The National Fire Protection Association (NFPA) recently issued a new standard regarding the organization, deployment and staffing of career fire departments—NFPA 1710. The International Association of Fire Fighters is providing the following questions and answers document to assist the fire and emergency medical service in understanding this standard.

GENERAL

1. Why was the NFPA 1710 Standard created?

The mission of the NFPA is “to improve the methods of fire protection and prevention” and to establish “proper safeguards against loss of life and property” due to fire. While the organization and deployment of fire and rescue services is potentially the most important factor in safeguarding against the loss of life and property due to fire, the NFPA had never previously issued a standard that set forth comprehensive minimum criteria to ensure safe and effective fire and emergency medical response by career fire departments. The NFPA 1710 Standard was created to meet the overwhelming need for just such a standard. It represents the culmination of more than a decade of work by the NFPA Standards Council, its Technical Committees and its membership. The result is a comprehensive, uniform and practical standard governing fire and rescue service deployment by career fire departments throughout North America.

2. Why is the NFPA 1710 Standard Important to the Fire/Rescue Service?

While modern science has been well integrated into many areas of emergency response, it is glaringly absent in the area of fire/rescue organization and deployment. Fire growth and behavior are scientifically measurable, as are the expected outcomes associated with untreated cardiac arrest, and the specific resource requirements to control fires and to prevent deaths. Despite these facts, many communities approach fire/rescue organization and deployment as if it were all art and no science—and abstract art, at that.
The NFPA 1710 Standard is important because it applies the documented and proven science of fire behavior and emergency medicine to the basic resource requirements for effective fire and emergency service deployment. This application allows a community to determine if the resources allocated for the different types of fires, emergencies, medical calls and other incidents are sufficient to effectively control the incident and protect lives and property.

The NFPA 1710 Standard sets forth in concise terms the recommended resource requirements for fires, emergencies and other incidents. It requires the emergency response organization to evaluate its performance and report it to the authority with jurisdiction. This common-sense, science-based formula categorically disproves the fallacy of the “something is better than nothing” model, which results in unnecessary risk for the public and for responders. The approach embodied in NFPA 1710 will make communities and fire fighters safer and responders more effective and efficient.

3. What are the Scope and Purpose of the NFPA 1710 Standard? (1.1)

The “scope” and “purpose” help to define what the standard does and what it covers. In both cases, the standard defines the minimum acceptable requirements, while still allowing more stringent or more comprehensive ones if a community so decides.

With respect to scope, these minimum requirements relate to how fire, EMS and special operations are organized and deployed in departments that are substantially career. If there are no volunteers, the organization is obviously career. Even if there are volunteers present to supplement the career staff, the department is still substantially career.

The minimum requirements address these organizations’ objectives as well as their functions. Not surprisingly, the standard emphasizes three key areas of a successful operation: service delivery, capabilities and resources.

The standard sets forth the minimum criteria related to the effectiveness and the efficiency of public entities which provide fire suppression, emergency medical service and special operations. Both efficiency and effectiveness are specifically related to protecting two groups: the public and fire department employees.

4. What are the legal implications of the NFPA 1710 Standard?

While the NFPA 1710 Standard has a number of legal implications, the one issue that seemed to generate the most concern during the standard’s development was whether jurisdictions could be held liable for failing to comply with the standard. A few principles will guide the judicial system’s approach to this question as it arises.

At the outset, it has been pointed out by some that courts have traditionally been reluctant to hold cities and towns, and their fire departments, liable for the consequences of their discretionary decisions related to fire department resource allocations. This reluctance is the
product of the age-old common law doctrine of “sovereign immunity,” under which courts in the English common law system traditionally held that the “king can do no wrong.”

The modern trend, however, is for courts to find exceptions to this rule, and over the past several years, this doctrine has rapidly eroded in ways that could expose jurisdictions to liability for the foreseeable consequences of their failure to adequately fund or staff their fire departments. Courts recognizing this modern trend will likely consider the NFPA 1710 Standard in determining whether such liability is properly imposed upon public fire departments and their municipalities.

Many NFPA standards have been enacted into law at the federal, state, provincial and local levels. Some have argued that, because jurisdictions having authority are not required to automatically enact a particular NFPA standard, violation of an NFPA standard does not automatically give rise to a finding of liability against a jurisdiction that has not adopted the standard. Having said that, however, one should be mindful that courts frequently rely upon NFPA standards to determine the “industry standard” for fire protection and safety measures. Judicial reliance on NFPA doctrines is most frequently found in common law negligence claims. To prevail in a common law negligence claim, the plaintiff must show that the defendant owed a duty of care to the plaintiff; that the defendant breached this duty of care; and that this breach was the cause of the plaintiff’s injury.

The NFPA 1710 Standard could be found to be highly relevant to the question of whether a jurisdiction has negligently failed to provide adequate fire or emergency medical protection to an individual harmed in a fire or medical emergency. To prevail in such a claim, the individual would have to show that the jurisdiction failed to provide the level of service required by the standard, and that this failure was a cause of his or her injury.

Because the NFPA 1710 Standard is the first international standard to establish a benchmark level for fire and emergency medical response capabilities, there is little precedence governing how the standard might be used in such lawsuits. It is safe to assume, however, that the level of fire and emergency medical service provided by a jurisdiction will be compared to the NFPA 1710 Standard in courts considering such lawsuits even where the particular jurisdiction has not specifically adopted the standard. As such, it is fair to say that a jurisdiction assumes some additional legal risk by failing to abide by the NFPA 1710 Standard even where it has failed to explicitly adopt the standard.

5. What is the "Equivalency" statement that is contained in the NFPA 1710 Standard? (1.3)

Equivalency statements are common features in NFPA Standards and the equivalency statement added by the Standards Council is not unique to the NFPA 1710 Standard. Customarily the equivalency statement does little more than clarify the written standard as the minimum to which users must comply. The equivalency statement contained in the NFPA 1710 Standard allows jurisdictions to use other “systems, methods or approaches” to meet requirements of the
standard if they can validate and document in writing that such avenues are equal or superior to the requirements contained in the standard. It is not intended to allow for any jurisdiction or fire department to reduce the requirements in the standard and still claim compliance.

