

**MINIMUM APPARATUS MANNING LEVELS FOR THE NORTH OLMSTED FIRE
DEPARTMENT**

OHIO FIRE CHIEFS' EXECUTIVE FIRE OFFICER PROGRAM

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ABSTRACT

The problem undertaken in this research project became apparent when members of the North Olmsted Fire Department expressed their position stating two men on an engine or ladder company was unsafe. The purpose of the research project was to determine how often two and three personnel were available for an emergency calls and whether or not staffing should be changed.

Numerical data was gathered and evaluated to answer the following questions.

1. What percent of the time was fire apparatus staffed with two personnel?
2. What percent of the time were they staffed with three personnel?
3. Current policy states station manning during emergency calls should be maintained at seven, ready to respond to another emergency. What percent of the time was staffing below seven and how long did it take, on the average, to bring manpower back to seven through overtime call back?
4. What percent of the time was each station staffed with no personnel? One? Two? Three? Four? Five? Six? Seven? Eight?

In order to prepare for this paper, the research procedure consisted of a literature review involving apparatus staffing, data collection of department responses over a three month period, and a review of the number of personnel on duty each day during the survey.

Upon review of the data collected it was determined that two personnel responding on an engine limits the amount of work that can be done on the scene of an emergency and presents a safety concern for personnel. Approximately thirty-four percent of all incidents left two people on duty and forty-two percent of the time there were three.

The recommendation from this research project was to increase staff personnel on shift by one, going from fifteen to sixteen per shift. A minimum/maximum policy citing twelve

personnel as a minimum on duty and fourteen as a maximum will help distribute off duty time over the year to increase apparatus staffing. Two personnel is not safe or efficient apparatus staffing. Increasing to three is the first step toward reaching the goal of implementing NFPA 1710.

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INTRODUCTION

Staffing of firefighters on emergency vehicles, i. e. engines and ladders, has been a very hot topic at the North Olmsted Fire Department for many years. With the implementation of the National Fire Protection Association (NFPA) 1710, Standards for the Organization and Deployment of Fire Suppression, Emergency Operations, and Special Operations to the Public Career Fire Departments, a new look at station manning conditions for fire apparatus response has created an awareness of firefighter safety for the chief and the union.

The North Olmsted International Association of Fire Fighters Union Local 1267 and their concern for safe staffing on engine and ladder companies created the purpose for this research project. NFPA 1710 has set a standard stating four personnel are to respond with an engine or ladder to an emergency. How does this standard relate to the staffing issues of North Olmsted? There are two fire stations in North Olmsted containing a rescue squad (ambulance) and an engine or ladder. Five personnel are the minimum number of staff on duty at each station. As long as the rescue squad is in quarters, as per NFPA 1710, four on fire apparatus is met. However, when a medical emergency incident occurs, three personnel will respond with the squad leaving two personnel behind. The standard outlined by the NFPA can no longer be met until the incident is over and personnel are back in quarters.

Current personnel at each station and standards for staffing equipment were obtained through historical research. Evaluative research was used to compare staffing before an emergency and personnel left during the present emergency for a secondary response, and how available personnel is reflected in the standard.

A three-month study of the department's emergency incidents was done to determine personnel availability during single and multiple calls. As a result of this study the following questions were answered.

1. What percent of the time was the engine or ladder staffed with two personnel?
2. What percent of the time was the engine or ladder staffed with three personnel?
3. Current policy states that station manning during emergency calls should be maintained at seven for response to other emergencies. What percent of the time was manning below seven and how long did it take, on the average, to bring manning back to seven through overtime call back?
4. What percent of the time was each station manned with zero personnel? One? Two? Three? Four? Five? Six? Seven? Eight?

BACKGROUND AND SIGNIFICANCE

The city of North Olmsted is located in northeastern Ohio, southwest of Cleveland and just west of the Cleveland Hopkins International Airport. It encompasses approximately twelve square miles with a resting population of approximately 34,000 residents as indicated in the 2000 census. General make up of the city is primarily residential and commercial containing 10,021 family homes, an eighteen and nineteen story apartment building, an industrial parkway, multiple shopping centers and a mall. The fire department is a multi functioning organization providing paramedic ambulance services, fire suppression, vehicle extrication, and fire prevention services to the community. North Olmsted began offering paramedic ambulance service in 1972, becoming one of the first cities in Ohio to do so. With many of our emergencies involving

ambulatory service, anyone seeking appointment to North Olmsted's Fire Department must be a certified paramedic upon appointment.

There are two fire stations within the city, one on the east side of town and one on the west, approximately four miles apart. The east side station contains the administration offices, fire prevention bureau, a front line advanced life support (ALS) rescue squad, and a seventy-five foot ladder truck. A reserve engine is available in the event an engine or ladder is out of service or personnel are called back to man the unit in the event of a fire. The satellite station on the west side of town contains a front line ALS unit and an engine. A secondary ALS unit is available to cover any that are out of service, as a third unit during multiple runs, or can be covered by overtime personnel when the station has been emptied. Presently there are forty-nine personnel on the department as a result of a new ordinance that was passed in 2001. Currently the department consists of a chief, an assistant chief, four captains, six lieutenants, a fire inspector, and thirty-three firefighters. There are three twenty-four hour shifts, A, B and C, composed of fifteen personnel consisting of one captain, two lieutenants, and twelve firefighters, operating on a budget of just over three million dollars.

Emergency incidents for 2001 totaled 3,244. 2,616 incidents involved medical emergencies with 750 customers signing release forms and not transported to the hospital. Medical calls amounted to eighty percent of the total emergencies for the year. Besides emergency medical service (EMS) incidents, there were 191 false alarms and 403 fire and miscellaneous incidents. Miscellaneous calls include, but are not limited to, carbon monoxide alarms, smoke detector alarms and smoke investigations, home lock-outs, and burning complaints. On an average day, each shift would respond to approximately 8.9 incidents, 7.2 as EMS and 1.7 for fire and miscellaneous. With minimum station manning at five per station, when three personnel would

respond on the ALS unit to a medical emergency, the question of two personnel left at the station for engine response became a major concern.

