Addressing the 2001 Edition of NFPA 1710 Standards

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CERTIFICATION STATEMENT

I hereby certify that the following statements are true:

1. This paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

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ABSTRACT

A new standard for emergency response went into effect on 2 August 2001 known as National Fire Protection Association 1710 Standard (NFPA-1710). The purpose of this research was to present options for Delaware City Administration to meet NFPA-1710.

A review of Delaware City Fire Department (Fire Department) emergency response records determined that the Fire Department did not meet NFPA-1710. NFPA-1710 and a study conducted by Vincent Werner (Garland, Texas Fire Department) were used as the basis for researching options to implement of NFPA-1710.

Questions of staffing schedules, fire ground policies, alternate staffing methods, mutual aid agreements, automatic response agreements, alternate funding sources, technology advances, and local building code changes were researched using historical and evaluative methods.

Review of emergency run data, tax levy information, insurance industry surveys, and residential builder surveys were conducted. NFPA-1710 can be achieved by the Fire Department if Delaware City leaders pursue a fair share of tax funding from Delaware County, implementing alternate staffing options, local fire code changes, and automatic response agreements.

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INTRODUCTION

Statement of the Problem

A new national emergency incident standard was established and implemented 2 August 2001 (NFPA 1710, 2001). This standard has created much controversy in the Fire/EMS service and may perhaps be the source of the greatest controversy in National Fire Protection Association (NFPA) history to date. NFPA 1710 Standard (NFPA 1710) is controversial as to its validity and enforcement. Views of the controversy are found in Firehouse.com news article "1710 Causes Sparks Between Firefighters and City" (11 June 2001). "A firefighter's top priority is safety while a city manager's eye is usually on the taxpayer's dollar. That often puts the two at odds…City managers say the standard is an unnecessary measure meant to pad fire departments with new union members, and they say it would cost cities millions of dollars…We lost about 100 firefighters [nationwide, who were] killed in the line of duty last year, said Miami-Dade Fire Rescue Lt. Gary Rainey…That's primarily attributed to understaffing. Firefighters are going in without people to help them…"

Applying NFPA 1710 to the Delaware City Fire Department (Fire Department) is the focus of this research, specifically the staffing and response time criteria. This research does not intend to determine the validity or enforceability of NFPA 1710. An internal review of the Fire Department response data was conducted. This review resulted in the determination that the Fire Department does not meet the standards established in NFPA 1710, specifically response times and fire personnel on the fire scene. For the years of 2000 through 2003, the Fire Department responded to a total of 233 actual structure fires. Only 4 structure fires of the 233 (1.9%), the Fire Department was able to achieve NFPA 1710 deployment standards of a full first alarm personnel assignment. This is far below standard of the 90% achievement requirement. The Fire

Department's failure to achieve NFPA 1710 is not due to the standard itself, but rather City of Delaware (City) growth unmatched by growth in the Fire Department.

In May 2003, a 0.6% levy to replace the 0.4% income tax was put before the City voters for the purpose of increasing Fire Department staffing and other City staffing needs. This levy failed. The problem this study will address is what viable option(s) is/are available to the Fire Department in achieving NFPA 1710 compliance without raising City resident's taxes.

Purpose of the Study

The purpose of this study was to answer the research questions. The results will then be made available Fire Department Officers, Fire Department Firefighters, City Administration, and City Council, to use as a basis in developing a plan that accomplishes NFPA 1710.

Research Questions

This study will investigate the following questions using evaluative and survey research methods:

1. Can the Fire Department better utilize current fire department staffing to accomplish NFPA 1710?
2. Can NFPA 1710 be accomplished by changing response polices, and fire ground procedures?
3. Can NFPA 1710 be accomplished using alternate staffing methods?
4. Can NFPA 1710 be met with the current mutual aid agreements?
5. Can NFPA 1710 be met with automatic response agreements?
6. Are there alternate funding sources or methods that can fund additional staffing?
7. Are there technology and/or local code changes that could reduce the risk to citizens and firefighters?

BACKGROUND AND SIGNIFICANCE

NFPA 1710 was implemented on 2 August 2001. This national standard changed the way that communities and fire service administrators would need to approach emergency scene response and staffing. The standard includes the establishment of deployment times, arrival times, definition of a company, and staffing needs for various emergency scene operations to name a few. The standard also applies to emergency medical service (EMS) response as well. The standard includes language that accommodates the use of alternate methods. The ideal result of this study is that the NFPA 1710 will be achieved or significant improvements are made towards the safety of emergency personnel and civilians in the City. The intent of NFPA 1710 is to reduce firefighter and civilian injuries and death on the emergency scene while preserving property. Life safety is touted by the fire service as the priority objective. Maintaining an injury and death free fire ground promotes the second priority of property protection and conservation. Though the Fire Department has the fortunate honor of claiming no firefighter line of duty deaths in its history, it has experienced civilian fire deaths.

In accomplishing this standard, there may very well be additional service costs. The cost is dependent on the service option implemented. The best solution must also take into consideration the cost of not implementing it. The historical data comparison of the total costs of injury and/or death versus the cost of implementation must be weighed. The cost of implementation must be affordable and desirable to the citizens served. A creative combination of changes may be the key to a cost effective solution. By looking at a wide host of possible solutions, the citizens of Delaware may be more apt to support a change that gives them options in their fire department and local government. The net result of change must equate to a reduced risk to the community and the fire fighter. This was the intended goal of NFPA 1710.

The City is centrally located in Delaware County, Ohio and is the county seat. Delaware County is located approximately 20 miles north of Columbus, Ohio and is not only the fastest growing county in Ohio, but one of the fastest growing in the nation. The City is home to Ohio Wesleyan University and of course The Little Brown Jug. The Little Brown Jug is one of the premier international events in harness racing. The City is comprised of residential, commercial, and industrial segments. The City provides services to the community in the form of water distribution, wastewater collection, solid waste collection, public roads, police protection, fire protection, emergency medical services, parks and recreation, a municipal airport, planning, and building inspection departments. The City is challenged to balance growth and services in a rapidly growing community. The focus of this research is on fire and emergency medical services for the City. As mentioned in the introduction, growth of the City unmatched by growth in the Fire Department is the problem, not NFPA 1710. Figure 1 illustrates the unmatched growth.

	1990	2003	% Change
DFD Staffing (1)	29	40	37.93%
EMS Runs(2)(3)	1633	2759	68.95%
Fire Runs (2)(3)	261	772	195.79%
City Population(4)	20030	28955	44.56%
City Area (sq. miles) (4)	9.54	17.4	82.39%
Residential Structures(4)	7137	11035	54.62%

Figure 1

(1)-Source: City of Delaware Budgets (1989-2004)
(2)-Source: Delaware City Fire Department Annual Report (1988-1997)
(3)-Source: Delaware City Fire Department, FirePrograms data (obtained 05/27/2004)
(4) Source:Comprehensive Plan 2003-2008 (03/16/2004)

The Fire Department is 1 of 13 fire departments in the county, whose districts lay mostly/entirely within Delaware County. The Fire Department is one of four departments staffed with IAFF Union firefighters and has a bargaining agreement, one of six fire departments in the county providing emergency medical services (EMS). Delaware County also provides EMS to persons within Delaware County where the fire department in that area does not provide EMS. The Fire Department historically and currently has maintained mutual aid agreements with all of the other fire departments in Delaware County. The Fire Department has recently entered into a few automatic response agreements with the goal of reducing response times to certain locations and utilizing specialized apparatus.

The Fire Department is funded by 0.4% income tax that was passed by Delaware citizens in 1987. This income tax does not provide for the entire funding needed to operate the Fire Department therefore supplemental funding from the city's general fund is necessary. Delaware City Administration has stated on numerous occasions that buildings and equipment funding is not an issue. The funding of personnel is the issue. Building and equipment purchases are a one-time expense whereas personnel are an ongoing expense. The City collects fees (Impact Fees) from developers to offset the additional expense to the City due to the growth. Impact Fees are to be specifically used to purchase additional properties needed to service the community due to growth. The Impact Fees can be used to purchase additional properties such as park space, park equipment, fire apparatus, fire equipment, and fire stations, to name a few. Impact Fees cannot be used for personnel or to replace existing properties.

EMS Funding has been an area of controversy between the City and the Delaware County Commissioners (Commissioners). The controversy is centered on the fair and equitable distribution of collected sales tax funds. On 15 November 1971, a 0.5% "piggy-back" sales tax

was enacted by unanimous vote of the Commissioners (Delaware County Commissioners, 1971). The Commissioners argue that the "piggy-back" sales tax resolution does not state that this tax revenue is to be specifically earmarked for EMS. The City argues that the whole premise and intent behind this tax passage was clear, all collected funds were to be allocated and used for EMS.

A revenue concept that has been gaining support throughout Ohio is the EMS Billing of insurance companies, including Medicaid and Medicare. Tim Newcomb, of Medicount Management, Inc. stated, "insurers have included EMS transportation expense components to the insured's coverage and that is figured into the premiums that they pay". He stated, "if Delaware is consistent with many other areas, approximately 10% to 15% of your citizens will use EMS, but 100% pay for the service in taxes". This concept of EMS billing places a greater share of the cost on those whom use EMS, still keeping the service available to all. The Fire Department currently provides EMS for those who do not pay City income tax. These persons for the most part are those involved in motor vehicle accidents while traveling through Delaware, event visitors, and many college students. By collecting insurance payments from these persons the expense burden to provide EMS is shared by all, including those who do not pay City income tax. This is a potential revenue source that would not increase taxes.

The Fire Department is a full-time paid department consisting of 41 personnel (Appendix A). All members of the Fire Department, with the exception of the Chief, Inspection Captain, and the Chief's Administrative Assistant, are members of the International Association of Firefighters Local No. 606 (IAFF 606). A collective bargaining agreement exists, *Agreement Between the City of Delaware and the International Association of Firefighters Local 606* (Agreement 2001), that establishes wages, benefits, and the hours of work. Agreement 2001

establishes that IAFF 606 members may be assigned to a three-platoon system or a forty-hour workweek. The three-platoon system consists of a 24-hour workday followed by 48 hours off duty. A 40-hour workweek consists of five 8-hour shifts followed by 2 consecutive days off or 4 10-hour shifts followed by 3 consecutive days off. Alternate scheduling options must take into consideration acceptable work hours consistent with Agreement 2001.

The Fire Department receives notification of emergencies, via an 800-megahertz radio system, from Delaware City Police and Fire Dispatch (City Dispatch). Part of the dispatch message includes the recommended apparatus response. The in-charge person then has the option to respond with the recommended apparatus or the authority to deviate from the recommendation. Current department policy addresses the utilization of on-duty personnel, but does not specifically address minimum numbers of personnel response to various emergency types. NFPA 1710 addresses response requirements to numerous types of emergencies in which the fire service typically responds to. These emergencies include structural firefighting, EMS, hazardous materials incidents, airport rescue and firefighting, marine rescue and firefighting, wildland firefighting, and other special operation incidents. The focus of this study will be structural firefighting and EMS.

