RUNNING HEAD: COMPLIANCE WITH NFPA

A REVIEW OF MONROE FIRE DEPARTMENT COMPLIANCE WITH THE FIRE SUPPRESSION AND OPERATION OBJECTIVES OF NFPA 1720

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Appendices Not Included. Please visit the Learning Resource Center on the Web at http://www.lrc.dhs.gov/ to learn how to obtain this report in its entirety through Interlibrary Loan.

Certification Statement

I hereby do certify that this research paper constitutes my own work and product, that where the language of others is set forth, quotation marks indicate so, and that appropriate credit has been given where I have used the language, ideas, expression, or writings of others.

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Abstract

The problem was the Monroe Fire Department had never completed a review of compliance with the noted standard. The questions to be answered were: How does the department compare to national consensus standards in relation to staffing? How does the department compare to national consensus standards in relation to apparatus response? How does the department compare to national standards in relation to completing essential emergency functions i.e. fire attack, search, and ventilation? How does response change based on time or day of the call? How does information given at the time of dispatch affect Monroe firefighters" desire and/or ability to respond? The project used descriptive research to answer these questions. After careful review of the appropriate consensus standards, response records, standard operating procedures and city resolutions and agreements it was determined that the department was in substantial compliance of response standards and staffing levels for first alarm or routine incidents. It was found that for more involved incidents the department lacks the resources or automatic aid agreements to ensure the best possible outcome of emergency incidents. Perhaps most interesting was that the type of call or time of day had little effect on the firefighter's ability or willingness to respond. It was noted that some routine calls have lower levels of participation due to information transmitted during dispatch. The recommendations are to strengthen or add response time standards in response policies and to work to ensure the members are engaged and participating at the level that they are able to. It was also recommended to continue dispatch procedures as they now stand and to complete a standard of cover document and consider developing automatic aid agreements with neighboring departments for certain types of incidents to work alongside existing mutual aid agreements.

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Introduction

For as long as fire departments and firefighting organizations have existed, it has rarely been agreed upon how many emergency responders are needed to safely and effectively mitigate the various emergency incidents that these organizations respond to. Especially contentious is how staffing effects essential fireground functions such as search and rescue, fire attack, ventilation and even overhaul and incident termination. There are numerous standards, rules and laws that have been passed or adopted that attempt to address firefighter safety and govern how emergency response agencies provide these services to the public. One of the standards approved is NFPA 1720, The *National Fire Protection Association Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments* (NFPA, 2010). The purpose of this descriptive research project is to compare the Monroe Fire Department's response system to the national standard of coverage.

The Monroe Fire Department had never completed a review of compliance with the noted standard. The questions to be answered include: How does the department compare to national consensus standards in relation to staffing? How does the department compare to national consensus standards in relation to apparatus response? How does the department compare to national standards in relation to completing essential emergency functions i.e. fire attack, search, and ventilation? How does response change based on time or day of the call? How does information given at the time of dispatch affect Monroe firefighters" desire and/or ability to respond? The project uses descriptive research to answer these questions.

This ARP relates to community risk reduction in that the ability to quickly and efficiently complete fireground tasks has a direct correlation in the time on scene, the efficiency of

operations, and firefighter safety thereby improving organizational and community equity. This research supports USFA operational objective 5(e) *to respond appropriately in a timely manner to emerging issues* (U.S Fire Administration, 2010).

Deploying an appropriate response is especially critical to a primarily volunteer department such as ours so that firefighters do not become disillusioned by being taken away from their jobs and families un-necessarily. We must also balance the needs of the firefighter to respond to an adequate number of calls to keep them active and interested.

The ARP is based upon a review of departmental policies and procedures, departmental response records, NFPA 1720 and includes a survey of departmental members concerning their needs and abilities to respond to various types of calls and time of days.

Background & Significance

The City of Monroe Fire Department is a combination department made up of 48 paid-on-call volunteers and two career members. The department protects a city of 10,991 citizens and a large part of Green County, with a rural population of 3,813, for a total served population of 14,804. Additionally, all of Green County or 33,647 residents (U.S Census, 2010) rely on The Monroe Fire Department through automatic or mutual aid. The department responds to over 300 fire- and emergency-related calls per year for fire suppression and various rescue situations. The department does not routinely respond to EMS calls and has no patient transport capabilities.

Monroe has become a major tourist destination in recent years; several community festivals draw large crowds to the area. For example, in September of 2010, over 200,000 people attended our bi-annual Cheese Days festivities held in Monroe. The City of Monroe is

also a major commercial and industrial area, with plastics production and worldwide shipping and handling of many consumer products including automobile parts and many food processing concerns, such as candy manufacturing and packaging, meat production, and cheese production—our major industry.

The City of Monroe is a regional shopping hub. Traffic studies have shown that over 20,000 vehicles a day currently pass through the city or are used to visit the city to shop, dine or conduct business, including 3,000 per day used by those who come to conduct business at one of the many Green County government buildings in Monroe (the county seat). The department operates four engine companies, one ladder company, and several support apparatus from two stations. Station Number 1 is located in the far west side of the city, while Station Number 2 is located in the central business area of the city. The City of Monroe enjoys an Insurance Services Office classification of 3, with a Class 8B (Monroe ISO Inspection Report, 2005) rating in the three rural townships served.

