Final Report

Fire Operations

Town of Auburn, Alabama

FIRE OPERATIONS FIRE OPERATIONS

ICMA CONSULTING SERVICES

Submitted by and reply to:

Public Safety Services

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ICMA

Leaders at the Core of Better Communities

ICMA Background

The International City/County Management Association (ICMA) is the premier local government leadership and management organization. Since 1914, ICMA's mission has been to create excellence in local governance by developing and advocating professional local government management worldwide. ICMA provides an information clearinghouse, technical assistance, training, and professional development to more than 9,000 city, town, and county experts and other individuals throughout the world.

ICMA Consulting Services

The ICMA Consulting Services team helps communities solve critical problems by providing management consulting support to local governments. One of ICMA Consulting Services' areas of expertise is public safety services, which encompasses the following areas and beyond: organizational development, leadership and ethics, training, assessment of calls for service workload, staffing requirements analysis, designing standards and hiring guidelines for police and fire chief recruitment, police/fire consolidation, community-oriented policing, and city/county/regional mergers.

Performance Measures

The reports generated by the academic data analysis team are based upon key performance indicators that have been identified in standards and safety regulations, by special interest groups such as the International Association of Fire Chiefs (IAFC), International Association of Fire Fighters (IAFF), Association of Public Safety Communication Officials – International (APCO), and through the Center for Performance Measurement of ICMA. These performance measures have developed following decades of research and are applicable in all communities. For that reason, comparison of reports will yield similar reporting pictures; the individual data is analyzed community by community by the ICMA specialists.

Contents

Executive Summary

The City of Auburn, Alabama serves as an example of using creative approaches to provide emergency services. It has been featured by the ICMA as one approach to successfully managing increasing costs of providing public safety services through a college firefighter program. The program utilizes students attending Auburn University as career, professional firefighters in exchange for tuition assistance. This year alone the program will save the city $1.23 million in personnel costs.

The City sought a comprehensive analysis of its public safety operations to determine if it was efficient, effective, and safe as well as look for opportunities to improve the existing services. It contracted with ICMA Consulting to evaluate its operations both from a data analysis as well as operational analysis. This report addresses the operations and data analysis for the Fire Division of Auburn Department of Public Safety.

The Auburn Department of Public Safety is the umbrella organization for four divisions: Fire Division, Police Division, Communications Division, and Codes Enforcement Division.

The presence of Auburn University has a significant impact on the city and the department.

The presence of the university poses significant challenges to the city and, in particular, the department. On football game weekends, the population can swell in the city by more than 100,000. In the case of games that are televised and at night, this population impact is felt across multiple days and more than doubles the regular demographics. The university and surrounding buildings are also alarmed and the Fire Division is deployed more on alarm calls than fire and EMS calls combined. This is an area of concern that will be addressed later in the report.

With a significant student population, a large number of industrial jobs, and continued growth, Auburn faces a number of challenges. To address these challenges it must continue to approach deployment and response in a non-traditional method for the most cost effective, efficient, and safe use of resources.

At the same time, there are several key components that Auburn can utilize to create a department that serves both current and future needs and demands. These components include:

- Installation of sprinkler system and fire protection control mechanisms. Efforts should be reviewed to determine how to sprinkle as may occupancies in the city as possible. Tax credits, loans through the stimulus program, or grants through home improvement funds should be reviewed for applicability for assisting with the installation of sprinkler systems in as many structures as possible. Any renovation work, particularly in student-occupied structures, should require sprinkler installation. Fire alarms are consuming a large portion of the deployed resources. An enforced ordinance should be created to discourage false alarms caused by preventable system failures.
- Deploying resources through the concept of integrated risk management planning that utilizes the resources not just from the fire division but also public works, police, code enforcement, and other city divisions/departments. Integrated Risk Management Plans focus emergency response to meeting the

needs of people, not property. The plans integrate risk assessments, deployment of resources, and enforcement with mitigation and prevention with the goal of eliminating calls for service. These will be discussed in detail in later sections. The IRMP process should not be confused with internal risk management; it provides the framework for strategic deployment of emergency services.

- Developing volunteer programs that utilize the considerable talent found in the community, especially at the university. Both educators and students can assist the department in positioning itself for not just today but well into the future. In areas of information technology, records management, and communication, the college has resources that are rarely found in similarly sized cities and that may be accessible at no or low cost. For planning, particularly strategic planning, the college should at least be tapped to facilitate creation of a comprehensive citizen-involved strategic plan. The effects of the economy on city finances should drive a discussion on what services are mandated, desired, or could be provided contractually by others. The student firefighter program model could be expanded to encourage students pursuing education degrees to participate in designing, developing, and presenting education programs for the Fire Division to the community; particularly peer-to-peer with students. ICMA's team regularly finds that communities have a struggle with reaching diverse demographic groups; the young-adult generation attending Auburn is a particularly difficult group with which to communicate using traditional means.
- Regularly evaluating the risks that are present in the community. The presence of a significant young-adult population is a risk that must be considered when deploying and designing resources, because of the unique

challenges this population places upon emergency response. These risks include first-time renters, disposable income limitations which forces more entertaining within residences, general housekeeping, and unfamiliarity with codes and enforcement. In addition to evaluating, the risk assessment should be integrated with hazards in the community to produce an All-Hazard Risk Management Plan. The Plan should incorporate resource support from other city agencies as well as mitigation and prevention steps that can be implemented to minimize exposure. The shared plan should be presented to the Authority Having Jurisdiction. Risks and response should be regularly reviewed using the COMPSTAT or Comparative Statistics models.

- Deploying resources based upon risk and hazard, with an even greater emphasis on prevention. The deployment process that is proposed for Auburn will also involve monitoring performance using benchmarks and baselines established by various standards and processes. These standards and processes include the 8th (and 7th) Edition of the Fire and Emergency Service Self-Assessment Manual issued by the Commission on Fire Accreditation, the Vision 20/20 Committee of the International Association of Fire Marshals, the International Codes Council, and the Center for Performance Measurement of the ICMA. Portions of the benchmarks are also used in developing standards such as the NFPA 1710 and 1720 Deployment Standards along with NFPA 1221 for Communication Systems. By definition, benchmarks are the performance levels achieved by agencies of like demographics and deployment. Baseline performance is the level of service achieved by the City of Auburn. By comparing these two points, Auburn will be able to continually adjust and improve (if possible) its service delivery and eliminate problems.

- Evaluation of communication and response times should take place on a regular basis with times lowered to levels established by professional standards and organizations. The ICMA can assist with further analysis in the communication area to determine how to reduce lengthy times now required to process data and information.
- Evaluate lease-purchase of major equipment purchases to spread costs evenly across budget years as well as provide more reliable and cheaper-to-operate vehicles.
- Greater use of technology in the Fire Division to transfer information and data. With the use of technology is the challenge of improving interoperability with existing programs and systems.

I. Creating the Department for the Future, Today

The ICMA team was impressed with the caliber of employees and the level of professionalism in the department, as well as the administration.

The department and city are taking a progressive view, looking at how resources can be shared rather than duplicated and how preventive strategies can be incorporated in all aspects of city development.

A. Administrative

The city budget, like most of those in the United States, has seen a flat revenue stream. It was anticipated that 2009 would begin to see an upswing in revenues, but this projection has been revised to 2011 or 2012. While revenues have remained flat, expenses have not. In Fiscal Year (FY) 2006, $383,412 was spent on equipment and building improvements; in FY 2007 $1,914,553.43 was spent on a new ladder truck, additional vehicles and a new fire station; in FY 2008 $112,422.70 was spent on non-capital emergency gear and additional building improvements and in FY 20009 $64,639.80 was spent on equipment, additional vehicles and turnout gear. A new engine has been authorized for $275,000.

The administration in the Fire Division is to be commended, and was a pleasure to work with. The benefits of the student program could not be better displayed than by the fact that the deputies in the department all came up through the student program and are today leading the next generation of employees. The fact that most firefighters in the department have college degrees also speaks to the value of the program.

In preparing for the future, ICMA recommends that a citizen-involved strategic planning session be conducted to ensure that goals and objectives adopted by the department meet the expectations of citizens, college officials, students, businesses, and industry. The process can also be used to determine if the expectations are funded, will require additional funding, or should be funded by others.

The City has contributed considerable resources to providing for emergency response. Determining if the level of effort is meeting the desires and needs of elected and appointed officials along with citizens is normally developed using a strategic planning process. Strategic planning provides objectives that can be developed and supported through the budgetary process and individual/group goals and objectives. Without strategic planning and thinking, most emergency services focus on tactics: specific pieces of equipment, stations, personnel, etc. Without strategy, most divisions resort to arbitrary standards and processes that are shrouded in tradition versus meeting a desire/need expressed by the authority having jurisdiction (AHJ) and citizens.

The department could also work with industry officials to determine the need for confined space personnel. If there is a need by particular firms, they may be willing to contribute to establishing and funding a team within the Fire Division to alleviate the need to train, equip, and deploy their own resources. An example as to the benefits of this approach can be found with the confined space efforts on the university campus. This requires an expansion of traditional services offered by the city and should be developed through a strategic process development with the associated costs and revenues identified. By combining efforts, companies, the city, and the university may save money and the department would gain additional expertise.

Similarly, hazmat situations are likely to occur and have occurred on the campus. The city has funded the hazmat efforts. Because of the complexity and variety of ongoing hazmat processes, particularly on the university, the college and city should form a joint team, with the college taking the lead on levels beyond operations (technician, etc.). It is extremely costly to prepare for mitigating incidents that have occurred and the city is limited in what costs it can recover. By joint development with university incidents mitigated by university personnel and with university funds, it relieves the city of this liability. Because it has the chemicals and trained personnel, the school could serve as a resource to the department on such incidents should they occur off campus. In those cases, a cost recovery ordinance could be enacted. This could preclude purchase of expensive equipment and materials by the city. Businesses that may benefit from this arrangement might also participate voluntarily.