This is not a new problem. In December of 1990 two ALS units were on emergency incidents and out of service. While overtime was requested to upgrade manning, a fire occurred at a three-story condominium complex with a female unconscious in the unit on fire. Two personnel, a captain and a firefighter, responded to the scene along with a request for mutual aid from Fairview Park. On arrival at the scene, the captain was informed of the unconscious female, he made entry into the building and pulled the victim to safety. Mutual aid arrived after the rescue and extinguished the fire. On July 30, 1997 another structural fire incident occurred with a two-person response. A multiple motor vehicle accident with several victims on Dover Center Road resulted in the response of one engine and two rescue squads. While overtime call back was in process, dispatch received a 9-1-1 call for a multiple unit fire at a five-story condominium complex. A landscaper hit a natural gas meter with a lawnmower causing a surge of gas into the building. Sixteen units were on fire with a response of two personnel, a captain and firefighter, going to the scene. What can two people do at an emergency where people are evacuating the building until mutual aid arrives?

Since firefighting is a profession involving a high death and injury rate, the manning of fire apparatus has become an issue of high priority. In both 1990 and 1997 the minimum manning of five per station was addressed. Even though shift staffing has increased from thirteen to fifteen, minimum manning has not.

The International Association of Fire Fighters Local 1267, representing the firefighters of North Olmsted, in 2001, made fire apparatus staffing a major concern. A manning committee was formed and, in April 2001, produced a report entitled "Fire Apparatus Staffing – A Proactive

Approach” outlining the problem of two personnel on an engine or ladder and seeking an increase in personnel to place four firefighters on the ladder and engine. This recommendation was presented to the Mayor, North Olmsted City Council, the Safety Director, and the chief.

Based on the union’s concern for apparatus manning and the historical data of two person responses, a three-month study was done to review all incidents to which the fire department responded. A recommendation for an increase in minimum staffing was made to help improve the services offered to the customers of North Olmsted.

LITERATURE REVIEW

Lack of personnel is a universal fire service problem regardless of geographic location, population, or type to development (Spicer, 2000). Minimum manning has been a controversial issue for many years and with the adoption of NFPA1710, it continues to create a standard of four man crews on fire apparatus. Recommendations by NFPA, as early as 1962, stated that fire apparatus responding to a structure fire should be staffed with at least four personnel to initiate an interior attack safely to save lives and protect property (IAFF, 1995). In 2001, the International Association of Fire Fighters (IAFF), the International Association of Fire Chiefs’ (IAFC), the International City Managers Association (ICMA), and other organizations became involved with the National Fire Prevention Association (NFPA) to set a standard for minimum manning.

The NFPA has produced two documents dealing with minimum manning on fire apparatus. They are: NFPA 1710, the Standard for the Organization and Development of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public Career Fire Department and NFPA 1500, the Standard on Fire Department Occupational Safety and Health.

NFPA 1710 is the most recent publication, which sets a standard of four man minimum manning on engines and ladders. During its development the IAFF was very influential in its passage. On May 16, 2001 a vote of acceptance occurred in Anaheim, California with many voting NFPA members were also members of the IAFF. Prior to the NFPA Standards Council meeting in Quincy, Massachusetts on July 11, 2001, many city managers' organizations and local fire chiefs' associations voiced their disapproval of NFPA 1710 due to budget limitations. For many cities to meet the standard more firefighters would have to be hired which means more money would be needed from the public.

In NFPA 1710 (2001), Chapter 5, Fire Department Services, staffing is discussed. Section 5.2.2.1.1 states "engine companies shall be staffed with a minimum of four on-duty personnel." In Section 5.2.2.2.1, a ladder or truck company, "shall be staffed with a minimum of four on-duty personnel." NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, references four personnel as a minimum operational requirement in two areas of the standard. During search and rescue operations, the Ohio Safety and Health Act (OSHA) established a two in / two out procedure. If two people are in an area immediately dangerous to life and health (IDLH), then two people equally trained and equipped must be outside to aid if needed. In Appendix A, A-6-4-1, "It is recommended that a minimum acceptable fire company staffing level should be four members responding on or arriving with each engine and each ladder company responding to any type of fire." The phrase "responding with or on" indicates personnel can respond from different locations, or the same location on different vehicles, but once on the scene they must combine in companies of four to meet minimum staff requirements. Along with the NFPA, the International Association of Fire Fighters (IAFF), both local and national chapters, has played a major role in minimum staffing issues. In 1995, the IAFF

published a document entitled “Safe Fire Fighter Staffing – Critical Considerations” which discusses minimum staffing requirements. In Chapter 2, “Staffing for Initial Fire Attack and Fire Fighter Safety”, it states “very few jurisdictions operate units with staffing level of more than four fire fighters, with many now suggesting that two or three fire fighters is adequate and an acceptable level of fire company staffing.”

Many studies are presented in the IAFF document dealing with manning of equipment and engine operations. Each study compares a three person crew against a four, five, and in some cases, a six person crew. Dallas, Texas (1969 and 1984) and Austin, Texas (1993) Fire Departments conducted similar studies using simulated fire drills to compare various levels of staffing. Dallas concluded, “the four person crew was capable of performing satisfactorily in controlling the fire and effecting the rescue operation.” Austin, Texas conclusion was their “staffing study had exactly confirmed the results that the Dallas study conducted some ten years earlier.” Other studies discussed included Columbus, Ohio; Phoenix, Arizona and Seattle, Washington. There was no reference to a two-person crew being tested in any of the studies. The main point presented by the IAFF was to follow the recommendations of the NFPA for initial responding units to be staffed with at least four personnel.