NFPA 1710 has established structural firefighting requirements for times and personnel. Turnout time shall be 1 minute or less, the first arriving Company shall have a response time of 4 minutes or less, and a total deployment of the full first alarm assignment shall have a response of 8 minutes or less. These requirements shall be met for 90% of fire incidents. NFPA 1710 [A.3.3.42.3] references NFPA 1221 for Call Processing Time. No precise limit was found for the time period from when the emergency call is answered until emergency units are notified. References were found in NFPA 1221 [4-3.1 (2)] and [4-3.1(3)]. NFPA 1221 [4-3.1 (2)] reads,

“Ninety-five percent of alarms shall be answered within 30 seconds, and in no case shall the initial call taker’s response to an alarm exceed 60 seconds”. NFPA 1221 [4-3.1(3)] reads, “The dispatch of the emergency response agency shall be made within 60 seconds of the completed receipt of an emergency alarm”. The amount of time in which a call taker has to answer the call and the amount of time the dispatcher has to notify emergency units are defined. It is the time in between that varies possibly due to the ability, or inability, of the caller to completely identify the emergency. The Delaware City Fire Department has set a benchmark of 2 minutes from the time the call is answered until emergency units are dispatched.

NFPA 1710 has established emergency medical requirements for times and personnel. Turnout time shall be 1 minute or less, first responders shall have a response time of 4 minutes or less, and advanced life support providers shall have a response time of 8 minutes or less, when the fire department offers this service. These requirements shall be met for 90% of emergency medical incidents. The Call Processing Time requirements for emergency medical incidents are the same as fire incidents.

The Fire Department uses some new technologies to perform their duties more efficiently and safely. The use of air sampling equipment to detect hazardous atmospheres, hand-held thermal imaging to locate victims in low visibility conditions and fire in concealed spaces, and battery powered tools, to name a few. Air sampling equipment allows firefighters to test atmosphere for unseen hazards that could render persons unconscious or cause death. Thermal imaging allows firefighters to work from a safer distance, observe hidden dangers not visible by plain sight through smoke, not search a dangerous area that they can now see is free of victims. New technologies allow for firefighters to work more efficiently, from safer areas, with less risk, and in some cases reduce the need of personnel to mitigate an incident. New battery technologies

have now made it possible to operate powerful hand tools with batteries. This reduces risk of electrical shock associated with using the conventional electrical extensions cords as well as the trip hazard. In same cases the battery-powered tools can now perform work that was once accomplished with gas powered engines at a lesser cost.

Current City building code does not require sprinklers in single-family residential structures. RFSI (2004) claims, "Sprinklers are the most effective fire safety devices ever invented. Look at this comparison with smoke alarms and with no fire protection at all. The National Fire Protection Association reports that people with smoke alarms in their home have a 50 percent better chance of surviving a fire. Adding sprinklers and smoke alarms increases your chances of surviving a fire by over 97 percent…" Smoke detectors are required in new residential structures by building code. Smoke detectors do not put the fire out, reduce fire spread, or reduce damage to the structure. Structural damage increases the risk to firefighters and the occupants. Larger fires require more firefighters for extinguishments. As the City grows, response times to fires will increase until new fire stations can be built and staffed. Increased response times will increase the amount of fire spread within a structure if automatic fire suppression systems are not in place. NFPA 1710 [FIGURE A.5.2.1.2.1] discusses the fire propagation curve and the potential for greater structural damage the more that time elapses after the fire origin until extinguishments begins. NFPA 1710 [Table A.5.2.1.2.1] illustrates the following statistics of fire loss. When a fire spreads beyond the room of origin and remains on the same floor there is a 275% greater incidence of civilian injury, 848% greater incidence of civilian deaths, and a 713% greater dollar loss as compared to fires contained to the room of origin. When a fire spreads beyond the floor of origin there is a 180% greater incidence of

civilian injury, 1144% greater incidence of civilian deaths, and a 1002% greater dollar loss as compared to a fire contained to the room of origin.

The results of this study should provide City Administration and the Fire Department with a basis to make change towards achieving NFPA 1710 without increasing taxes. Achieving NFPA 1710 will reduce the risk of life and property loss to Delaware citizens and Delaware firefighters. Some changes will come with additional costs to the City. Some changes are operational improvements with no additional cost to the City. Some changes include placing the cost burden back onto those who create the additional strain on services. These additional costs may be offset by alternate revenue sources. Alternate revenue sources have been identified. Exploring alternate revenue sources will show Delaware citizens that they have been heard. They have made it clear that they do not want more taxes, yet expect the same services to which they are accustomed.

LITERATURE REVIEW

Implementing NFPA 1710 Standards

In order address the research questions there must be an understanding of what NFPA 1710 requires for structural firefighting and EMS. The requirements for structural firefighting are:

1. Turnout time of 1 minute or less.
2. Response time of 4 minutes or less for the first arriving company.
3. Response time of 8 minutes or less for the deployment of full first alarm assignment. (Figure 2 contains the full deployment staffing assignments)
4. The time requirements shall be met for 90% of incidents.

Full Deployment	# of Firefighters per NFPA	NFPA 1710 Standard Ref.
Incident Commander	1	5.2.3.2.2(1)
Uninterupted water supply	1	5.2.3.2.2(2)
Attack line	2	5.2.3.2.2(3)
Backup line	2	5.2.3.2.2(3)
Provision support attack line*	1	5.2.3.2.2(4)
Provision support backup line*	1	5.2.3.2.2(4)
Victim Search/Rescue team	2	5.2.3.2.2(5)
Ventilation Team *	2	5.2.3.2.2(6)
Aerial Operator(if used)	1	5.2.3.2.2(7)
Establishment of an IRIC	2	5.2.3.2.2(7)
TOTAL	**15**	

Figure 2

The requirements for EMS are:

1. Turnout time of 1 minute or less.
2. Response time of 4 minutes or less for the arrival with personnel trained at the first responder level or higher and an automatic external defibrillator (AED).
3. Response time of 8 minutes or less for the arrival of advanced life support (ALS) personnel where the service is provided by the fire department.
4. The time requirements shall be met for 90% of incidents.
5. Response to an ALS incident shall include two ALS personnel and two basic life support (BLS) personnel.

The Garland, Texas Fire Department continuously struggled with the question of just how much fire protection and funding was needed. Werner (2002) set out to answer those questions in his study of the Garland Fire Department. He received some guidance with this issue when NFPA 1710 became a standard. He now had guidelines in which to determine just how much fire protection was needed. The funding solution would simply be the cost to fulfill the needs. In order to determine needs Werner set out to find out how the Garland Fire Department measured up to NFPA 1710. Werner reviewed Garland Fire Department records to determine whether or not response times and staffing requirements were met. In summarizing the results, additional stations were needed to reduce response times, an upgrade of computer dispatching equipment was needed to provide accurate data in which to measure times, department Officers needed statistical data training, additional funding would be needed, and a long term plan was needed to spread the cost of implementation over several years. Werner

looked at the federal government as a potential source of revenue to partially fund Garland Fire Department's needs.

Alternate Shift Schedules

Are 24-hour shifts the best way to schedule staffing is a question that is often asked. Frazier (1999) wrote, "The uniqueness of each department and the alarm load plays a significant role in determining the most efficient overall schedule. Although there are several alternative schedules being used in the fire service such as 10/14, the traditional 24-hour shift continues to be the most popular and cost efficient…" (Page 2)

When exploring alternate shift schedules, consideration must be given to the effects of health and safety. Frazier (1999) writes, "Disruption of the bodies normal work/sleep cycle by rotating shifts may produce problems with chronic fatigue, depression and mood swings, intestinal ailments, chronic sleep problems, increased drug and alcohol abuse, and hypertension…" (Page 8)

Similar findings as to increased costs for shift scheduling were reported by Frazier (1999), "In many cases, the cost to implement a shift schedule to reduce work hours may involve adding another shift or platoon, or adding personnel to cover peak times of the day. The total cost including employee benefits, which may exceed 30%, must be figured when evaluating what shift schedule is the most cost effective to reduce the length of a shift or as a means of cutting overtime costs" (Page 12).

Frazier (1999) also discusses various forms of the 24-hour shift. He states that 67.65% of fire departments use some form of the 24-hour shift. "The three most common forms of the 24-hour schedules found were the Chicago Plan (24 on/24 off with varying days off), the California Plan (24 on/24 off/24 on/24 off/24 on/96 off), and the Modified Plan (24 on/48 off with Kelly

Days)". He also reported that there are fire departments utilizing either the 10/14 or 12/12 hour shifts. The majority that is using these schedule options are combination fire/EMS or EMS transport only departments. This schedule is attractive to departments that have high EMS run volumes in order to reduce stress on EMS personnel (Page 33).

Davis (2000) states the Fair Labor Standards Act (FLSA) allows for firefighters to work 53 hours per week before overtime compensation is mandated (Page 8). This is a lesser cost than working firefighters a 40-hour week. A common public and administrative concern is that productivity is diminished when firefighters sleep during a shift. For the argument of productivity many believe that the sleep time would be better spent on training, inspections, and other activities. Even though the firefighters are on call and in a position to respond to emergencies, overcoming the mindset of paying for non-productive work time is difficult (Page 12).

The results of the Davis (2000) study indicate that the cost for staffing would increase by 40% to operate on 8-hour shifts (Page 19). He also addresses alternative schedules that may include variations and combinations of 8, 10, and 14-hour shifts for spot staffing. This had advantages in maintaining available command officers for emergency incidents and to attend meetings (Page 20).

Mutual Aid/Automatic Response

Cooper (1998) writes, "No community can handle a disaster without outside assistance. It is the community's responsibility to manage that outside assistance and to be ready to give assistance when called. That is the essence of mutual aid". Mutual aid has been used for over 200 years. Mutual aid is available in two basic forms of assistance. The first is when agency requests additional assistance after arriving at the incident. The second is response of agencies, based on

prearranged agreements, upon notification of an incident. This is termed an "automatic aid agreement" (Page 7-8).

The purpose for Cooper's (1998) study was to determine whether or not mutual aid was a realistic option to improve response times to certain areas of Balch Springs, TX. Taxpayer demands created the challenge of improving response times while working within the same operating budget. The study identified a response area in which Balch Springs Fire-Rescue could not achieve response objectives. Two neighboring fire departments were identified and response times were researched. The results of the study indicated that a mutually beneficial automatic aid plan would improve response times for all of the fire departments involved. This improvement of service delivery could be accomplished without increasing operational funding.

Alternate Funding

Citizens have come to expect more and pay less for government services, including the fire department. Funding is a necessity in order to operate fire departments. Fire Chiefs are now being forced to find other sources of funding besides taxes. Koelz (1997) conducted research to find creative and successful alternate funding ideas. Some of the ideas collected (Pages 6-9) were:

1. "Rescue user fee: residents and non-residents would be charged differently for services provided".
2. "Fire user fee: non-residents would be billed for vehicle fires which the owner may claim with their insurance company".
3. "Driving Under the Influence (DUI) Reimbursement: collection for service rendered on convicted DUI offenders".