6. Why require an organizational statement and what are its key elements? (4.1)

The NFPA 1710 Standard creates a common template for evaluating performance. The Organizational Statement of the Standard sets forth the minimum information required concerning what the organization does, how it is structured and the staffing that is required to achieve its objectives.

Unfortunately, many emergency response organizations assume responsibility to provide additional services without ensuring that they have the resources to accomplish the additional objectives. This chapter requires the authority having jurisdiction to specifically enumerate the level of service, the number of personnel required to provide that level of service, and the duties these members are expected to perform in order to be successful.

7. What is meant by the term “service delivery objective”? (4.1.2)

Service delivery objectives found in the standard are specific requirements for deployment, staffing, response times and the necessary support systems. These support systems include safety and health, communications, incident command, pre-incident planning and training.

8. What are the time components that must be measured to evaluate compliance with the NFPA 1710 Standard? (4.1.2.1.1)

There are three time components defined in the NFPA 1710 Standard relating to emergency response system performance. All three components must be measured and documented by departments in their quadrennial report. The components and definitions as follows:

- Call receipt and processing time – the interval between receipt of the emergency alarm at the public safety answering point to the moment where sufficient information is known to the dispatcher and applicable units are notified of the emergency. The maximum time for this component is specified in NFPA 1221.

- Turnout time – the interval between acknowledgement of notification of the emergency by the units to the beginning point of response time.

- Response time – the time that begins when units are en-route to the emergency incident (wheels rolling) and ends when units arrive on scene (wheels stopped at the address). This time component has in the past been referred to as “travel time.”

It is important to note that these three time components, if measured cumulatively, have historically been known as “response time.” However, to truly evaluate an emergency response
The purpose of department evaluation and reporting is to measure and document compliance with the NFPA 1710 standard. According to the standard, a department must perform an annual evaluation of service based on actual response data. Using this data, the department must prepare and submit a quadrennial written report to the governmental authority noting compliance or non-compliance with the standard. The report must explain any deficiencies, the consequences of the deficiencies and offer improvements on how it plans to become compliant.

10. **What is meant by the term “intercommunity organization” and what do these requirements mean? (4.8)**

The NFPA 1710 Standard acknowledges that where fire and EMS response are concerned, many communities have decided to work together across geographic and municipal boundaries. The standard recognizes the existence and usefulness of mutual aid pacts in their various forms. It stipulates that these agreements must be in writing and that they must address certain specific concerns:

- Liability
- Disability retirements
- Service costs
- Staffing
- Equipment

The standard requires that personnel from multiple organizations working at the scene of an incident must have common procedures in order to ensure safe operations. This can occur only if these personnel train together and are familiar with procedures and equipment that will be used to control an incident.

Finally, a crucial component of effective intercommunity response is adequate communication. The NFPA 1710 Standard mandates that these organizations be equipped with compatible communications equipment for that purpose.
FIRE SUPPRESSION

11. What are the components included in “Fire Suppression Services”? (5.2)

Fire departments must be capable of establishing the following functions at each structural fire: incident command, water supply, attack lines, backup lines, search and rescue teams, ventilation teams and rapid intervention teams. These “benchmark” requirements are based upon a 2,000 square-foot detached single-family occupancy. Fire departments will have to deploy additional resources according to the occupancies and hazards in their jurisdiction.

12. What is a “Fire Protection Services” task analysis and why does the NFPA 1710 Standard require it? (5.2.1.1)

The total number of on-duty personnel is established by means of a task analysis that evaluates expected fire fighting deployment using the following factors:

- Life hazards in the jurisdiction;
- The safety and efficiency of fire fighters;
- The potential property loss;
- The nature, configuration, hazards and internal protection of properties within the response area; and
- The department’s standard tactics and evolutions, apparatus deployed and expected results.

For example, a jurisdiction would need to evaluate all locations within its response area to determine those that have tactical hazards such as concentrated fire potential; high hazard occupancies such as schools, hospitals, nursing homes, manufacturing complexes, refineries, or high-rise buildings; geographical restrictions that could result in a delayed response affecting the frequency, severity and spread of the fire occurrence; or other factors that would necessitate additional staffing per company and additional companies for the initial alarm assignment, additional alarm assignments and simultaneous emergencies. By collecting, analyzing and evaluating this information and data, total on-duty staffing can then be established.

13. What is meant by the term “fire suppression company units”? (5.2.1.2)

Companies are defined as either engine or truck (ladder) companies or specialized apparatus—such as rescue or squad companies—depending on the type of apparatus and the fire suppression functions that are performed.

Regardless of the type of company, each must consist of a group of trained and equipped fire fighters under the supervision of an officer who operates and arrives on the emergency scene.
with one piece of fire apparatus. The standard allows for an exception in those instances when multiple apparatus are used to make up a company. However, such exceptions require that these multi-piece companies are always dispatched at the same time and arrive together, are continuously operated together and are managed by a single company officer. The standard recognizes and clarifies the limited use of such multi-piece companies.

Examples include:

- The use of a fire department personnel vehicle if the apparatus does not have adequate seating.

- An engine and a water tanker, such as those used in some suburban and rural response where a water supply (hydrant or natural water bodies) is not available.

- An engine and an EMS unit (ambulance or rescue). It should be noted that the usefulness of such an assignment—though allowed by the standard—is questionable, especially if patient transport is provided, since the engine would always have to remain with the EMS unit to keep the company intact.

14. What is the basis for a four-person minimum? (5.2.2.1.1)

The NFPA Technical Committee reviewed numerous studies, evaluations and stakeholder reports containing empirical data on departmental response and mitigation of fire. These studies clearly demonstrate that for safe, effective and efficient fire suppression, each responding company needs a minimum of four fire fighters.

The following are some of the studies that support the four-person minimum:

**American Insurance Association, “Fire Department Efficiency,” Special Interest Bulletin No. 131, December 1975.**

Bulletin prepared by the American Insurance Association on fire department efficiency. Emphasis is placed on the importance of staffing companies with a minimum of four personnel. The bulletin further states that if companies are staffed with two or three personnel, they cannot perform the required functions of either an engine or ladder company.

**American Insurance Association, “Fire Department Manning,” Special Interest Bulletin No. 319, December 1975.**

Bulletin prepared by the American Insurance Association on fire department staffing levels. Emphasis is placed on the importance of staffing companies with a minimum of four personnel. The bulletin further states that four personnel do not represent an adequately staffed company. It concludes with a statement that progressive fire chiefs believe a company should never respond with fewer than five or six personnel.