The challenge to most fire departments revolves around identifying what is necessary and likely to occur in their communities. Hazmat response capability and many other functions are great enhancements to a department; they are also very costly to maintain fixed assets as well as skill/training. However, the ICMA team has seen millions of dollars of specialized equipment going to waste because a department first did not identify a detailed strategy for its use and did not maintain firefighter skills or the equipment. Specialized hazmat equipment has a shelf-life; it must be periodically replaced and grants that were originally used for its purchase may no longer be available. Departments can seek grant funding to upgrade equipment; they cannot use grant funds to replace through obsolescence. When seeking to replace hazmat and other grant-funded equipment, upgrades should be the focus of applications.

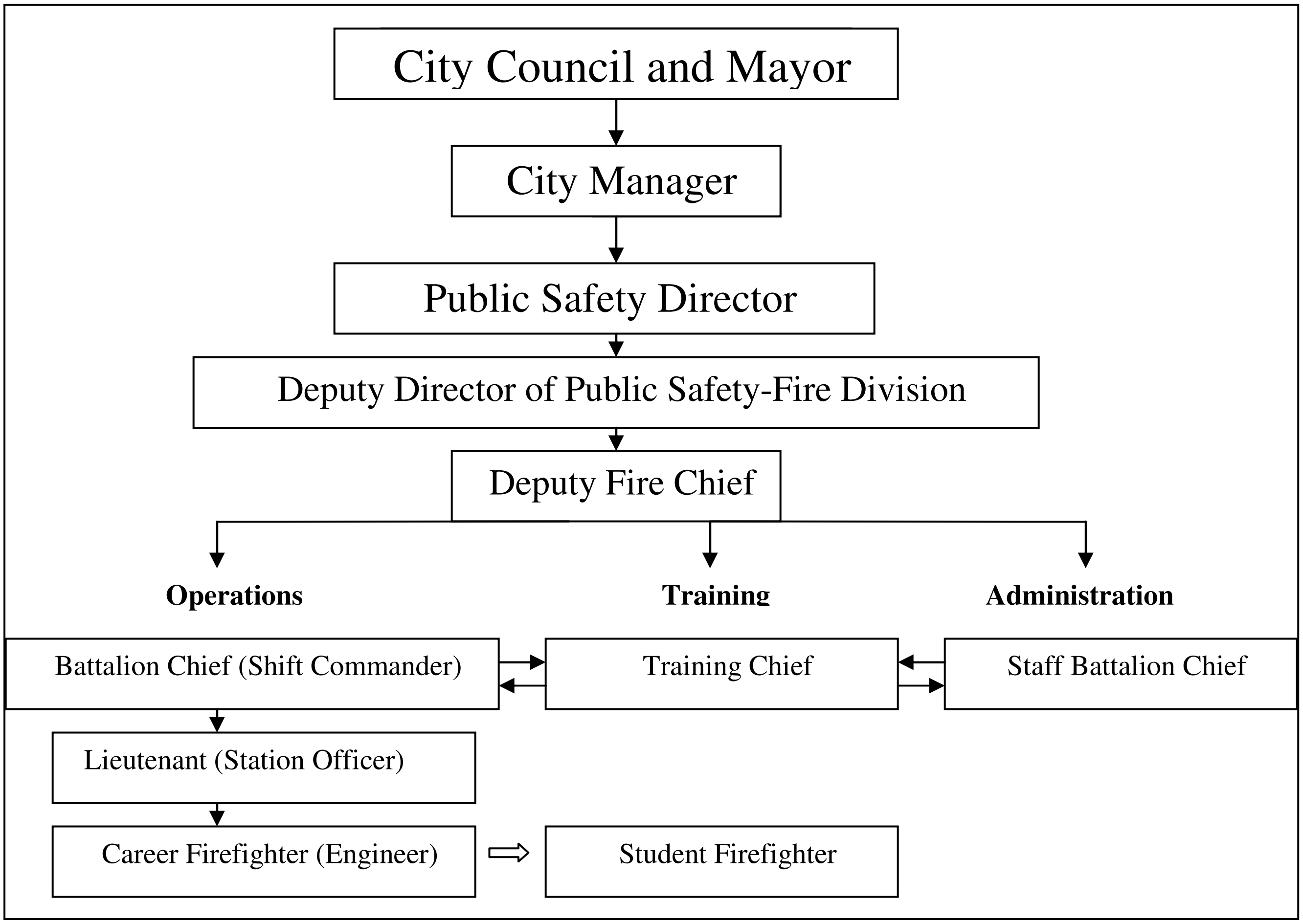
By developing strategy jointly among all sectors of the community, many goals and objectives established by the department can be carried out by partners, such as the university. A report card can then be established within the department to report to the authority having jurisdiction, the administration, and citizens on progress being made (or not being made).

Examples of successful partnership include (small agency): Ionia Public Safety Department in Ionia, Michigan. A larger community that opted to integrate and utilize the Department of Public Works for all confined entry processes: Lacey, Washington. The focus of efforts is to meet the community needs while minimizing the need to exhaust local resources (financial and human).

Focusing on strategy enables the department to look at a variety of tactics to accomplish the strategy and not rely on "tradition" to make decisions or to operate the department.

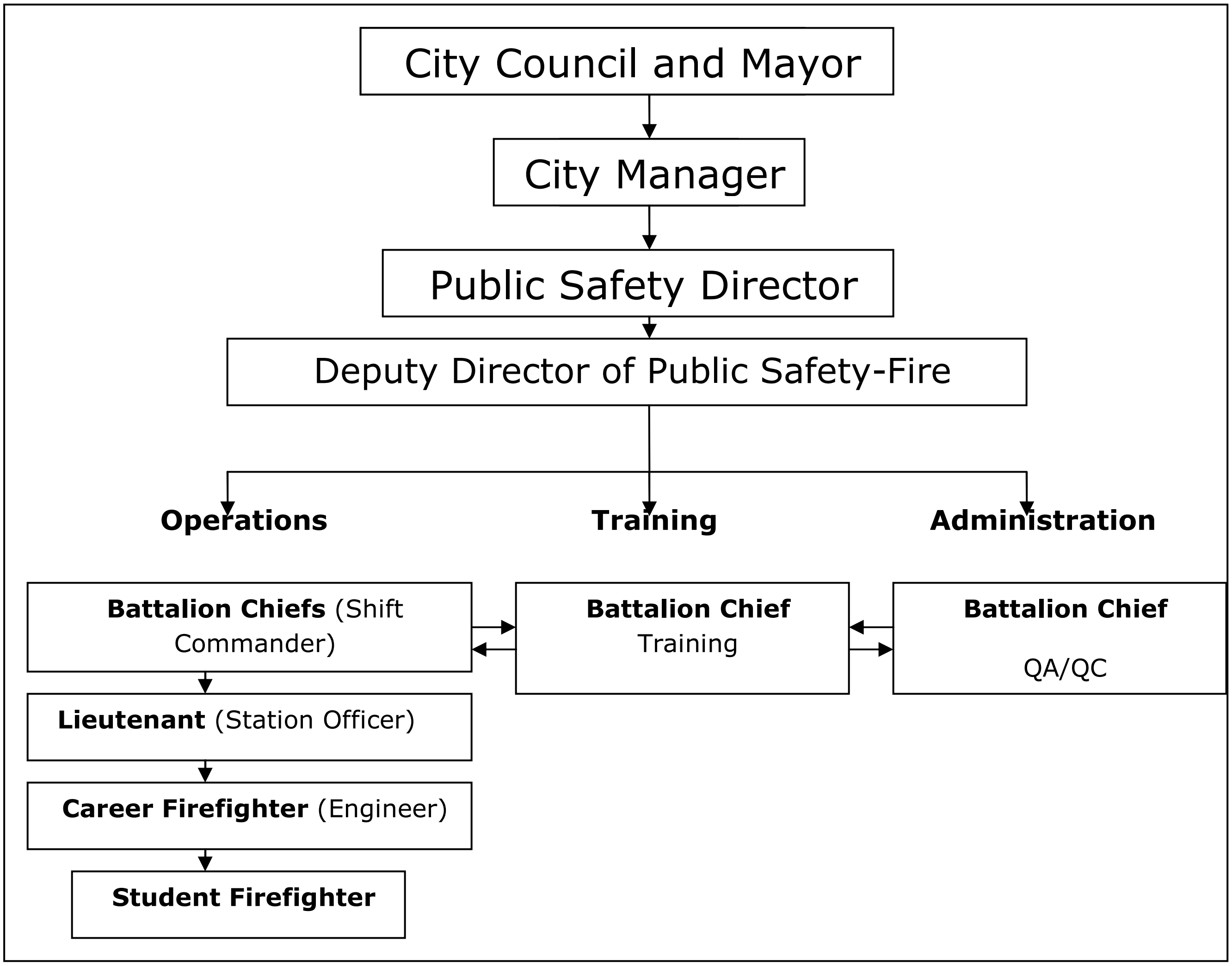
We recommend the department consider the model used in the Commission on Fire Accreditation International (CFAI) through the Center for Public Safety Excellence to guide a continual improvement process.

The question was raised about Chain of Command. The current chain of command is contained in the following graphic:



ICMA Publishing produces a publication entitled "Managing Fire and Rescue Services" which is currently under revision. However, the book agrees with the titles involved in the current organization; some changes are recommended.

Operating within the Public Safety structure, the deputy chief could be eliminated in favor of having Battalion Chiefs in command of operations, training, and administration. The Administrative Battalion Chief would assume command in the absence of the Deputy Director of Public Safety-Fire Division.



