

**PAID-ON-CALL FIRE DEPARTMENT STAFFING STRATEGIES  
TO MEET THE  
PROVISIONS OF THE OSHA 2IN/2OUT RULE**

Executive Analysis of Fire Service Operations  
In Emergency Management

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## ABSTRACT

Nationally mandated operational requirements of the modern fire service have challenged the ability of the paid-on-call fire department to effectively and adequately staff for emergencies. One such challenge for the Plymouth Fire Department is providing the required staffing to meet the intent of the Occupational Safety and Health Administration's (OSHA's) Respiratory Protection Standard (29 CFR 1910.134), paragraph (g) (4) "Procedures for Interior Structural Firefighting," specifically, the requirement for two stand-by personnel and two fire suppression personnel on-scene prior to the commencement of fire suppression activities (2In/2Out).

The purpose of this research was to identify staffing and operational strategies that paid-on-call departments may employ to provide adequate staffing to comply with the requirements of the 2In/2Out standard.

The research employed historical and descriptive analysis, supported by evaluative research methodology. The following research questions were presented:

1. What staffing strategies may be implemented by paid-on-call departments to comply with the 2In/2Out provisions?
2. What is the expected impact of the 2In/2Out standard upon the paid-on-call fire department?
3. Did OSHA clearly define the requirements of the 2In/2Out standard?

The principle procedures utilized for this research project were: (a) a literature review of existing material addressing staffing alternatives relative to the 2In/2Out provisions and published literature concerning the requirements of the 2In/2Out provisions, (b) an historical overview of staffing and its impact upon the Plymouth Fire Department, (c) a survey of similar

paid-on-call departments to solicit responses relative to the research questions, and (d) personal interviews conducted with fire service administrators.

The findings of this research indicated that many paid-on-call fire departments are experiencing difficulty in the recruitment and retention of personnel. The ability to attract and retain personnel impacts the operational abilities of the department, specifically the ability to adequately staff for fire ground activity. The 2In/2Out provisions for fireground staffing challenge those departments already experiencing difficulty in providing adequate personnel in their operations. The required staffing provisions 2In/2Out rule will force departments to analyze their current staffing strategy and adopt new and innovative staffing approaches for the use of existing personnel.

Recommendations that may be implemented by paid-on call departments include: (a) increase the role and use of automatic mutual aid as well as “traditional” mutual aid practices, (b) initiate multiple station dispatching to increase the pool of available personnel, (c) incorporate the use of city workers to supplement available personnel, (d) explore the use of personnel in a duty crew type program, and (e) undertake efforts to increase the membership of the paid-on-call/volunteer department.

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## INTRODUCTION

The Plymouth Fire Department is a paid-on-call agency that provides fire protection services for the 62,000 residents of the City of Plymouth. An authorized strength of seventy-one firefighters, operating out of three fire stations, addresses the fire protection needs of our growing community. In 1997, the Department responded to nearly 1200 calls for service.

The volunteer/paid-on-call fire service is a crucial national resource. The organizational style of volunteer and paid-on-call fire departments has a significant history in our country and is a tradition which dates back to the roots of the United States. It is not, however, a system without limitations. Staffing levels of fire apparatus and the response time of fire department resources to the incident scene are at the forefront of issues challenging the fire service. Of particular concern is whether the paid-on-call fire service can meet the continuing demand for service into the next century, and can provide its services in a safe and efficient manner while remaining compliant with mandated regulations.

The problem that this research project addressed is the Plymouth Fire Department's difficulty in providing the required staffing to meet the intent of the Occupational Safety and Health Administration's (OSHA's) Respiratory Protection Standard (29 CFR 1910.134), paragraph (g) (4) "Procedures for Interior Structural Firefighting," specifically, the requirement for two stand-by personnel and two fire suppression personnel on-scene prior to the commencement of fire suppression activities (2In/2Out).

The purpose of this research project was to identify staffing and operational strategies that paid-on-call departments may employ to provide adequate staffing in order to be in compliance with the requirements of the 2In/2Out standard.

Historical and descriptive research, supported by evaluative research methodology, was utilized to answer the following research questions:

1. What staffing strategies may be implemented by paid-on-call fire departments to comply with the 2In/2Out provisions?
2. What is the expected impact of the 2In/2Out standard upon the paid-on-call fire department?
3. Did OSHA clearly define the requirements of the 2In/2Out standard?

## **BACKGROUND AND SIGNIFICANCE**

On November 1, 1959, the Plymouth Village Council passed Ordinance No. 59-22, which chartered the Plymouth Volunteer Fire Department to provide service to Plymouth's 9576 residents. Francis Bauer, credited as being the driving force behind this initiative, served as the chairman of the Fire Protection Committee which laid the groundwork for the new Fire Department. On June 14, 1960, Bauer was appointed by the Village Council as the City's first Fire Chief. Chief Bauer served in this capacity until March of 1980.

On April 26, 1960, Council Resolution No. 60-4 was passed. This resolution provided for the sale of \$80,000 in bonds to build Plymouth's first fire station and to purchase fire service equipment. On November 27, 1960 the Village Council appropriated \$20,800 for the purchase of the City's first piece of fire apparatus, a John Beam pumper. This marked the humble beginning of the Plymouth Volunteer Fire Department, where 15 volunteer firefighters and several officers answered the City's fire protection needs by operating out of one fire station located in the south-central portion of the City.