North Olmsted Union Local 1267 conducted its own study on apparatus manning entitled “Fire Apparatus Staffing – A Proactive Approach” (April 2001). The intent of the report was to outline the concerns of improper manning and to determine the minimum staff level. The report indicated that in the year 2000, two personnel were left on a fire engine 33% of the time and both engines were left with two personnel 56.5% of the time. With only two firefighters left to respond at each station, per engine, safety and inefficiency were cited as major concerns. Comparing our department’s manning requirements to studies completed by Dallas (1984),

Austin (1993), the U. S. Fire Academy, and many other organizations, it was concluded that we did not meet the requirements outlined in the NFPA standards. The recommendation presented in the 2001 report was to “staff all fire apparatus with a minimum of four personnel.” (IAFF Local 1267)

In 1966, Warren Kimball, a member of the NFPA, wrote “Fire Attack I” to help fire officers make decisions on the fire ground. One of the concerns discussed was how to use available manpower on the fire scene to perform efficiently. The role of a firefighter is to save lives and protect property. In Chapter 3, “Increased Efficiency with Tactical Groups”, Kimball states “an individual command of less than five men (including the officer) cannot be considered as an effective tactical company.” In Chapter 5, “Fire Department Manpower Requirements”, Kimball states that fire departments worked an eighty-four hour week at a cost of \$200 per month. It was possible to keep as many as seven personnel on engines and ladders in high value area of the city and four personnel for other areas of town. As a result of the Fair Labor Standards Act and collective bargaining agreements, hours worked per week have greatly decreased and the cost of personnel has increased. With new technology and increase in cost, the number of personnel working per department has decreased. Kimball states the cost of the department should not determine manpower on fire apparatus but the amount of water, gallons per minute, needed at the scene of the emergency.

Many other documents were reviewed for this project offering the same results. As can be seen, the manning requirements indicate that at least four personnel are needed on the fire scene to form a working company. There are many studies involving a three person crew versus a four and five person crew, but there were none involving two person crews. This indicates that a two person crew cannot function effectively, if even safely, on the fire ground.

PROCEDURE

The research paper consisted first as a literature review to determine what standards were currently in place that impact engine company staffing. (Spicer, 2000) The literature review was conducted, first, by using the internet to obtain materials from the National Fire Academy Research Center and the National Fire Protection Association. Other resource materials were obtained through the county library, the International Association of Fire Fighters, the North Olmsted Fire Department Library, and my own personal library. The documents were reviewed to gather information to help design standards and collect data on the manning of fire apparatus. Upon completion of the literature review, it was determined that the NFPA and IAFF recommend a four person staffing requirement for engine and ladder response. Did North Olmsted meet this requirement? If not, what was recommended as the minimum response staffing per vehicle in North Olmsted? In order to answer these questions, a three-month study was conducted to compare on-duty personnel at various staffing levels both during emergency and non-emergency incidents. The time chosen for the study were the months of November and December of 2001 and January of 2002 for a total of ninety-two days.

Why choose the months of November, December, and January? Based on a six month time frame to complete the research paper and the recommendation for a three month versus one month study, it was necessary to collect run data as soon as possible. Another reason for choosing the end of the year and beginning of a new year revolves around the number of personnel on-duty. There were more personnel off in December due to holidays, vacation time, and personal days than in November and January. Very little time was taken off in January, which is a normal department practice at the beginning of the year. The policy in place does not

specify when personnel shall take time off making each firefighter responsible to use holidays and vacations to meet their needs and the staffing requirements of their shift.

In order to compile data on shift manning, the daily shift roster (Appendix A) was examined each day to obtain the number of personnel on duty at each station, vehicle assignments, who was off duty and why and if overtime was required to meet minimum staffing of ten. Using the shift roster, a summary sheet (Appendix B) outlining on duty staff was completed to determine how many times ten, eleven, twelve, thirteen, and fourteen firefighters were on duty. With three personnel being assigned to the ALS rescue squad every shift, it was important to determine how engine manning changed with an increase in on-duty staff and how to determine a recommendation for a minimum number of personnel per station upon conclusion of the study.

Two other pieces of information were required to help the manning study. The daily summary sheet (Appendix C) was produced to look at the number of calls per day and divided the incidents by type. For example, out of the total number of calls, how many involved the rescue squad, fire calls, miscellaneous incidents, and multiple calls, i. e. two squad calls at the same time. Other information collected was the amount of time the personnel was out of the station for each call and how many incidents involved leaving two and three men at the station.

The information for the daily summary sheet was obtained by identifying what units responded to the emergencies, the type of emergency, personnel left at the station during the incident, and determining if overtime was required to man the station(s). Present policy indicates that on-duty staff between the two fire stations, during an emergency, shall be seven people. With three personnel responding on the rescue squad, two medical emergencies will reduce manpower below seven if shift manning is less than thirteen. Fire calls will also drop station staffing below seven. As manning drops below seven, the dispatch center begins a call back

procedure to bring staff back to seven with overtime. Personnel closest to the stations are called back first with the intent to cover the stations in twenty minutes. If this does not occur, the dispatcher calls the officer-in-charge (OIC) for permission to continue or receive a status of vehicle availability on scene.

Once the daily activity information was gathered, a monthly summary sheet and a three month compilation sheet was developed (Appendix D). The summary sheets were able to determine how many calls were made out of each station, total time in minutes, the incidents involved, and the number of calls and time each station was at two and three personnel. The data was used, not only to look at the percent of time the incidents caused a drop in personnel, but the number of times it occurred. This was an important tool that was used to help determine manning recommendations.