The suppression/operations division is staffed primarily through paid-on-call personnel. Upon receipt of a call, the Green County Sheriff's Office 911 call center alerts the members via pager. Most members are allowed to leave their employment to respond to calls, although some must wait for a second alarm to be transmitted prior to being allowed to leave. Most of these members work on the west side of the city where nearly all of our employers are located.

Once firefighters arrive at the station, they don their PPE, and board the apparatus. They then place accountability tags on a passport system and the truck leaves the station. Six-person crews are used on the first alarm engine companies and six-person crews are used on the first alarm ladder company. Additional alarm responses are based on need and normally include apparatus crews of 4 or more members. Each apparatus is normally staffed by at least

one of the 11 department officers before leaving the station. An additional issue is that nearly all the residential areas are located in the central and eastern areas of the city so when firefighters are not working, they are located in these areas. Because of these diverse and much defined residential versus commercial areas the department has developed a staffing model wherein firefighters have PPE at both stations and are allowed to respond to whichever station they are nearest to when the call is received. This dynamic staffing model, as it has come to be called, has worked well for the department although response numbers can fluctuate based on time and day of week. This can lead to reduced staffing at one station or the other, however, this fluctuation is addressed in that apparatus respond from both stations to all calls no matter the location of the incident.

For years, the “rule of thumb” has been to send as many apparatus as needed to transport the firefighters who report for the call. Response to emergency calls averages 18 personnel. Many times the apparatus, as well as the personnel, are not needed but are allowed to respond anyway, this has led to multiple apparatus used as personnel transporters only. A command officer is on duty and responds to all calls; career members staff this position Monday 0700 hrs through Friday at 1600 hrs. Paid-on-call officers staff this position on weekends and holidays, using a rotating schedule (every eleventh weekend). In this manner, the command position is staffed 24/7/365. This on-call officer handles approximately 100 routine calls each year, such as carbon monoxide checks, illegal burning and other public service calls, without the need to alert suppression forces.

While the city fire data shows most alarms are answered in 4 minutes (ACS Firehouse Software, 2011), the data is misleading since, in reality, the public safety answering point records only the arrival time of our first arriving unit. Many times arrival times for suppression

apparatus are not recorded unless the incident command officer makes note of arrival time or the company officer activates a touch screen command on the apparatus mobile data computer. In cases when the data for each arriving apparatus has been recorded, actual times show an average response time of eight to twelve minutes for the first arriving engine company, ten to fourteen minutes for arrival of the ladder company, and ten to sixteen minutes for the second arriving engine company. Of course, these times are much higher for rural responses.

These factors, together with traffic congestion in the city, have created longer response times in many areas of the city. On one occasion, prior to special council meeting on March 9, 2010, the City Council President, and former fire chief, indicated that he felt turnout time for a call on March 8 at approximately 1020 hrs was "over 6 minutes" (C. Koch, personal communication, March 9, 2010). In January, 2009, a delayed alarm and a thirteen-minute response to a fire at an ethanol plant resulted in significant damage that could have been avoided (ACS Firehouse Software, 2011).

While life safety of the general public has been a primary consideration, preserving property and tax base must also be considered when determining what response times are appropriate. The state has mandated that tax rates must not be increased. Because of this, the only way to increase revenues is to promote growth in the community. Improved capabilities demonstrated by lower property loss and lower insurance rates will encourage businesses to locate in our community.

Lastly, firefighter safety has to be our very highest priority. Attacking fires earlier and more aggressively can prevent room and content fires from reaching flashover and extending. While we have been discussing first arriving apparatus, we must also consider if our second

due apparatus are adequately responding and adequately staffed. Firefighters must know when to expect help from second- and subsequent-arriving apparatus.

The ability to improve response activities and improve life safety and property conservation efforts must start with a thorough understanding of the components that make up a response to emergency incidents. Arguably, the most important element of emergency response is appropriate staffing of apparatus and the fireground.

Consideration must be given to current and future resource availability, based upon today's economic climate, so that we can find ways to improve without assuming additional long-term funding burdens that may not be sustainable.

Literature Review

Literature review began with a card file search at The National Fire Academy Learning Resource Center at Emmitsburg, Maryland on March 28, 2011. A review of previous EFO applied research projects, trade journals and texts found quite a lot of information concerning the various aspects of emergency response that can help us understand what elements are germane to a predominantly volunteer department. This review helped the author understand what elements of emergency response time can be modified, as well as those which cannot.

One of the greatest challenges of today's fire service is to achieve excellence in life safety and property protection through the process of continual quality improvement (Commission on Fire Accreditation International; *Fire &Emergency Service Self-Assessment Manual*, 2009). One of the primary areas targeted for improvement is apparatus response and staffing, or the ability of the department to respond quickly and efficiently with adequate staffing and equipment when needed. To fully understand how response can be improved

required the evaluation of all of the various components that make up response and reflex times, or the total time from discovery of the emergency until firefighters take definitive action at the scene to mitigate the hazard.