Thirty-eight years later, the City of Plymouth is now host to more than 62,000 residents, and the Plymouth Fire Department has grown into a modern, full service, paid-on-call fire department. Sixty-five highly trained firefighters, one half-time Public Safety Education Specialist, a full time Administrative Fire Officer and a career Fire Chief address the fire protection challenges of a rapidly growing community. Plymouth firefighters work out of three fire stations and respond to approximately 1100 calls each year. Since 1993, calls for service in Plymouth have increased by 18 percent.

Over time, the fire service has drastically expanded the services it provides to include a variety of duties beyond fire suppression. The American fire service is in a state of transition on two fronts. The first is the transition from providing the limited traditional function of fire suppression to becoming agencies that capture the range and diversity of modern society. Service to our community now incorporates many response fields such as hazardous materials, emergency medical response and technical rescue. New responsibilities also include focused customer relations activities such as post-fire assistance, medical screenings, public education activities and non-emergency assists. Fire departments are challenged to provide this expanded scope of services due to both internal and external influences. The relatively stable fire service of the past has been replaced by a dynamic and ever-changing environment that places extraordinary demands on the fire service (Addezio, et al. 1995).

The second transition involves the additional challenge confronting the fire service, specifically paid-on-call departments, of how to provide the expanded scope of services utilizing part-time and volunteer personnel. Providing these expanded services in a manner that places firefighter safety as a priority has been, and will continue to be, a significant challenge.

With the expansion of services offered by the local fire department, an expectation of quality service delivery is a valid concern for our customers. The recruitment and retention of personnel is vital to the future of paid-on-call fire agencies. Most contemporary paid-on-call fire departments would rate member recruitment and retention as a major problem they face (Fleming, 1996, p. 38). In the growing and dynamic community served by the Plymouth Fire Department, the increased demand for service has created a concern regarding our ability to meet these service demands utilizing a paid-on-call staff.

In 1969, the Plymouth Fire Department provided the limited services of fire suppression and rescue to those endangered by fire. In 1998, the Department's paid-on-call professionals are highly trained to provide a wide range of services to meet the growing needs of our urbanized community.

The most significant challenge that a volunteer fire department faces is its ability to secure and retain a professional staff from the community which it serves. This challenge is rooted both in the demanding standards intrinsic to the career of firefighting and the service levels unique to the demographics of the community.

A significant challenge for current service delivery is the ability to recruit potential members for the Plymouth Fire Department. During the past five years, the recruitment of prospective members has challenged fire department leadership, and has become a top priority. During this five year period (1993 through 1997), the Plymouth Fire Department has experienced a decrease in the number of applications received for firefighter positions, and also a decrease in the total number of new members joining the department following successful completion of the pre-employment process.

The Plymouth Fire Department functions like any other professional organization in its hiring process. Candidates must be able to pass job-related performance tests, succeed in a personal interview, be able to commit to an on-call 12-hour work shift, and be exemplary in character. Physical agility, psychological, and drug analysis tests, as well as criminal background checks, must also be passed.

With current recruitment practices, we have found that for every twenty candidates who have applied for the position of firefighter, only four will be qualified to receive an interview and usually only one of these candidates will receive a conditional job offer. It may take over twelve months to generate such a pool of twenty candidates.

The Plymouth Fire Department experiences the loss of three to four members annually. Difficulties in the recruitment and retention of paid-on-call members has placed the effective delivery of fire protection services at risk due to low staffing levels which impact firefighter safety and overall response time to emergency incidents.

A National Fire Prevention Association survey of volunteer fire departments reported a steady decline in the number of fire service volunteers from 1983 (when there were 884,600 active volunteers) to 1992 (when there were 795,400 active volunteers) (National Volunteer Fire Council). The Plymouth Fire Department has not been immune to this trend.

Changing demographics, some unique to the City of the Plymouth, pose significant barriers that impact the delivery of fire protection service and impede the Fire Department's ability to recruit and retain firefighters. These changing demographics include:

- a tripling of the City's population;
- the movement from an agrarian economy to an economy of technology and light industry;

- an increase in the demand for fire protection service, especially during daytime hours;
- the need for a diversified fire service delivery system, including technical rescue, hazardous materials response, water rescue, and radiological monitoring;
- an increase in state and federally mandated training requirements;
- an increase in the time commitment required for call response and training;
- the fact that Plymouth is a professional, white collar community, with many residents commuting to daytime employment outside of the City;
- an increase in household income and the value of housing;
- a predominance of dual career families raising children;
- the cost of child care;
- the misnomer of a “volunteer” fire service;
- the fact that management team and firefighter committed time is already at full capacity; and
- the financial compensation of a fire service professional.

As we look to the twenty-first century, we should ask ourselves what influences are emerging today that will affect the services we provide now and how we will deliver them in the future (Bruegman, 1997, p. 23).

The Plymouth Fire Department is struggling with response issues which are directly related to the rapid growth of the community, the changing community demographics and an increase in call volume, all of which impact the ability to attract and retain personnel to answer the increased demand for services.

Difficulty in the recruitment of paid-on-call members is significant because of its impact upon the strategy and tactics employed on the fire ground. Predictable staffing levels,

particularly during daylight hours, is of concern for the incident commander. As a result of too few firefighters arriving on first due apparatus, aggressive interior fire attack activities are often delayed until reinforcements arrive to support the first responders. This delay in the initiation of aggressive tactics is required to ensure firefighter safety.

From 1993 through November of 1998, Plymouth Fire Department statistics indicate that the staffing level of first arriving apparatus on structural assignments averaged two to three firefighters during the hours of 6:00 am. to 6:00 pm. Staffing increases to four members (arriving on apparatus) during the hours of 6:00 pm. to 6:00 am.