B. Human Resources

One challenge facing the Auburn Fire Division which was noted by command is communication for recruiting staff, particularly for the student division. Achieving the most diverse mix of applicants who will complete the process and be retained as members of the department has been reviewed. Communicating with the various generations, particularly with the widespread use of electronic means, is frequently mentioned to the ICMA team in communities.

As newspaper and other print media decline, the Division may want to consider using a software tool known as ESRI® Business Analyst Online℠. This program has been used by the Charlottesville, Virginia fire department to reach the people often overlooked by traditional information, recruitment, advertising, and promotion processes. The program is used by many large commercial entities to target messages to potential buyers as well as to locate stores. In the case of Charlottesville, the city found that advertising on the golf channel during an evening hour allowed it to garner a far larger response from the public than any other venue it used. Richmond, Virginia has also used the software for many of its city services, with equally impressive results.

Communication within and to the community will continue to be a challenge. The department should pursue efforts either with the college or other entities to produce and publish public education via the Internet and emerging social media.

Auburn's young population has been raised using the computer. That demographic tends to rely on a computer much like older generations relied on television or newspapers. In order to deliver messages or to educate, public entities are going to have to utilize the Web. For example, a sprinkler video produced by the Fresno, California fire department has had 85,160 "hits" since being put on YouTube. Recruitment and other videos could benefit not just the Fire Division but other city functions in Auburn.

C. Performance Measurement and Benchmarking

Most United States fire departments have been organized using a series of traditional tactics that are based on research and actual experiences in the United

Kingdom beginning in 1936. The concept traditionally utilized in deploying resources is known as the Standard of Response Coverage (SOC).

SOC was begun in the UK because of the realization that ultimately the war in Europe would spread to that island nation. Professionals had reviewed the consequences of aerial bombardment that had taken place on mainland Europe and saw they needed tactics to extinguish the resulting fires and control disorder that was likely to result. The focus of the effort was upon preservation of the infrastructure: buildings, equipment, assets.

The work on this process did not stop with World War II, but continued and was brought to the U.S. through the Fire Accreditation process in 1985. However, further UK research completed in 2001, demonstrated that this use of tactical deployment produced similar outcomes which did not significantly change despite contributing more and more resources. The process had evolved into a continuing succession of outputs that built upon each other and yet produced no increase in overall safety. These reports can be found at:

- http://www.communities.gov.uk/corporate/?view=Gsearch+results&query=Integrated+Risk+Management+Plans&contentTypes=all&sites=all+sites&quickSearch=true&resultsPerPage=20
- http://www.communities.gov.uk/fire/developingfuture/integratedriskmanagement/
- http://www.fbu.org.uk/workplace/irmp/irmpdoc/index.php
- http://www.communities.gov.uk/documents/fire/pdf/940448.pdf

The weaknesses in the earlier SOC is approach were further exposed when the Center for Public Safety Excellence (CPSE) reviewed existing software tools that had been developed for the U.S. Fire Service based on the SOC method. The software that had been developed – known as "RHAVE" which stood for Risk, Hazard, and Value Evaluation – was released in 2001. It was subsequently updated by the CPSE and re-released as "VISION" Software. A 2007 grant from the Assistance to Firefighters program through the Department of Homeland Security (DHS) was used to review the software's formulas. This study found the software utilized a linear approach and was not able to incorporate regression analysis. In other words, a community could follow the recommendations of the software program to add fire stations, equipment, and staffing, and outcomes would remain the same. Risks did not decrease nor were prevention strategies recognized as having any impact on the outcome of deployment.

This led the accreditation agency to abandon the software, but further research to develop a new tool has been stalled by lack of available funding. At the same time two other developments were taking place. The first was the decision in the UK to mandate Integrated Risk Management Planning for all fire brigades. The second was performance of the IRMP process in areas of the UK such as the Merseyside Fire District. The data showed that moving from a reactive to preventive deployment strategy with aggressive and comprehensive prevention processes significantly affected the outcomes of emergency calls for service. It improved safety for people. It integrated the assets of the community for a specific outcome: safety of citizens and safety of responders. Without comprehensive prevention and mitigation efforts, the outcome of events was predictable and unchanging.

The UK is now in its second cycle of developing Integrated Risk Management Planning. It still has as a component the Standards of Response Coverage but is built upon eliminating hazards of all kinds through rigorous inspection and mitigation. The result include significant improvement in safety for people (responders and citizens) and significant reductions in property fire loss.

Several progressive departments in the United States have utilized these concepts and are achieving similar results. One such example is Fargo, North Dakota, which has seen a decrease in fire loss and at the same time has been able to manage calls for EMS service in a growing population. The department has also saved resources by using the integrated risk management planning model to evaluate the need for specialized equipment recommended by entities like the Insurance Standards Organization (ISO) as part of its Public Protection Classification (PPC), and then reach the decision that the purchases were not necessary based on historical performance.

Addison, Texas has enforced installation of sprinkler systems before current standard changes (International Building code). Its efforts have shown that prevention measures eliminate calls for service. It is one of only a few cities that have made this change from tradition, and we recommend Auburn also begin this transition. Prevention is always cheaper than reaction; studies by road agencies (U.S. Department of Transportation Asset Management Division) as well as emergency managers (Department of Homeland Security – FEMA) indicate that for every $1 spent on prevention, $4 to $7 is saved in reaction to calls for service and subsequent loss.

Other Assistance to Firefighters grants funded a process known as "Vision 20/20," which led a group of fire experts through the International Association of Fire Marshalls to determine that prevention and mitigation were critical to successful outcomes. The group reviewed historical efforts and found that building codes, production of non-flammable bedding and sleepwear, fire alarms, and similar measures had reduced the severity and calls for fire response. The work of the group led the International Code Council (ICC) to adopt a recommendation for installing sprinklers in all new construction single-family homes beginning with the 2009 code amendments. An effort to remove the new language failed in October of 2009. The success of sprinklers has been evident in Addison, where actual fires are rare and calls that are received are often to shut off activated sprinkler heads and perform clean-up versus fighting growing fires. A detailed analysis of the benefits of sprinklers was just published by the Home Fire Sprinkler Coalition:

http://www.nfpa.org/newsReleaseDetails.asp?categoryid=488&itemId=45026&rss=NFPAnewsreleases&cookie%5Ftest=1

Reacting to an activated sprinkler is safer for occupants as well as responders; the environment is much more controlled when resources arrive. Fixed smoke alarms often do not wake the very young or very old. Student populations tend to remove the batteries to power other devices, rendering smoke alarms useless.

To determine if improvements are being made in service delivery, it is important to identify methods for measurement.

Inspecting all of the commercial structures within the city limits at least yearly should be a goal; inspecting with trained personnel is better. Hazardous or those found with frequent violations may need additional scrutiny. A 2009 goal of the department is to schedule and teach Fire Inspector I so at least 50% of career personnel achieve this certification. Creation and enforcement of performance measures will help determine if inspections are occurring as desired. Departments which focus strictly on numbers of inspections could see "inspecting" buildings by driving up to the front and checking a box as "complete." The purpose of the inspection is to look for conditions that may result in a call-back for service. Performance measures such as time per inspection and violation per inspection can be combined with measures such as if a call back does occur, what was the outcome? Auburn Fire Division has focused on quality and performance measurement is one way to ensure quality is being provided absent one-on-one supervision.

Making the transition to having stations become inspection centers will require training on the application of codes, and the use of current duty-fire battalion chiefs and lieutenants to accompany staff will aid in the process. Command can receive more extensive training that they can then demonstrate to firefighters during inspections. This will help ensure that the maximum result is achieved for the effort being expended. Linking the current pre-plans to the GIS files to be retried through Mobile Data Technology (part of the 2009 goals) will enhance the knowledge of responders when a call is received. It will enhance the current efforts as well as educate staff on risks, hazards, and dangers in buildings found in their district. During inspections, firefighters are able to familiarize themselves with conditions in structures; this knowledge can prove vital in emergency situations. In the case of the fatal fire in Charleston, unfamiliarity with the building involved played a huge factor in the loss of nine fire professionals.

Using the talents of the career firefighters and students not just to react to incidents but to prevent them from occurring is critical to the Integrated Risk Management Planning process. Auburn has some unusual challenges with the large number of students in residence; what better way to reach them than through the student firefighters?

Unless performance measures are created and monitored, considerable effort can be wasted. By tracking time, a better picture of the total deployment of resources can be compiled and presented.

Prevention efforts should not be limited just to fire; identifying frequent users of the EMS service and intervening or eliminating these calls through the efforts of volunteers or paid staff frees up resources to develop even more preventive efforts. Such intervention can include daily blood pressure or blood-sugar analysis by paid staff; phone calls from volunteers to ensure prospective users of emergency services are doing well and taking medication; arranging rides to medical treatment centers on a non-emergency basis by volunteers or other city services; and inspection of homes to eliminate hazards. These tasks are not current to the public safety department; they can help to eliminate the emergency calls for service that ultimately become the responsibility of public safety.

With so many fraternity houses, student housing and other like structures in the city, an effort should be made to educate all employees in those establishments to perform CPR, how to use an automated external defibrillator (AED), and how to deliver basic first aid. Public Education has worked to take on the roll of CPR educator in the community and presents classes as needed. Moving forward, pre and post testing should be instituted in all Public Education programs to determine if messages are being communicated as well as if a knowledge increase has taken place. This is the most frequently used evaluation tool used to measure performance of educators as well as value of programs.

It is simply not possible to employ enough firefighters nor to build enough stations to reach every caller within specific times (traffic plays a huge role in achieving response goals). With a trained populace, citizens can take immediate action so that viable patients might be delivered to responders when they arrive. They, in turn, can deliver viable patients to care facilities.

By employing a preventive approach, the department can eliminate many emergencies and free up resources currently being used to respond to repeated calls from some locations and people.