This study, performed by the Seattle Fire Department, analyzed the link between staffing and fire fighter injuries by reviewing the average severity of injuries suffered by engine companies of fewer than four fire fighters as compared to companies with four or more fire fighters. The study concluded that the average time per disability increased as company strength decreased for both types of companies. This analysis indicated that the rate of fire fighter injuries expressed as total hours of disability per hours of fireground exposure were 54% greater for engine companies staffed with three personnel when compared to those staffed with four fire fighters, while companies staffed with five personnel had an injury rate that was only one-third that associated with four-person companies.


This study concluded that an aggressive early initial interior attack on a working structural fire results in greatly reduced loss of life and property damage. Given that the progression of a structural fire to the point of flashover generally occurs in less than 10 minutes, two of the most important elements in limiting the spread of fire are the quick arrival of sufficient numbers of personnel and equipment to attack and extinguish the fire as close to the point of its origin as possible.


The ICMA concluded that there must be enough personnel to put fire apparatus into effective use. It determined that a minimum of five personnel are required for engine (pumper) companies, three personnel are needed to place a single line of 2 ½-inch hose in service, and one additional person, plus a foreperson, is needed to operate a pump.


This study was a comprehensive analysis of fire fighter injuries and minimum staffing levels in a number of cities. The study found that 69% of jurisdictions that maintained crew sizes of fewer than four fire fighters had fire fighter injury rates of 10 or more per 100 fire fighters, while only 38.3% of jurisdictions maintaining crew sizes of four or more fire fighters had comparable injury rates. In other words, jurisdictions having crew sizes of fewer than four fire fighters suffered a benchmark injury rate at nearly twice the percentage rate of jurisdictions that maintained crew sizes of four or more fire fighters.

This book thoroughly covers staffing of fire companies. In summary, effective fireground staffing was demonstrated to involve two fundamentals: first, carefully engineered equipment components designed to deliver specified fire extinguishing capacity under stated conditions and second, personnel assigned and used to deliver specified fire attack capabilities. In other words, the fire fighting capability of a fire department ultimately depends upon a complete systems approach and not a mere massing of random forces when an emergency occurs.


The Dallas Study is a benchmark study of the link between crew size and fire suppression effectiveness. This study was performed as a series of controlled evolutions on a specified set of fire situations using different components in the range of four to six people. Significantly, the study found that “fatigue was a serious problem for smaller groups.” Indeed, the author of a 1993 memorandum concluded that this finding was relevant because it highlights the link between staffing and fire fighter deaths and injuries.


In 1992, the Metro Fire Chiefs Division of the ICHIEFS not only endorsed assembling at least four fire fighters before initiating an interior attack, but went a step further stating: In order to permit the effective operation of fire companies at the scene of a structure fire, the minimum number of personnel on both engine and ladder companies should be five members per unit. This firm position was taken by the Metro Fire Chiefs solely in the interest of the safety of both the citizens “we serve and our nation’s fire fighters.”


The conclusions reached in the Dallas study were confirmed for small fire departments by the Westerville, Ohio Fire Department. Using standard fire fighting tactics, the results of the Westerville Fire Department report showed that four fire fighters could perform rescue of potential victims 80% faster than a three fire fighter crew.


This NFA report summarizes a 1977 test conducted by the Dallas Fire Department, which consisted of a simulated fire involving several rooms at the rear of the third floor
of an old school. This simulation was conducted to determine how long it took a three, four, or five-person team to advance its line to this area and get water on the fire. Immediately following those tasks, each individual’s physical condition was assessed. Timing began as each engine company entered the schoolyard.

The average time for the engine companies to complete the tasks is revealing. The three-person team average was 18.8 minutes. All personnel were exhausted, rubber legged, had difficulty standing up and were unfit for further fire fighting. The four-person team, conducting the very same test, averaged 10.29 minutes and upon completion, were nearing exhaustion. The five-person team averaged 6.15 minutes, and showed little evidence of fatigue at the end of the exercise.


In 1993, the NFPA included in its NFPA 1500 Consensus Standard on Fire Department Occupational Safety and Health a requirement addressing the minimum number of fire fighters necessary to initiate an offensive interior attack on a structural fire. This Tentative Interim Agreement (TIA) to the fire fighter safety standard states:

“At least four members shall be assembled before initiating interior fire fighting operations at a working structural fire.”

Consequently, in 1994, Mr. M.E. Hines, Director of the Texas Commission on Fire Protection, sought formal clarification from the NFPA on this issue. NFPA’s formal interpretation of how the four fire fighters should be assembled is as follows:

“…when a company is dispatched from a fire station together as a unit (which includes both personnel responding on or arriving with apparatus), rather than from various locations, the standard recommends that the company should contain a minimum of 4 fire fighters.”


The NFPA 1410 Standard contains the minimum requirements for evaluating training for initial fire suppression and rescue procedures used by fire department personnel engaged in emergency scene operations. This standard specifies basic evolutions that can be adapted to local conditions and serves as a standard mechanism for the evaluation of minimum acceptable performance during training for initial fire suppression and rescue activities.
The following are pertinent excerpts from NFPA 1410:

3-2.2* In addition to the requirements set forth in 3-2.1, the company officer shall ensure that the following are accomplished in interior structural fires:

(1) At least two fire fighters enter the immediately dangerous to life and health (IDLH) atmosphere and remain in visual or voice contact with each other at all times.

(2) At least two fire fighters are located outside the IDLH atmosphere.

(3) All fire fighters engaged in interior structural fire fighting use SCBA.

A-3-2.2 One of the two individuals located outside the IDLH atmosphere could be assigned an additional role, such as incident commander in charge of the emergency, or safety officer, as long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any fire fighter working at the incident. Nothing in this section is meant to preclude fire fighters from performing rescue activities before an entire team has been assembled.