“The organizational structure should reflect the ability of all first on-scene companies to be able to perform interior structural firefighting without having to wait for companies from other stations to arrive” (Dziuban, 1998, p.26). Difficulty in providing adequate staffing on first arriving apparatus has challenged the Plymouth Fire Department in its endeavor to be in compliance with the provisions of the OSHA 2In/2Out standard.

This research project is closely related to discussions, lectures and practical sessions conducted in the Executive Fire Officer (EFO) Program *Executive Analysis of Fire Service Operations in Emergency Management* as offered by the National Fire Academy (NFA). Capability assessment, based upon identified organizational needs and requirements, as discussed in class lecture and practical administration, proved useful in defining methods for the Plymouth Fire Department to plan strategies so to obtain needed resources. Organizational improvements will be initiated through the introduction of course concepts.

## LITERATURE REVIEW

Firefighting has long been recognized as one of the most hazardous occupations in North America in terms of occupational health and injury statistics. Each year, in statistics compiled by the National Fire Protection Association, the fire service has lost 100 or more career and volunteer firefighters in line-of-duty deaths. In the past decade, injuries sustained on the fireground have typically resulted in half or fewer of the annual number of firefighter deaths. In 1997, 40 of the 97 firefighters, who died on duty, did so on the fireground (Washburn, LeBlanc and Fahy, 1998).

Prior to 1971, safety and health efforts aimed at improving firefighter safety were primarily driven by individual incidents and by particular departments. Between 1971 and 1983, the first national safety and occupational health standards, designed to improve the overall safety and welfare of firefighters, were promulgated by the National Fire Protection Association (NFPA) and the Federal Occupational Safety and Health Administration (OSHA). Many of these safety standards addressed only the protective equipment and clothing worn by firefighters and the design requirements of fire apparatus. In 1983, a comprehensive approach to improve firefighter health and safety was introduced through the NFPA. The publication of *NFPA 1500: Standard on Fire Department Occupational Safety and Health*, placed the safety and health of our firefighters as the number one priority for progressive fire departments. The 1997 edition of NFPA 1500 did contain language relative to 2In/2Out and the formation of rapid intervention teams. Prior to NFPA 1500, there was no consensus standard for an occupational safety and health program for the American fire service.

Fire service organizations are generally subject to regulations developed for general industry, which do not provide for many of the specific needs and concerns of emergency service

providers. Depending on government authority and legislative actions, a fire service organization may or may not be subject to mandatory occupational safety and health requirements (Teele, 1992).

Previously, two-in/two-out was not a regulation, but part of an interpretation of safety regulations issued in 1995 by Assistant Secretary of Labor James Stanley and, as such, did not have the force of law (Campbell, 1998, p. 12).

In 1998, following many years of discussion and comment, the Federal Occupational Safety and Health Administration issued its revised Respiratory Protection Standard (29 CFR 1910 and 1926). The standard specifically addressed the use of respirators in immediately dangerous to life or health atmospheres (IDLH), which include those found in interior structural firefighting. OSHA further defines the atmosphere in structure fires as IDLH if the fire progresses past the incipient stage of fire growth. In these atmospheres, OSHA requires the use of protective equipment, including self-contained breathing apparatus (SCBA). In addition, OSHA requires that interior fire suppression activities be conducted with a minimum of two firefighters working as a team within the structure, and that a minimum of two firefighters be on stand-by rescue status outside the structure to provide assistance or perform rescue (IAFC, 1998, p.1). The regulation also requires that both the interior structural fire fighting team and the exterior stand-by team be in direct visual, voice or physical contact. Further requirements define who may be members of the stand-by team and the scope of their activities. The section of the revised respiratory protection standard containing these requirements has been dubbed the firefighters “two-in/two-out (2In/2Out)” regulation.

This federal OSHA standard applies to all private sector workers engaged in firefighting activities through industrial fire brigades, private incorporated fire companies, including the

“employees” of incorporated volunteer companies and private fire departments under contract with public jurisdictions (Pennsylvania Fireman, July 1998). In 23 states and two territories, the state, not the federal government, has responsibility for enforcing worker health and safety regulations. These “state plan” states must establish and maintain occupational safety and health programs that are approved by federal OSHA and are as effective as the federal program. The State of Minnesota is a “state plan” state.

Safety and health matters of our nation’s firefighters have been sadly neglected at the federal level and deserve their fair share of attention (Vickery, 1980). In 1979, President Jimmy Carter, in a speech delivered during the observance of the Firefighters Memorial stated, “We must do more to reverse the trend toward injuries and deaths of our firefighters.”

Several key health and safety standards, mandated by law and recommended in consensus format, have been proposed to safeguard the occupational safety and health of our firefighters. Consensus standards such as NFPA 1500 have addressed firefighter safety and contain many of the safety provisions as required in the OSHA 2In/2Out standard. Proposed NFPA standard 1200 also provides recommended guidance concerning fire department staffing levels and associated fireground activities.

Much improvement in the reduction of fireground injury and deaths can be attributed to a combination of better protective clothing and equipment, safer fire apparatus, better training and better incident management (Washburn, et al. 1998, p. 57). An essential part of fireground safety is firefighter accountability and establishing stand-by teams of fire personnel to effect rescues of our own members. The OSHA respiratory protection standard, with its accompanying firefighter safety 2In/2Out provision, provide fire department leadership with a powerful tool to enhance firefighter safety.