D. Communications Data Analysis

To demonstrate the importance of regular monitoring of performance measures, one only has to look at the overall performance for fires and EMS. The ICMA team was concerned particularly by the time needed to dispatch calls in Auburn.

Dispatchers are averaging 3.3 minutes to process calls for service from the point the phone rings until responders are alerted. The actual time ranges from a low of 2.5 minutes at midnight to a high of 5.7 minutes at 6 AM. National benchmarks indicate that call processing should include elements with specific performance measures. The first is that calls enter the dispatch center and are answered in 15 to 30 seconds (which the Auburn dispatch is meeting), with responders alerted within 1 minute. At 5.7 minutes, Auburn's dispatch time equals what is usually allotted for dispatch, turnout, and arrival of the first unit. Another way to look at this is that standard travel times used to locate stations enable the first deployed truck to reach the scene in 4 minutes. Auburn would have to double the number of its stations to meet this objective. The reason for the time delay was noted in this report and is related to EMS calls entering the dispatch center, then transferred to the ambulance transport, with Auburn responders ultimately alerted sometime after that time. If Auburn is going to be "first responders" then it should take enough information to alert and dispatch personnel. Without this change, Auburn responders often arrive with the transport unit and the effectiveness and efficiency of patient care is negatively impacted.

Average turnout time in Auburn of 1.3 to 1.9 minutes is slightly higher than national benchmarks, with the longest time of 2.4 minutes occurring at 5 AM. National benchmarks indicate turnout time should be within 1 minute 90% of the time, so work could be targeted to reduce the turnout times. Such efforts must keep the safety of personnel in mind.

Combined dispatch, turnout, and arrival times put Auburn's overall response performance well above established targets. For example, at 6 AM, on average, first units do not arrive until almost 12 minutes after a call is received. In the following sections of this report, the seriousness of this type of response will be discussed further.

We recommend the department utilize the COMPSTAT process for communicating both within the department as well as with other city departments. COMPSTAT or "Comparative Statistics" looks at calls for service and performance on a regular basis. From that review, problems are identified both in terms of the agency responding as well as how other departments in the city might be of use in achieving improved levels of service.

When a problem develops, staff from involved departments can focus on the problem with the goal of eliminating it in the future, if possible. One example is in the area of enforcement of building and property codes. Instead of having to hire additional employees, can existing personnel be trained on these codes and conduct the inspections as part of their regular duties? By eliminating blight and hazards, calls for emergency response are eliminated or reduced and responders that are called are armed with better education and familiarity with the premises. Public Safety Departments are well suited for this type of integrated management because of the interaction under a common administrative umbrella.

Sharing what is being seen in the field can lead to agencies changing their processes and ultimately result in a safer community. Compliance with codes can be enforced more rigorously with trained responders patrolling the community for violators. This will also ensure that aesthetic issues are addressed quickly.

In order to present an accurate picture of the time demands facing the department, all activity must be recorded accurately in the Computer Aided Dispatch/Records Management System (CAD/RMS). Weekly progress reports should be prepared for the city administration. If service does not meet adopted levels, an explanation should be given for the non-compliance.

E. Deployment and Staffing

The department operates on a traditional 24-hour deployment cycle. Along with this report, we suggest review of a study prepared for the International Association of Fire Chiefs (IAFC) through a grant from the Department of Homeland Security. The study showed that the traditional deployment of resources for a 24-hour period can be hazardous to the long-term health of responders as well as a detriment to safe and effective customer service. The study and other information can be found:

http://www.iafc.org/displaycommon.cfm?an=1&subarticlenbr=559

The study looked at the 24-hour shifts and found that health concerns included obesity, heart problems, and severe fatigue brought on by sleep deprivation. As departments become busier and attempt to make better use of time, the ability to achieve quality rest is much more difficult. The study recommended changes to the 24-hour shift schedule.

We note that moving away from a 24-hour deployment schedule would require additional personnel or an adjustment to deployment. Instead, the city might look at using the 24-hour shift as a base and then target peak demand times with flex staffing. Auburn is unusual in that it does not have a normal bell curve for service demand. Additional resources could be “flexed” to handle the peak-time demands identified in the data analysis section; the same increase in staffing adjustment already takes place for special events at the university. The use of flex shifts may be attractive to student firefighters to meet the demands of school/work.

F. Prevention Strategy

As was noted earlier, the prevention and education command are to be commended; they are some of the most forward thinking that have been encountered by ICMA. They recognize that fire prevention and education is not to be limited to one "show" during a fire prevention week. It is only by repetition and repeated exposure that people learn and then respond automatically when an emergency occurs.

The messages Auburn needs to deliver may be different than in many other communities. The city has a very young population, with lower disposable income. Reaching that audience and getting them to make lifestyle changes will be a challenge. YouTube, Facebook, Twitter and other social websites may help the department reach the intended audiences. Fresno, California fire department has been very aggressive at producing videos. Some examples:

- http://www.youtube.com/watch?v=qqIE5lnsGrw&feature=player_embedded
- http://www.youtube.com/watch?v=bVdUNkRDNMk&feature=player_embedded
- http://video.google.com/videosearch?sourceid=navclient&gfns=1&rlz=1T4GPEA_enUS297US314&q=fresno+fire+youtube&um=1&ie=UTF-8&ei=JnfwSq-wGMLNlAfno4z6CA&sa=X&oi=video_result_group&ct=title&resnum=1&ved=0CBMQqwQwAA#

As was noted, prevention is far cheaper than response. The city should review ways to encourage sprinkler installation in all existing properties. Careful consideration should be given to the cost of adding fixed fire costs versus tax credits or some other form of assistance to encourage sprinkler systems.

A Citizen Emergency Response Team (CERT) or Fire Corps program should be integrated into the division, with participants recruited from college students in the community. The department currently helps with other teams; having one serve and designed for the needs of the fire division may alleviate the need for paid staff to handle these types of duties. These individuals can also assist the department when an incident occurs by providing rehab to department members. They can, for example, operate cooling stations to reduce firefighter exposure to high heat and humidity during incidents.

These same units have been beneficial to communities, targeting “frequent fliers” who make calls for service to the department on a regular basis. Washington, DC has used the volunteers to call seniors on a daily basis to check on their condition as well as to remind them to take medication. The volunteers intervene so that the call does not have to be handled as an emergency.

G. Elements of Time

For a positive outcome to occur, particularly in EMS but also for fire, time is a critical element. Thus, ICMA’s team looked at the performance of the department across a spectrum of time elements that have been identified as important to achieving successful outcomes. Based on our examination, we conclude that the Auburn Fire Division needs to improve its time-to-task elements.

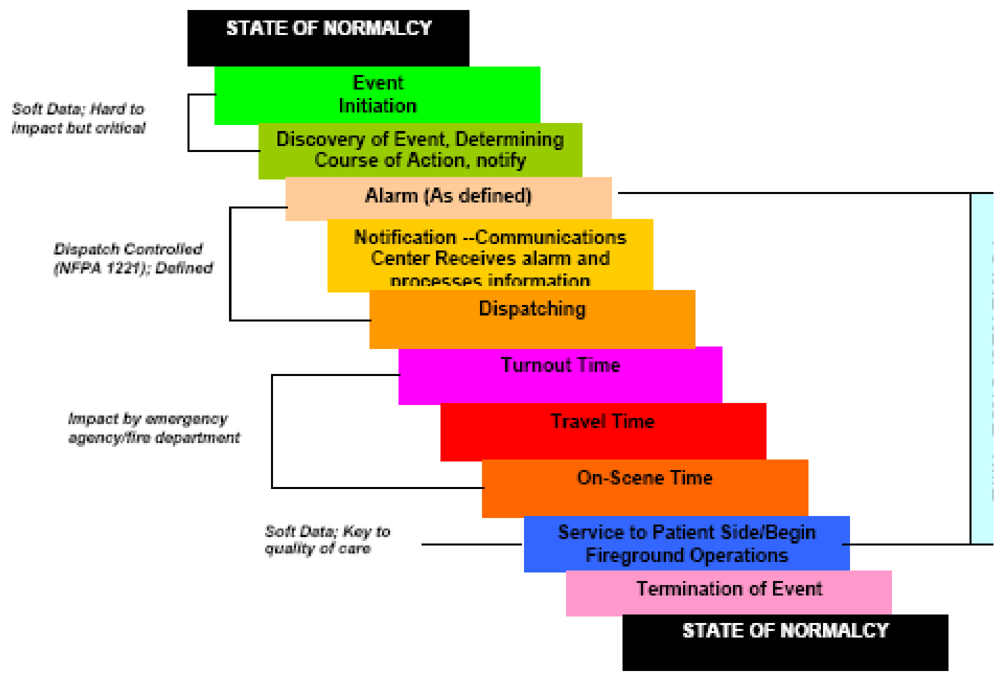


Exhibit 1 – Time Elements for Response

Various standards quantify the critical time elements that occur during emergencies. These standards are not limited just to fire and EMS, but also have applicability for all-hazard responses. An all-hazard response includes natural as well as human-caused incidents such as storms, disasters, and terrorism incidents.

It is critical that departments continually review the elements that can be controlled. As Exhibit 1 illustrates, dispatch time is one of the few elements that can be improved and which may make a difference on the outcome of an event.

In the case of cardiovascular incidents requiring defibrillation, there is a 10-minute window of opportunity from the onset of the incident, according to a study published in 1998 by the Emergency Medical Director's Association of California.

According to the study (see Exhibit 2), the highest survival rates (37 percent) occur when cardiopulmonary resuscitation is begun in fewer than 5 minutes of collapse and in which defibrillation occurs in under 10 minutes. Those survivability percentages plunge to a 0 percent probability when CPR is begun after 5 minutes and defibrillation is begun after 10 minutes. Therefore, it is critically important that dispatchers receive information, process the information, and alert responders in as short of time interval as possible.