The last step was to collect information concerning the number of personnel at the stations each day during run activity and at times of rest. The daily summary sheet outlined the number of calls per day, presented information covering overtime call back, the number of personnel on a call, and the amount of time spent on the incident to help determine how long the station was empty, fully, and partially staffed. For this study, personnel away from the station but within the city for training drills, paramedic in-service, and building inspections were considered personnel at the station since they were in-service and available to respond on fire apparatus when called by dispatch.

There were a number of limitations subject to the data collection for this paper. Run times were reported as documented by the person or officer-in-charge of the call. On many rescue calls the incident time documentation was incomplete with in-service and in-quarters time not recorded but estimated based on an estimated time from past calls. Past practice in North

Olmsted recommends three personnel on every medical call regardless if it's a basic emergency, for example a cut finger, versus a paramedical emergency such as a heart attack. Ohio law states that two emergency medical technicians (EMT) are required for patient transport to the hospital. NFPA 1710 indicates two EMTs are required for basic calls and additional two paramedics for advanced life support calls for a total of four.

RESULTS

1. What percent of the time was the engine or ladder staffed with two personnel?

In order to answer this question a review of the run data collected for November, December, and January was reviewed. Figure I outlines the number of incidents, types of incidents, time away from station and the number of calls where engine and ladder manning was at two and three personnel.

FIGURE I

	<u>CALLS</u>	<u>SQ</u>	<u>F</u>	<u>SQ-SQ</u>	<u>THREE MONTH SUMMARY</u>				<u>SQ TIME</u>	<u>F/M TIME</u>	<u>2 LEFT</u>	<u>3 LEFT</u>
					<u>F-F</u>	<u>SQ-F</u>	<u>MA</u>	<u>MISC</u>				
Nov. 01	254	164	38	20	4	8	12	8	9648 min	1523 min	82	99
Dec. 01	304	183	42	35	2	8	16	18	11624 min	2606 min	135	113
Jan. 02	284	183	24	43	1	5	9	19	10859 min	1272 min	64	138
TOTALS	842	530	104	98	7	21	37	45	32131 min	5401 min	281	350
PERCENT	100	62.9	13	11.6	0.8	2.5	4.4	5.3			33.4	41.6

There were 842 incidents during the study period with 628 involving the rescue squad for medical care. This amounts to approximately 75% of the activity which, historically, is close to the average percentage per year. Coupled with the amount of personnel on duty per station, the probability of two remaining at a station is high. In Figure II and Figure III the number of times Station One and Station Two were staffed at five can be obtained.

FIGURE II

	November	November		December	December		January	January
	Station 1	Station 2		Station 1	Station 2		Station 1	Station 2
5 on duty	9	23	5 on duty	11	22	5 on duty	4	11
6 on duty	17	7	6 on duty	19	9	6 on duty	16	20
7 on duty	4	0	7 on duty	1	0	7 on duty	9	0
8 on duty	0	0	8 on duty	0	0	8 on duty	2	0

FIGURE III

STAFF	THREE MONTH STAFF SUMMARY	
	STATION 1	STATION 2
5	24	56
6	52	36
7	14	0
8	2	0

On review of the data, Station One was staffed with five personnel twenty-four days out of ninety-two and Station Two at five personnel fifty-six times. On comparison, Station Two was 2.3 times more likely to be left with two personnel on the engine than Station One.

Not only was it important to know how many people were on duty each day, but how many calls were responded to from each station. Figure IV summarizes the data collected for runs per station and the amount of time personnel were on those calls.

FIGURE IV

MONTH	STATION 1 RUNS - MINUTES	STATION 2 RUNS -MINUTES	STATION 1 @ 2 RUNS - MINUTES	STATION 1 @ 3 RUNS - MINUTES	STATION 2 @ 2 RUNS - MINUTES	STATION 2 @ 3 RUNS - MINUTES
NOV	144 --- 6,732	120 --- 4,964	29 --- 1,526	63 --- 3,170	53 --- 2,449	36 --- 1,426
DEC	186 --- 9,199	126 --- 6,457	62 --- 3,349	78 --- 3,723	73 --- 3,248	35 --- 1,514
JAN	167 --- 7,308	136 --- 5,448	24 --- 1,338	72 --- 3,172	40 --- 1,548	66 --- 2,293
TOTALS	497 -- 23,239	382 -- 16,869	115 --- 6,213	213 -- 10,065	166 --- 7,245	137 --- 5,233

The total number of calls with two people left on station was 281, or 33.3% of all incidents. This occurred 115 times, or 23.2%, at Station One and 166 times, or 43.5%, at Station Two.

The first step in answering the question presented discussing the percent of time the stations were staffed at two personnel was to evaluate the amount of incidents that caused staff reduction. Next was to compare the amount of time, in minutes, to see if the percents were the same. In a ninety-two day cycle there are 132,480 minutes of time. From Figure IV, Station One was manned with two personnel 6,213 minutes or 4.7% of the time on duty. Station Two was manned at two personnel 7,245 minutes or 5.5% of shift time. The percent of time both stations were at two personnel was 10.2%.

2. What percent of the time was the engine or ladder staffed with three personnel?

Referring back to Figure I, out of the 842 incidents, 350 or 41.6% involved ladder or engine manning at three. The probability of this occurring was determined by shift staffing each day of the study. With the historical past practice of responding three on the rescue squad for medical emergencies, it was required to have six personnel per station each shift. According to Figure II, this occurred at Station One fifty-two times and at Station Two thirty-six times. Why was staffing higher at Station One? Since the main station is on the east side of town and considered a high risk area with the high rise buildings and shopping areas, extra personnel was always placed at this station. Station Two, due to age and size of the structure, has a maximum capacity of six. Therefore, the capability of having more than three personnel left to cover the engine on the west side of town will only occur if two personnel respond on medical calls with three or four being left behind. Based on this information, the ladder at Station One was manned with three personnel 213 times, or 25.3% of all calls, and the engine at Station Two was manned with three personnel 137 times, or 16.3% of the incidents.