Chief Fowler, of the Sumner Fire Department believes that this standard was driven by the International Association of Fire Fighters (IAFF) union in order to increase staffing levels of career personnel. He adds however, that many departments are, or have been, meeting the intent of this standard (2In/2Out provisions) for a number of years (Fowler, personal interview, November 1998).

The concept of an enforceable, legal standard is new to the fire service. The revised OSHA respiratory protection standard addresses and leaves no doubt that two-in/two-out requirements must be followed for firefighter safety and compliance with the law (Pennsylvania Fireman, July 1998, p.106). In addition to the specifically referenced 2In/2Out provisions, OSHA's general duty clause states, "Each fire jurisdiction shall furnish to each employee employment and a place of employment which is free from recognized hazards that may cause or are likely to cause death or serious harm to the employee" (Soros, 1997, p.1).

This standard, with its 2In/2Out provisions, may be one of the most important safety advances for firefighters in this decade (Pennsylvania Fireman, July 1998, p. 106). Too many firefighters have died or have been injured due to poor accountability practices, lack of communications, or incident commanders who place personnel in fire combat assignments without assistance.

The Fire Department Safety Officers Association (FDSOA) also supports this important OSHA standard. The Board of Directors of the FDSOA stated in their February 1997 Health & Safety newsletter, "When will our profession look at the need of its members and greet a practice that is long overdue with acceptance? Your Board did, and we agreed that two-in and two-out is in the best interest of our members" (Soros, 1997, p.8).

Judy Thill, Fire Operations Officer for the Maple Grove (MN) Fire Department, believes that this standard and its 2In/2Out provisions provide a much needed base to develop effective and safe staffing levels during fireground operations (Thill, personal interview, September 1998).

John Fowler, Chief of the Sumner Fire Department in Sumner, Washington, also reports that, although the provisions of the 2In/2Out standard require a set number of personnel to be on-scene prior to fire attack and may impose difficulties on some departments, this standard is a positive step in assuring safer operations during true, life threatening emergencies (Fowler, personal interview, August 1998).

Many in the fire service see this OSHA standard as an additional burden to their business and argue that the rule will prevent us from doing our job(s). Claims of financial restraints and the ability to place four members on the initial response, assertions of not having enough personnel available, worries that buildings will burn down and lives will be lost while waiting for the required number of fire personnel on-scene to begin operations are some arguments presented against the adoption of the 2In/2Out provisions.

We must see the 2In/2Out as an opportunity, not a burden. Two-in/Two-out is just another challenge, only this time we'll be taking care of each other (Marentette, 1998, p.37).

How do departments plan to meet the staffing requirements of the 2In/2Out rule? A 1998 Fire Chief Magazine survey disclosed the following:

- Nearly 60 percent of the respondents plan to up-date their SOP's to accommodate for staffing requirements;
- More than 27 percent of volunteer departments plan to increase their number; and
- Respondents reported that engine company staffing levels are to be increased to meet the requirements of the 2In/2Out provisions.

The survey also suggested and highlighted the difficulties that volunteer chiefs have in obtaining additional personnel (Baltic, 1998, p. 48).

At the time of authorizing the revised OSHA respiratory protection standard, Secretary of Labor Alexis Herman stated, “Every day, America’s firefighters put their lives on the line to protect us. Today we act to protect them” (IAFF Newsletter, 1998, p. 1). The International Association of Fire Fighters (IAFF) believes this standard to be the single most important advance in fire fighter safety in the last century. IAFF General President Al Whitehead adds to this support with his statement that, “This new OSHA regulation will prove to be the most significant advance in fire fighter safety this decade” (IAFF Newsletter, 1998, p. 1).

Central to any discussion concerning firefighter safety is that of adequate staffing on the fire ground. There continues to be ongoing debate and controversy over the minimum crew size requirements for interior fire operations (O’Connor, 1997, p.16).

Much debate in the fire service literature and in the fire management profession concerns the relative effectiveness of a fire company (a functional working unit of a fire department, usually consisting of a given number of personnel assigned to a single piece of apparatus) at various staffing levels. The main issues are the minimum company size needed to provide fire suppression capabilities with the potential to impact fire control, provide rescue (if required) and ensure firefighter safety. Within the past decade, there have been several studies relative to defining effective staffing levels on the fireground.

The Dallas (TX) Fire Department in 1984 conducted one of the most significant studies of firefighter staffing. This study examined the relative effectiveness of staffing levels in three separate fire scenarios: a single-family dwelling, an apartment house and a high-rise structure. Researchers observed and measured the effectiveness (performance) of varying crew sizes on

different fireground simulations. As a general rule, this study concludes that staffing below the crew size of four can overtax the operating force and lead to higher losses (Onieal, 1993, p.56).

The Austin (TX) Fire Department also conducted a staffing study to measure efficiency and safety of crew sizes in different fireground scenarios. This study has revealed that four-person fire company staffing is both safer and more efficient than crew sizes consisting of fewer than four personnel (IAFF, 1994).

National consensus standards and OSHA both require that a minimum of four personnel be on the fireground before interior structural fire fighting may commence. According to NFPA 1500, fire ground commanders should limit emergency operations to those that can be safely conducted by the number of personnel on scene to reduce the risk of firefighter injury and death due to understaffing. NFPA 1500 strongly recommends that interior operations (fire attack) not be conducted until an adequate number of firefighters are on scene. 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 (Teele, 1993, p.102).