The following are pertinent excerpts from NFPA 1500:

2-1.2* The fire department shall prepare and maintain written policies and standard operating procedures that document the organization structure, membership, roles and responsibilities, expected functions and training requirements, including the following:

(a) The types of standard evolutions that are expected to be performed and the evolutions that must be performed simultaneously or in sequence for different types of situations

(b) The minimum number of members who are required to perform each function or evolution and the manner in which the function is to be performed
(c) The number and types of apparatus and the number of personnel that will be dispatched to different types of incidents

(d) The procedures that will be employed to initiate and manage operations at the scene of an emergency incident

6-4.1* The fire department shall provide an adequate number of personnel to safely conduct emergency scene operations. Operations shall be limited to those that can be safely performed by the personnel available at the scene. No member or members shall commence or perform any firefighting function or evolution that is not within the established safety criteria of the organizational statement as specified in 2-1.2 of this standard.

A-6-4.1 The limitation of emergency scene operations to those that can be safely conducted by the number of personnel on the scene is intended to reduce the risk of firefighter death or injury due to understaffing. While members can be assigned and arrive at the scene of an incident in many different ways, it is strongly recommended that interior firefighting operations not be conducted without an adequate number of qualified firefighters operating in companies under the supervision of company officers.

It is recommended that a minimum acceptable fire company staffing level should be four members responding on or arriving with each engine and each ladder company responding to any type of fire. The minimum acceptable staffing level for companies responding in high-risk areas should be five members responding or arriving with each engine company and six members responding or arriving with each ladder company. These recommendations are based on experience derived from actual fires and in-depth fire simulations and are the result of critical and objective evaluation of fire company effectiveness. These studies indicate significant reductions in performance and safety where crews have fewer members than the above recommendations. Overall, five member crews were found to provide a more coordinated approach for search and rescue and fire suppression tasks.

During actual emergencies, the effectiveness of companies can become critical to the safety and health of firefighters. Potentially fatal work environments can be created very rapidly in many fire situations. The training and skills of companies can make a difference in the need for additional personnel and in reducing the exposure to safety and health risks to firefighters where a situation exceeds their capabilities.
This NIOSH report details a September 6, 1990, fire in Sedgwick County, Kansas that killed a 25-year-old fire fighter. The cause of death was determined to be heat stroke. In the discussion and findings section of the report, the issue of staffing was addressed as follows:

A two-fire fighter engine company is, at a minimum, 50% understaffed and increases the work effort by a factor of three. In a brushfire where one fire fighter operates the pump, the second is left to pull 200’ of booster through rough terrain covered with low-lying undergrowth. At the fatal fire, the pump was left unattended and each of the two fire fighters advanced a separate booster line up to 200’ in opposite directions from the engine.

Fire fighters operating at an emergency incident must always operate in teams of two or more. Such a buddy system permits fire fighters to share work, thereby reducing the metabolic heat they produce and reducing the heat stress.

Nevada Occupational Safety and Health Review Board, Administrator of the Division of Occupational Safety & Health v. Clark County Fire Department (Statement of Position and Stipulation), Docket No. 89-385, October 1990.

Citing that the Clark County Fire Department had prior knowledge that units staffed with three personnel were unsafe, the Nevada Department of Occupational Safety and Health issued a complaint that the Fire Department had willfully violated the industry standards relating to fire fighter safety. In late 1990, the NDOSH agreed to vacate the violation when the Clark County Fire Department stipulated that it would immediately “maintain minimum staffing levels at each fire station so that no engine or ladder truck shall be dispatched from a fire station, staffed with less than four persons.”

In addition, the stipulation entered into by NDOSH and the Fire Department stated that:

“Any engine or ladder truck manned with less than four persons shall be defined to be “unsafely manned.”


In 1993, the Fire Marshal of Ontario (Canada) Research Project conducted a study to thoroughly examine the tasks which three and four-person crews could safely
accomplish. The study specifically noted the crucial role played by response times in avoiding flashover conditions. It concluded that “after flashover, the opportunity for successful rescue from other areas in the structure rapidly diminishes.” It also concluded that, once flashover occurs, “there is an increased fire fighting demand if intervention does not take place prior to flashover.”


This study concludes that the only reliable available research data obtained under fire conditions indicate that four is the minimum staffing level for a fire fighting engine or ladder company. Cited research firmly and unequivocally concludes that for an engine company or ladder company, the minimum acceptable staffing level is four. That number of fire fighters is the minimum number required to successfully accomplish the fireground tasks required within an acceptable time period. Four is not the number at which negotiations begin, but it is the absolute bare minimum required for an effective and efficient fire company.


In 1993, the Austin Fire Department conducted a study to determine whether companies staffed with four fire fighters were safer and more effective than the three-person companies the department was currently deploying. In order to compare the effectiveness of fire companies, the physiological impact on fire fighters and Austin fire department injury rates at various staffing levels, the Fire Department conducted drills consisting of a series of common fireground tasks divided into three scenarios: a simulated two-story residential fire; a simulated aerial ladder evolution; and a simulated engine company high-rise fire.

These simulations revealed that regardless of the experience, preparation or the training of fire fighters, loss of life and property increases when a sufficient number of personnel are not available to conduct the tasks required in an efficient manner. The severity and the degree of hazard increases until controlled or the fire passes the critical point. Consequently, the Austin Fire Department concluded that fire fighter effectiveness significantly improves when a company is increased from three to four personnel. In the two-story residential fire, the efficiency or time improvement between the three-person and four-person crew was 73%. In the aerial ladder evolution, the efficiency improvement between three-person and four-person crews was 66%. In the high-rise fire, the efficiency improvement between the three-person and four-person engine company crew was 35%.

In addition to the fireground simulation, the Austin Fire Department also reviewed injury reports involving 136 emergency incidents from 1989 to 1992 to which 1,938
fire fighters responded. The analysis revealed that the injury rate for four or five-person crews was 5.3 per 100 fire fighters while the three-person companies experienced an injury rate of 7.77 injuries per 100 fire fighters. The injury rate for three-person companies was 46% higher than the rate for larger crews.

15. If it is deemed that more than four are required, how do you determine whether five or six is the correct number? (5.2.2.1.2)

Deployment using the NFPA 1710 Standard’s mandatory requirements for a benchmark fire would typically be met by a response of two engines (each staffed with four members), a truck (staffed with four members) and a chief’s vehicle (staffed with a supervisory officer and an aide). However for a high hazard response, four engines, two ladders, a heavy rescue, an EMS unit and two chief vehicles may be required with additional staffing on each of the companies. The number of additional fire fighters above four is predicated on the specific duties to be accomplished at these high hazard locations as well as the time requirements associated with initiating these tasks.