4. “Special Duties Unusual Circumstances: reimbursement schedule for stand-by or services for unusual requests, i.e. hazardous material cleanups, fire watches, hazardous condition standby”.
5. “Rescue Squad Stand-by: charging for apparatus and/or personnel”.
6. “Public Education: charging for public education programs; i.e. CPR classes, fire extinguisher training, fire brigade training”.
7. “Fire Prevention Bureau Inspections and Repeat Inspections: charging for fire prevention inspections for businesses. Rates would increase for repeat inspections”.
8. “New construction Plan Review: charge based on square footage for reviewing new construction”.
9. “False Alarm Ordinance: charging for false alarms when conditions are controlled by the occupants and to include citations and fines for non-compliance”.
10. “Fire Investigation and Fire Reports: insurance companies would reimburse the fire department for time spent investigating cause and origin. Charging for pictures taken would also be included”.
11. “Fire Prevention Maintenance Inspections: charge existing properties for regular scheduled building inspections”.
12. “Monitor Alarm Company Circuits: charge a flat monthly fee to alarm companies whose fire alarms terminate at the communications center”.
13. Government contracts.
14. Government bonds.
15. Grants.
16. Selling engraved bricks.

17. Billing health insurance for EMS transportation.

18. Direct mail requests for donations.

Wheeler (2000) conducted research on EMS billing of health care coverage. In this study he surveyed 50 fire departments nationwide in which 31 fire departments responded (Page 14). The results indicated that 83% of the respondents bill for services (Page 16). Of the respondents that bill for services;

1. 69% used the services of a third party billing agent (Page 18).
2. 80% had the collected monies incorporated into their budgets (Page 22).
3. 20% had the collected monies incorporated above and beyond their budgets (Page 22).
4. The average charge for BLS transports was $281.00 (Page 23).
5. The average charge for ALS transports was $357.00 (Page 23).
6. The average rate of return on billing was 57% (Page 23).

Wheeler (2000) points out that Montgomery County, MD had a population of over 900,000 people in 1999 and transported 25,023 patients. This amounts to less than 3% of the population being billed for EMS. “There are a number of individuals who are simply traveling through the area and require EMS services…However, if shown that the people are in most cases already paying for these services through Medicare or private health insurance, most everyone will support the idea” (Page 27).

Technology

The constant drive for finding solutions to problems is the basis of developing new technologies. A statement contained in Carnegis (1999) research sums up the human drive for new technology, "After the Falkland War, the U.S. Navy and Coast Guard began an aggressive program in thermal imaging for fire suppression application. The lessons of this war and its devastating effects of fires at sea especially in the areas of hidden fires, lack of visibility and heavy toll on life prompted this action".

In firefighting applications smoke reduces or eliminates the ability to see (Pages 12-13). Carnegis (1999) also writes, "…not being able to see slows the progression of search and rescue, advancement of handlines, makes ventilation difficult, and hides failing structural components. This lack of visibility causes risk to firefighters…" (Page 14)

Carnegis (1999) identifies methods of approach to evaluate thermal imaging devices. A manufacturers product and model chart are included in this study (Page 51).

Taylor (1997) conducted research to explore a technology that he thought might improve the effectiveness of early fire extinguishments. The technology that Taylor researched was Compressed Air Foam Systems (CAFS). The typical problem experienced was "…in the early stages of fire suppression operations, there were frequently insufficient personnel to employ traditional extinguishments methods safely and efficiently" (Page 81). His goal was to determine whether CAFS technology would improve safety and efficiency during the early stages of fire control. The following advantages of CAFS were some of those contained in Taylor's (1997) research (Pages 91-94);

1. "Class A foams allow faster fire suppression and extinguishments than plain water".

2. “Class A foam increases efficiency and conservation of water supply”.
3. “CAFS attack lines are lighter than plain water hose lines”.
4. “Foam use may help to preserve evidence of fire cause”.
5. “Class A foam can be used on flammable liquids”.
6. “Class A foam may provide long-term cost savings and reduced water damage”.
7. “Firefighter stress and fatigue may be reduced”.
8. Time of CAFS fire knock down is ¼ the time of plain water.
9. CAFS uses 30% of the water needed when plain water is used.
10. “CAFS has the firefighting capability eight to ten times that of plain water”.

CAFS technology equates to greater fire knock down with less firefighter effort, in a shorter period of time, reducing water damage, therefore reducing loss.

A study conducted by NIST (2002) includes a troubling statement in the introduction. The statement reads, “Automatic sprinkler systems have been successfully used to protect industrial and commercial buildings and their occupants for more than 100 years. Historically the place which has offered the least amount of fire protection to occupants, was and still is, their own home…Unfortunately 8 out of 10 victims still died in a residential structure fire…” (Page 2) NIST (2002) study referenced a study of Scottsdale, Arizona (Scottsdale) conducted in 1996. Scottsdale experienced 109 fires in sprinklered buildings, of which 44 were residential fires. One or two sprinklers controlled the fires in greater than 90% of the incidents with an average of 299 gallons of water per fire. It was estimated that manual suppression activity would have yielded 6,000 gallons of water being applied per fire. The greatest statistic of this study was that the sprinklers saved eight lives. The Scottsdale study stated that the average residential sprinkler cost per square foot in 1986 was $1.14 and in 1996 the cost had dropped to $0.59 per square foot.

Another financial benefit of residential sprinkler systems in Scottsdale study reads, “Surveys of the home insurance companies in the Scottsdale area yielded an average discount of 10% for homes with residential sprinkler systems installed” (Page 13).

RFSI-2 (2004) states that homebuilders are often a source of objection to residential sprinkler systems. RFSI-2 (2004) is a literature packet that identifies the most common “list of reasons why the ordinance is a bad idea” and offers information to the most common objections (Page 1).

PROCEDURES

Since the basis of this research was on NFPA 1710 and five of the seven research questions required specific knowledge of NFPA 1710, a thorough review of NFPA 1710 was conducted. In order to determine whether the Fire Department currently met NFPA 1710 a comparative evaluation of Fire Department emergency run data with NFPA 1710 was performed. The Werner (2002) study was used as a guideline in which to evaluate the Fire Department. This evaluation consisted of reviewing structural fires and EMS data of the Fire Department for the years of 2000 through 2003. Though NFPA 1710 language was clear and specific, one area of the standard allowed for creativity in meeting the standards. NFPA 1710 [1.3] reads, "Equivalency. Nothing in this standard is intended to prohibit the use of systems, methods, or approaches of equivalent or superior performance to those prescribed in this standard. Technical documentation shall be submitted to the Authority Having Jurisdiction (AHJ) to demonstrate equivalency".

In order to consider other options of utilizing Fire Department personnel in different configurations boundaries were identified. Boundaries for the use of personnel existed in the form of FLSA and Agreement 2001. FLSA set limits on hours worked per week and is addressed by Agreement 2001. Agreement 2001 establishes that only three different types of shift schedules may be used. A firefighter may either work an 8-hour, 10-hour, or 24-hour shift. Fire Department emergency run data was evaluated to determine if patterns or tendencies existed as to peak emergency incident periods. The evaluation compared day of week, hour of day, eight-hour periods, and emergency type. It was found that tendencies did exist over a 4-year period. Alternate staffing solutions were available for consideration to address the discovered tendencies.

Alternate staffing options were found by Internet search and a search of USFA website research papers. Volunteer, part-time, and apprenticeship staffing options are the most common alternates to full-time staffing. The obvious reason for alternate staffing is the cost factor. Volunteer staffing, in which personnel respond from home or other locations, most likely would not correct the current problem of achieving NFPA 1710 full-deployment criteria of an eight-minute response. On duty personnel is needed to meet the full deployment criteria.

The closest neighboring fire department is Tri-Township Fire Department (Tri-Twp). Tri-Twp lies within the city limits of Delaware on the eastern edge of the corporation limits. To determine the effectiveness of mutual aid response, response data from Tri-Twp was evaluated. Tri-Twp emergency response data of mutual aid runs with the Fire Department were reviewed.

Alternate funding options, ideas, and lists were obtained from Koelz (1997). This list was narrowed to areas that the author felt were the most practical to pursue. Historical news coverage and Delaware County tax revenue data was collected in an effort to find the original intent of the Delaware County "piggy-back" sales tax.

Another major funding source that has been gaining acceptance to communities and the fire service is EMS billing. A literature search of the USFA research papers and direct contact with EMS third party billing companies provided a basis for calculating the potential revenue from EMS billing. A listing of Ohio's top 25 health insuring corporations (Appendix G), based on Ohio premiums collected in 2002, was obtained from the Ohio Department of Insurance (ODI). This 2002 list, the most current data from the ODI, represented $6,136,314,071 of collected premiums in Ohio. There is no scientific justification for this list and no representation is made that it represents a majority of Ohio citizens. By soliciting the input of the top 25 health insuring corporations, it was felt that a large sampling of Ohio's insured were represented. The

thought behind the survey was to solicit the opinion of health insurers about EMS billing ideas on a larger scale than just local insurers. A survey (Appendix D) was developed to solicit the views of the health insuring corporations. The greatest challenge to sending out surveys was finding the contact persons. The survey was sent twice. The first survey cover letter did not contain an anonymity clause and some property and casualty insurers, mentioned below, felt that their company information was proprietary. To prevent a similar concern with the health insuring corporations, the survey was resent with the anonymity clause included in the cover letter.

A personal interview was conducted with the Fire Department Fire Inspector, Captain Vanderbosch. Charging for inspections and permits was discussed as possible revenue sources.

Residential sprinkler systems were researched as a means to reduce risk of death and injury to residents and firefighters. The thought behind sprinklers was due to trying to find ways to control fire, or reduce fire spread, prior to firefighter arrival. As Delaware grows response times to the outlying area will increase until new fire stations are built. The increased response time equals increased fire spread. A literature search was conducted and data was collected supporting the benefits and use of residential sprinkler systems. The main argument against sprinklers was the cost.

A listing of Ohio's top 25 property and casualty insurers (Appendix H), based on Ohio premiums collected in 2002, was obtained from the ODI. This 2002 list, the most current data from the ODI, represented $10,502,102,432 of collected premiums in Ohio. There is no scientific justification for this list and no representation is made that it represents a majority of Ohio citizens. By soliciting the input of the top 25 property and casualty insurance companies, it was felt that a large sampling of Ohio's insured were represented. The thought behind the survey was to solicit the opinion of property and casualty insurers about residential fire prevention ideas on a

larger scale than just local insurers. A survey (Appendix E) was developed to solicit the views of the property and casualty insurers. The greatest challenge to sending out surveys was finding the contact persons. The survey had to be sent twice. The first survey cover letter did not contain an anonymity clause and some insurers felt that their company information was proprietary. The survey was resent with the anonymity clause included in the cover letter.

A third survey (Appendix F) was conducted. It related to another point of view, the local building industry. Historically, the building industry has not supported local building codes requiring residential sprinkler systems. A similar survey that was sent to Ohio property and casualty insurers was sent to ten of local builders in Delaware. The list (Appendix I) of the 11 builders was received from Fire Inspector, Captain Vanderbosch of the Fire Department. The builders on the list were based on the experience opinion of Captain Vanderbosch that they were the top builders, as to quantity of residential structures. The surveys included an anonymity clause and were sent to the home office of each builder.