NFPA 1500 also influenced and helped shape the revised OSHA respiratory protection standard, particularly the 2In/2Out provisions. Several key safety procedures are recommended by the NFPA 1500 standard. These recommendations mirror those of the 2In/2Out provisions required by OSHA. NFPA recommended practices include:

- members operating in teams of two or more;
- members in constant verbal, physical or visual contact;
- “stand-by” member(s) assigned outside of the hazardous area during the initial stages of operations;

- rapid intervention team requirements.

The survival of the paid-on-call fire department is dependent upon the organization's ability to recruit and retain personnel. According to Atwater (MN) Volunteer Fire Department Fire Chief Greg Tauer, "Within the next five years, we could see half of our department leave because of age and years of service" ("Shortage of Volunteer Recruits", 1998).

Approximately 89.7 percent of fire departments in the United States are either volunteer or mostly volunteer (West, 1998). The ability to provide sufficient personnel to staff volunteer and paid-on-call fire departments into the next century is a critical issue not appreciated by many in the fire service. The problems caused by population shifts, suburban development, the diminished value of "volunteering," societal demands and an aging society are raising the question of who will provide the necessary fire protection in the smaller city and urban/suburban environments (Kline, 1997, p.8). John Fowler, Chief of the Sumner Fire Department, a combination department in Sumner, Washington, states that due to a decline in the number of volunteer fire firefighters on his department, he has had to increase the number of paid personnel on duty to supplement and assist the volunteer members of the department (Fowler, personal interview, November 1998). Correspondingly, the Maple Grove (MN) Fire Department has experienced a similar reduction in the number of day available volunteer responders (Thill, personal interview, September 1998).

A survey of Chester County (PA) Fire Departments revealed a 65 percent reduction in the number of members responding to calls over the past five years, an increase in call volume county wide, and a decrease in available personnel. These trends are predicted to continue in Chester County (Long, 1990).

A decline in 19 to 25 year olds' time commitment and a seeming lack of desire to provide public service has caused a statewide and national shortage of firefighters, according to Bill Bruen, Manager of the Fire/EMS/Safety Center of the Minnesota State Colleges and University System ("Shortage of Volunteer Recruits", 1998). Limited staffing has an impact upon fireground activities and the safety of first responders. Fowler's department will not be hiring additional people to meet the requirements of the 2In/2Out standard. He suggests the use of mutual aid assistance on more incidents to supplement staffing levels (Fowler, personal interview, August 1998). Fire Operations Officer Thill shares Chief Fowler's opinion of increasing the use of mutual aid, and adds that her department has initiated several automatic mutual aid agreements with neighboring departments to increase staffing levels (Thill, personal interview, September 1998).

Minimum staffing levels of fire apparatus and the response time of fire department resources to the incident scene are at the forefront of issues challenging the volunteer fire service. The Plymouth Fire Department has not been immune to this trend.

This literature review indicates that a decline in volunteer and paid-on-call membership of many fire departments in this country does have a negative impact on the ability to provide adequate personnel on the fireground to enhance firefighter safety. It became apparent during the course of the review of current literature that support of the OSHA 2In/2Out provisions is universal among fire service leadership. Literature reviewed also revealed the necessity of requiring minimum staffing levels on first-due companies to maintain adequate performance and reduce the overall risk to fire personnel operating on-scene.

## PROCEDURES

The procedures utilized for this research included a review of current literature, a survey of comparable departments, and two personal interviews.

A review of current literature concerning fire service safety and health practices and a review of fire department operational guidelines was conducted. Initial efforts to locate appropriate material were conducted at the Learning Resource Center at the National Emergency Training Center in Emmitsburg, Maryland, in August of 1998. Additional research was conducted at the Fire Information Resource Center (F.I.R.E.) in St. Paul, Minnesota, between August and December of 1998.

Two personal interviews were conducted with John Fowler, Chief of the Sumner Fire Department in Sumner, Washington. The first interview was conducted on the campus of the National Fire Academy in August of 1998. This interview lasted approximately 30 minutes. A second interview with Chief Fowler was conducted in November of 1998, and lasted 40 minutes.

A personal interview with Judy Thill, Operations Officer for the Maple Grove Fire Department, Maple Grove, Minnesota, was conducted in September of 1998. This interview lasted twenty minutes and was conducted on the campus of Hennepin Technical College, Eden Prairie, Minnesota.

All three interviews included specific questions pertaining to the research problem and questions posed in this study. Information was solicited concerning the reaction and impact of the OSHA 2In/2Out provisions upon the paid-on-call fire department, the need for such requirements, alternative service delivery options and staffing strategies to meet the intent of those requirements and compliance with the standard. Appendix A contains the questions asked of those interviewed.

A survey of fifty-two suburban fire departments in the Minneapolis/St. Paul metropolitan area and in Chester County, Pennsylvania, was conducted during the months of September through November 1998. The focus of the survey was to solicit information concerning the impact of the OSHA 2In/2Out provisions upon the paid-on-call and volunteer fire departments. Questions regarding alternative service delivery options, the impact of the standard and compliance relative to fire department services were asked of all surveyed. Thirty-two survey forms were returned. Of those returned, twenty-seven were utilized for this research project because they represented volunteer and paid-on-call departments. The remainder, five surveys, were completed by career fire departments. Survey questions may be found in Appendix B.

Several limitations were noted during the course of this research project. It was assumed that all individuals who responded to the survey were providing truthful, unbiased information. Survey results were compiled from paid-on-call and volunteer fire department representatives only. As such, they may not be representative of the fire service in general.