In A *Leadership Guide For Combination Fire Departments*, Windisch and Crosby (2008) maintain that minimum response requirements and response time standards may not differ between combination departments and fully volunteer organizations. It is apparent, however, that response cannot be compared between these types of organizations and fully career departments. Windisch and Crosby (2008) go on to say that the level of service must be fair to all persons involved, including the community, the department, and the individuals who are members.

A thorough review of the current National Fire Protection Association standards was also conducted. The various elements of emergency response were evaluated and it was found that although NFPA 1720 does set various benchmarks for predominately volunteer department, the standard does not set minimum response time standards (NFPA, 2010) for volunteer or combination departments. Various fireground activities and abilities are specifically mentioned and those activities are further delineated in the NFPA Compliance Matrix IAFC/VCOS (IAFC, 2001). This document lists 54 separate points of evaluation, including appropriate level of response and staffing, but no mention is made towards response time analysis. Brian Hensler, in his FireBurea.com article; *NFPA 1710, 1720 and Response Times* (2008), goes so far as to state:

> The NFPA treats volunteer and career departments differently when it comes to response time standards. For those that are substantially (>80%) career, there is NFPA

1710. For departments that are substantially (>80%) volunteer, there is NFPA 1720.

For those departments in between the range, there is nothing (Hensler, 2008). Instead, National Fire Protection Standard 1720 (NFPA, 2010) addresses staffing and response time issues by recognizing the response time differences that often occur between in-station responders and volunteers who likely are not at the station. *The National Fire Protection Association, Fire Protection Handbook, 20th Edition* calls for minimum numbers of firefighters, depending on local population density per square mile, and differing maximum response times, which are also related to population density (NFPA, 2008).

Reviews of current Monroe Fire Department Standard Operating Guidelines and The Monroe Fire Department Member Handbook (MFD, 2008) also identified several response profile policies; however, no response time standards or goals were found.

There is a correlation in response time and severity of the incident as referenced in numerous publications and studies. In The National Institute of Standards Bulletin 1661: *Report on Residential Fireground Field experiments* (NIST, 2010) it is stated that delayed response, particularly in conjunction with the deployment of inadequate resources, reduces the likelihood of controlling the fire in time to prevent major damage and possible loss of life, and increases the danger to firefighters.

One of the greatest measures of a fire department's effectiveness is how they respond when the public calls. In a Fire Chief magazine article; *No Time-Out In Tactics* (Coleman, 2006) stated that turnout time is a direct reflection to the citizens on how much you care about what you're doing when you've been told to respond.

In the publication; *Your Next ISO Rating*, actual response times, if allowed to continue to increase, will have a significant adverse effect on ISO classifications (Stevens, 2004). The

crew's attitude towards certain types of calls can also affect response times. In two different unpublished manuscripts Weninger (2004) and Pointon, et al. (2004) assumed that more serious calls would result in shorter response times; however, no substantial correlation could be found between call priority and turnout time. In an EFO ARP; *The Importance of Efficient Turnout Times*, D. L. Kitterman (NFA, 2008) recommends that an organization increase personnel awareness of the importance of all types of calls and the effect on public opinion and support.

NFPA has stated that a major challenge in the discovery process often lies in assessing the existing protection characteristics (*IAFC NFPA Compliance Matrix*, Introduction, 2001). This has proven especially true in determining statistics for The Monroe Fire Department since our county dispatch center does not record the response times for suppression apparatus. Only the arrival time of "the first unit" is recorded according to Green County Sheriff dispatcher James Moldenhauer, (personal communication, May 13, 2010). According to available dispatch records, the first arriving unit is usually one of our on-call command units, which are essentially chiefs' cars with little or no suppression capabilities (Spillman Technologies, 2011). A more complete review of sample incidents for 2005 through 2009 indicates that the actual arrival times of suppression personnel were substantially longer (ACS Firehouse software, 2011).

More importantly, perhaps, than all of the statistical data is how the members feel about response policies, response times for emergency incidents, and especially how they feel about various elements of the total response time that they or the department can control. The members know that some areas such as reluctance to change, and a general lack of concern for response times in other agencies cannot be helped. However, many active

department members feel that we are deficient in certain areas of our emergency response, and are anxious to make changes. This is one of the key elements in affecting cultural change in their book; *Leadership On The Line: Staying Alive Through The Dangers of Leading* (2002). Heifetz and Linsky also distinguished the difference between technical versus adaptive challenges, and recommend orchestrating conflict as a way to manage change. In this case, making subtle but recognizable changes in response policies brings to light the deficiencies that some members see. This enables an open dialogue among members, command staff and administration, and can lead to improved response times. By simply alerting department members that response times are important, In another EFO ARP; *A Qualitive Look at Turnout Times in Emergency Reponses (2005),* L. A. Soptich maintains there will be some improvement in response times. Rufer, in his book; *Help-Wanted – Volunteer Recruitment and Retention* (2009), proposes that members are motivated by reputation and that members look for organizations that are respected and supported by those people they consider to be their peers. They want to be part of an organization they can be proud of.