If the amount of calls leaving the stations staffed at three is 41.6%, what about the amount of run time and its percentage at three? Total minutes at Station One was 10,005 (Figure IV) and at

Station Two it was 5,233 (Figure IV). This accounts for 11.5% of all time away from the stations.

3. Current policy states that station manning during emergency calls should be maintained at seven personnel to be ready to respond to any other fire or medical emergency. What percent of the time was manning below seven? How long did it take, on the average, to bring staff personnel back to seven as a result of overtime call back procedures?

Overtime call back has been part of the North Olmsted Fire Department manning concept for many years. Historically, when a station was empty, full time personnel were called in to cover equipment left unstaffed. As time progressed and emergency calls increased, a minimum staff requirement was adopted. Today, it stands at seven.

Staff personnel fell below seven under two circumstances, multiple medical calls and working fires. Figure V documents fifty incidents where personnel dropped below seven, which amounts to 6% of the calls, documented in this study.

FIGURE V

MANNING LESS THAN SEVEN IN STUDY		
NOVMEBER		DECEMBER
11		24
		JANUARY
		15

Appendix E outlines the number of calls and the reason why manning dropped below seven and the amount of time at seven until overtime personnel arrived. The predominate reason for loss of personnel dealt with multiple medical calls. Only six times in the three month period did working structure fires empty both stations.

Under the present policy, dispatchers once notified that vehicles are committed and out of service, begin the call back procedure to increase standby personnel to seven. Using a designated list of personnel, arranged in order from the closest to furthest away from the stations,

phone calls begin. With no residency requirement established and no phone paging system, call back can become a nightmare. There is a point on the call back list where dispatchers must advise the OIC of personnel on stand-by and whether or not to continue the phone search. The determinant is whether the stations are covered. If the vehicles can be in-service at the fire scene or if one of the rescue squads is back in service, then the call back system is cancelled, otherwise dispatch will continue to find coverage as needed.

The total time manning was less than seven amounted to 1,531 minutes for the fifty calls in the study. Average time below seven was 30.6 minutes per incident. There were three cases where the minimum of seven was not met, two being fire calls and one a multiple squad call.

4. What percent of the time was each station staffed with zero personnel? One? Two? Three? Four? Five? Six? Seven? Eight?

As mentioned earlier in this research paper a major concern about the number of personnel on fire apparatus was presented by the IAFF Union Local 1267, the Union Manning Committee, and NFPA 1710 to the Chief, Mayor, and North Olmsted City Council. To help understand where North Olmsted falls in the staffing requirements, an overview of the time, in minutes, spent with no one on duty to a maximum of eight on duty at each station must be reviewed. Figure VI summarizes the time each station was manned for the three-month study covering ninety-two days or 132,480 minutes.

FIGURE VI

DATE	STATION 1								STATION 2							
	0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6
NOV	1110	0	1526	3170	924	12869	19057	4543	0	768	0	2449	1426	237	32447	5873
DEC	1633	0	3349	3723	223	13189	21540	985	0	1430	0	3248	1514	240	29259	8949
JAN	951	0	1338	3172	1595	7582	18269	9381	2352	790	0	1548	2293	300	17538	22171
TOTALS	3694	0	6213	10065	2742	33640	58866	14909	2352	2988	0	7245	5233	777	79244	36993
Percent	2.8	0	4.7	7.6	2.1	25.4	44.4	11.3	1.7	2.2	0	5.5	4	0.6	60	27.7

At the time of the study A and C shift were at fifteen members and B was at fourteen until January when another firefighter was hired. When personnel report for duty, the OIC must account for assigning personnel to be sure there is at least five people at each station. Based on the collective bargaining agreement's definition of a work schedule of twenty-four hour shifts with forty-eight hours off meeting a 51.7 hour work week, the maximum number of firefighters on duty can not exceed fourteen. Station One, being built in 1995, is capable of handling eleven personnel per shift where Station Two, built in 1956, is limited to six personnel. Whenever on-duty staff exceeds six per station; the remaining staff will be assigned to the main station. In the literature review many documents researched stated a minimum of four personnel were needed to work efficiently and effectively as a company on the fire scene. What percent of the time, according to Figure VI did North Olmsted meet or exceed this standard? Four personnel were on duty at the main station 2.1% of the time. But when adding in the percentages for five, six, seven, and eight on duty, the figure climbs to 84.9%. The amount of time Station One was below four personnel was 15.1%. Station Two was manned at four personnel 0.6% of the time on duty. Adding that number to the amount of time five and six were on duty, the figure amounts to 88.3%. Station Two manning below four equals 11.7%.

Two fire incidents involving a two-person response were discussed in the background and significance section of this paper. One involved a rescue from a three-story condominium fire; the other involved sixteen fires in a five-story condominium building. In Figure VI two personnel were on duty at Station One for 4.7% of the time averaging about one hour per day. Station Two had two people on duty 5.5% of the time averaging seventy-eight minutes per day. It is hard to believe that in such a small time frame a serious fire can occur.