The existence of literature germane to the provisions of the OSHA 2In/2Out standard and its application to the paid-on-call/volunteer fire department proved to be difficult to locate. Very little literature discussed specific strategies which departments could employ to meet the provisions of the 2In/2Out standard.

The research procedures which were selected involved discussion of several terms. These terms are defined as follows:

*Paid-On-Call:* A fire service organizational style. Members of the organization receive an hourly wage and may receive a length of service pension award following retirement.

<i>Volunteer:</i>	One who gives time, energy and expertise to an agency or to support a cause. This is done without expectation, or receipt, of monetary compensation for services rendered.
<i>Working Fire:</i>	A fire involving a structure where the application of water in excess of 150 gallons per minute is required for extinguishment.
<i>Duty Crew:</i>	An organizational style of a paid-on-call fire department where personnel are assigned work shifts. The Duty Crew system consolidates member requirements (training, maintenance and fire educational duties) and provides a predictable staffing level.

## RESULTS

At the outset of this research project, three specific research questions were identified. The results of the research are organized around those three questions and presented in turn.

**Research Question 1:** What staffing strategies may be implemented by paid-on-call departments to comply with the 2In/2Out provisions?

Personnel is a primary resource of fire departments, and analyzing appropriate staffing levels is an essential component of determining the fire department's ability to safely mitigate emergencies (Hord, 1996). Staffing levels of first arriving companies dictate the suppression strategy employed and have substantial impact upon the general safety of firefighters. When asked about minimum staffing levels for the department's first arriving engine/truck company on structure fires, respondents reported that they require the following:

- Four percent use a crew of one;
- Four percent use a crew of two;

- Twenty-six percent use a crew of three;
- Thirty percent use a crew of four;
- Twenty-two percent use a crew of five;
- Seven percent use a crew of six; and
- Four percent use a crew of seven.

When considering the 2In/2Out provisions requiring teams of two for fire attack operations and a minimum of two firefighters as back-up team(s), 67 percent of departments state that they have enough personnel responding from each station so that the first arriving companies can perform interior fire attack without waiting for additional units to arrive.

Eighty-eight percent of the departments surveyed comply with the 2In/2Out provisions. All reporting departments address the need to adequately staff to meet the 2In/2Out requirements by utilizing a number of available options. Ninety-five percent use a combination of several options to deliver required staffing on the fire ground. In order to meet the staffing requirement of the 2In/2Out rule, departments used the following staffing methods:

- Seventy percent use Chief fire officers as “stand-by” personnel;
- Fifty-five percent depend upon mutual aid assistance;
- Forty-four percent utilize multiple station response;
- Thirty-seven percent plan to use apparatus operators as “stand-by” personnel;
- Nineteen percent use “automatic” mutual aid on reported structure fires;
- Fifteen percent plan to recruit additional paid-on-call personnel;
- Eleven percent utilize “duty crew” programs to provide predictable staffing; and
- Seven percent use city workers and fire inspectors to supplement fire crews.

The implementation of several different staffing strategies to meet the provisions of the 2In/2Out rule appears consistently among survey respondents. Chief Seal of the Bloomington (MN) Fire Department stated, “We have always used a variety of staffing options to meet requirements of the fireground. The new rule did not require any change in our operating procedures.”

The reliance on mutual aid and an increase in the use of automatic mutual aid to satisfy the 2In/2Out requirements is a common method to address the staffing challenge. The Loretto (MN) Fire Department will “require the department to request mutual aid more often.” The increased use of automatic mutual aid is one avenue the Maple Grove (MN) Fire Department will utilize to gather adequate numbers of personnel on-scene (Thill, personal interview, 1998).

The environment in which firefighters perform their duties has a significant level of risk of injury or death. The risk of injury or death can be minimized through the adoption of required staffing levels to accomplish fireground tasks, through proper training, implementation of appropriate tactics and strategies and the avoidance of unnecessary risks. Fire departments will be required to comply with the OSHA Respiratory Protection Standard by October 8, 1998. How departments accomplish compliance with the 2In/2Out provisions must be decided prior to the need or the occurrence of an incident.

The fire service must be able to adapt to an ever-changing and dynamic work environment. By utilizing creative staffing alternatives, the volunteer and paid-on-call fire service is meeting the demands of this OSHA initiative.

**Research Question 2:** What is the expected impact of the 2In/2Out standard upon the paid-on-call fire department?

A surprising number of respondents (45 percent) report that the provisions of the OSHA 2In/2Out standard will have minimal impact upon their department. Chief Kevin McGinty of the West Metro (MN) Fire District states, “We were already using back-up crews and accountability. Two In/TwoOut will not pose a significant staffing burden.” The White Bear (MN) Fire Department adds, “Based on our current staffing levels and response levels, the 2In/2Out has minimal impact on our operations.”

Several departments report that they will realize a staffing impact, particularly during daytime response periods. Watertown (MN) Fire Department believes that, “Daytime calls will be hard at the first response.” Of the respondents who reported in adequate staffing as a result of the 2In/2Out provisions, 55 percent will rely on mutual aid to ensure the required staffing on the fireground. Chief Mike Richardson reports that mutual aid assistance works well in his community of Woodbury, Minnesota. Richardson states that, “We can mobilize 20-30 people and have them on the scene in a short period of time, normally by the time the first engine is set-up and the second engine is arriving.”

Political concerns were not reported as an anticipated impact. Financial and budgetary impacts were predicted by only two percent of the respondents. John Fowler, Chief of the Sumner (WA) Fire Department, stated that, “This standard is causing us to become less dependent on our volunteer personnel”. This results in a greater reliance on automatic mutual aid companies and increased career staffing” (Fowler, personal interview, November 1998).