Collapse To CPR	Collapse To Defibrillation	Probability Of Survival
< 5 minutes	< 10 minutes	37%
≤ 5 minutes	> 10 minutes	7%
> 5 minutes	< 10 minutes	20%
> 5 minutes	> 10 minutes	0%

**Numbers drawn from The Emergency Medical Directors' Association of California 1998 Position Paper.*

For successful outcomes, EMS patients must have bleeding, breathing, and heartbeat controlled or restored within 10 minutes. Communities that experience high success rates for surviving an incident typically have a program to educate the public to respond at the onset of the incident. When trained citizens can provide some immediate response, a viable patient is more likely for medical first responders, who are able to deliver a higher level of care. Responders then have a better chance of transporting a viable patient to a trauma center equipped and capable of advanced life-saving processes.

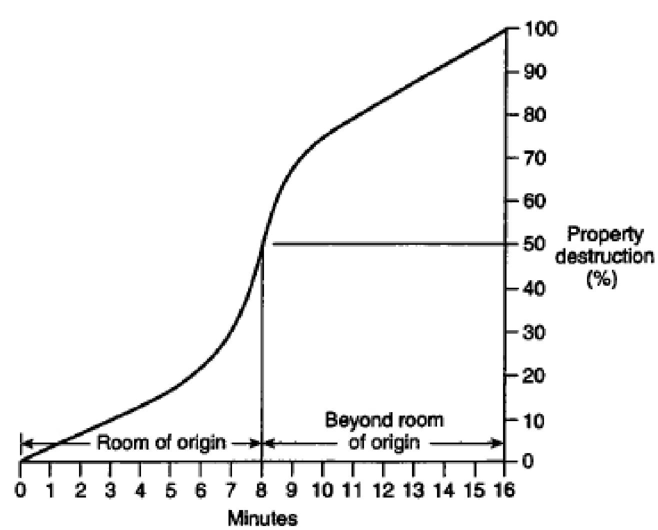


Exhibit 3 – Flashover Curve

For fire response, the historical reference has been 12 minutes for a fire to reach the stage of flashover (see Exhibit 3). Flashover is the point at which all objects in a room have been heated to the point of ignition but oxygen levels have been so depleted that combustion does not occur. An influx of oxygen, either through a breaking window or an opening door, causes the room and its contents to spontaneously ignite in an at-time explosive nature. Fire is rarely confined to the point of origin at this level; severe damage of the building and contents is normally the outcome.

When responders are caught in flashover, even the best protective equipment can fail to prevent injury. Also, the equipment is usually rendered useless for future use after being subjected to such high temperatures and intense conditions.

Research underway through a grant from the Assistance to Firefighters program of DHS to the Center for Public Safety Excellence indicates that the time to flashover may be getting shorter because of the use of lighter and less dense building material. In the past, structural framing consisted of dense growth 2 x 4 studs, with larger diameter wood used for floor and roof support. Now, lighter weight wooden "I" beams are used, which enables longer floor spans and more creative open space. The danger with these new products is that fire can compromise the structural integrity without warning and lead to collapse. At least six such incidents have been identified in the Washington, DC metropolitan area over the past year alone.

We recommend that the following standards be established for the Auburn Fire Division:

a. All alarms and phone alarms shall be answered within 15 seconds 95 percent of the time and within 40 seconds 99 percent of the time (NFPA 1221, APCO, NENA).
b. All alarm notifications for public safety shall be processed within 60 seconds 90 percent of the time and within 90 seconds 99 percent of the time (NFPA 1221, APCO, NENA).
c. Turnout time should occur in less than 1 minute and 30 seconds. Existing National Fire Protection Association (NFPA) standards such as 1710 and 1720 use a 1 minute turnout time, but national discussion has led to a comprehensive study to determine the viability of this standard. Fifty-nine departments are being surveyed to determine whether or not the existing standard of one minute should be revised. The preliminary consensus was that the 1 minute 30 second time provided a safer response and was more likely achievable.
d. First-dispatched units shall leave the station and arrive at the address of the call within 4 minutes 90 percent of the time. The first full-alarm response shall travel and arrive at the address within 8 minutes 90 percent of the time. Additional alarms, specifying what is needed at the incident, will occur and all responding units shall be tracked by dispatch to determine whether protocols are successful or need revision.

The travel times reviewed in the data sections indicate that Auburn easily meets the travel times but work may be needed to produce the 90th percentile in other areas.

H. Use of AEDs and Technology

City GIS records should be integrated into the dispatch center's CAD system so that when calls for service are received, responders have all available data needed to respond. This project is a goal for 2010 and has been hindered by the CAD system. All hazardous material reports should be computerized and linked by geocodes to property files within the city and be immediately accessible to responders through mobile data terminals in fire equipment.

The existing CAD model does not work well. It does not integrate all of the resources and as a result is limited in the value it provides. The IT department is attempting to work out the issues with the vendor; it is critical to the future of the department. A goal of the department should be to go paperless by using laptops, computers in vehicles, barcodes, and computers in stations. Because the department operates across five stations, sharing data as well as information can be difficult. Officers now make rounds using pick-up trucks which may be simplified with electronic records management. ICMA's team has had contact with FireHouse Records Management System which has been used by the division and can provide contacts that may benefit the agency.

Because the various functions of the city—building department, inspections, records, GIS—are also spread across a number of departments, incorporating all of these records into a computer service that could be shared both at the station levels and on mobile data terminals is critical.

Automatic vehicle locators (AVLs) should be installed on all vehicles so dispatch and command know where department resources are at any given time. Software systems for doing so are available and are being used in areas like Hilton Head Island, South Carolina, Moorhead, Minnesota, and Grand Rapids, Michigan to deploy resources and shorten transportation times. With use of automated dispatching systems, the closest unit can be dispatched and additional units can be sent using predetermined protocols, thus alleviating dispatcher efforts. Command officers would have instant access to vehicle location, and department calls and management decisions could be automated, with the closest call units receiving the call for service.

It is important in cases of sudden cardiac arrest that defibrillation take place to restore the electrical impulses in the heart. To achieve maximum success, all police vehicles should be equipped with AEDs. All AEDs in the community should be located on a layer of the Geographic Information System and should be displayed as part of an interlink with the CAD system on dispatch consoles. Today there are more than 300,000 AEDs in place in the United States, with a projection that more than 1 million will be in place by 2010. This is according to studies by Atrus, Inc., which is working with the Sudden Cardiac Arrest Association. AEDs are used in only 0.5 percent of the sudden cardiac arrest incidents reported, but the study indicated a unit was typically located within 50 feet. By linking AED locations to the CAD system, a dispatcher can relay this information to the caller. When this is done, the effective useful range of each

AED is increased from less than 50 feet to more than 300 feet, a 500 percent increase in effective range.

The Sudden Cardiac Arrest Association research shows that when the location of an AED is pinpointed, a viable patient is more likely delivered to responders. Because a viable patient is critical to the outcome of a call for service, the fire division should be charged with coordinating these efforts.

I. Alarms

The department should adopt national policy standards that are available from APCO, CALEA, NENA*, and other organizations to deal with false alarms and dispatch protocols. In the case of repeat alarms, violations should be issued and a cost recovery mechanism created. Alarms deplete resources and repeated false alarms cause responders to often lower their guard. Alarms are installed to alert when emergency services are needed; if they fail or send false signals repeatedly, it defeats the purpose for which they are created. Failure to maintain should result in penalties for owners of such systems to encourage them to maintain optimal performance. (*Association of Public-Safety Communications Officials, Commission on Accreditation for Law Enforcement Agencies, National Emergency Number Association.)

In a review of the department's performance, it was found that alarms are requiring the deployment of 1,014 hours of staff time. That deployment equals the total deployment spent fighting structure fires and responding to EMS calls and is among the highest ever seen by ICMA.

J. Vehicle Maintenance and Replacement

Because of the limited size of the city and low volume of calls, the city should investigate lease-purchasing its vehicles. As demonstrated by the recent equipment purchases, fire equipment is expensive and produces spikes in capital budgets.

An effort should be made to standardize all equipment through a specification program. Ideally, all pumps, transmissions, and major components should be interchangeable. When responding in high stress times to uncontrolled incidents, there is not time to think about what truck or what piece of equipment is being used; it needs to become automatic for the responder.

Department vehicles are aging and have needed numerous costly repairs. When an engine or transmission is lost in a vehicle, the performance of maintenance staff as well as users of the equipment should be examined to answer the question: "Why?" It may be staff but it could also be existing equipment is not built to meet the demands and needs of the department. Engines and transmissions for fire equipment are costly as well as removing assets from response.

At the point engines or other major components are failing, the truck will never garner enough on trade to justify the repair expense, particularly on older models. By going to a lease program, the department will be able to enjoy modern equipment and avoid costly repairs. The dependability of these devices is also critical to successful outcomes when intervention is required.

When leasing, maintenance is critical to getting the best value for the city. Thus, performance measures and improved service must be built into the repair facility. If the facility cannot make these improvements, the department should evaluate contracting this service out using specific performance measures so that it ensures work is being done and being done properly, efficiently, and safely.

Hand tools of the department such as the infrared cameras should be evaluated and standards established for outfitting all vehicles and stations uniformly. At least two manufacturers have introduced smaller, lightweight models suited for search and rescue by individual engine companies. The smaller cameras are limited, however, in use for inspections. More complex, modern cameras can be used for purposes other than during fires: for example, identifying motors that are running hot and fluorescent light fixtures with bad ballasts can be offered as a service to business. When motors run hot, it is often because they need maintenance and would otherwise fail. By adding this as a service, the city may be able to afford to purchase and replace these units on a more regular basis and with better equipment. Auburn University may also be a source to pay for this equipment, as it has hundreds (if not thousands) of lights and motors that require maintenance.