An important element of organizational culture is the force of change. In the book; *Understanding Organizational Change* (2008), D. L. Nelson and J. C. Quick hypothesize that change is the norm in most organizations and it is inevitable, but change can also be managed. Change comes from both internal and external forces. In his seminal book; *Resolving Social Conflicts* (1948) Kurt Lewin incorporated a change model that contends that a person's behavior is the product of both forces that push towards preserving the way things are, and forces that push towards change (Lewin, 1948). In the September, 2008, issue of Fire Rescue

magazine, James Crawford wrote a column entitled; *Leading with Heart* (2008). He believes that true leaders find and use tools to create passion. He suggests the following quote:

> You can buy people's time; you can buy their physical presences at a given place; you can even buy a measured number of their skilled muscular motions per hour, but you cannot buy enthusiasm…you cannot buy loyalty…you cannot buy the devotion of hearts, minds or souls. You must earn these.-Clarence Francis (Crawford, 2008, p.188).

Crawford encourages the use of shared vision, competent leaders and mutual respect. He goes on to say mistakes are alright but compassion must be part of the plan (Crawford, 2008, p.188).

This research points to opportunities to evaluate both technical elements of total response time and perceptions and actions of firefighters and others. If the Monroe Fire Department is truly serious about improving emergency response and adherence to national consensus standards, the members must be an integral part of the solution.

Based on information reviewed, this applied research project focuses on compliance to the consensus standard. Response time elements that the department may control (including standard operating guidelines, response policies, station locations and apparatus staffing and assignment), and on how perceptions and motivation all affect the actions of the responding firefighters in relation to the call location, severity or priority of the call and finally, whether changes should be made in response profiles in order to improve emergency response and gain compliance.

In reviewing NFPA 1720, it was determined that most fire suppression and emergency response requirements are located in Chapter 4. This chapter states in part, that fire suppression operations shall be organized to guarantee that the departments emergency

response includes adequate resources (personnel and apparatus) to safely and effectively deploy suppression forces as needed to mitigate the incident (NFPA, 2010). While the number of actual number of responders is up to the Authority Having Jurisdiction, certain record keeping requirements, use of ICS, chain of command and automatic or mutual aid must be appropriately addressed. Others have endeavored to determine the actual number of responders "needed". The International Association of Fire Chiefs states that:

> Historically, the standard for fire suppression in North America has mandated an offensive attack in situations involving structure fires. Study after study has shown that if the force available to initiate an interior fire attack is less than fifteen personnel. The goals of victim rescue, fire control and property conservation are seriously compromised (IAFC, 2001, p.2)

The Leadership Guide for Volunteer Fire Departments, 4th Edition offers a more realistic method of determining the needed level of response to prevent firefighter injuries or loss of life. It states, the formula used to determine the minimum number for this response is simple: the number of tasks plus the number of firefighters needed to complete each task equals the total manpower needed (Snook, Gasaway and Holmen, 2011).

NFPA 1720 also references several other NFPA standards including *NFPA 472, Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction, 2008 editions, NFPA 1221 Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems, 2010 edition, NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, 2007 edition* and *NFPA 1561, Standard on Emergency Services Incident management System, 2008 edition*. These

references necessitate a review of these documents to determine compliance with the materials referenced in the IAFC NFPA 1720 Compliance Matrix (IAFC, 2001).

NFPA 472, Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction, 2008 edition, as referenced in NFPA 1720, specifically addresses hazardous materials incidents. The standard addresses core competencies as "The operations level responder shall be that person who responds to hazardous materials/weapons of mass destruction (WMD) incidents for the purpose of protecting nearby persons, the environment, or property from the effects of the release" (NFPA, 2008, 5.1.1.1). The standard goes on to address the level of response employed by the Monroe Fire Department as "The operations level responder shall be trained to meet all competencies at the awareness level (chapter 4) and the competencies of chapter 5 (NFPA, 2008, 5.1.1.2).

NFPA 1221 Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems, 2010 edition, addresses the need for reliable communications. It spells out the need for standardized training, site security and dispatch and radio communication protocols (NFPA, 2010).

NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, 2007 edition, establishes minimal staffing for safety based on incident type, essential fireground task that need to be established and department staffing model. This standard specifically addresses the number of firefighters and other personnel needed to safely mitigate the incident (NFPA, 2007).

NFPA 1561, Standard on Emergency Services Incident management System, 2008 edition, focuses on risk management, communications, roles and responsibilities of the incident safety officer and the advent of rapid intervention teams. The latest revision provides

additional emphasis in areas of incident management to improve the safety, health, and survival of responders (NFPA, 2008).

The NFPA Fire Protection Handbook, 20th Edition also states that NFPA 1720 calls for minimum numbers of firefighters responding depending on local population density and differing maximum response times, which also related to population density. The Fire Protection Handbook goes on to explain; any additional needs of the system and the fire department must be projected in order to represent the content components of the plan (NFPA, 2008, V-II, p. 12-5).

Table 1 (NFPA, 2010) shows the population density and type of areas serve as demand zones and the response levels required in order to gain compliance with NFPA 1720. The City of Monroe, if classified as a separate demand zone would fall into the urban category and would therefore require a response of a minimum of fifteen firefighters within 9 minutes, 80% of the time. The Federal Emergency Management Agency however, classifies the department as a rural department. This changes the response criteria to 6 firefighters responding within 14 minutes of the call, 80% of the time.