Operationally, 45 percent of the respondents anticipate a reduction in suppression aggressiveness and the increased use of exterior fire attack, resulting in an increase in property

loss as a direct result of the staffing requirements of the 2In/2Out standard. Chief Bowman of the Brooklyn Center (MN) Fire Department replied that, “If we have visible fire and can’t comply, we will attack the fire from the outside until enough manpower arrives.” Several respondents cited an anticipated increase in fire loss. Some believe that the fire chief should recognize the possibility of increased property loss and educate their elected officials regarding the expected outcome of delayed suppression activities.

**Research Question 3:** Did OSHA clearly define the requirement of the 2In/2Out standard?

The goal of the OSHA respiratory standard is to enhance and improve firefighter safety. The interpretation of specific requirements of the 2In/2Out provisions for those affected is paramount if we wish to attain the goal of the standard. The scope of who is affected, or who must comply, is not an issue, but there remain questions and controversy as to when the provisions must be enacted on the fire ground.

Although most survey respondents (77 percent) believe that the 2In/2Out rule(s) will improve firefighter safety, they also report that OSHA has not adequately defined when the rule applies. Specific uncertainty exists among 64 percent of the respondents who believe that OSHA has not clearly defined the “incipient stage” of fire growth as applied to the 2In/2Out provision. Chief Fowler agrees and states that although he concurs with the safety requirements of the standard, he doesn’t believe the definition of “incipient fire” is clear to those who must decide when to initiate 2In/2Out (Fowler, personal interview, November 1998).

This is a critical issue of definition that impacts the point in time at which the responders elect to comply with the “buddy” system of fire attack and the required stand-by crew.

## DISCUSSION

Creative alternatives to the traditional volunteer and paid-on-call delivery system are needed in order to comply with the many mandated requirements of the fire service. The survival of the paid-on-call fire department is dependent upon the organization's ability to recruit and retain personnel. Research conducted for this project supports the findings of others who have studied the problems associated with volunteer/paid-on-call fire departments, primarily that of fireground staffing. This regulation ( 2In/2Out) will have little impact on large career departments, but can have a profound impact on departments outside the big cities where it is not uncommon for an engine company staffed with two or three firefighters to arrive at a working fire and to operate alone for several minutes before help arrives (Gustin, 1998, p. 74). Staffing requirements may hinder the smaller paid-on-call or combination department by reducing their strategic options. According to Terry Pye of the North Fort Myers (FL) Fire department, "The impact of this ruling is that we do not have sufficient manpower to do our job according to OSHA" (Pye, 1997). Many departments will need to establish creative staffing strategies and alter their suppression strategies based upon fire conditions and available personnel.

A decline in the number of volunteer firefighters is recognized as a concern of volunteer fire service leaders. Ninety-percent of emergency service agencies in the United States are comprised of people volunteering to help their community. Over the past two decades, the size of the nation's volunteer fire service has declined (National Volunteer Fire Council, 1995, p. xii). Fire departments cannot operate without a sufficient number of qualified individuals to respond to, and control, emergency situations.

Staffing strategies, such as the increased use of mutual aid appear to be a common way to meet the OSHA requirements. A 1998 Fire Chief Magazine 2In/2Out survey found that a more

proactive use of automatic mutual aid and/or more aggressive use of mutual aid earlier in the incident was a staffing strategy reported repeatedly by survey respondents (Baltic, 1998).

In an editorial response to the OSHA 2In/2Out ruling, Chief Dwight B. Van Zanen states; “The ruling has nothing to do with unit staffing and everything to do with assembling sufficient personnel before attempting hazardous activities” (Van Zanen, July 1998, p.19). With dwindling numbers of available personnel, volunteer fire departments will be forced to adopt alternative staffing strategies. Analysis of this research compares favorably to the results of others that have studied the effects of adequate staffing upon the volunteer/paid-on-call fire service.

There continues to be on-going debate and controversy over the minimum crew size requirements for interior fire operations. A 1997 survey of National Fire Academy students conducted by Steven O’Connor found that 58 percent of those surveyed stated their fire department had standard operating procedures which required a crew size between two and five to be on the fire ground before interior structure firefighting could begin. Seventeen percent of the respondents of O’Connor’s survey cited requirements of four or more firefighters on the fireground, and the formation of a rapid intervention team with the first arriving company (O’Connor, 1997). The International Association of Fire Firefighters (IAFF) union cites a recent study which concludes that, “Firefighters in companies of less than four are one third more likely to get killed or injured on the job” (IAFF, 1992). The findings of this research project are in agreement with the results of others that have published staffing studies related to effective fire ground staffing.

As a fire service leader, the impact of this research is important to the survival of the Plymouth Fire Department as a paid-on-call agency. The ability to recognize the issues and problems affecting the paid-on-call department is paramount to its survival. Strategic planning

and visioning for the future operation of the organization must be based upon competent research, valid data acquisition, analysis, planning, and benchmarking. Direct implications for the Plymouth Fire Department include the identification and application of alternative staffing strategies.

The majority of the increase in demand for service in the City of Plymouth has occurred during the daytime hours, and has generally corresponded to providing service to the business community and a rapidly growing residential occupancy base. The growth in the City's population and change in economy have created barriers for the delivery of fire protection. Since 1982, calls for service have tripled. The Department has been challenged not only to provide service to the escalating demand, but also to recruit and retain a paid-on-call force able to carry out this service.