A continuous struggle of the fire service is to mitigate emergency situations in which the uses of human senses are limited. The sense of sight, smell, taste, hearing, and touch are limited due to the protective clothing and environments in which firefighters perform. However it is the human senses in which the firefighter relies to make split second, life and death decisions. This is where technological improvements help firefighters tremendously. Air sampling equipment and SCBA has been developed to utilize the sense of smell, yet protect it, thermal imaging for sight improvement, protective clothing for touch, and headsets for hearing.

Technology was more challenging to research. Searching “technology” on the Internet, in the library, trade journals, and so on will not necessarily yield useful tools for the fire service. A problem must exist, such as low visibility, before solutions can be researched. The CAFS system

was researched as another means to assist understaffed incidents as well as reduce structural damage. Existing studies were found and reviewed from the USFA.

Definition of Terms

For the purpose of this research project, the following terms are defined as follows.

Automatic Aid/Response. "The immediate assistance from an another agency. The assisting agency responds simultaneously with the agency having jurisdiction".

Call Processing Time. (NFPA 1710 [3.3.42.2] def.) See Dispatch Time

Company. (NFPA 1710 [3.3.8] def.) A group of members: (1) Under the direct supervision of an officer; (2) Trained and equipped to perform assigned tasks; (3) Usually organized and identified as engine companies, ladder companies, rescue companies, squad companies, or multi-functional companies; (4) Operating with one piece of fire apparatus (engine, ladder truck, elevating platform, quint, rescue, squad, ambulance) except where multiple apparatus are assigned that are dispatched and arrive together, continuously operate together, and are managed by a single company officer; (5) Arriving at the incident scene on fire apparatus.

Company Officer. (NFPA 1710 [3.3.30.1] def.) "A supervisor of a crew/company of Personnel".

Dispatch Time. (NFPA 1710 [3.3.42.3] def.) "The point of receipt of the emergency alarm at the public safety answering point to the point where sufficient information is known to the dispatcher and applicable units are notified of the emergency".

First Responder. (NFPA 1710 [4.3.2] def.) "The fire department organizational statement shall ensure that the fire department's emergency medical response capability includes personnel, equipment, and resources to deploy with an automatic external defibrillator (AED) or higher treatment level".

Mutual Aid/Response. “The request for assistance from another agency. This request occurs during response to an emergency or after arrival on the scene of an emergency”.

Response Time. (NFPA 1710 [3.3.42.4] def.) “The time that begins when units are en route to the emergency incident and ends when units arrive at the scene”.

Turnout Time. (NFPA 1710 [3.3.42.5] def.) “The time beginning when units acknowledge notification of the emergency to the beginning point of the response time”.

Limitations of the Study

For the surveys of the insurance companies, it was assumed that the listings from the Ohio Department of Insurance were accurate and the most current data available. It is not known as to what percentage of Ohio’s insured are represented by the insurance listing. It is believed, based on the total dollar amount of Ohio premiums received, that the insurance companies listed represented a significant number of Ohioans.

The survey response for insurers may have been limited due to not including an anonymity clause in the first survey letter. After receiving a letter of concern from two insurers, the survey letter was rewritten and resent.

The survey for the builders were selected based on the personal experience of one person, the Fire Department Inspector. No evaluative study was conducted to determine that the list of builders contained the top 11 builders in Delaware. It is assumed that the list is accurate and represents a large number of newly built homes in Delaware.

RESULTS

Question #1- Can the Fire Department better utilize current fire department staffing to accomplish NFPA 1710?

The staffing schedule consists of three crews working 24-hour shifts, with Kelly Days, resulting in a 50-hour workweek. Administrative and inspection personnel are working 8-hour shifts, resulting in a 40-hour workweek. Personnel working under Agreement 2001 will receive the same pay and benefits whether they work a 40 or 50-hour week. The advantages of a 50-hour work week over a 40-hour workweek include more hours worked for same pay, a lesser overtime hourly rate, fewer shift changes, and fewer personnel needed to cover 24/7 operations. The main disadvantage is of a 50-hour work week is that rest periods are needed to maintain alertness. Rest periods reduce productivity. Frazier (1999) and Davis (2000) both conclude that the 24-hour shift is the most overall effective shift for the fire service. Davis (2000) addresses alternative schedules that may include variations and combinations of 8, 10, and 14-hour shifts for spot staffing.

A review of Fire Department emergency response data for all fire and EMS runs by hour of the day (Figure 3) and 8-hour shifts (Figure 4) of the day was completed. The five busiest days of the work for were Monday, Tuesday, Thursday, Friday, and Saturday. The busiest 8-hour shift for all days was the time from 12:00 P.M. to 8:00 P.M.

NFPA 1710 [3.3.8] addresses another staffing need for the Fire Department, "a company is to be managed by a single company officer". NFPA 1710 [5.2.1.2.2], states, "Each company shall be led by an officer who shall be considered a part of the company". NFPA 1710 [5.2.2.1.1-5.2.2.1.2] defines a company as four to six firefighters. Interpreting NFPA 1710, one company officer is required per every four to six firefighters. The Fire Department has one officer, a

Captain, assigned to a crew of 11 other personnel spread amongst two fire stations. It is obvious that more officers are needed per crew to effectively supervise a fire emergency as well as the non-emergency supervisory functions. Each crew should have a minimum of two officers per crew and ideally three officers per crew based on current Fire Department staffing.

ALL RUNS (01/01/2000-12/31/2003)								
Hour of Day	Sun	Mon	Tue	Wed	Thur	Fri	Sat	Total
00:00 - 00:59	59	44	50	49	52	56	82	392
01:00 - 01:59	66	40	36	39	43	46	77	347
02:00 - 02:59	55	38	52	44	38	46	70	343
03:00 - 03:59	47	36	39	33	41	39	57	292
04:00 - 04:59	41	37	32	35	41	37	44	267
05:00 - 05:59	30	40	29	45	34	35	49	262
06:00 - 06:59	38	54	41	31	53	50	37	304
07:00 - 07:59	42	69	76	71	72	45	54	429
08:00 - 08:59	58	88	90	105	78	81	69	569
09:00 - 09:59	95	106	94	107	109	92	87	690
10:00 - 10:59	77	84	121	102	115	100	95	694
11:00 - 11:59	75	114	96	100	109	114	105	713
12:00 - 12:59	89	113	94	123	121	111	112	763
13:00 - 13:59	88	115	114	133	131	129	98	808
14:00 - 14:59	98	96	121	108	96	115	86	720
15:00 - 15:59	76	102	119	111	125	85	89	707
16:00 - 16:59	99	115	96	75	109	102	98	694
17:00 - 17:59	89	98	111	88	114	108	88	696
18:00 - 18:59	111	119	128	110	101	101	96	766
19:00 - 19:59	125	93	107	113	99	121	103	761
20:00 - 20:59	68	96	96	95	99	95	89	638
21:00 - 21:59	62	104	86	65	81	87	100	585
22:00 - 22:59	83	83	79	64	69	90	81	549
23:00 - 23:59	53	66	62	60	60	61	83	445
Total	1724	1950	1969	1906	1990	1946	1949	13434

Figure 3

RUNS BY 8-HOUR INCREMENTS								
Hour of Day	Sun	Mon	Tue	Wed	Thur	Fri	Sat	Total
0100-0859	377	402	395	403	400	379	457	2813
0200-0959	406	468	453	471	466	425	467	3156
0300-1059	428	514	522	529	543	479	492	3507
0400-1159	456	592	579	596	611	554	540	3928
0500-1259	504	668	641	684	691	628	608	4424
0600-1359	562	743	726	772	788	722	657	4970
0700-1459	622	785	806	849	831	787	706	5386
0800-1559	656	818	849	889	884	827	741	5664
0900-1659	697	845	855	859	915	848	770	5789
1000-1759	691	837	872	840	920	864	771	5795
1100-1859	725	872	879	848	906	865	772	5867
1200-1959	775	851	890	861	896	872	770	5915
1300-2059	754	834	892	833	874	856	747	5790
1400-2159	728	823	864	765	824	814	749	5567
1500-2259	713	810	822	721	797	789	744	5396
1600-2359	690	774	765	670	732	765	738	5134
1700-0059	650	703	719	644	675	719	722	4832
1800-0159	627	645	644	595	604	657	711	4483
1900-0259	571	564	568	529	541	602	685	4060
2000-0359	493	507	500	449	483	520	639	3591
2100-0459	466	448	436	389	425	462	594	3220
2200-0559	434	384	379	369	378	410	543	2897
2300-0659	389	355	341	336	362	370	499	2652
0000-0759	378	358	355	347	374	354	470	2636

Figure 4

Question #2-Can NFPA 1710 be accomplished by changing response polices, and fire ground procedures?

After reviewing NFPA fireground-staffing requirements listed in Figure 2, thought was given to NFPA 1710 Equivalency. Based on the personal experience of the author some of the personnel assignments listed in Figure 2 have been historically short-term assignments. Assignments such as provisional support for the attack line, provisional support for the back-up line, and the ventilation team has not been continuously needed throughout many incidents. Two personnel with short-term assignments may be able to be re-deployed to another assignment. This would change the fireground personnel requirement from 15 to 13. This equivalency suggestion would need examined, tested, and presented to the AHJ. If the AHJ determines equivalency, then modifications to fire ground standard operating guidelines would need to be made as to personnel assignments and responsibilities.

Reviews of City Dispatch response time records indicate that the Fire Department has work to do in the area of response times. There are a higher achievement percentage of response time requirements than turnout time requirements.

	2000	2001	2002	2003	TOTAL
Total EMS Emergencies	2221	2626	2719	2759	10325
# Call Processing Time 2 minutes or less	2054	2408	2399	2563	9424
% Calls Processed in 2 minute or less	92.48%	91.70%	88.23%	92.90%	91.27%
# Turnout Time of 1 minute or less	945	1226	848	771	3790
% Turnout Time 1 minute or less	42.55%	46.69%	31.19%	27.94%	36.71%
# Turnout Time > 1 minute	1276	1400	1871	1988	6535
# Turnout Time > 1 minute between 2300-0730 hrs	534	576	588	532	2230
%Turnout Time > 1 minute between 2300-0730 hrs	41.85%	41.14%	31.43%	26.76%	34.12%
# Response Time of 4 minutes or less	1640	1736	1619	1636	6631
% Response Time of 4 minutes or less	73.84%	66.11%	59.54%	59.30%	64.22%

Figure 5

	2000	2001	2002	2003	TOTAL
Total All Fire Emergencies	465	628	669	772	2534
(Includes canceled runs and assists to EMS)					
Total of all Apparatus that responded to fires	310	691	452	535	1988
# Call Processing Time 2 minutes or less	229	567	331	351	1478
% Calls Processed in 2 minute or less	49.25%	90.29%	49.48%	45.47%	58.33%
# Turnout Time of 1 minute or less	62	107	72	85	326
% Turnout Time 1 minute or less	20.00%	15.48%	15.93%	15.89%	16.40%
# Turnout Time > 1 minute	248	584	380	450	1662
# Turnout Time > 1 minute between 2300-0730 hrs	40	56	70	65	231
%Turnout Time > 1 minute between 2300-0730 hrs	16.13%	9.59%	18.42%	14.44%	13.90%
# Response Time of 4 minutes or less	200	237	279	352	1068
% Response Time of 4 minutes or less	64.52%	34.30%	61.73%	65.79%	53.72%

Figure 6

Figure 5 illustrates this for EMS emergencies and Figure 6 for Fire emergencies. EMS call processing times have been met however fire call processing times have not. There is a significant disparity of call processing times between EMS and fire calls.