K. Training and Education

Steps should be taken to develop training locations that can be used by fire/EMS and other city departments such as police and DPW. For example, a driving course could be located on airport property. By integrating a training facility, one department does not have to provide for maintenance and all city services can benefit.

We recommend yearly performance evaluations (written) be accompanied with practical or skills testing. A firefighter's gear is critical to the survival of not just the firefighter but also his team members. Demonstrating competency should be a part of the annual performance review. This helps identify weaknesses that can then be addressed in the following year's training regimen.

L. Hydrants

The Fire Division paints and exercises the hydrants in the city. A compensation method should be established for the water provider to pay the Fire Division to conduct the maintenance, inspection, and flow tests on the hydrant system.

The Fire Division, in turn, should locate all hydrants using GPS devices and ensure that all work, damage and repairs, and flows are recorded on the city's GIS system. The data are crucial to determine whether sufficient fire flows exist prior to building new or renovating old lines.

A similar program was negotiated recently in Washington, DC. The department is paid more than $1 million a year by the water provider for the work. When the department began to inspect hydrants, it was thought that about 2 to 4 percent of hydrants would not deliver flows. However, the figure is closer to 20 percent.

II. Existing Performance Data

To develop the department that will meet future needs, it is critical that the city understand existing challenges and demands.

A. Aggregate Call Totals and Dispatches

The data include calls between January 1 and December 31, 2008. Auburn's Fire Division has five first-run engines, one reserve engine, two ladder trucks, and seven pickup (PU) trucks in five stations. In 2008, Auburn's Fire Division received 2,768 non-cancelled calls. Of these, 283 (10 percent) were structure fire, outside fire, or fire out on arrival calls, and 1,119 (40 percent) were emergency medical service (EMS) calls. In addition, 3,497 other activities were recorded in 2008. These activities included administrative duties, supply details, training, hydrant detail, and fire drill.

We categorized the call and activity type based on the call description, run description, and run extinguishment method. The corresponding table has 968 different combinations and is too detailed to be included in this report. The analysis of call types is captured in the following tables and figures:

- Table 1. Call Types
- Figure 1. Fire Calls by Type and Duration
- Figure 2. Fire Calls by Type
- Figure 3. Average Calls per Day by Month
- Figure 4 and Table 2. Calls by Hour of Day
- Figure 5 and Table 3. Calls by Hour of Day by Station
- Figure 6 and Table 4. Number of Units Dispatched to Calls

B. Workload by Individual Unit—Calls and Total Time Spent

On-scene time was calculated as the difference between "unit clear time" and "unit on-scene arrival time." Travel-back time is the difference between the "unit back in headquarter time" and the "unit clear time." Therefore, total deployed time includes turnout time, travel time, on-scene time, and travel-back time (if it exists).

Our report looks at two key areas: dispatches and workload.
For the year, there were 2,768 non-cancelled calls, but because multiple units were often sent, 6,083 dispatches are analyzed. In addition, 591 dispatches (9 percent) were cancelled, meaning that the dispatched unit was cancelled enroute or spent less than a minute on scene.

Workload is the actual time spent by each unit on every call. The average time from dispatch until the unit was available for the next dispatch was 30 minutes per run. The total workload for the year for all units combined was 3,036 hours. When 4,535 runs for nonemergency activities are included, the total workload for the year for all units combined was 7,382 hours. For nonemergency activities, the average time from dispatch until the unit was available for the next dispatch was 1 hour and 38 minutes per run.

After the introductory table, we present run data and workload data for every unit, as well as the daily average for fire and ambulance units, as follows:

- Table 5. Annual Total Deployed Time by Call Type Including Cancelled Units
- Table 6. Annual Total Deployed Time by Call Type Excluding Cancelled Units
- Figure 7. Department Total: Average Deployed Minutes per Day by Call Type
- Table 7. Call Workload by Unit
- Table 8. Engine and Ladder Units: Total Annual and Daily Average Runs by Call Type
- Table 9. Engine and Ladder Units: Daily Average Deployed Minutes by Call Type
- Table 10. PU Truck Units: Total Annual and Daily Average Runs by Call Type
- Table 11. PU Truck Units: Daily Average Deployed Minutes by Call Type
- Table 12. Total Workload by Activity Type
- Table 13. Activity Workload by Unit
- Table 14. Engine and Ladder Units: Total Annual and Daily Average Runs by Activity Type
- Table 15. Engine and Ladder Units: Daily Average Deployed Minutes by Activity Type
- Table 16. Calls and Activities Combined: Total Workload by Type

C. Dispatch Time and Response Time

Dispatch processing time is the difference between the "unit dispatch time" and the "call receipt time."

Turnout time is the difference between the "unit enroute time" and the "unit dispatch time," while travel time is the difference between the "unit on-scene arrival time" and the "unit enroute time."

Response time includes dispatch processing time, turnout time, and travel time. Due to missing data, response time is calculated as the difference between the "unit on-scene arrival time" and the "call receipt time" instead of the sum of dispatch processing time, turnout time, and travel time.

For most types of calls, we look primarily at the dispatch time and response time of the first arriving units. The average dispatch processing time was 3.6 minutes, and the average total response time was 7.6 minutes. However, for structure fire calls, we analyze the response time of the first, the second, and all arriving fire vehicles. The following figures and tables show the dispatch and response times for Auburn's fire and PU truck units:

- Figure 8 and Table 17. Average Dispatch, Turnout, Travel, and Response Time of First Arriving Units by Call Type
- Table 18. Average Response Time and Travel-Back Time of First Arriving Units by Call Type
- Figure 9 and Table 19. Percent of Time Each Unit Arrived First by Call Type

- Figure 10. Average Dispatch Time, Turnout Time, Travel Time, and Response Time of First Arriving Units by Hour of the Day for EMS, Structure Fire, Outside Fire, and Fire Out on Arrival Calls
- Table 20. Average Dispatch Time, Turnout Time, Travel Time, Response Time, and Travel-Back Time of First Arriving Units by Hour of the Day for EMS, Structure Fire, Outside Fire, and Fire Out on Arrival Calls
- Figure 11 and Table 21. Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit for EMS Calls
- Table 22. Average Response Time of First Arriving Fire Units for Structure Fire, Outside Fire, and Fire Out on Arrival Calls
- Table 23. Average Response Time of All Arriving Fire Units for Structure Fire, Outside Fire, and Fire Out on Arrival Calls
- Figure 12 and Table 24. CDF of Response Time of First and Second Arriving Fire Units for Structure Fire, Outside Fire, and Fire Out on Arrival Calls

Table 1. Call Types

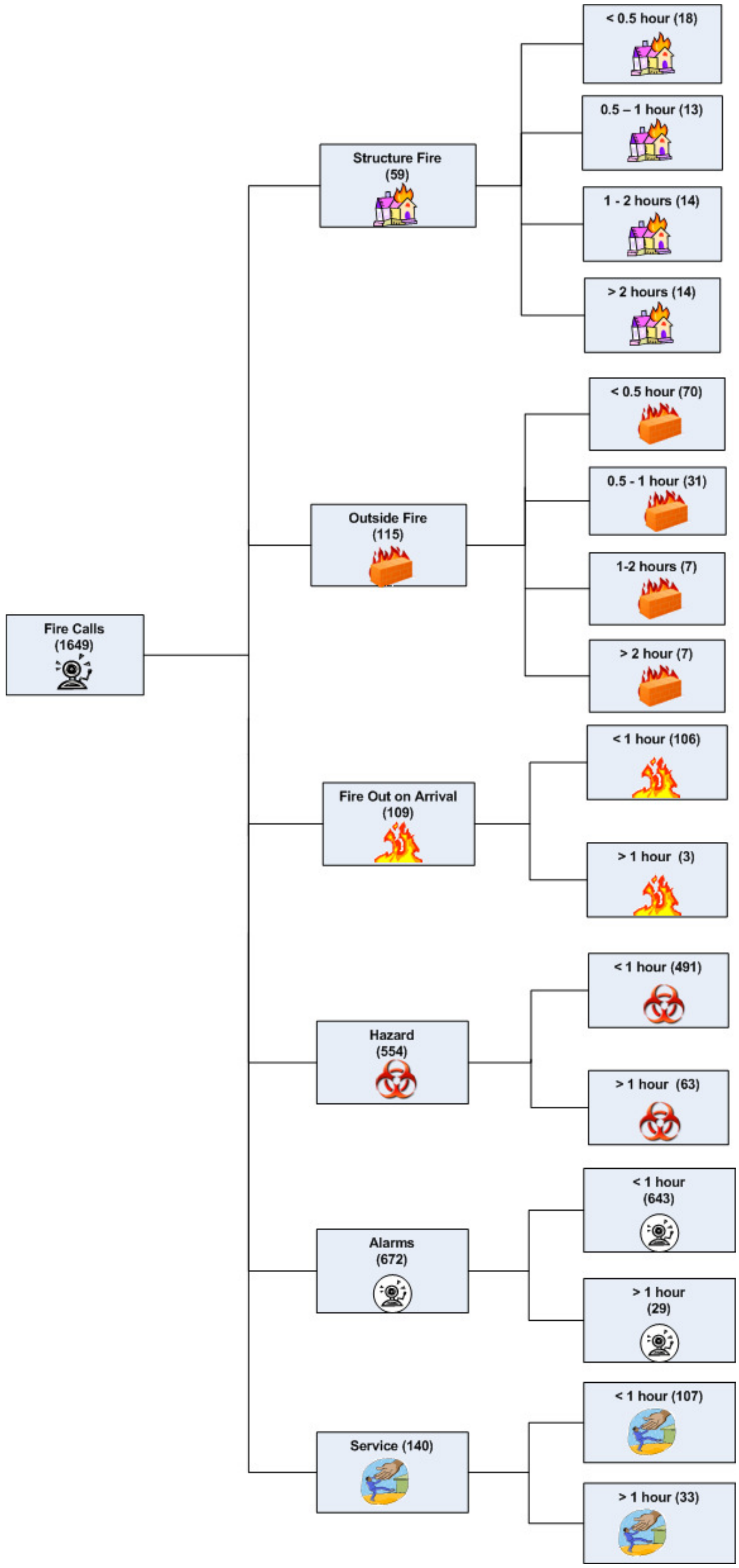
	Call type	# of Non-cancelled calls	Calls / day	Percent of calls	# of cancelled calls	Percent calls cancelled	Total calls
EMS	**EMS**	**1,119**	**3.1**	**40.4**	**33**	**2.9**	**1,152**
Fire	Structure fire	59	0.2	2.1		0.0	59
	Outside fire	115	0.3	4.2	2	1.7	117
	Fire out on arrival	109	0.3	3.9		0.0	109
	Hazard	554	1.5	20.0	12	2.1	566
	Alarm	672	1.8	24.3	44	6.1	716
	Service	140	0.4	5.1	21	13.0	161
	Fire total	**1,649**	**4.5**	**59.6**	**79**	**4.6**	**1,728**
Total		**2,768**	**7.6**	**100**	**112**	**3.9**	**2,880**

Note: 112 cancelled calls include 39 calls with call description of "CANCEL" and 73 calls with the total on-scene time of less than a minute for all dispatched units.