The Technical Committee considered various studies in developing this section of the standard. Some of these studies are described below:


Chief Alan Brunacini concludes that it is illogical to maintain that the requirements, capabilities and conditions of fire department operations differ from one place to another. Fire conducts, convects and radiates the same all over North America. As such, two fire fighters cannot conduct a primary search that requires six fire fighters for effective completion in a survivable time frame.


James Casey concludes that staffing levels are the key to successful fire fighting operations. Response must be prompt and adequate. In order to ensure full potential of personnel and equipment, engine companies should be staffed with no fewer than five personnel. Ladder companies should be staffed with no fewer than six personnel.


In 1982, the U.S. Fire Administration conducted a survey of over 150 fire departments to evaluate current crew size and standard response practices. The study determined that there was a direct correlation between fire fighter safety and the number of personnel
on the initial fire attack. When asked to identify those factors most important in determining crew size and initial response, fire chiefs and city managers ranked crew safety at the top of the list.


The ICMA cited various controlled and statistically-based experiments by jurisdictions and universities that reveal that if 16 trained fire fighters are not operating at the scene of a working fire within the critical time period, then dollar loss and injuries are significantly increased, as are the square feet of fire spread. Additionally, as fire fighting tactics were conducted for comparative purposes, five-person fire suppression companies were judged to be 100 percent effective in their task performance, four-person companies 65 percent effective and three-person companies 38 percent effective. Six-person companies are judged 20 percent faster than four person companies.

16. Regarding response times, the NFPA 1710 Standard says, “the fire department shall establish a time objective of four minutes or less for the arrival of the first arriving engine company at a fire suppression incident and/or eight minutes or less for the deployment of full first alarm assignment at a fire suppression incident.” Can the first unit arrive later than four minutes if the entire assignment is on the scene within eight minutes? (4.1.2.1.1)

Technically, the answer is yes. However, the standard’s intent for fire suppression is to have the first-due engine capable of arriving within its response area consistently within four minutes, 90% of the time. The “and/or” criteria is intended to recognize the effects of simultaneous emergencies, training or other occurrences that take one or more companies out of service, and not to relieve a department of its responsibility to plan for overall deployment of resources by location to satisfy the four minute criteria.

17. In the chapter on Deployment it references the requirements to be met by the initial full alarm assignment. What is the minimum number of persons required for this assignment? (5.2.3.2.2)

The fire department shall have the capability to deploy an initial full alarm assignment within the eight-minute response time. The number of people required falls between 14 and 17, depending on whether or not an aerial is used, if both pumper are being used provide attack and backup lines and if a safety officer is required. The following is a list of required functions for the benchmark fire defined in the standard and the number of personnel required to be deployed to perform these functions:

- Incident command shall be established by the deployed supervisory chief officer outside of the hazard area for the overall coordination and direction of the initial full
alarm assignment. A minimum of one supervisory chief officer shall be dedicated to this task.

- The supervisory chief officers shall have staff aides deployed to them for purposes of incident management and accountability at emergency incidents. A minimum of one individual shall be dedicated to this task for each supervisory chief.

- A safety officer shall be dispatched to an initial alarm assignment when significant risks to fire fighters are present and shall be deployed to all emergencies that go beyond an initial full alarm assignment to ensure that the health and safety system is established at the emergency incident. A minimum of one individual shall be dedicated to this task.

- An uninterrupted water supply of a minimum 400 gpm for 30 minutes shall be established. Supply line(s) shall be maintained by an operator who shall remain with each fire apparatus supplying the water flow to ensure uninterrupted water flow application.

- An effective water flow application rate shall be established: 300 gpm from two handlines, one of which shall be an attack line with a minimum of 100 gpm and one of which shall be a back-up line with a minimum of 100 gpm. Attack and backup lines shall be operated by a minimum of two personnel each to effectively and safely maintain the line.

- One support person shall be provided for each attack and backup line deployed to accomplish hydrant hookup and assist in line lays, utility control and forcible entry. This individual shall be permitted to be assigned as a member of the initial rapid intervention team (IRIT) if the fire department determines that the support person can abandon his/her tasks without placing any personnel in jeopardy.

- A minimum of one search-and-rescue team shall be part of an initial interior attack. Each search-and-rescue team shall consist of a minimum of two personnel.

- A minimum of one ventilation team shall be part of an initial interior attack. Each ventilation team shall consist of a minimum of two personnel to perform structure ventilation in coordination with the primary interior attack.

- If an aerial device is used in operations, one person shall function as an aerial operator who shall remain at the primary control of the aerial device at all times.

- An Initial Rapid Intervention Team (IRIT) shall be established that shall consist of a minimum of two properly-equipped and trained personnel. When an incident escalates beyond the initial full alarm assignment, or when there is significant risk to fire fighters due to the magnitude of the incident, the Incident Commander shall upgrade the IRIT
to a full Rapid Intervention Team (RIT) that consists of four dedicated, fully equipped and trained fire fighters.

- The fire department shall have the capability for additional alarm assignments that can provide for additional personnel and additional services including the application of water to the fire; engagement in search and rescue, forcible entry, ventilation and preservation of property; accountability for personnel; and provision of support activities for those situations that are beyond the capability of the initial alarm assignment.

The following figure illustrates the above requirements for the response to the benchmark room-and-contents fire in a 2,000 square-foot single-family occupancy, without a basement and with no exposures (adjacent buildings). In an urban environment, with high population density dwellings in very close proximity, multi-family occupancies, industrial areas and high occupancy institutions—including hospitals and schools—the fire department’s response capability must be enhanced with additional apparatus, personnel and resources for the initial alarm assignment.

**ORGANIZATION OF 8-MINUTE INITIAL ATTACK**

Two Engines/One Truck/ One Chief Response
The following are synopses of some of the studies considered in developing this section of the standard:


The ICMA subscribed to NFPA 197 Standard on resource deployment but also endorsed the NFPA’s definition relating to the number of personnel required to conduct those initial interior attack operations. Initial attack criteria codified in NFPA 197 and reemphasized in the Fire Protection Handbook is a minimum of 12 to 15 personnel plus a chief.