Organizationally, the Plymouth Fire Department attempts to maintain a minimum staffing level of three firefighters on engine and ladder companies, with a crew size of four preferred. Fire conditions and available personnel will prompt a change in fire ground strategy and tactics for the Plymouth Fire Department.

The OSHA 2In/2Out provisions have been publicized as being among the most important safety advances for firefighters in this decade. Requiring minimum staffing levels at "working" fire incidents can certainly be debated. The safety of our firefighters and injury reduction is not only a function of how many people are present on the fireground but also, as Gregg Gerner and Frank Shape suggest, firefighter safety is also related to: (a) managers who don't manage, (b) supervisors who don't supervise, and (c) firefighters who do dumb and stupid things (Gerner and Shaper, 1997, p.11). The reason for a reduction in fire service injuries may be explained by the application of education, engineering and enforcement. A requirement for minimum staffing, in

and of itself, will not reduce firefighter injury and death. Fixed fire detection and suppression systems, incident management systems, better equipped and trained firefighters and requiring a level of physical fitness of our firefighters may have greater impact than a stand-alone minimum staffing requirement.

Response agencies must adopt response guidelines based upon available personnel and their expected duties. Fire departments must review their safety programs and emergency operating procedures. Failure to establish and follow these programs and procedures are resulting in injuries and deaths of firefighters (NIOSH, 1994).

## **RECOMMENDATIONS**

The following recommendations are endorsed after an analysis of the data and information derived from this research:

1. Initiate multiple station dispatching to increase the pool of available personnel to respond to emergency incidents.
2. Incorporate the response of fire inspectors to assist on “working” fires during daytime incidents.
3. Increase on-scene personnel at “working” incidents by using automatic mutual aid with neighboring communities.
4. Increase the role of mutual aid departments and activate these departments sooner for “working” incidents.
5. Include efforts to increase the recruitment of new members and strategies to maintain membership.

6. Communicate the provisions of the 2In/2Out rule to all members. Expectations, roles and responsibilities must be understood by all personnel.
7. Emphasize and train personnel on fire attack strategy and tactics based upon fire conditions and available personnel.
8. Undertake efforts to identify the fire service delivery level expected within the community. Expected service delivery levels have a direct relationship on the strategies concerning adequate staffing, fireground strategy, response times, enhanced service delivery and fire loss.
9. Explore variations in the traditional organization style(s) of volunteer and paid-on-call fire departments. The “Duty Crew” concept is one organization style, which utilizes current personnel in a non-traditional fashion to provide a predictable staffing level.

Research to improve the delivery of fire department services involves continuous evaluation of how we do our business. Recommended practices to improve our services should be incorporated into fire department operations.

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**APPENDIX A****2 In/2 Out Interview Questions  
1998**

1. How will the provisions of the OSHA 2 In/2 Out ruling impact volunteer/POC fire departments?
2. Was this a needed standard? Why?
3. What methods may fire departments employ to meet the intent and be in compliance with the 2 In/2 Out provisions?
4. Would many departments comply with the 2 In/2 Out provisions if they were only recommendations?
5. Is OSHA clear in defining when the 2In/2Out provisions are to be enacted on the fireground?
6. How will your department meet the intent of this standard?

## APPENDIX B



Plymouth Fire Department, 3400 Plymouth Blvd. Plymouth, MN 55447

Department: \_\_\_\_\_ Style: Volunteer/POC                      Combination

Contact name and number: \_\_\_\_\_

Copy of survey results?    Yes            No                      If yes, fax number: \_\_\_\_\_

Please circle the response that applies to your department regarding the "2 In/2 Out" provisions of the Occupational Safety & Health Administration (OSHA) Respiratory Protection Standard (29 CFR 1910.134). You may fax your response to Chief Richard Kline at 612-509-5167. Your response by October 9 is appreciated. Thank you!

Does your department currently comply with the 2 In/2 Out provision?                      Yes                      No

What staffing methods have you implemented to comply with the 2 In/2 Out provisions? (check those that apply)

- Use of Chief officers as "stand-by" personnel
- Use of apparatus operators as "stand-by" personnel
- Mutual aid
- Recruitment of additional firefighters
- Use of city workers and/or fire inspectors
- Alarm level change (automatic initiation of multiple alarms for additional personnel)
- Multiple station response
- Duty crews (staffing of station(s) during peak call volume time)
- Other: \_\_\_\_\_

Does your department have an operating guideline that addresses the 2 In/ 2 Out provisions?    Yes                      No

What is the minimum staffing of your first due engine/truck companies on structure fires? \_\_\_\_\_

Considering the 2 In/2 Out provision, do you have enough personnel responding from each station (or single station) so first arriving companies can perform interior fire attack without waiting for additional units to arrive (when the OSHA exceptions do not apply)?                      Yes                      No

In your opinion, has OSHA clearly defined when the 2 In/2 Out provisions must be implemented?    Yes                      No

Has OSHA clearly defined "incipient stage fire" as applied to the 2 In/2 Out provisions?                      Yes                      No

Will your department's strategy & tactics for structural fire attack change due to the provisions of the 2 In/2 Out ruling?                      Yes                      No                      If yes, what are these changes?

Do you believe that the 2 In/2 Out provision will improve firefighter safety?                      Yes                      No

Would you comply with the 2 In/2 Out provision if it were only a recommendation?                      Yes                      No

What is the overall impact of the 2 In/2 Out standard upon your department? *Considerations: financial, budgetary organizational, personnel and operational impacts.*

Other comments on the OSHA 2 In/2 Out standard?