DISCUSSION

How does North Olmsted shift manning requirements meet the recommendations of the NFPA 1710 of four personnel on the engine and four personnel on the ladder? Is there a lack of personnel for the department? It is interesting to note that when the rescue squad is not on an emergency call station manning meets NFPA 1710. With a minimum staffing of five per station, Station One meets the requirements 82.9% of the time and Station Two for 87.8% of the time. However, with 80% of the emergency incidents involving medical emergencies, staffing will drop down to two or three personnel left for response 12.3% of the time at the main station and 9.4% of the time at the west station. Even though the percentages are small, “when a firefighting crew size is at or below three firefighters, critical fireground operations cannot be carried out effectively, efficiently or in a safe manner.” (Dunkel II, 1994)

During this study the department responded to 842 incidents with less than four firefighters on duty 631 times, 328 calls from Station 1 and 303 from Station 2. Based on the data collected, 75% of the time when the rescue squad leaves the building, manpower was reduced. What happens when a fire alarm occurs? According to the NFPA 1710 Implementation Guide (IAFC, 2001) the criteria of four on a fire crew can be met with mutual aid, automatic aid, or by vehicles responding to the same location and combining personnel to establish work crews of four. NFPA 1710 states that the first arriving crew of four shall have one minute to leave the station and be on scene within four minutes, once on the road, approximately 90% of the time. The initial full alarm assignment, fifteen personnel with two engines, a ladder and a chief, shall be on scene within eight minutes, once on the road, 90% of the time. One of the above criteria needs to be met under the NFPA standard. North Olmsted has implemented a mutual aid box alarm system (M.A.B.A.S.). Once dispatch tones the stations with an audible alarm, the OIC will

determine what equipment to request and call a box alarm upon leaving the station. Provided the surrounding city fire departments are available, the probability of meeting NFPA 1710 for the full alarm assignment 90% of the time within eight minutes is very high. Another study involving mutual aid response would have to be done to verify this prediction.

While waiting for mutual aid and the second station response to the scene, what can two or three people do? NFPA 1500 adopted the OSHA two in / two out rule for search and rescue. However, if someone is trapped in a burning building, the personnel on the scene will notify the dispatch center to advise other units they are in the structure involved in a search and rescue. The number one job of fire fighting is to save lives. It is quite obvious that NFPA 1710, NFPA 1500, and OSHA have been challenged whenever a life can be saved. This was true in North Olmsted in December of 1990 when two firefighters responded to a condominium fire and the captain rescued an unconscious female from the burning condominium. Fire ground tactics had to be changed in order to meet the emergency at the scene of the fire.

This research project indicates a need to increase apparatus manning at the North Olmsted Fire Department. There were no reports or studies found showing a time study for simulated fire drills comparing two, three, four, and five man crews. Studies outlined by the IAFF report of 1995 and the Union Local 1267 report of 2001 review data from three, four, and five man crews. Therefore, based on this premise, two person firefighting crews are not safe and cannot function adequately or effectively on the fire scene.

RECOMMENDATIONS

Based on historical data, literature review, and the analysis of data collected from a three-month study of emergency incidents and equipment manning, a recommendation to increase staff

by at least one member per shift is made. This would increase shift staffing from fifteen to sixteen to begin to meet an increase in apparatus personnel. Along with the increase in personnel it would be necessary to create a policy establishing a minimum and a maximum number of personnel on duty per twenty-four hour shift. The recommended minimum is twelve and the maximum is fourteen. This would help shift captains mandate personnel to take holiday and vacation days when only one person is off as a result of accumulated time or a Kelly day as offered by the collective bargaining agreement.

With twelve personnel being assigned as the minimum manning of the department, each station would be staffed with six firefighters. When the rescue squad responds to an emergency with three personnel, three will be left at the station. The problem of two personnel on an engine or ladder would now be addressed. Three may not be the ideal number, but it is far better than two. There is a way to increase the probability of having four at a station versus three. If a rescue squad responds to an emergency with two personnel with a chase car and one paramedic to follow, a decision can be made on the scene to either send the chase car back to quarters or take the medic to the hospital to help with medical care. By doing so, the cut finger, stomachache, etc. can be assessed and the chase staff returned increasing the engine to four personnel. More research would need to be done to see how well this would work.

Finally, in order to continue to add personnel to the west end of town, a new station should be built to replace Station Two. Opening in 1956, the area was very urban with a combination part-time, full-time fire department. With only one restroom, one shower, and inadequate living space it would create a health and safety violation to continue to add personnel. There is an undeveloped area protected by Station Two. Looking into the future land zoned for industry is open for development. Property has been annexed from Olmsted Township, which extends our

boundaries to an area for which the west station is responsible. The only way to meet the needs of the future is to create a plan to continue to add personnel and to build a fire station to meet the needs of the customer to the best of our ability.

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APPENDIX A

North Olmsted Fire Department

24291 Lorain Road

North Olmsted, Ohio 44070

Headquarters Fire Station No. 1

Edward C. Bak, Chief

Daily Shift Roster

A Shift Beginning At 0800 Hrs. On 9/6/2001 Lock Box Keys Accounted For

Number of personnel on duty at Station No. 1: 0

Engine Sta. 1:

Squad Sta. 1:

Number of personnel on duty at Station No. 2: 0

Engine Sta. 2:

Squad Sta. 2:

On Kelly Day:

Holiday:

Vacation:

On Sick Leave:

Personal Day :

CompTime:

Other:

Crew 1	Ventilation Crew	Crew 2	Mutual Aid
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Ladder 1		Engine 2	
_____		_____	