Observations:

- 3.9 percent of calls were cancelled.
- On average, the department received 7.6 non-cancelled calls per day.
- EMS calls for the year totaled 1,119 (40.4 percent), about 3.1 per day.
- Fire category calls totaled 1,649 (59.6 percent), about 4.5 per day.
- Structure fire, outside fire, and fire out on arrival calls combined averaged 0.8 per day, 10.2 percent of total calls.
- There were 554 hazardous condition calls in 2008, about 1.5 per day.
- There were 672 alarm calls (1.8 per day) and 140 service calls (0.4 per day) in 2008.

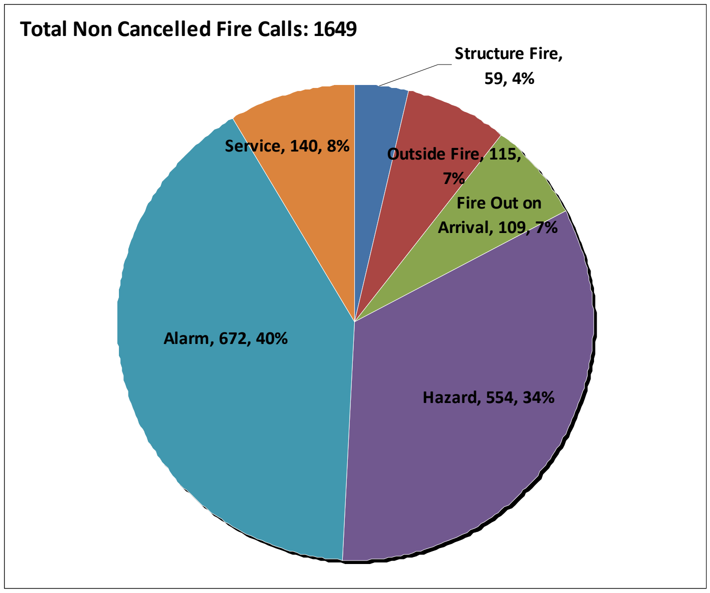
Figure 1. Fire Calls by Type and Duration


Fire Calls (1649)
Structure Fire (59)
< 0.5 hour (18)
0.5 – 1 hour (13)
1 - 2 hours (14)
> 2 hours (14)
Outside Fire (115)
< 0.5 hour (70)
0.5 - 1 hour (31)
1-2 hours (7)
> 2 hour (7)
Fire Out on Arrival (109)
< 1 hour (106)
> 1 hour (3)
Hazard (554)
< 1 hour (491)
> 1 hour (63)
Alarms (672)
< 1 hour (643)
> 1 hour (29)
Service (140)
< 1 hour (107)
> 1 hour (33)

Observations:

- The City of Auburn averaged slightly more than one structure fire call per week in 2008. Of the 59 structure fire calls, 14 lasted more than two hours, 14 lasted between one and two hours, and 31 lasted less than one hour.
- Of the 115 outside fire calls, 7 lasted more than two hours, 7 lasted between one and two hours, and 101 (88 percent) lasted less than one hour.
- In all, the department handled 170 calls that lasted more than one hour, which is about one long fire category call every two days. Of these, 75 percent consisted of service calls (33), alarm calls (29), fire out on arrival calls (3), and hazardous condition calls (63).

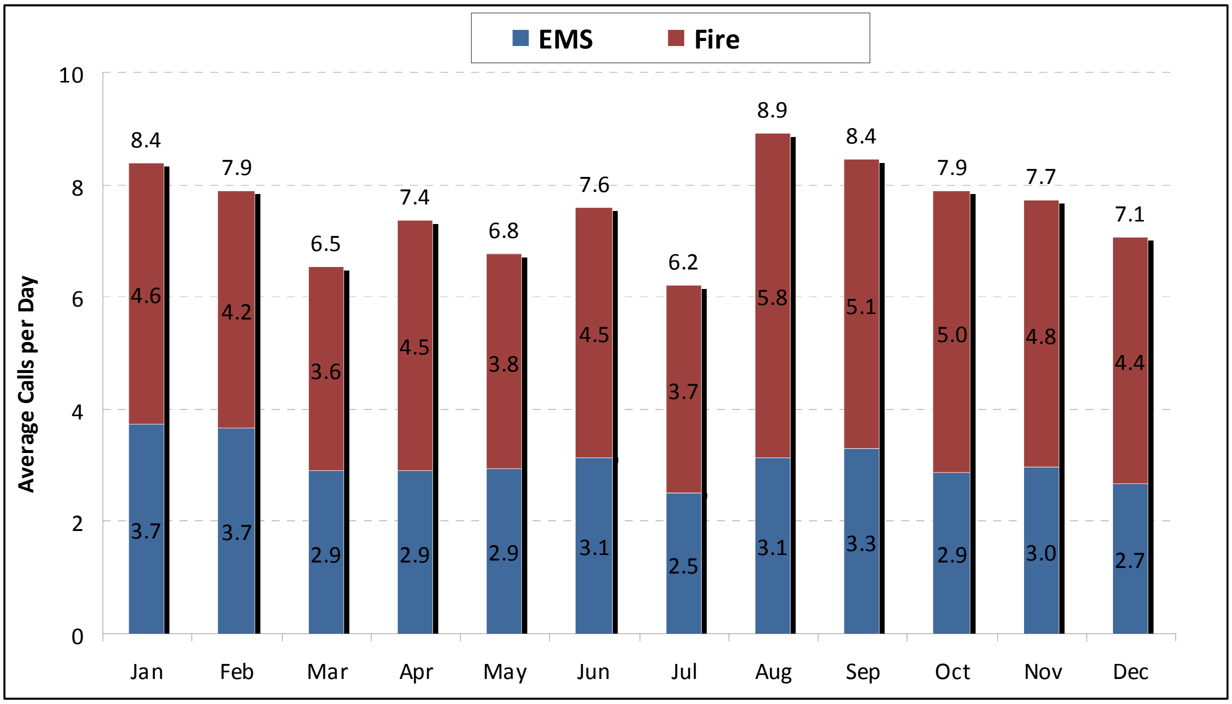
Figure 2. Fire Calls by Type



Observations:

- A total of 174 structure fire and outside fire calls accounted for 11 percent of the fire category total.
- Fire out on arrival calls accounted for 7 percent of the fire category total.
- The largest category was alarm calls, which were 40 percent of the fire category total.
- Hazardous condition calls were 34 percent of the fire category total, and service calls were 8 percent of the total.

Figure 3. Average Calls per Day by Month



Observations:

- Average calls per day varied by month and ranged from a low of 6.2 calls per day in July to a high of 8.9 calls per day in August, or 44 percent more.
- Average EMS calls per day varied from a low of 2.5 in July to a high of 3.7 in January.
- Average fire category calls per day varied from a low of 3.6 in March to a high of 5.8 in August.