Table 1

Demand Zone	Demographics	Staffing	Response Time	Percentage
Special Risks	AHJ	AHJ		90
Urban	1000 people/1 sq. mile	15	9	90
Suburban	500-1000 People/ 1 sq mile	10	10	80
Rural	Less than 500 People/ 1 sq mile	6	14	80
Remote	Less than or equal to travel distance of 8 miles	4	Dependent on travel distance as determined by AHJ	90
* Upon assembling the necessary resources at the emergency scene, the fire department shall have the capacity to safely initiate an initial attack within two minutes 90% of the time (NFPA 1720, 2010, p. 7)				

The National Institute of Standards and Technology conducted research on twenty-two different fireground skills. In their *Report on Residential Fireground Field Experiments* research, they found a 30% improvement (on average) in completion of all tasks on the fireground using four-person crews as opposed to two-person crews (NIST, 2010, p. 10-11). Their conclusions were arrived at after more than 60 full-scale fire experiments conducted to determine the impact of crew size, first-due engine arrival time, and subsequent apparatus arrival times on firefighter safety and effectiveness at a low-hazard residential fire clearly demonstrate the benefits of a minimum staffing of four firefighters per apparatus, staggered apparatus response profiles and timeliness of dispatch and arrival (NIST, 2010 p. 11).

The author reviewed the mutual aid policies and procedures in an attempt to determine the level of automatic or mutual aid that was available for various types of incidents. The Mutual Aid Box Alarm System is used for the basis of a countywide mutual aid agreement that was adopted by the City of Monroe and signed in 2006. The system consists of a series of printed box cards showing the desired response based on the type and severity of the call. The box card system provides an easy way to implement theses response in a preplanned and logical manner. Box Card 0518 was particularly reviewed as an example because it deals with structure fires occurring in the city limits. This type of alarm is typical of our responses and does include the type of fireground tasks being looked at in this research (MABAS Division 105, 2006).

Finally, a review of *The Monroe Fire Department Member Handbook and Standard Operating Guidelines*, specifically SOG MFD 6.001, found that staffing recommendations are in place listing an optimal crew size of 6-firefighters per apparatus for engines and the truck company with two members responding in tenders and utility vehicles. No maximum or

recommended response times were found in any response profiles or Standard Operating Guidelines (MFD, 2008).

In summary, it is clear that the same emergency response is not expected from a volunteer department such as the Monroe Fire Department as is expected from a career staffed department. This does not negate the need for a level of service that the community has come to expect. There are clearly divergent opinions of what is acceptable by the various writers reviewed. This can be driven by perception, socio-economic backgrounds and life-experiences by the authors. The purpose of this research is to determine compliance with NFPA 1720; the associated literature sets the tone and timber of various organizations but does not directly address compliance by any department. Review of this material does address why the consensus standard exists and the history behind its development. The literature clearly demonstrates the need to use the elements of NFPA 1720 and the reference standards to objectively and methodically evaluate each component of the department's emergency response but also emphasizes the point the department cannot be gauged against another to determine what level of compliance has been met. The literature review reinforced that which standards, if any, to implement is strictly a local decision and that the average staffing for first due apparatus should be at least four firefighters and specialized or hazardous operations may necessitate more staffing. The literature supports a need for defined response time standards and minimum staffing requirements based upon the type of call received.

Procedures

The purpose of this project was to determine if the Monroe Fire Department was meeting the objectives of NFPA 1720. The procedures used while preparing this report began with a review of literature from The NETC Learning Resource Center while at The National

Fire Academy at Emmitsburg, Maryland in March and April of 2011. This research proved that quite a lot had already been written concerning the need and desire of various departments to meet the operational and fire suppression objectives of the standard. It became apparent that not little research was conducted to address specific fireground tasks and how crew size, response times, and apparatus s assignment variations could affect the timely completion of these tasks. Additional research was conducted via internet and through review of departmental policies and standard operating guidelines between April 2011 and July 2011. The International Association of Fire Chiefs NFPA 1720 compliance Matrix was completed in late July 2011, along with a cover-to cover review of the associated tertiary NFPA standards. A completed copy of the Compliance Matrix is included (Appendix A).

Finally, a survey concerning the needs, desires and abilities of the department meeting the NFPA 1720 standard requirements was developed. This survey was presented as an anonymous survey using surveymonkey.com to the all department members to complete. Thirty of forty eight members chose to complete the on-line survey. The survey and a compilation of answers are included (Appendix B)

Research questions number 1 and 2 are very much contingent on the other. NFPA 1720 states, “Fire suppression operations shall be organized to ensure that the fire department’s fire suppression capability includes sufficient personnel, equipment and other resources to deploy fire suppression recourses efficiently, effectively and safely” (NFPA, 2010). NFPA further places the responsibility in determining sufficient staffing to the authority having jurisdiction. NFPA 1720 further states; “The authority having jurisdiction shall promulgate the fire department’s organizational, operational, and deployment procedures by issuing written administrative regulations, standard operating procedures (SOPs), and departmental orders.”

Since total staffing can be very dependent on apparatus response, to determine this a review of departmental response statistics, payroll records and standard operating guidelines was conducted to determine how the department compared to national standards in relation to staffing and apparatus response.

Research question number 3 deals specifically with essential fireground tasks, since verifiable times for completion of these essential tasks could not be verified using the department's records management system or radio logs. It was necessary to gauge fire department members' perception of these particular activities. Questions were included in the department members' survey addressing these tasks (Appendix B).