In 1984, the National Fire Academy introduced the training manual *Fire Risk Analysis: A System’s Approach*. The manual stated that suppression capability must be measured to include both initial attack operations that attempt to quickly deal with marginal situations before they get out of control, and sustained fire fighting procedures that can be put into operation against major fires. In addition to the ability to apply water to the fire, the analysis emphasized that the fireground workforce must be of sufficient size in order to simultaneously have the ability “to engage in search and rescue, forcible entry, ventilation, preservation of property, and additional support activities as required by the situation.” The NFA manual further stated that time is a critical factor in determining the effectiveness of the tasks with the expectation for the fire to increase until sufficient personnel are assembled to overcome it. Based on the above objectives, the U.S. Fire Academy concluded that the safety conduct of an effective interior attack required at least 15 personnel.

**National Fire Protection Association, NFPA 197 Training Standard on Initial Fire Attack, 1966.**

NFPA 197 was the precursor to NFPA 1410. This historic standard set forth the evolutions required for an initial interior attack on working structural fires. The minimum standard required a sufficient number of fire fighters and equipment to deploy two 1½" attack lines conveying at least 150 gpm within 60 seconds of arrival, followed by a 2½" backup line providing at least 250 gpm within 180 seconds of arrival.

While NFPA 197 did not specify the number of fire fighters necessary to deliver this required flow, it does specify the tasks that must be performed within a given time period. Although NFPA 197 was silent on the minimum number of fire fighters necessary to safely conduct these evolutions, the NFPA clearly defined in its book, *Fire Attack-1*, the number of personnel required. Adherence to NFPA 197 required two pumpers and a ladder truck with a total complement of at least 15 personnel.
Ohio State University/Columbus Fire Division, “Measuring Firefighting Effectiveness,” September 15, 1980.

This is a study performed by Ohio State University of 404 actual fire incidents to which the Columbus Fire Department responded. It concluded that there exists a "negative statistical correlation between the size of the fire fighting complement and the probability of fire fighter injury." In fact, the study found that the fire fighter injury rate for two different types of responses was 22 percent and 59 percent, respectively, for fires where 14 or fewer fire fighters responded, as compared to 15 percent and 34 percent, respectively, for fires where 15 or more fire fighters responded.


The FIREDAP Study was initiated by the NFPA as part of its Urban Forums activities to objectively evaluate fireground operations and precisely identify the tasks and functions required to safely and efficiently conduct an interior attack. The project's Select Committee included representatives from seven jurisdictions, as well as the U.S. Fire Administration, the ICMA, ICHIEFS, IAFF, the Insurance Services Organization (ISO) and a number of technical subject matter experts. The observational study gathered empirical data from validated fireground simulations for the purpose of providing a comprehensive list of all key tasks that must be performed to rapidly and effectively confine a fire. Based upon these findings, the Select Committee concluded that control of an emergency incident is a function of how these specific tasks are performed. The Committee also relied on the findings to establish deployment criteria for a benchmark structural fire; command evolutions for a third alarm structural fire; and deployment criteria on a single patient medical response using BLS engines, ALS engines and ambulances.

18. In the section referring to quint apparatus, it states that if the company is expected to perform multiple roles simultaneously, that additional staffing shall be provided. How much additional staffing is required? (5.2.2.4)

When jurisdictions use “quint” apparatus, the standard requires that these units be designated as either an engine or a truck company, unless the jurisdiction expects multiple roles (i.e. engine and truck company functions) to be performed simultaneously from this unit. If such is the case, the standard requires that additional staffing, beyond the four-member minimum, be provided for such companies.
EMERGENCY MEDICAL SERVICES (EMS)

19. Does the NFPA 1710 Standard require all fire departments to provide a basic level of emergency medical service? (4.3)

Yes, the NFPA 1710 Standard does require all fire departments to provide a basic level of EMS. The standard calls for the department to be capable of responding to emergency medical incidents at the First Responder Level with Automatic External Defibrillators (AED). If the department chooses to provide EMS at a higher level, the standard sets forth operational requirements for that service as well.

Fire departments that provide EMS at any level must establish in their organizational statements the criteria for the types of incidents to which they will respond. The established level of EMS provision must be recognized and the department must allocate the necessary resources to adequately provide the services required by the local jurisdiction and expected by the citizens. Necessary resources include personnel and equipment.

20. If the fire department provides only first responder level services and an agency or private company provides the higher levels of EMS and transport, does the NFPA 1710 Standard still apply? (4.3.2.1)

Where EMS beyond the first responder level is provided by an entity other than the fire department, the higher-level provider must adhere to minimum staffing, deployment and response criteria recommended by the fire department according to the requirements in the NFPA 1710 Standard. These operational requirements must be set forth in both the fire department’s organizational statement and any contract or other agreement between the jurisdictional authority and the EMS agency or private company.

21. Can the fire department use automatic or mutual aid agreements to meet these EMS requirements? (5.3.1)

Yes, the NFPA 1710 Standard is clear that fire departments are permitted to establish automatic and mutual aid agreements to comply with emergency medical response requirements.

22. Does the NFPA 1710 Standard establish patient care or EMS protocol requirements? (5.3.2.1)

No. Specific patient care capabilities associated with each EMS service level are to be determined by the authority having jurisdiction to approve and license EMS providers. This is typically the state, provincial, or local EMS agency in conjunction with physician medical direction/oversight.
23. **What are the different EMS service levels referenced in the NFPA 1710 Standard? Does every fire department have to provide every level?** (5.3.3.1)

There are three levels of EMS provision recognized in the NFPA 1710 Standard; First Responder with AED, Basic Life Support (BLS), and Advanced Life Support (ALS). The standard also recognizes EMS transport as a service that may be provided by the fire department. It is not a requirement that a fire department provide all levels of EMS service beyond First Responder (AED). However, the standard establishes operational requirements for each level that is provided by a department. For each level, operational requirements are set forth as follows:

a) First Responder (AED) – a fire department must appropriately train all response personnel at the First Responder with AED capability level and personnel must arrive within a four-minute response time frame to 90% of all emergency medical incidents. The number of personnel must be sufficient to assure adequate care capability and member safety.

b) BLS – a fire department that provides BLS, beyond the first responder level, shall adhere to staffing and training requirements as set forth by the state or provincial licensing agency. The department must also deploy sufficient mobile resources to arrive within a four-minute response time frame for 90% of all incidents.

c) ALS – a fire department that provides ALS beyond the first responder and BLS level, shall adhere to staffing and training requirements as set forth by the state or provincial licensing agency. The department must also deploy sufficient mobile resources to arrive within an eight-minute response time frame for 90% of all incidents.