Turnout times for EMS and fire are poor and do not meet standards. An interesting comparison was made to determine whether turnout times during sleep hours were different from turnout times during non-sleep hours. The interesting result was that sleep did not have a significant impact on turnout times.

Response time for both EMS and fire fall below the standard. The Fire Department is able to arrive on the scene in 4 minutes, or less, a higher percentage of the time for EMS incidents than fire incidents.

Question #3- Can NFPA 1710 be accomplished using alternate staffing methods?

Research revealed another very interesting concept to cost-effective staffing. The concept is a residency program. The Fire Department's main station is located within the campus area of Ohio Wesleyan University (OWU), which may be ideal for this type of program. The Hyattsville Fire Department in Hyattsville, Maryland and the Richland Township Fire Department in

Johnstown, Pennsylvania have developed and operate a residency program. College students are offered free living quarters in exchange for a commitment to respond to emergencies. As mentioned previously in this research, City Administration has funding for properties, but not staffing. With the ever-increasing educational requirements for fire and EMS personnel, a cooperative program with OWU may be a cost effective solution. A residency program may increase enrollment for OWU as well as benefit the Fire Department with staffing and cost effective educational options.

A part-time program was established and failed at the Fire Department. Unresolved differences between IAFF 606 and Delaware Administration were the cause of this program to fail. IAFF 606 supports, in principle, an apprenticeship type program in which an on-going training program prepares untrained, or minimally trained, personnel to develop into full-time firefighters.

Question #4- Can NFPA 1710 be met with the current mutual aid agreements?

Mutual aid agreements will not accomplish NFPA 1710 standards due to the delayed dispatch and delayed response. With the response time requirements of NFPA 1710, mutual aid will not accomplish the standard for full deployment in eight minutes for Delaware at the present time. This was verified through a review of fire incident reports in which mutual aid was received from Tri-Twp. From 2000 to 2003 The Fire Department responded to 233 actual structure fires. Tri-Twp assisted the Fire Department on 26 of these fires. Tri-Twp was able to arrive on the scene within 4 minutes on nine fires and within 5 to 8 minutes on 12 other fires. Tri-Twp's response times were not from the original dispatch time but rather from the time the Fire Department requested mutual aid assistance. Requests for mutual aid delays response time when compared to automatic response.

Question #5- Can NFPA 1710 be met with automatic response agreements?

Automatic response can help the Fire Department achieve NFPA 1710 as evidenced by the results of Question #4 above. Automatic response causes a response from the original dispatch time. There are no response delays by waiting for a request from units already en route or on the scene of an incident.

Question #6- Are there alternate funding sources or methods that can fund additional staffing?

On 15 November 15, the Delaware County Commissioners (1971) passed a resolution that enacted a 0.50 % sales and excise tax. There is a history of dispute between the City of Delaware and the Commissioners in regards to sales tax revenue. The two issues of dispute with this sales tax are what is the tax revenue to be used for and the equitable distribution. The Commissioners argue that the resolution does not specifically state that the tax revenues are to be allocated solely for emergency medical services. The Fire Department argues that the tax was intended specifically for emergency medical services throughout Delaware County and nothing else. Since the current members of the Commissioners, Delaware City Council, or the Fire Department were not involved with the passage or implementation of this resolution, local research of public documents was conducted. The Delaware County Commissioners Resolution (1971) states in the third paragraph

"…for the preservation of the public peace, health, and safety…". This supports the current Commissioners position that the sales tax revenues are not specifically for emergency medical services. Throughout the entire existence of this sales tax there has been an ongoing dispute in regards to the use and distribution of the funds.

In reviewing historical records and accounts on this issue information was found in local newspapers and governmental documents. Macklin (1991) compiled an extensive timeline collection of newspaper articles, governmental documents, and numerous other documents that illustrated the dispute.

The Delaware Gazette (The Gazette) printed an article (13 November 1971) that read in part, "Commissioner's Chairman Donald E. Fisher said today a decision on the proposed one-half percent piggyback sales tax to finance a county-wide ambulance service will probably be made on Monday…a one-half percent piggyback sales tax was proposed to provide operating revenue. The plan also included a reimbursement plan for Liberty Township and Delaware where squads are already operating". The Gazette article (15 November 1971) read, "Delaware County Commissioners today passed a resolution adopting a one-half percent sales tax to finance a county-wide ambulance service". The Gazette article (23 November1971) reads, "Fisher said he hopes there will be a consensus on a proposal by Monday so the plan may be submitted for state approval. When approval is obtained on the emergency plan the commissioners will request state approval of the one-half percent piggyback tax to finance the service". The Gazette article (24 November 1971) reads, "The proposal also calls for Delaware and Liberty emergency squads to be reimbursed for all non-fire runs at an amount set in accordance with income received from the one-half percent piggyback sales tax recently passed by county commissioners". The Gazette article (21 December 1971) reads, "The State of Ohio Department of Taxation has approved the one-half percent permissive sales tax enacted by the County Commissioners last month to pay for a county-wide ambulance service". Delaware City Council Passed Resolution No. 71-17 (7 February 1972) reads in part "…WHEREAS, the Delaware County Commissioners have approved the levying of a county-wide ½% sales tax for the express purpose of funding the

operational costs of such an ambulance service". Radde (1974) wrote in The Gazette, "THE SERVICE IS FUNDED from a one-half percent piggyback sales tax levied by the Delaware County Commissioners…(Councilman) Gray said that the sales tax was presented to the public as a means of underwriting the emergency service". Dispatch article (1974 December 3) reads, "Commission President Kenneth Reed admitted the sales tax had been levied to provide money for the emergency service".

On several occasions, the Commissioners have suggested that the City of Delaware give the responsibility of emergency services to Delaware County. Each time the City of Delaware argued that they had invested significant amounts of time and money into training and equipment to provide this service for the citizens of Delaware. The Delaware City Fire Department's personnel are cross-trained as firefighter-emergency medical technicians and firefighter-paramedics. This is a more cost effective system than a single role provider as Delaware County EMS personnel are. In 2002, Delaware County EMS responded to 4,742 EMS emergencies with expenditures of $4,765,476.84 for wages and benefits. The average wage and benefits cost per EMS emergency for Delaware County EMS was $1,004.95. In 2002, the Fire Department responded to 3,388 EMS and fire emergencies with expenditures of $3,135,710 for wages and benefits. The average wage and benefits cost per Delaware Fire emergency was $925.53.The Delaware Fire Department provides fire, EMS, rescue, and hazardous materials responses at a lesser cost than Delaware County EMS can provide EMS service alone.

Figure 7 illustrates the piggyback sales tax revenue and expenditures for 2000-2003.

	2000	2001	2002	2003
.50% Sales Tax Collected(1)	$7,190,858.70	$7,810,259.30	$10,234,762.02	$11,513,678.06
Less EMS Expenditures(2)(3)	$4,126,018.98	$5,574,823.15	$5,632,105.94	$6,282,189.60
Balance	**$3,064,839.72**	**$2,235,436.15**	**$4,602,656.08**	**$5,231,488.46**
(1) Source: Delaware County Auditor, Sales Tax Collections Report (2000-2003)				
(2) Source: Delaware County Auditor, EMS Expenditure Report (2000-2001)				
(3) Source: Delaware County Auditor, Budget to Actual Report (2002-2003)				

Figure 7

For the years of 2000-2003 $10,426,080.41 was not found to have allocated for EMS expenditures. Since the implementation of the piggyback sales tax in 1971, the Commissioners have authorized limited reimbursements to the Fire Department and Liberty Township Fire Departments. Reimbursement has been based on different formularies directed by the Commissioners throughout the years. The formularies include a flat annual amount, per run basis, percentage of piggyback tax revenue, purchase of EMS vehicles, and various combinations of the formularies.

Three EMS billing companies were contacted and questioned on this potential revenue source. Wheeler (2000) indicated in his study that 83% of surveyed departments billed for EMS. The companies were Life-Force Management Inc (Streetboro, OH), Medicount Management, Inc (Cincinnati, OH), and Physicians Choice Management (Westerville, OH). Information was obtained as to billing rates, fees, and collection rates. The billing rates were broken down by transport type (BLS or ALS). BLS type runs ranged from $280.00 to $400.00 billed per transport and ALS type runs ranged from $350.00 to $650.00 billed per transport. The Wheeler (2000) study indicated BLS type runs averaged from $281.00 per transport and ALS type runs averaged $350.00 billed per transport. Fees for the EMS billing companies were eight percent of the collected amount. The range of collection rates was 55% to 72%. The Wheeler (2000) study indicated that the average collection rate was 57%. A common statement by EMS billing companies was that many health care plans calculate EMS transport payments into the health insurance premium. In 2003 the Fire Department transported 2,333 patients to the hospital. Based on a conservative $300.00 per transport, 8% commission, and a 55% collection rate,

revenue for insurance for 2003 would have been $354,149.40. Based on a reasonable $600.00 per transport, 8% commission, and a 72% collection rate, insurance revenue for 2003 would have been $927,227.52.

To get the viewpoint of Ohio's top 25 health insuring corporations a survey (Appendix D) was sent out to them. Of the 25 surveys sent only eight were returned and no response was received from 17 insurers. The results of the returned surveys were;

2 insurers declined to participate.

4 insurers stated that they were dental insurers only and did not offer EMS transport.

1 insurer stated that they were vision insurers only and did not offer EMS transport.

1 insurer stated that they were "going out of business and no longer in health insurance

The survey of health insuring corporations produced no information as to the opinion of EMS billing.

Captain Vanderbosch was interviewed in regards to his thoughts on billing for permits, inspections, and re-inspections. It was his opinion at this time billing for these services would not be worthwhile or did not have the data breakdown to determine the potential revenue. Current inspection management reports of the Fire Department did not breakdown the types of permits issued. The report only indicated a total number of permits that were issued. Without a breakdown of permit types, a permit fee schedule could not be applied to calculate potential revenue.

A fee schedule was obtained from Orange Township Fire Department (Lewis Center, OH). The subject of charging for inspections and re-inspections was discussed with Captain Vanderbosch, Fire Prevention Captain of the Fire Department. Captain Vanderbosch stated that

Delaware's inspected establishments have a great history of compliance with fire code and it is a rare occasion that a citation is issued. It was his opinion that with a successful program charging for inspections would only create problems.

The other point of opinion that Captain Vanderbosch made was that the Fire Department only had two inspectors to inspect all of the establishments in Delaware. If a billing program was put into place it would reduce the number of inspections by consuming inspection time to create bills, collect payments, and the fulfill the accounting duties involved with collecting the public's money.

Question #7- Are there technology and/or local code changes that could reduce the risk to citizens and firefighters?

Technology is continuous creativity and improvement. The Fire Department must continue to look at all forms of technological advances in the business segment, industrial segment, military segment, medical segment, and the transportation segment. The benefits of sprinkler systems and thermal imaging are well documented. CAFS technology has reduced the weight of attack lines, more fire suppression capability than plain water, reduces property damage, and may protect arson evidence.