Research question number 4 looked at how response changes based on time of day or day of week. In order to address this question payroll records were reviewed from October 31, 2010, when the second station was opened, through April 1, 2011. While the statistical sample is limited, review of older records would provide no useable data since the department transitioned from a single station response to a multiple station response system when the second station opened.

Lastly, research question number 5 asks how the provided dispatch information affects the firefighter's desire or ability to respond. This question is addressed by specific questions in the department members who were chosen to participate in the survey because they are considered subject matter experts and most have 5 years or more experience in department emergency operations.

This research was affected by the following limitations; While the city fire data shows most alarms are answered in 4 minutes (ACS Firehouse software, 2011), the data is

misleading since, in reality the public safety answering point records only the arrival time of our first arriving unit. This unit is normally our on-call officer who drives an SUV with little or no firefighting capability. Many times arrival times for suppression forces are not recorded unless the incident command officer makes note of arrival time or the company officer activates a touch screen command on the apparatus mobile data computer. In cases when the data for each arriving suppression apparatus has been recorded, actual times show an average response time of eight to twelve minutes for the first arriving engine company, ten to fourteen minutes for arrival of the ladder company, and ten to sixteen minutes for the second arriving engine company. Of course, these times are much higher for rural responses.

An assumption was made prior to beginning the research that The Monroe Fire Department was substantially in compliance with most of the requirements of NFPA 1720. It was further assumed that the department had the resources needed to gain compliance with the noted standard.

Results

After a thorough review of the NFPA 1720 and the associated standards, it has been determined that the department is compliant with many areas of NFPA 1720. After completion of the NFPA compliance matrix (IAFC, 2001) the department was found to currently meet 59% of the objectives, partially met 39% of the objectives and was non-compliant in only 2% of the areas, specifically radio terminology and maximum response time standards. The research questions are presented along with the findings that pertain to each question in narrative format. Additional information is provided for the objectives that department is partially meeting and areas where the department is non-compliant.

Research question number 1 asked; How does the department compare to national standards in relation to staffing? The standard does list some minimum staffing requirements based upon population, distance and type of call. The City of Monroe falls into the suburban area classification according to Table 4.3.2 the minimum listed staffing is 10 firefighters who respond within 10 minutes, 90 percent of the time (NFPA, 2010). The Monroe Fire Department routinely responds with crews of 6 firefighters on all suppression apparatus. Additionally, the department responds to hazardous material/WMD calls with multiple personnel who far exceed any of the requirements in NFPA 1720, NFPA 472, NFPA 1500 and NFPA 1561. An average response of more than 18 personnel to all first –alarm calls ensures that the initial alarm and subsequent alarm levels are adequately staffed. In addition, formally adopted mutual aid agreements provide virtually unlimited staffing for long duration or personnel intensive operations. The departmental SOP's clearly delineate the chain of command, the requirement to implement an incident command structure, assignment of safety officer(s) and require the use of crew resource management elements. All members are required to be certified by the state at the level that they serve. Additionally, all members receive hazardous materials operations level training as well as incident system command training. The department has written response profiles and standard operating guidelines but those guidelines do not include maximum response time requirements and the department has not formally implemented a quality management program although an informal review of critical incidents is conducted. Arrivals of the first fire suppression vehicles average 9.5 minutes while the ladder company and subsequent apparatus arrival averages 12 minutes (ACS Firehouse software, 2011). While it is clear that the department the meets the requirements of

section 4.3 in the area of total staffing, it is not clear that the full first alarm assignment of two engines and a truck arrive in the designated time frame listed in table 4.32 (NFPA, 2010).

Research question number 2 poses the question; How does the department compare to national standards in relation to apparatus response? Total response to a working fire (Code Red) will routinely exceed 30 firefighters from The Monroe Fire Department along with 4 engines and a ladder truck. At least two engine companies are assigned however; arrivals of the first fire suppression vehicle averages 9.5 minutes while the ladder company and subsequent apparatus arrival averages 12 minutes (ACS Firehouse software, 2011). This indicates that the department is in partial compliance to the standard but improvements can be made in turn-out and response times. Currently, one engine is sent from both stations as well as the ladder truck from station 2. Additional alarms bring another engine from both stations along with mutual aid engine companies and another ladder company from neighboring communities. This additional response is provided through activation of a Mutual Aid Box Alarm System MABAS card as shown in (Appendix C). NFPA 1720 recommends that automatic aid agreements be developed to improve response times for outside agency assistance to certain types or levels of calls. (NFPA, 2010) The department has not implemented any automatic aid agreements bring outside resources into the district.