APPENDIX B
SUMMARY OF ON DUTY SHIFT STAFFING

DATE	STATION 1	STATION 2	DATE	STATION 1	STATION 2	DATE	STATION 1	STATION 2
11/1/01	6	5	12/1/01	6	6	1/1/02	6	6
11/2/01	6	5	12/2/01	6	6	1/2/02	6	5
11/3/01	5	5	12/3/01	6	6	1/3/02	7	6
11/4/01	5	5	12/4/01	6	5	1/4/02	6	5
11/5/01	6	5	12/5/01	5	5	1/5/02	6	6
11/6/01	6	5	12/6/01	6	6	1/6/02	7	6
11/7/01	7	6	12/7/01	6	6	1/7/02	5	5
11/8/01	6	5	12/8/01	5	5	1/8/02	6	6
11/9/01	5	5	12/9/01	5	5	1/9/02	6	5
11/10/01	5	5	12/10/01	6	5	1/10/02	5	5
11/11/01	6	5	12/11/01	6	6	1/11/02	6	5
11/12/01	6	6	12/12/01	7	6	1/12/02	6	6
11/13/01	7	6	12/13/01	6	5	1/13/02	7	6
11/14/01	5	5	12/14/01	5	5	1/14/02	7	6
11/15/01	5	5	12/15/01	6	5	1/15/02	7	6
11/16/01	6	5	12/16/01	6	6	1/16/02	7	6
11/17/01	6	5	12/17/01	6	5	1/17/02	6	6
11/18/01	6	5	12/18/01	6	5	1/18/02	6	5
11/19/01	7	6	12/19/01	6	5	1/19/02	5	5
11/20/01	6	6	12/20/01	6	5	1/20/02	6	5
11/21/01	6	5	12/21/01	5	5	1/21/02	7	6
11/22/01	6	5	12/22/01	5	5	1/22/02	7	6
11/23/01	5	5	12/23/01	5	5	1/23/02	6	5
11/24/01	5	5	12/24/01	5	5	1/24/02	6	6
11/25/01	6	5	12/25/01	5	5	1/25/02	7	6
11/26/01	6	5	12/26/01	6	5	1/26/02	6	6
11/27/01	5	5	12/27/01	6	5	1/27/02	8	6
11/28/01	7	6	12/28/01	6	5	1/28/02	5	5
11/29/01	6	5	12/29/01	6	6	1/29/02	6	6
11/30/01	6	6	12/30/01	5	5	1/30/02	8	6
			12/31/01	5	5	1/31/02	6	6
TOTAL	175	157	TOTAL	176	164	TOTAL	195	175
5 on duty	9	23	5 on duty	11	22	5 on duty	4	11
6 on duty	17	7	6 on duty	19	9	6 on duty	16	20
7 on duty	4	0	7 on duty	1	0	7 on duty	9	0
8 on duty	0	0	8 on duty	0	0	8 on duty	2	0
% at 5	9/30 = 30	23/30 = 76.7	% at 5	11/31 = 35.5	22/31 = 71	% at 5	4/31 = 12.9	11/31 = 35.5
% at 6	17/30 = 56.6	7/30 = 23.3	% at 6	19/31 = 61.3	9/31 = 29	% at 6	16/31 = 51.6	20/31 = 64.5
% at 7	4/30 = 13.3	0	% at 7	1/31 = 3	0	% at 7	9/31 = 29	0
% at 8	0	0	% at 8	0	0	% at 8	2/31 = 6.5	0
BBBB	E MONTH TOTALS		THREE MONTH DAILY AVERAGE					
% at 5	24/92 = 26	56/92 = 60.9	STA #1	546/92	5.9 / SHIFT			
% at 6	52/92 = 56.5	36/92 = 39.1	STA #2	496/92	5.4 / SHIFT			
% at 7	14/92 = 15.5	0						
% at 8	2/92 = 2	0						

APPENDIX D

MANNING MONTHLY SUMMARY SHEET

MONTH	STATION 1 CALLS - TIME (MIN)	STATION 2 CALLS - TIME (MIN)	TOTAL TIME (MIN)	STATION 1 @ 2 CALLS - TIME (MIN)	STATION 1 @ 3 CALLS - TIME (MIN)	STATION 2 @ 2 CALLS - TIME (MIN)	STATION 2 @ 3 CALLS - TIME (MIN)	TOTAL CALLS
NOV	144 --- 6,732	120 --- 4,964	11,171	29 --- 1,526	63 --- 3,170	53 --- 2,449	36 --- 1,426	254
DEC	186 --- 9,199	126 --- 6,457	14,230	62 --- 3,349	78 --- 3,723	73 --- 3,248	35 --- 1,514	304
JAN	167 --- 7,308	136 --- 5,448	12,131	24 --- 1,338	72 --- 3,172	40 --- 1,548	66 --- 2,293	284
TOTALS	497 -- 23,239	382 -- 16,869	37,532	115 --- 6,213	213 -- 10,065	166 --- 7,245	137 --- 5,233	842

STATION 1 SUMMARY FOR THREE MONTHS	STATION 2 SUMMARY FOR THREE MONTHS
TOTAL TIME IN MONTHS = 92 X 24 X 60 = 132,480 MINUTES	TOTAL TIME IN MONTHS = 92 X 24 X 60 = 132,480 MINUTES
497 CALLS COVERING 23,239 MINUTES	382 CALLS COVERING 16,869 MINUTES
% OF CALLS = 497/842 = 59%	% OF CALLS = 382/842 = 45.4%
% OF TIME ON CALLS = 23239/132480 = 17.5%	% OF TIME ON CALLS = 16869/132480 = 12.7%
AVERAGE TIME PER CALL = 23239/496 = 46.8 MINUTES	AVERAGE TIME PER CALL = 16869/382 = 44.2 MINUTES
CALLS AT 2 LEFT = 115 % = 115/497 = 23.2%	CALLS AT 2 LEFT = 166 % = 166/382 = 43.5%
CALLS AT 3 LEFT = 213 % = 213/497 = 42.9%	CALLS AT 3 LEFT = 137 % = 137/382 = 35.9%
TIME AT 2 LEFT = 6213 MIN % = 6213/132480 = 4.7%	TIME AT 2 LEFT = 7245 MIN % = 7245/132480 = 5.5%
TIME AT 3 LEFT = 10065 MIN % = 10065/132480 = 7.6%	TIME AT 3 LEFT = 5233 MIN % = 5233/132480 = 4%
CALLS < 4 LEFT = 328 % = 328/497 = 66%	CALLS < 4 LEFT = 303 % = 303/382 = 79.3%
TIME < 4 LEFT = 16278 % = 16278/132480 = 12.3%	TIME < 4 LEFT = 12478 % = 12478/132480 = 9.4%
TIME ON FIRE & MISC = 3994 MIN % = 3994/132480 = 3%	TIME ON FIRE & MISC = 3952 MIN % = 3952/132480 = 3%
TIME ON SQUAD CALLS = 19245 MIN % = 19245/132480 = 14.5%	TIME ON SQUAD CALLS = 12917 MIN % = 12917/132480 = 9.8%