NIST (2002) shows compelling evidence on the value of residential sprinklers. When 8 out of 10 fire deaths occurred in residential structures, the need for residential sprinkler systems was obvious. The reduction in property damage is also illustrated by the willingness of insurers to reduce home insurance premiums by 10%.

RFSI-2 (2004) states that residential sprinklers help reduce the future demand for firefighters and stations. NFPA 170 requires that a fire company shall arrive on the scene within four minutes of being dispatched. Response times are directly related to the fire propagation

curve in which fire spreads over time. Sprinkler systems control the spread and can apply water to the fire before a single firefighter arrives.

More research needs to be conducted on the benefits of residential sprinklers in residential structures constructed by new construction methods. Examples of new construction methods in residential structures include laminated "I"-beams, stamped metal floor joists, and other engineered systems that are replacing dimensional lumber. Perhaps the new materials do not withstand the heat produced by fire as well as dimensional lumber. If this were found true, a greater need for residential sprinklers would then exist.

NIST (2002) referenced the home insurance savings for homes with residential sprinkler systems installed. A survey (Appendix E) was sent to Ohio's top 25 property and casualty insurers. Fourteen survey responses were received. The results are as follows;

2-declined to participate citing "proprietary information" concerns.

4-stated they were automobile insurers only.

4-stated they were not property and casualty insurers.

1-responded with a letter of support for the research but declined to complete the survey.

2-were completed.

The responses on the completed surveys indicated that that the average residential structure cost $413.00, commercial structure was $1,810.00, and the industrial structure was $18,574.00 per year insurance premium. Both respondents replied that Delaware had an ISO rating of four. By Delaware lowering their ISO rating one point an average reduction of 0% for residential, 3% for commercial, and 4% for industrial structure insurance premiums would be experienced. By Delaware lowering their ISO rating two points an average reduction of 0% for residential, 4% for

commercial, and 5% for industrial structure insurance premiums would be experienced. If automatic sprinkler systems were installed in residential structures the reduction in insurance premiums would range from 8% to 13%. This was based on whether the sprinklers covered part of the house or the whole house. Both respondents indicated that no insurance premium reductions would be given for 5/8-inch drywall, instead of ½-inch, or automatic door closers. When asked if their companies would be in favor local residential building code requiring automatic sprinkler systems, 5/8-inch drywall, or automatic door closing hinges, one respondent replied yes and one respondent replied no to all to all three requirements. In the comments section one respondent noted that their company would support any effort to reduce fire loss.

DISCUSSION

The focus of this research was NFPA 1710. This standard is a very complex and encompasses many aspects of fire and EMS protection. The complexity of NFPA 1710 alone would indicate that the solution would be complex. Add to the formula the citizens of Delaware refused to pay additional taxes increased the need to cast a large net for options. The results and of this research provide many options and many possible solution combinations to achieve NFPA 1710.

Some changes need to be made to improve turnout and call processing times. First the problems causing the delays must be identified. Most of the needs to fulfill NFPA 1710 by the Fire Department came with a price tag. To achieve NFPA 1710 additional personnel would need to be obtained and officer positions would need created and filled. Personnel come with a price tag so alternate funding sources would be the priority emphasis. Research options, based on the results of Koelz (1997) resources were explored. Because of the history and recent discussions with County Commissioners there was readily available data that indicated a large fund source in which Delaware residents already paid, but did not receive a fair share from. In order to justify a fair share research into the purpose of this fund was conducted. Third party accounts, such as newspapers, revealed the intent of this sales tax. There is no refuting that the sales tax was to be strictly used for EMS. Pursuing these funds will show Delaware citizens that Delaware Administrators have represented them and fought for their best interests.

Knowing that it was not prudent to rely on a single source of alternate funding led to researching EMS billing. With increasing demands for EMS service the potential revenue source was certainly a must to research. EMS billing would provide another needed revenue stream. It also placed a bigger share of the cost to provide EMS service back on those who use it. Some do

not pay for Fire Department EMS services yet receive the service when needed. These include non-residents visiting or passing through Delaware. Other revenue streams were researched, but Delaware County and EMS billing should be the first resources to explore.

Once additional funding is obtained then organizational changes and staff recruiting can begin. Organizational changes need to be made to create a reasonable span of control and division of work. This includes increasing the number of supervisor positions. This will create the groundwork for additional stations to reduce response times. With the additional personnel dispatching and fireground policies would need changed to include personnel numbers for responses. Other forms of staffing need to be explored. Another resource is the use of automatic response. Automatic response should be used during first alarm assignments to put more personnel on the scene with lesser response times. Another personnel source that should be researched more extensively is a residency program. Not only is it cost effective staffing it creates additional educational training opportunities for personnel. An apprenticeship program has advantages as well, especially for spot scheduling of personnel. This would create available personnel around the clock instead of the limited hours that personnel in a residency program would have.

Most of what has been discussed already is reactive preparation, that is building up for emergencies. More emphasis must be placed on the prevention of incidents. The Fire Department needs to be more actively involved in prevention and public education. The Fire Department has allies in prevention from the insurance companies. In addition to school programs, public presentations, and public service announcements, the Fire Department has to address the fact that more fire deaths (8 out of 10) have occurred in a residential structures more often than any other structure type. This fact cannot be overlooked. This same statistic holds true for Delaware. The

Fire Department must take a hard line stance to prevention in the form of residential sprinkler systems. The homebuilders must be expected to resist, but the Fire Department must persistently work to cause residential sprinkler systems to be required in Delaware building code.

Technology must be a continuous and ongoing process. The Fire Department must continue to find new solutions to old problems and new problems alike. Technology that improves the senses of firefighters, causes more efficient work, increases productivity, and improves safety must be sought and utilized. Thermal imaging, CAFS, battery powered equipment, computers, and so on. Funding must be allocated to explore new technologies. Technology has a history of making operations safer and more effective.

The Fire Department must start immediately addressing NFPA 1710. As can be seen above, by confronting the Fire Department's non-compliance issue of NFPA 1710 the Fire Department will cause improvements in many other aspects. The result equates to safer emergency scene operations in which the Fire Department can better serve the citizens of Delaware. NFPA 1710 is the standard, not the problem.

RECOMMENDATIONS

Question #1- Can the Fire Department better utilize current fire department staffing to accomplish NFPA 1710?

Currently, the Fire Department has 40-personnel scheduled Monday through Friday from 8:00 A.M. until 4:30 P.M. These personnel occupy the positions of Fire Chief, Training Captain, Fire Prevention Captain, and an Inspector. The crew strength is 12 personnel. Nine personnel are expected on a crew due to three personnel permitted to be off duty by Agreement 2001. If a fire emergency is received typically the crew and periodically the Training Captain responds. The responding personnel could be increased by three if the Training Captain, Inspection Captain, and Inspector automatically responded to fire emergencies.

The Fire Department should conduct trials of spot staffing for the purpose of increasing available personnel for emergency response during the peak run periods. Though not a problem at this point, future consideration may be given to spot staffing if EMS run volumes would indicate the need. Spot staffing would also be beneficial for training events. One possibility is to remove one person from each of the three crews and assign them to a 40-hour position. This position should be assigned an eight-hour or ten-hour shift starting after 5:00 P.M. This would reduce the crew assignment from twelve to eleven, but increase the personnel on duty to 12 during peak periods (assumes three personnel have taken some form of leave or time off). Another advantage of spot scheduling is that crewmembers could be offered rest periods from EMS emergencies after 5:00 P.M. Another variation of this spot schedule would be to remove two persons from each crew, instead of one, and assign them to a 40-hour position. This would reduce the crew assignment from twelve to ten, but increase the personnel on duty to 13 during peak periods (assumes three personnel have taken some form of leave or time off).

By Agreement 2001, when on-duty personnel levels drop below the threshold of five, off-duty personnel are called to the Fire Department and paid at the overtime rate (Call-in overtime). Moving personnel from 50-hour weeks to 40-hour weeks would increase the overtime rate for personnel on 40-hours, but the on-duty personnel increase during peak times should reduce the incidence of Call-in overtime.

The results for Question #1 identify and justify the need to increase supervisory personnel (Officers). With this requirement, the Fire Department Organization Chart (Appendix A) would need changed. Suggested changes to the Organization Chart are identified in Alternate 1 (Appendix B) and Alternate 2 (Appendix C). The Fire Department has had a Lieutenant rank in the past. The historical first year difference between a Step 5 firefighter base wage and a Lieutenant's was 5%. The first year base wage cost to implement Alternate 1 would be $13,669.80. This is based on 5% above a Step 5 firefighter base wages defined in Agreement 2001. The Battalion Chief would be a new position for the Fire Department. To implement Alternate 2, a pay and benefits package would need to be established for Battalion Chiefs. A cost to implement Alternate 2 is not available.

Question #2- Can NFPA 1710 be accomplished by changing response polices, and fire ground procedures?

Department SOG's for fire response and fireground operations need to be updated. Fire response guidelines need to include numbers of personnel in addition to apparatus response. Fire response guidelines need to include procedures for obtaining additional personnel shortly after dispatch and prior to responding to fire incidents. NFPA 1710 time requirement will not be met if the Fire Department waits until arrival on the scene to request additional personnel. Response polices need to be updated to reflect the recommendations found below for Question #4 and

Question #5.

More testing needs to be conducted on reassigning fireground personnel from short-term assignments. If the results of testing indicate that doing reassigning personnel meets with equivalency then documentation must be submitted to AHJ and implement.

The results of call processing, turnout, and response times indicate success and failure. Research needs to be conducted to determine why call processing times are being met for EMS, but not fire. Turnout times seem to be correctable internally. These times need evaluated more to determine whether training, vehicle maintenance, building maintenance, or other causes may be a factor in increased turnout times. More research needs conducted on response times. The apparent solution would be to build more stations due to land annexations and growth. Automatic response agreements (See Recommendations, Question #5) may be part of the solution to reduce response times.

Question #3- Can NFPA 1710 be accomplished using alternate staffing methods?

An apprenticeship program has benefits other than lower cost supplemental staffing. An apprenticeship program can also create a pool of trained personnel for full-time position vacancies. It also creates an additional human resource for large-scale incidents and disasters. A cooperative effort between City Administration and IAFF 606 needs to be made. The Dayton Fire Department, Dayton, OH, Washington Township Fire Department, Dublin, OH, and the International Association of Firefighters have apprenticeship style programs. These entities should be contacted to help establish such a program.

More operational and budgetary information on The Hyattsville Fire Department and the Richland Township Fire Department residency programs need to be obtained. Operational information needs to include building design information and cost estimates. OWU and several

other local colleges should be contacted, provided information about this residency program, and then surveyed on the concept of participating in a residency program. This program would assist with supplemental staffing and perhaps create a mutual cooperation of educational benefits. A cooperative program could create a unique educational concept for the college and college level education for firefighters. A program of this type could assist in meeting the prerequisite courses of anatomy and physiology for paramedic training.

Question #4- Can NFPA 1710 be met with the current mutual aid agreements?