Research question number 3 asks: How does the department compare to national standards in relation to completing essential fireground functions i.e. fire attack, search and ventilation? NFPA 1720 section 4.6 requires that four firefighters be assembled before interior fire suppressions are initiated (NFPA, 2010, p.1720-7). Since the department nearly always responds with a full crew of six and a review of records for the last 5 years show no occurrence where a suppression engine has responded to a structural fire with less than 4 members it is

apparent the requirements in section 4.6.1 are being met. All of the other requirements of section 4.6 are also being met. Much of the literature review highlighted challenges in meeting these requirements. Because of budget issues in career departments and volunteer staffing issues in volunteer departments many apparatus are responding with skeleton crews. In many communities a inability to provide for overtime staffing and unfilled positions have created a need to respond with only two or three firefighters. Additionally, permanent or rotating station closures have lengthened response times for second arriving and support apparatus. The fireground field experiments conducted by The National Institute of Standards & Testing clearly show a correlation between initial engine and truck company staffing with successful incident mitigation and the completion of essential tasks. It also recognizes that increased staffing provides for an enhanced level of firefighter safety (NIST, 2010).

NFPA 1720 Section 4.3.3 also requires that the department shall have the capability to commence an initial attack within two minutes of arrival (NFPA, 2010, p.1720-7). The Monroe Fire Department does not capture data indicating completion of these so-called essential tasks so no determination could be made concerning how fully the standard is being met (ACS Firehouse software, 2011).

NFPA 1720 (2010) section 4.7 indicates that the department shall have the ability for sustained operations. Both written standard operating guidelines and written mutual aid agreements clearly delineate the response structure to be employed for these sustained operations. The department has clear guidelines for implementation of incident command and requests for mutual aid as needed. Review of department SOG's (Monroe Fire Department, 2008) clearly indicate that the department meets many of the requirements of this section, however automatic aid policies would help more fully meet the requirements in this section.

NFPA 1720 (2010) section 4.8 requires that these mutual aid agreements address the areas of mutual aid, automatic aid, staffing and designation of the incident commander. The standard also requires that all department members receive training on requesting, implementing and functioning within the mutual aid system. The department implemented a Mutual Aid Box Alarm agreement in 2004 that exceeds the requirements of this section (Appendix D).

Research question number 4 addresses average response to calls based upon time or day of the week. Upon reviewing department response statistics and payroll records it was determined that on average calls, 33% of members respond to calls. When considering only structure fire calls it was noted that the number of responding firefighters increased significantly to 64% of members (ACS Firehouse software, 2011). There was little difference in total response numbers based on the time of day or the day of the week in our records management system statistics. It could be determined as expected which members were likely to respond based on these factors as most members showed a pattern of the times they can respond because of work, family or leisure commitments (Appendix B). The reasons for these significant fluctuations are addressed by the survey conducted and indicated that the type of call, if announced, the location of the call, and the proximity that the members was to one station or the other had a little impact on the firefighters ability or desire to respond to the call.

In question number 5 specifically addressed the firefighter's ability or desire to respond to calls based upon the information given at the time of dispatch. As Rufer stated, firefighters want to be a part of a successful and respected organization (Rufer, 2009). However the collected data conflicts with Soptich's finding that the severity of the call is a factor in determining the ability to respond (Soptich, 2005). The data collected in the member survey

(Appendix B) indicates that Monroe Firefighters do not vary their response based on the type of call or information provided at time of dispatch. It is apparent that some members choose not to respond during certain portions of day or to lesser extent dependant on the day of the week.

The firefighters are generally very satisfied with dispatch procedures and response policies. They do not appear to vary their response due to the severity of the calls but do considered response if they feel that there is a high probability of the response being cancelled especially if they are at their full-time jobs. This is to be expected and generally does not slow response since the response numbers are still above require participation levels for routine calls.

A review of the completed IAFC/VCOS compliance matrix shows that while the departments standard operating guidelines and department policies are generally well written the policies do not contain appropriate maximum response times or minimum staffing requirements. The community has not conducted a community-wide risk assessment and does not adhere to a quality management program. Radio communications do not completely meet the standard protocol and terminology requirements listed in NFPA 1221 (2010) or those in NFPA 1561 (2008).

Discussion

The reasons for a fire department to meet NFPA 1720 are well documented and supported. Especially in these financial times many department leaders are using NFPA 1720 as a tool to justify their continued levels of staffing and funding. It is however as important to meet these requirements from a legal standpoint and in so doing a higher level of service and firefighter safety can be achieved. Indeed, Snook, Gasaway and Holmen state:

> If a fire department is to serve the community effectively and provide competent and effective services, the fire chief has to initiate a strategic planning process. The goal of

> the process is to ensure that adequate levels of resource, including staffing, are allocated to meet the communities need for the services delivered by the department (Snook, Gasaway and Holmen, 2011).

This certainly indicates that strategic planning or the lack thereof can be a significant hindrance to ensure the appropriate level of response both now and in the future. Even though Windisch & Crosby (2008) maintain that response requirements and response time standards may not differ between combination and volunteer departments, one cannot ignore the needs, desires and abilities of the membership. In departments that are staffed by members who do not rely upon the department to support them and their families, members need to feel "needed". Windisch & Crosby go on to say that the service provided must treat all persons served in a fair and equitable manner and that the service must be appropriate to the community. The City of Monroe is served by a predominantly volunteer department and changing to a fully career department could certainly address the few non-compliant areas of NFPA 1720, the community may not be able support that level of service as well as all other essential services. This is an area that would be well-addressed by a completing a community risk assessment and development of a community risk management plan. However, a formal strategic planning process and capital expenditure plan is being discussed but has not been formally adopted. Another method may be to implement the process that Pegram recommends which entails simply identifying all of the fireground tasks that need to be accomplished plus the number of firefighters needed to complete each of those tasks equals the total manpower needed (Snook, Gasaway and Holmen, 2011). Finally NFPA1720 states in Annex A.1.3.1 (NFPA, 2010, p.1720-9) that the authority having jurisdiction generally has the responsibility to determine level of service, needed funding and necessary personnel,

equipment and facilities for the community. This should be done in conjunction with and only after careful strategic planning and consideration of the needs, desires and abilities of the volunteer force if that is how the department is to be staffed.

