officer takes the place of the company officer and speaks on his or her behalf at the evaluation, using the form.

Incident evaluation

A specific format should be used for the incident evaluation. It should cover specific areas so that the main focus of the session is kept on track. Sometimes, incident evaluations tend to go off track and accomplish nothing. One way to head this off is to conduct a preevaluation meeting or a post-incident analysis. This is conducted by the chief officers and the SO as a way to preplan the evaluation and steer it in the proper direction. In the postfire analysis, after-action reports and dispatch tapes are reviewed. SOPs are evaluated and operational strengths and weaknesses are discussed and determined. What went right and what went wrong from the command officer's point of view must also be discussed. A strategy on how to best address those issues in the incident evaluation is the goal of the post-incident analysis. If the post-incident analysis is done properly, the incident evaluation should be productive.

The format the incident evaluation takes covers the following areas.

Communications

- Were transmissions prioritized?
- Was proper radio etiquette followed?
- Were personnel on the fireground being "stepped on?" Chief officers should never be stepped on.

Secure a copy of the dispatch tape. It is like the eye in the sky and can tell you a lot about how well things went in regard to communications. It doesn't lie. As in football, if the referee says you were holding, you were.

Apparatus positioning

- Were SOPs followed?
- Were there obstacles to response?
- Were there any unusual circumstances, and if so, how were they addressed?

One piece of apparatus out of position can affect the entire fireground. Improper positioning can never be swept under the carpet.

Company integrity

- Was freelancing an issue?
- Were accountability procedures followed?
- How well coordinated was the relief and rehab of companies?
- Were companies broken up as a result of an injury or other unforeseeable occurrence? How was that handled?

Reinforce fireground discipline at this time. Violations of the principle of company integrity are unacceptable and cannot be tolerated at any time for any reason.

Tactics and lessons learned

- Officers discuss their positions and assignments.
- What problems were encountered?
- What solutions were used? How effective were they?
- What lessons were learned from the incident?

Safety considerations—this portion is conducted by the SO

- Was everyone wearing proper protective equipment?
- Were department SOPs followed?
- Was the fire attack coordinated with proper and timely support?
- Did companies stay together, or was freelancing evident?
- Did the operation provide for emergency firefighter egress from the interior?
- Did the operation provide for emergency firefighter egress from the roof?
- Were communications conducive to safe operations?
- Were tools and equipment used safely and properly?
- Was the RIT properly equipped and ready to be deployed?

The real value of the SO's input into the evaluation is that it should be from a point of view of someone that is standing back and taking in the big picture at the fire scene. This point of view should be from a different angle than the operating companies. It should be a constructive session, aimed at improving the department's performance from a safety standpoint. A safer operation will always translate into a better, more effective operation.

Finally, anyone, regardless of rank, who has something to say should be given a chance to talk about the incident. Allowing all players to have input into the evaluation process makes them more likely to buy into the process.

In concluding the evaluation, together with the SO and the shift officers, the platoon commander should set goals that are both measurable and realistic in regard to a safer and more effective fireground operation. Unsafe practices as well as subpar scene performance should be looped back into the training process and approached in a positive manner. Remember that the further you are from the last "big one," the closer you are to the next.

Postfire analysis in many departments is conducted on scene. Montgomery County, MD, conducts company officer critiques at the end of each fire. This allows each officer to know the actions of every company. After these critiques are complete, the officer or senior firefighter will often walk through the tactics used at the fire with any new personnel. This provides valuable insight to the new firefighter. Even if your department is lacking a formal policy, ask your officer to explain the other company's actions and the fireground action plan. This will allow you to visualize and understand all the tactics that were utilized.

The goal of the incident evaluation is to improve department performance and identify training needs. The overriding concern is always the safety of the participants.

FIREGROUND NOTE

There are six sides to the box. Is there a better way to get the firefighter out while your team sets up this operation?

QUESTIONS

1. Safety is the overriding concern of _____ fireground operations, firefighter training, and station activities.
2. Explain "drifting into failure."
3. Who is responsible for firefighter safety?
4. On average, there are over _____ firefighter fatalities and _____ firefighter injuries each year.
5. Name five causes of firefighter injuries.
6. Injury _____ is a vital part of the injury prevention cycle.
7. When should injury documentation start? Why?
8. What on the job injuries should be investigated? Why?
9. List the 10 Rules of Engagement for Structural Firefighting.
10. What role does a fire ground accountability officer play?
11. What is the most important part of a fire department wellness program? Why?
12. NFPA _____ discuss the recommendations for fire department staffing for fire suppression.
13. What is freelancing and why is it dangerous on the fireground?
14. What is a fireground Mayday? When should it be initiated?
15. What does RIT stand for? When is it used?
16. A _____ should be done after every fire.