Mutual aid will still have its place for large-scale incidents, additional alarms, and specialized apparatus requests, but not for first alarm assignments in Delaware. In order to meet personnel and response time requirements of NFPA emergency apparatus needs to be dispatched within 60 seconds of the completed receipt of an emergency alarm. This would necessitate automatic response for first alarm assignments.

The Fire Department should update response policies and mutual aid agreements to redefine mutual aid requests. Mutual aid requests should be for additional alarms, disasters, and requests for specialized equipment.

Question #5- Can NFPA 1710 be met with automatic response agreements?

The Fire Department should meet with Tri-Twp to evaluate response times in each department's response areas. They should then use the data to establish automatic response areas in where the department with the best response history responds to the first alarm, with the other, regardless of whose response area it is. Other considerations for automatic response should include specialized equipment being dispatched for special incident or locations. Examples of such equipment would include rescues, aerial ladders, tankers, boats, and the like. This policy and guideline change could have minimal, if any, additional costs to either department.

<u>Question #6</u>- Are there alternate funding sources or methods that can fund additional staffing?

There is certainly strong evidence to support the claim that the one-half percent piggyback sales tax was to be used solely for emergency services. Since the piggyback sales tax is collected throughout all of Delaware County, the tax should be distributed equitably amongst all EMS providers in Delaware County. The historical record has clearly established that the piggyback sales tax was to be used for EMS services in all of Delaware County. City Council, along with the remaining EMS providers in Delaware County, should meet with the Commissioners to cause the fair and equitable distribution of the piggyback sales tax revenue. Should the commissioners be unwilling to do implement a fair and equitable plan, then by joint effort of the EMS providers, a repeal of the piggyback sales tax should be initiated and presented to Delaware County voters. Figure 8 illustrates a fair and equitable distribution of the piggyback sales tax. There are 17 EMS units operating from within Delaware County. A fair and equitable distribution would provide each EMS unit with one-seventeenth of the total piggyback sales tax revenue.

	# EMS Units	Revenue share 2002	Revenue Share 2003
County(Not covered by below)	9	$5,418,403.42	$6,095,476.62
Delaware City	3	$1,806,134.47	$2,031,825.54
Concord Twp	1	$602,044.82	$677,275.18
Genoa Twp	1	$602,044.82	$677,275.18
Harlem Twp	1	$602,044.82	$677,275.18
Liberty Twp (& Powell)	1	$602,044.82	$677,275.18
Orange Twp	1	$602,044.82	$677,275.18
Total	17	$10,234,762.02	$11,513,678.06

Figure 8

Should a piggyback sales tax initiative need to be initiated, Figure 9 illustrates what each EMS service provider would need, in terms of mills to replace the piggyback sales tax.

	2003 Property Valuation	Mills to Replace Sales Tax	Addtl Cost to $150,00 home(2)
County(Uncovered by below)	$1,403,751,668.00	4.34	$132.98
Delaware City	$590,357,111.00	3.44	$105.40
Concord Twp	$259,545,607.00	2.61	$79.91
Genoa Twp	$647,764,513.00	1.05	$32.02
Harlem Twp	$92,768,993.00	7.30	$223.58
Liberty Twp (& Powell)	$891,366,025.00	0.76	$23.27
Orange Twp	$685,254,073.00	0.99	$30.27

Figure 9

The potential revenue from EMS billing is significant and cannot be overlooked. As mentioned early it shifts some of the financial cost back to those who use EMS services, without creating a hardship. The Fire Department should interview EMS billing companies and select one to initiate a program suited for Delaware. The EMS billing companies have personnel on staff to develop a community promotional campaign, as well as the background and resources to establish a successful program.

<u>Question #7-</u> Are there technology and/or local code changes that could reduce the risk to citizens and firefighters?

The Fire Department must continuously research new technologies to improve emergency operations, reduce firefighter fatigue, and reduce life and property losses.

The Fire Department currently owns thermal imaging camera technology in the form of a hand-held unit. The obvious disadvantage of the hand-held unit is that a firefighter must have one hand on the camera and only one on a hose line or tool. A firefighter could be assigned to the hose line and one to the camera. Extra staffing is not a luxury the Fire department has. Helmet mounted units are now available and would enable a firefighter on a hand line to efficiently handle the hose line and utilize thermal imaging technology simultaneously.

The CAFS information should be reviewed and updated. When the Fire Department is in need of a fire engine replacement, this technology information should be made available to the apparatus committee for consideration of inclusion.

The Fire Department should initiate a task force to review model residential sprinkler ordinances and adopt the ordinance into Delaware residential building code. This ordinance will obviously affect new residential structures the most. New residential growth, however, is greatly responsible for creating the problem of increased demand for service and increased response times. The insurance companies that responded to the survey (Appendix E) both offered lower premiums and one of the respondent companies supported local building code ordinances requiring residential sprinkler systems.

Research needs to be conducted on the benefits of residential sprinklers in residential structures constructed by new construction methods. If new construction methods in residential structures are determined to be vulnerable or subject quicker failure due to fire conditions this would further support the need for residential sprinklers.

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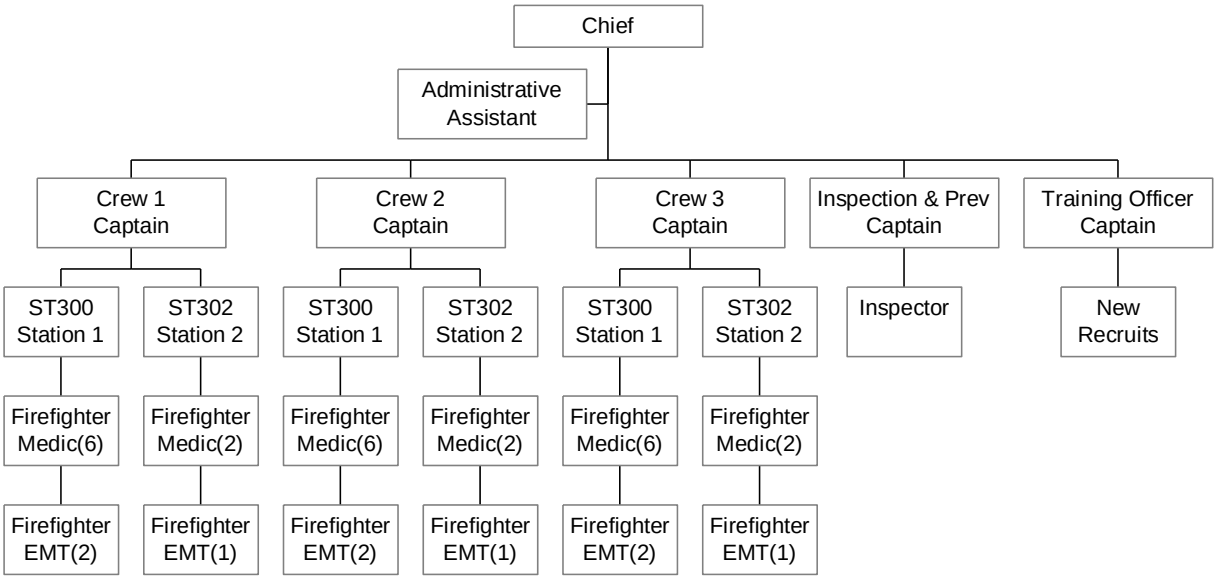
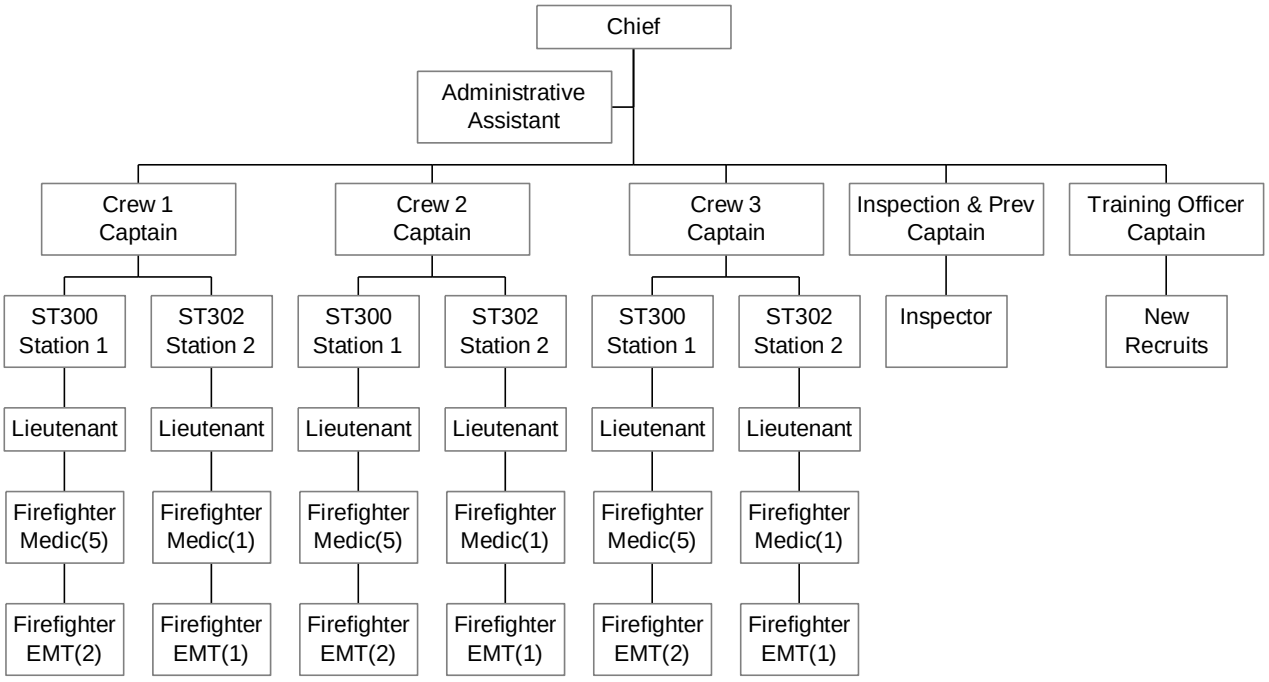
APPENDIX A – ORGANIZATION CHART (CURRENT)