24. **Does the NFPA 1710 Standard contain minimum staffing numbers for BLS and ALS emergency transport units? Who determines the staffing and training levels for BLS and ALS transport units?** (5.3.3.2.1)

The NFPA 1710 Standard clearly states that staffing and training requirements for both BLS and ALS transport units are to be determined by the state or provincial agency responsible for providing EMS licensing.

25. **Does the NFPA 1710 Standard contain minimum staffing numbers for ALS emergency responses? Why is this staffing requirement different from the staffing requirement for transport units?** (5.3.3.4.4)

Yes, the NFPA 1710 Standard does designate a staffing level for ALS response that is different from the requirement ALS transport. The standard requires that staffing for ALS emergency medical responses include a minimum of two members trained at the ALS level (EMT-Paramedic). Additionally, the standard requires that ALS responses include a minimum of two BLS trained providers. All response personnel are to arrive within the response time frame established for ALS.
The different staffing requirement for ALS responses is based on experience and expert consensus that time-critical ALS calls require more personnel resources on scene for assessment and initiation of care than those required for BLS level incidents or transport. Additionally, the American Heart Association has long-established guidelines for response to the most time critical incident—cardiac arrest. Their recommendations, which were reviewed by the NFPA 1710 Technical Committee, are contained in the following AHA publications:


Following scientific research conducted by cardiologists and universities throughout the United States, AHA guidelines note that, "in systems that have attained survival rates higher than 20% for patients with ventricular fibrillation (cardiac arrest), the response teams have a minimum of two ACLS providers plus a minimum of two BLS personnel at the scene." Experts agree that four responders (at least two ALS and two BLS) are the minimum required to provide ACLS to cardiac arrest victims.

26. Why must first responder/AED units arrive within four minutes to 90% of emergency medical incidents? (5.3.3.4.2)

This requirement is based on experience, expert consensus and science. Many studies note the role of time and the delivery of early defibrillation in patient survival due to heart attacks and cardiac arrest, which are the most time critical, resource intensive medical emergency events to which fire departments respond. Various study findings and national EMS stakeholder organization guidelines are as follows:


This study, with a population of 10,554 patients, showed that a reduction in response time from 15 minutes (90%) to eight minutes (90%) was significantly associated with increased probability of receiving defibrillation and survival to hospital discharge. A further reduction in response times to five minutes (90%) doubled the rate of patient survival to discharge. The study conclusion: Reducing response times from 15 to five minutes or less could almost double the survival rate for cardiac arrest not witnessed by the responding crew.
Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiac Care (AHA).

Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care (AHA).

In systems that have attained survival rates higher than 20% for patients with ventricular fibrillation (cardiac arrest), the response teams have a minimum of two ACLS providers plus a minimum of two BLS personnel at the scene. Most experts agree that four responders (at least two ALS and two BLS) are the minimum required to provide ACLS to cardiac arrest victims.

New Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiac Care (Kern, KB, et al).

“An out of hospital goal of early defibrillation within five minutes of a telephone call is now recommended.”


This study showed that the survival rate for those who were defibrillated within three minutes of collapse was 74%, concluding that intervals of three minutes or less are necessary to achieve the highest survival rates.

Predicting Survival From Out-of-Hospital Cardiac Arrest: A Graphic Model (Eisenberg, MS et al).

This study included a study population of 1,667 cardiac arrest patients. A multiple linear regression model fitting the data produced a model that is useful in planning community EMS programs showing how different arrival times within a system affect survival. The study conclusion: Without timely intervention of three treatments; CPR, Defibrillation and Advanced Cardiac Life Support, the decline in survival is 5.5% per minute. Dr. Eisenberg’s model has become the standard for measuring effectiveness in the delivery of prehospital emergency medical services because it clearly links response time to probability of survival.

Response Interval Comparison Between Urban Fire Departments and Ambulance Services (Jermyn, BD).

This study points out that any decrease in response time will result in an increase in the probability of successful prehospital defibrillation, stating that every minute without defibrillation decreases the chances of successful conversion by 7-10%.
Staffing and Equipping EMS Systems: Rapid Identification and Treatment of Acute Myocardial Infarction (National Institutes of Health).

As a rule of thumb, a first responder should arrive at the scene less than five minutes from the time of dispatch in 90 percent of all such calls. This will generally result in a median first-responder response time of two to three minutes.

Statement on Early Defibrillation from the Emergency Cardiac Care Committee (Kerber, RE, et al).

To achieve the goal of early defibrillation, all emergency personnel should be trained and permitted to operate an appropriately maintained defibrillator if their professional activities require that they respond to persons experiencing cardiac arrest.

To further facilitate early defibrillation, it is essential that a defibrillator be immediately available to emergency personnel responding to a cardiac arrest. Therefore, all emergency ambulances and other emergency vehicles that respond to or transport cardiac patients should be equipped with defibrillators.

27. Why must an ALS company arrive within eight minutes to 90% of the incidents to which they are dispatched? (5.3.3.4.3)

Once again, this requirement is based on experience, expert consensus and science. As stated previously, various studies note the role of time, the delivery of early defibrillation and the provision of advanced care in patient survival from heart attack and specifically cardiac arrest. Some of the study findings and national EMS stakeholder guidelines are documented as follows:

Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiac Care (AHA).

Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care (AHA).

For cardiac arrest, the highest hospital discharge rate has been achieved in patients for whom CPR was initiated within four minutes of arrest and ACLS within eight minutes. Early bystander rescue breathing or CPR intervention and fast emergency medical services response are therefore essential in improving survival rates.

Predicting Survival From Out-of-Hospital Cardiac Arrest: A Graphic Model (Eisenberg, MS et al).

This study included a study population of 1,667 cardiac arrest patients. A multiple linear regression model fitting the data produced a model that is useful in planning community EMS programs showing how different arrival times within a system affect survival. The study conclusion: Without timely intervention of three treatments; CPR,
Defibrillation and Advanced Cardiac Life Support, the decline in survival is 5.5% per minute. Dr. Eisenberg’s model has become the standard for measuring effectiveness in the delivery of prehospital emergency medical services because it clearly links response time to probability of survival.