Careful review of the National fire Protection standards has shown that most areas of NFPA 1720 are being adequately met. This includes the tertiary requirements in NFPA 472, NFPA 1221, NFPA 1500, and NFPA 1561 and that only minor changes are needed to gain complete compliance in the areas of radio protocol and terminology and to fully implement fireground accountability requirements.

What was most interesting, and perhaps most significant were the results from the survey of department members. To have a 63% response to the survey indicates that there is interest in improving response. Kitterman's (2008) and Soptich (2005) finding that an increase in organizational awareness can improve response times is apparent in that the members are actively engaging in the discussion. Rufer (2009) also proposes that members want to belong to quality, well-respected organizations. The survey clearly indicates that most members respond as much as they can. 73% are allowed to leave work for first alarm calls, while nearly all (98%) are allowed to leave for more serious calls. (Appendix B, question 1 and 2). The majority (62%) do not consider the type or severity of the call prior to choosing to respond (Appendix B, question 3 through 7). A more significant factor in member participation is the likelihood that the call will be cancelled or that the member will not arrive in time to respond with the apparatus. (Appendix B, question 8 through 11). It is also clear that time of day or day of week has little significance in the ability or desire of members to respond to the incident (Appendix B, question 12 and 13). The members also feel

that the current dispatch procedures are adequate and do not need significant adjustments (Appendix B, question14 and 15).

All of these statistical analysis, standards review and survey results support the prior assumption that the Monroe Fire Department is in substantial compliance with the requirements in NFPA 1720 however some minor and easily accomplished changes could improve our level of compliance, and service to the community. These changes can be accomplished with little cost and with only minor policy and procedural changes.

Recommendations

After completing this research The Monroe Fire Department has a clearer understanding of the portions of the standard where both compliance and on-compliance rest. If The Monroe Fire Department is to attempt to gain compliance with all emergency response and operational aspects of NFPA 1720 the following recommendations should be considered.

A formal community risk assessment analysis must be conducted. This assessment should include understanding the make-up of the community, identifying hazards and vulnerabilities, establishing priorities and creating risk reduction objectives. This risk reduction assessment coupled with a formal strategic plan would form the basis of any needed and appropriate changes needed to gain compliance as determined appropriate by the AHJ.

The department should immediately develop and fully implement a total quality management system addressing both emergency incident response and daily operations and standard operating guidelines should be reviewed with an eye towards strengthening the response time standards and minimum staffing requirements as needed. Specifically standard

operating guidelines should include minimum response staffing requirements based upon type and location of incident reported.

The department should begin develop standards of response data reporting so that verifiable response time data can be captured including apparatus arrival times, critical fireground task completion times, and time-on-scene reports can be implemented. This data should then be used to provide additional training, if warranted, and to develop improved response profiles in order to mitigate hazards in a more timely fashion.

Accountability policies should be re-emphasized and completely implemented to enhance fireground safety. In this manner the available resources will be appropriately deployed, services will be improved and firefighter safety will be enhanced.

The department should provide additional training in the area of the incident command system and ensure that all participants on the fireground understand and follow proper radio procedure and use proper radio traffic terminology as defined in the national Incident management system and NFPA 1221 (2008).

Department leadership must be constantly scanning and cognizant of additional environmental, economic and community demographics which create challenges in delivery of effective emergency service. These challenges must be identified and addressed to quickly develop alternative strategies which minimize risk while maintaining or improving serves. This can be accomplished by completing a formal strategic planning process.

Finally, the department must continue to be aware of the changing motivating factors, needs and desires of the volunteer members of the department. The city cannot afford to hire more full-time members and can very effectively provide emergency services to the citizens so

long as the firefighter members feel that their needs are being considered by management and appreciated by the public. This should be done through continued discussion with members and usage of regular survey tools use to gauge perceptions and identify changing department dynamics. By implementing the recommended changes The Monroe Fire Department will be well poised to continue to provide exemplary service to the community.

While this research was conducted specifically for The Monroe Fire Department, many of the elements discussed could be considered in analyzing other departments. The member survey that was conducted only addressed questions directly related to incident response staffing and response times. It is suggested that the member survey could have included more questions concerning how members feel about various types of response. While the department is considered a volunteer department, in reality the members are essentially part-time employees and as such the responses in a truly volunteer department would certainly be different. If this process were used to analyze a career department the opinions, needs and desires of the members may not be so important since most of those needs self-actualization can be over-ridden by the security needs that a full-time position provides. If this study was to be duplicated certain modifications would need to be made to accommodate department and community demographics. In short to determine any department's ability or need to comply with any national consensus standard remains a local decision that is up-to the authority having jurisdiction and other community officials and leaders.

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