Delaware City Fire Dept



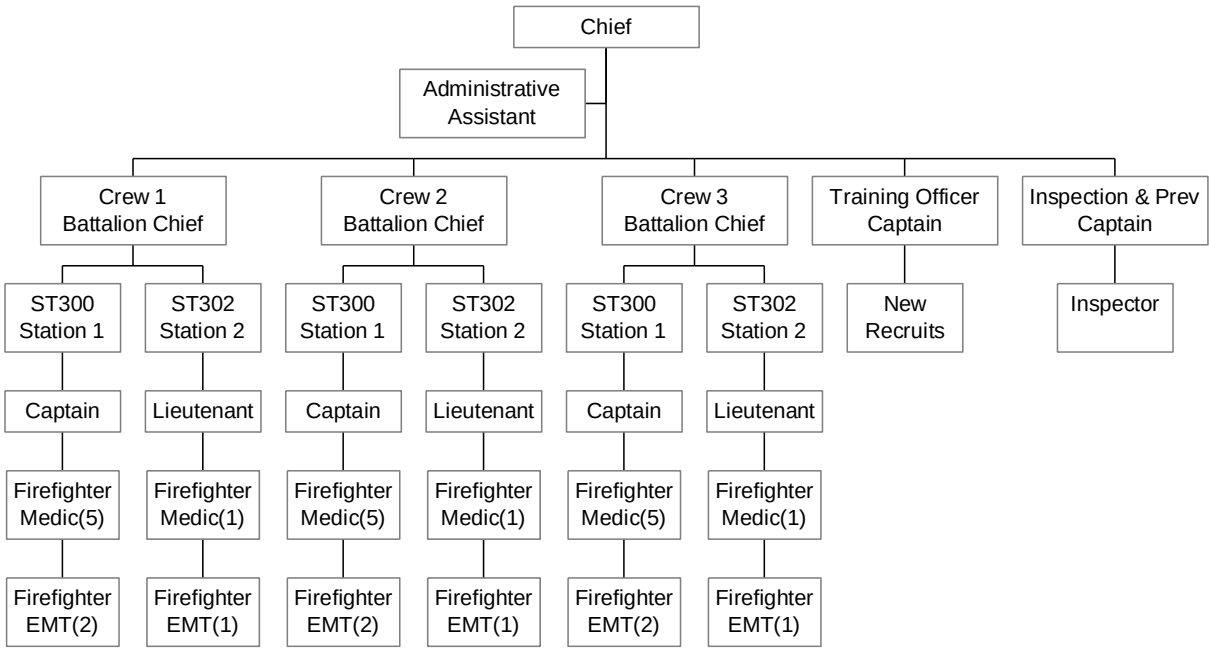
APPENDIX B – ORGANIZATION CHART (ALTERNATE 1)

Delaware City Fire Dept



APPENDIX C – ORGANIZATION CHART (ALTERNATE 2)

Delaware City Fire Dept



APPENDIX D – HEALTH INSURERS SURVEY

OHIO HEALTH INSURERS

1) What percent of health claim costs are associated with emergency medical transportation?

_____%

2) What is the average health care premium in Ohio for

a. Individual (0- 40 years old) $_____

b. Individual (41- 65 years old) $_____

c. Individual (65 or more years old) $_____

d. Family (4 persons) $_____

e. Family (5 persons) $_____

f. Family (6 or more persons) $_____

3) In Ohio, is an emergency medical service provider in the majority or minority if they bill insurance companies for emergency patient transport?

___ Majority ___ Minority

4) Do you anticipate that emergency medical transportation billing will cause health insurance premium or deductible rates to increase?

___ Yes ___ No (go to Question #8)

5) If your answer to # 4 was "Yes", what will increase

___ Individual Policy Premiums? ____ All Area Policy Premiums?

6) **If your answer to # 4 were "Yes", at what point would your company's premium increase for the following policy types that are in?**

Individual policy: **Number of claims paid for transportation = _____**

Amount of claims paid for transportation = $_____

All area policies: **Number of claims paid for transportation = _____**

Amount of claims paid for transportation = $_____

7) **If your answer to # 4 was "Yes", what amount of increase do you anticipate?**

$ _____ or _____% per _____

8) **Do you feel that emergency medical transportation billing is a fair means in which to recover partial service provider costs?**

___ Yes ___ No

9) **Do you have any other suggestions or ideas that you believe would help emergency medical transportation services with funding (except for new taxes) or reducing operational costs?**

_____
_____
_____
_____
_____

Company Name : _____
Your Name: _____
Best way to contact you: _____

APPENDIX E – PROPERTY & CASUALTY SURVEY

OHIO PROPERTY & CASUALTY INSURERS

1) What is the average insurance premium for…

a. Residential Structure: Single family, 5 years old, $150,000 structure value?

$_____ Per year

b. Commercial Structure: Office use, 5 years old, $1,000,000 structure value?

$_____ Per year

c. Industrial Structure: Light manufacturing, 5 years old, $5,000,000 structure value?

$_____ Per year

2) What is the ISO rating for Delaware, OH, 43015 in the incorporated areas?

_____

3) If the Delaware City Fire Department made improvements to lower their ISO rating by 1 point, what percentage reduction of insurance premiums could be experienced for

d. Residential? _____%

e. Commercial? _____%

f. Industrial? _____%

4) If the Delaware City Fire Department made improvements to lower their ISO rating by 2 points, what percentage reduction of insurance premiums could be experienced for

g. Residential? _____%

h. Commercial? _____%

i. Industrial? _____%

5) If automatic sprinkler systems <u>alone</u> were installed in residential structures, what insurance premium reductions could be experienced?

j. New built? _____%

k. Existing Structures retrofitted with a sprinkler system

i. 5 to 9 years old? _____%

ii. 10 to 14 years old? _____%

iii. Fifteen or more years old? _____%

6) If 5/8" drywall were used instead of 1/2" for all interior wall and ceiling surfaces <u>alone</u> were installed in residential structures, what insurance premium reductions could be experienced?

l. New built? _____%

m. Existing Structures updated with 5/8" drywall

i. 5 to 9 years old? _____%

ii. 10 to 14 years old? _____%

iii. Fifteen or more years old? _____%

7) If automatic door closing hinges <u>alone</u> were installed in residential structures, what insurance premium reductions could be experienced?

n. New built? _____%

o. Existing Structures updated with automatic door closing hinges

i. 5 to 9 years old? _____%

ii. 10 to 14 years old? _____%

iii. Fifteen or more years old? _____%

8) If automatic sprinkler systems, 5/8" drywall, and automatic door closing hinges all together were installed in residential structures, what insurance premium reductions could be experienced?

p. New built? _____%

q. Existing Structures updated with automatic sprinkler systems, 5/8" drywall, and automatic door closing hinges

i. 5 to 9 years old? _____%

ii. 10 to 14 years old? _____%

iii. Fifteen or more years old? _____%

9) Would your company be in favor of local residential building code ordinances that required

r. Automatic sprinkler systems? Yes or No

s. 5/8" drywall instead of 1/2"? Yes or No

t. Automatic door closing hinges? Yes or No

10) What other efforts do you feel could be made by fire departments to save lives, reduce firefighter and civilian injury, and reduce property losses?

_____

_____

_____

_____

_____

Company Name : _____
Your Name: _____
Best way to contact you: _____

APPENDIX F - BUILDER SURVEY

DELAWARE, OHIO BUILDERS

1) What is the average cost for a new single-family residential structure built by your company in Delaware, Ohio?

$_____

2) What is the average square footage of a new single-family residential structure built by your company in Delaware, Ohio?

_____

3) What would the cost of a residential sprinkler system be for an average, new single-family residential structure built by your company in Delaware, Ohio?

$_____ in addition to the cost of the home.

_____% more to the cost of the home.

4) What would the additional cost of using 5/8" drywall instead of 1/2" drywall be for all interior walls and ceiling surfaces for an average, new single-family residential structure built by your company in Delaware, Ohio?

$_____ in addition to the cost of the home.

_____% more to the cost of the home.

5) What would the additional cost of using automatic door closing hinges be for an average, new single-family residential structure built by your company in Delaware, Ohio?

$_____ in addition to the cost of the home.

_____% more to the cost of the home.

6) What would the cost difference be for using one of the structural members below, *instead* of using dimensional lumber for floor joists, for an average, new single-family residential structure built by your company in Delaware, Ohio?

Metal joists $_____ or _____% more / less (circle one)

Engineered wood joists $_____ or _____% more / less (circle one)

7) Would your company be in favor of local residential building code ordinances that required new structures to have;

u. Automatic sprinkler systems? Yes or No

v. 5/8" drywall instead of 1/2"? Yes or No

w. Automatic door closing hinges? Yes or No

8) If you answered "No" to 7a, 7b, or 7c, please explain why.

9) What other efforts do you feel could be made by builders and/or fire departments to save lives, reduce firefighter and civilian injury, and reduce property losses?

Company Name : _____
Your Name: _____
Best way to contact you: _____

APPENDIX G – 2002 TOP 25 HEALTH INSURERS IN OHIO

RANK	COMPANY NAME	OHIO PREMIUMS
1	* United Healthcare of OH Inc	1,484,812,253
2	* Health Maintenance Plan (Community)**	1,167,629,109
3	* Kaiser Fndtn Health Plan OH	499,558,393
4	* Paramount Health Care	453,662,944
5	* Humana Health Plan of OH Inc	378,967,956
6	* Aetna Health Inc	378,264,337
7	* Dayton Area Health Plan	373,116,251
8	* Summacare Inc	253,681,745
9	* Qualchoice HMO**	221,744,710
10	* Medical Health Insuring Corp of OH	201,042,960
11	* Mount Carmel Health Plan Inc	112,533,192
12	* Hometown Health Plan	106,175,914
13	* Delta Dental Plan of OH Inc	102,472,385
14	* Primetime Medical Ins Co**	90,228,696
15	* Family Health Plan	86,639,948
16	Health Plan of The Upper OH Valley Inc	70,257,731
17	* Vision Service Plan	41,313,658

18	* Dental Care Plus Inc	23,930,049
19	* Superior Dental Care Inc	16,267,178
20	* Cigna Healthcare of OH Inc	13,706,492
21	* Vantage Health Plan Inc	13,520,287
22	* Cigna Dental Health of OH Inc	12,621,885
23	* One Health Plan of OH Inc	12,368,202
24	Healthamerica Pennsylvania	11,511,707
25	* Aultcare Hmo	10,286,089

APPENDIX H – 2002 TOP 25 PROPERTY & CASUALTY INSURERS IN OHIO

RANK	COMPANY NAME	OHIO PREMIUMS
1	* Community Ins Co	2,614,373,003
2	* Medical Mut Of OH	1,435,773,488
3	State Farm Mut Auto Ins Co	949,506,998
4	* Cincinnati Ins Co	630,909,896
5	State Farm Fire And Cas Co	479,555,189
6	* Grange Mut Cas Co	428,949,362
7	* Qualchoice Health Plan Inc	371,946,266
8	* Nationwide Mut Fire Ins Co	369,371,045
9	Allstate Ins Co	357,329,834
10	* Nationwide Mut Ins Co	334,730,474
11	Anthem Ins Co Inc	271,955,929
12	* Progressive Preferred Ins Co	258,089,638
13	* Westfield Ins Co	246,127,978
14	* Motorists Mut Ins Co	217,209,685
15	* State Automobile Mut Ins Co	204,145,065
16	Erie Ins Co	166,811,854
17	Federal Ins Co	165,561,236
18	Continental Cas Co	143,343,461
19	National Union Fire Ins Co Of Pitts	139,281,894

20	* Westfield Natl Ins Co	139,094,038
21	* Progressive Max Ins Co	126,793,995
22	* Farmers Ins Of Columbus Inc	117,095,571
23	* Primetime Medical Ins Co	114,986,376
24	* American Family Ins Co	110,502,205
25	* Progressive Halcyon Ins Co	108,657,952

APPENDIX I – DELAWARE BUILDERS SURVEY LIST

1. Bob Webb Builders
2. MI Homes
3. Dominion Homes
4. Centex Homes
5. Meridian Homes
6. Rockford Homes
7. Moronda Homes
8. Gladman Builders
9. Wayne Homes
10. Ryland Homes
11. Medallion Homes