**Staffing and Equipping EMS Systems: Rapid Identification and Treatment of Acute Myocardial Infarction (National Institutes of Health).**

“As a rule, 90% of all top-priority emergency medical calls in all sectors of a city should receive an ALS response to the scene in less than eight minutes from the time of call dispatch. This generally results in a median ALS response time of four to five minutes.”

28. Does the NFPA 1710 Standard require a fire department to have a quality management program for EMS system evaluation? (5.3.4)

Yes, the NFPA 1710 Standard clearly requires the establishment of a quality management program as a basic function of EMS provision. The purpose of the quality management program is to ensure adequate response capability and quality patient care. All quality review of both BLS and ALS services must be documented. An additional quality management requirement of the standard is that the department must provide a mechanism for immediate communication with the EMS system supervisor and physician oversight (medical director).

**SPECIAL, ARFF, MARINE AND WILDLAND OPERATIONS**

29. What general requirements are included in the NFPA 1710 Standard in the area of special operations? (4.4)

The fire department is required to formally define the types of special operations that it is required or expected to perform in an emergency or other incident. These types of special operations include, but are not limited, to hazardous materials response, confined space response, technical rescue, high-angle rescue and water rescue. Regardless of the fire department’s defined special operation capability, all fire fighters who provide emergency response must be trained to the first responder operations level for both hazardous materials response and confined space response. Likewise, all fire departments must define their response capability to natural disasters, terrorism incidents, large-scale emergencies and mass casualty events.

Where fire departments have established that they will provide response beyond first responder level for hazardous materials or confined space emergencies, they are required to ensure that all members involved in this level of response be trained to the levels specified in the standard.
The fire department must also determine the availability of resources outside the fire department—through federal, state, provincial, or local assistance or private contractors—that are deployed to emergencies and other incidents and the procedures for initiating such outside response.

The fire department must also limit the level of response to special operation emergencies to the level for which they have staffed, trained and equipped their personnel. Additionally, they must have the capacity to initiate a rapid intervention crew during any and all special operations responses.

30. What general requirements are included in the NFPA 1710 Standard in the area of airport rescue and fire fighting (ARFF) services? (5.5)

The NFPA 1710 Standard requires that airport fire departments be organized to ensure that their response capabilities to non-aircraft incidents (non-airframe structural fires and EMS emergencies) within the department’s response jurisdiction are identical to non-ARFF fire department capabilities.

During the development of the standard, the Technical Committee merged the standards addressing ARFF activities developed by the NFPA, the FAA and the US Department of Defense, so for the first time the deployment and staffing of ARFF capabilities would be addressed. During the public review, the NFPA committee that had the responsibility for developing NFPA 403, Standard for Aircraft Rescue and Firefighting Services at Airports, claimed jurisdiction over the deployment and staffing of ARFF services, even though the NFPA 1710 Technical Committee and others in the fire service, including the IAFF, ICHIEFS and the NFPA, recognized that the NFPA 403 was deficient in these areas.

However, the NFPA did require that a Task Force made up of members of the NFPA 403 and NFPA 1710 committees be quickly established to address this issue. The task force is expected to meet immediately after the issuance of NFPA 1710 to address this issue. If consensus between the two committees cannot be met, the NFPA 1710 Technical Committee will initiate a Tentative Interim Amendment utilizing the language contained in the Report on Comments draft of the NFPA 1710 Standard.

31. What general requirements are included in the NFPA 1710 Standard in the area of marine fire fighting operations? (5.6)

Marine fire fighting was recognized as a specialized fire suppression support function by the NFPA 1710 Standard, with the initial response to a land-based incident provided by land-based fire suppression forces as well as shipboard crews and sea-based response provided initially by the shipboard crew. Land-based forces’ staffing and deployment criteria are recognized by the standard and require the jurisdiction that responds to such emergencies to address the resource allocation to such events; the US Coast Guard or other legal authority regulates sea-based crew staffing and deployment capability with jurisdiction over navigable waterways.
32. **What general requirements are included in the NFPA 1710 Standard in the area of wildland fire fighting operations?** (5.7)

The NFPA 1710 Standard recognizes that many, if not most, fire departments must respond to either wildland or wildland/urban interface fires. Accordingly, the fire department must address the service delivery for such occurrences. The standard specifies the minimum wildland staffing for defined wildland companies, as well as engine and truck companies that respond to wildland or urban interface/wildland emergencies. Likewise, deployment requirements, for a wildland Initial Direct Attack are specified. Much of the basis for such requirements was validated through a scientific and medical study conducted by the Los Angeles County Fire Department. The study’s purpose was to establish benchmarks for necessary staffing requirements, wildland tasks and deployment times for wildland response.

**FIRE DEPARTMENT SYSTEMS**

33. **What is meant by the term “system” as used in the NFPA 1710 Standard in Chapter 6 (Safety and Health System, Incident Management System, Communications System)?** (6.1, 6.2, 6.3, 6.4, 6.5)

A system is a functionally related group of components. These are areas where a set of needs or requirements work closely together and are inter-related to achieve a key result. The NFPA 1710 Standard addresses five of these systems:

- **Safety and Health** - Each organization must have an occupational safety and health program meeting the requirements of NFPA 1500, Standard on Fire Department Occupational Safety and Health Program.

- **Incident Management** - Each organization must have in place an incident management system designed to handle expected incidents. That system must be in accordance with NFPA 1561, Standard on Emergency Services Incident Management System.

- **Training** - Each organization must ensure members are trained to execute all responsibilities consistent with its organizational statement. This training must be accomplished using a programmatic approach that includes a policy.

- **Communications** - Each organization must have a communications system characterized by:
  - Reliability
  - Promptness
  - Standard operating procedures, terminology and protocols
Departments must also comply with all the requirements set forth in NFPA 1221, Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems.

- **Pre-Incident Planning** - Safe and effective operations are grounded in identifying key and high hazard targets. The standard requires departments to develop operational requirements to gather information regarding these locations.

Taken together, these five systems help to ensure that emergency responders have the essential tools, information, procedures and safeguards to operate effectively and efficiently.

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