THREE MONTH MANNING SUMMARY	THREE MONTH MANNING SUMMARY
TOTAL TIME IN MONTHS = 92 X 24 X 60 = 132,480 MINUTES	CALLS AT 2 LEFT = 281 % = 281/842 = 33.4%
842 CALLS COVERING 37,532 MINUTES	CALLS AT 3 LEFT = 350 % = 350/842 = 41.6%
AVERAGE TIME PER CALL = 37532/842 = 44.6 MINUTES	TIME AT 2 LEFT = 13428 MIN % = 13428/132480 = 10.1%
AVERAGE ON DUTY MANNING STATION 1 = 546/92 = 5.9 MEN PER DAY	TIME AT 3 LEFT = 15307 MIN % = 15307/132480 = 11.6%
AVERAGE ON DUTY MANNING STATION 2 = 494/92 = 5.4 MEN PER DAY	CALLS < 4 LEFT = 631 % = 631/842 = 75%
	TIME < 4 LEFT = 28735 % = 28735/132480 = 21.7%
	TIME ON FIRE & MISC = 7946 MIN % = 7946/132480 = 6%
	TIME ON SQUAD CALLS = 32162 MIN % = 32162/132480 = 24.3%

APPENDIX E

SUMMARY OF INCIDENTS WHERE CALL BACK PROCEDURES INCREASED STAFF TO 7

DATE	REASON WHY <7	RUN TIME	TIME WHEN AT 7	MINUTES < 7	NOT MET
11/1/01	SQUAD - SQUAD	1:21	1:39	18	
11/2/01	SQUAD - SQUAD	6:46	7:18	32	
11/6/01	SQUAD - SQUAD	13:53	14:15	22	
11/8/01	SQUAD - SQUAD	10:14	10:43	29	
11/10/01	FIRE	12:06	12:41	35	
11/14/01	FIRE	16:20	16:50	30	
11/18/01	SQUAD - SQUAD	22:46	23:21	35	
11/21/01	SQUAD - SQUAD	23:37	0:06	29	
11/24/01	SQUAD - SQUAD	15:14	16:00	46	
11/25/01	SQUAD - SQUAD	8:57	9:16	19	
11/27/01	SQUAD - SQUAD	15:40	16:09	29	
12/1/01	SQUAD - SQUAD	15:24	15:52	28	
12/2/01	FIRE	15:01	15:54	53	ONLY 4
12/5/01	SQUAD - SQUAD	13:11	13:40	29	
12/5/01	SQUAD - SQUAD	16:51	17:21	30	
12/7/01	SQUAD - SQUAD	13:52	14:20	28	
12/8/01	SQUAD - SQUAD	23:10	23:39	29	
12/8/01	SQUAD - SQUAD	23:49	0:10	21	
12/8/01	FIRE	3:53	4:47	54	
12/9/01	SQUAD - SQUAD	14:17	14:44	27	
12/9/01	SQUAD - SQUAD	15:23	15:58	35	
12/14/01	SQUAD - SQUAD	16:35	17:00	25	
12/17/01	SQUAD - SQUAD	21:26	21:39	13	
12/22/01	SQUAD - SQUAD	18:19	18:50	31	ONLY 6
12/23/01	FIRE	23:18	0:27	69	ONLY 5
12/24/01	SQUAD - SQUAD	9:59	10:34	35	
12/24/01	SQUAD - SQUAD	14:05	14:40	35	
12/25/01	SQUAD - SQUAD	19:18	20:17	59	
12/26/01	SQUAD - SQUAD	10:27	10:48	21	
12/26/01	SQUAD - SQUAD	16:08	16:35	27	
12/27/01	SQUAD - SQUAD	9:14	9:41	27	
12/27/01	SQUAD - SQUAD	12:17	12:34	17	
12/27/01	FIRE	21:42	22:13	31	
12/31/01	SQUAD - SQUAD	14:42	15:36	54	
12/31/01	SQUAD - SQUAD	20:02	20:40	38	
1/2/02	SQUAD - SQUAD	12:33	13:26	53	
1/2/02	SQUAD - SQUAD	16:54	17:15	21	
1/2/02	SQUAD - SQUAD	18:06	18:20	14	
1/2/02	SQUAD - SQUAD	18:28	18:55	27	
1/6/02	SQUAD - SQUAD	13:31	13:42	11	
1/6/02	SQUAD - SQUAD	18:00	18:27	27	
1/7/02	SQUAD - SQUAD	9:41	10:39	58	
1/7/02	SQUAD - SQUAD	6:02	6:29	27	
1/11/02	SQUAD - SQUAD	13:29	13:48	19	
1/17/02	SQUAD - SQUAD	13:59	14:10	11	
1/18/02	SQUAD - SQUAD	10:15	10:28	13	
1/19/02	SQUAD - SQUAD	19:59	20:25	26	
1/20/02	SQUAD - SQUAD	15:13	16:43	30	
1/23/02	SQUAD - SQUAD	23:38	0:08	30	
1/26/02	SQUAD - SQUAD	14:38	15:02	24	
TOTALS	50 INCIDENTS		7 @ 30.62 MIN AVE	1,531 MINUTES	