Figure 4. Calls by Hour of Day

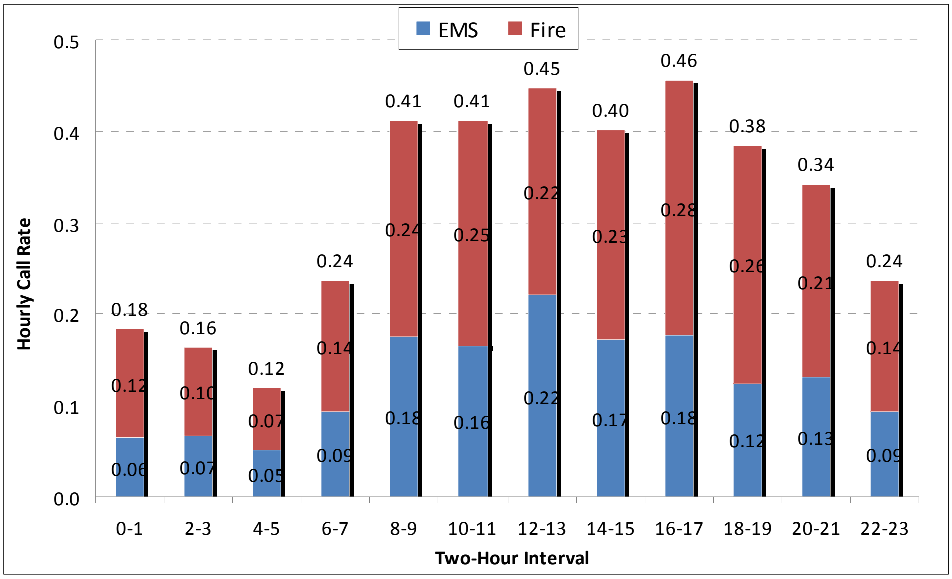


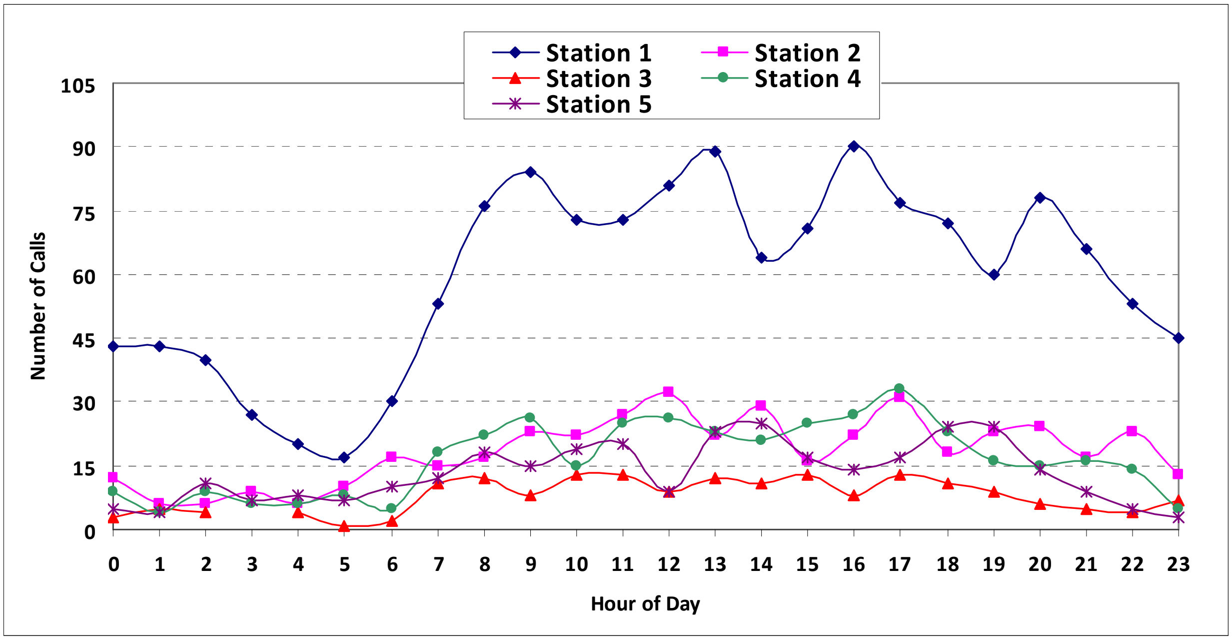
Table 2. Calls by Hour of Day

	Hourly call rate		
Two hour interval	EMS	Fire	Total
0-1	0.06	0.12	0.18
2-3	0.07	0.10	0.16
4-5	0.05	0.07	0.12
6-7	0.09	0.14	0.24
8-9	0.18	0.24	0.41
10-11	0.16	0.25	0.41
12-13	0.22	0.22	0.45
14-15	0.17	0.23	0.40
16-17	0.18	0.28	0.46
18-19	0.12	0.26	0.38
20-21	0.13	0.21	0.34
22-23	0.09	0.14	0.24
Calls/Day	3.07	4.52	7.58

Observations:

- Hourly call rates peaked between 8 AM and 10 PM, averaging from 0.34 to 0.46 calls per hour. During this time period, the city averaged one call every two and one-half to three hours.
- The call rate was lowest between midnight and 6 AM, fewer than 0.2 calls per hour.

Figure 5. Calls by Hour of Day by Station



Note: The number of calls was counted based upon the station of the first dispatched units.

Table 3. Calls by Hour of Day by Station

Hour	Station 1	Station 2	Station 3	Station 4	Station 5	Total
0	43	12	3	9	5	72
1	43	6	5	4	4	62
2	40	6	4	9	11	70
3	27	9		6	7	49
4	20	6	4	6	8	44
5	17	10	1	8	7	43
6	30	17	2	5	10	64
7	53	15	11	18	12	109
8	76	17	12	22	18	145
9	84	23	8	26	15	156
10	73	22	13	15	19	142
11	73	27	13	25	20	158
12	81	32	9	26	9	157
13	89	22	12	23	23	169
14	64	29	11	21	25	150
15	71	16	13	25	17	142
16	90	22	8	27	14	161
17	77	31	13	33	17	171
18	72	18	11	23	24	148
19	60	23	9	16	24	132
20	78	24	6	15	14	137
21	66	17	5	16	9	113
22	53	23	4	14	5	99
23	45	13	7	5	3	73
Total	1,425	440	184	397	320	2,766

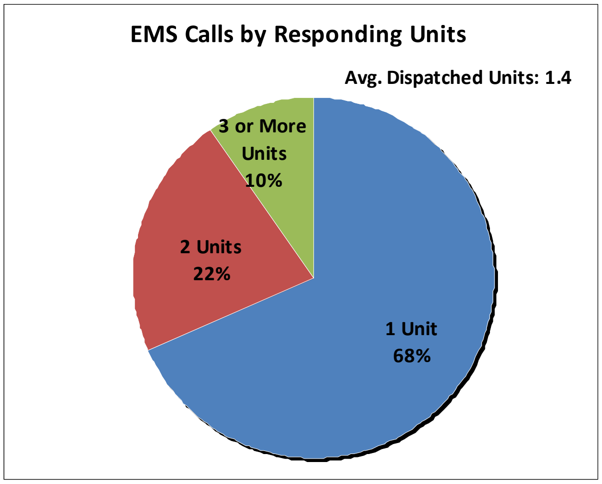
Note: Two calls with first dispatched units from PS admin. are not included.

Observations:

- The call rate was lowest between midnight and 6 AM for all stations.
- The pattern of received calls by time of day varied significantly for Station 1.
- Station 1 was the first to be dispatched to 52 percent of all calls.

- All other stations were the first to be dispatched on average less than 1.2 calls per day. Station 3 was first on average for one call every two days.

Figure 6. Number of Units Dispatched to Calls



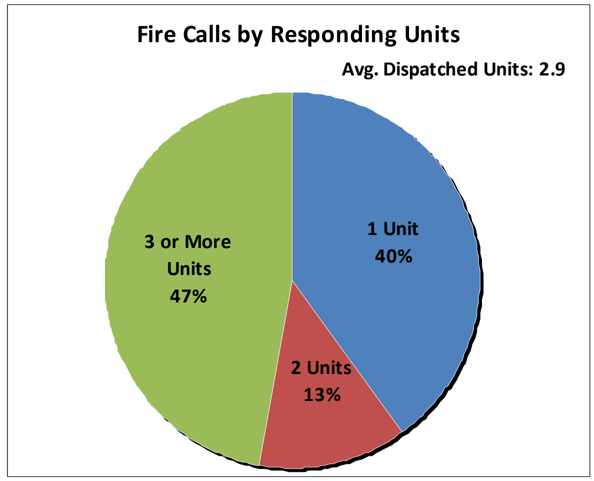


Table 4. Number of Units Dispatched to Calls

Call type	1 unit	2 units	3 or more units	Total
EMS	**766**	**243**	**110**	**1119**
Structure fire	3	6	50	59
Outside fire	43	30	42	115
Fire out on arrival	13	28	68	109
Hazard	412	74	68	554
Alarm	95	44	533	672
Service	94	29	17	140
Fire total	**660**	**211**	**778**	**1649**
Grand total	**1426**	**454**	**888**	**2768**
Percent	**51.5%**	**16.4%**	**32.1%**	**100%**

Note: Includes cancelled units.

Observations:

- Overall, three or more units were dispatched to 32 percent of calls.
- On average, 1.4 units were dispatched per EMS call.
- On average, 2.9 units were dispatched per fire category call.
- For structure fire calls, three or more units were dispatched 85 percent of the time.
- For fire alarm calls, three or more units were dispatched 79 percent of the time. This was by far the largest category of multiple unit dispatches. This occurred ten times more frequently than multiple unit dispatch to actual structure fire calls.
- For outside fire calls, three or more units were dispatched 37 percent of the time.
- For fire out on arrival calls, three or more units were dispatched 62 percent of the time.

Table 5. Annual Total Deployed Time by Call Type Including Cancelled Units

All Runs	Avg. deployed minutes/call	Total deployed hours	Percent total hours	Avg. deployed minutes/day	# of runs	Avg. runs / day
EMS	**27.4**	**747**	**23.8**	**122.4**	**1,646**	**4.5**
Structure fire	72.1	323	10.3	53.0	271	0.7
Outside fire	42.4	189	6.0	30.9	271	0.7
Fire out on arrival	21.8	141	4.5	23.0	387	1.1
Hazard	34.9	505	16.1	82.8	869	2.4
Alarm	21.8	1,084	34.5	177.7	2,982	8.1
Service	37.7	150	4.8	24.6	248	0.7
Fire total	**28.7**	**2,392**	**76.2**	**392.1**	**5,028**	**13.7**
Total	**28.4**	**3,139**	**100.0**	**514.5**	**6,674**	**18.2**

Observations:

- All units were deployed a combined 3,139 hours, including 103 hours for cancelled units. The average total department workload per day was 8.6 hours. This is the total deployment time of all the units that were deployed on service calls.
- There were 6,674 runs, an average of 18.2 runs per day. This includes runs that were cancelled. A total of 591 (9 percent) runs were cancelled, or 1.6 per day.
- Medical calls accounted for 24 percent of the total workload.
- Structure fire, outside fire, and fire out on arrival calls combined were 21 percent of the workload.
- Hazardous condition calls accounted for 16 percent of the total workload.
- Alarm calls accounted for more than one-third of the workload.

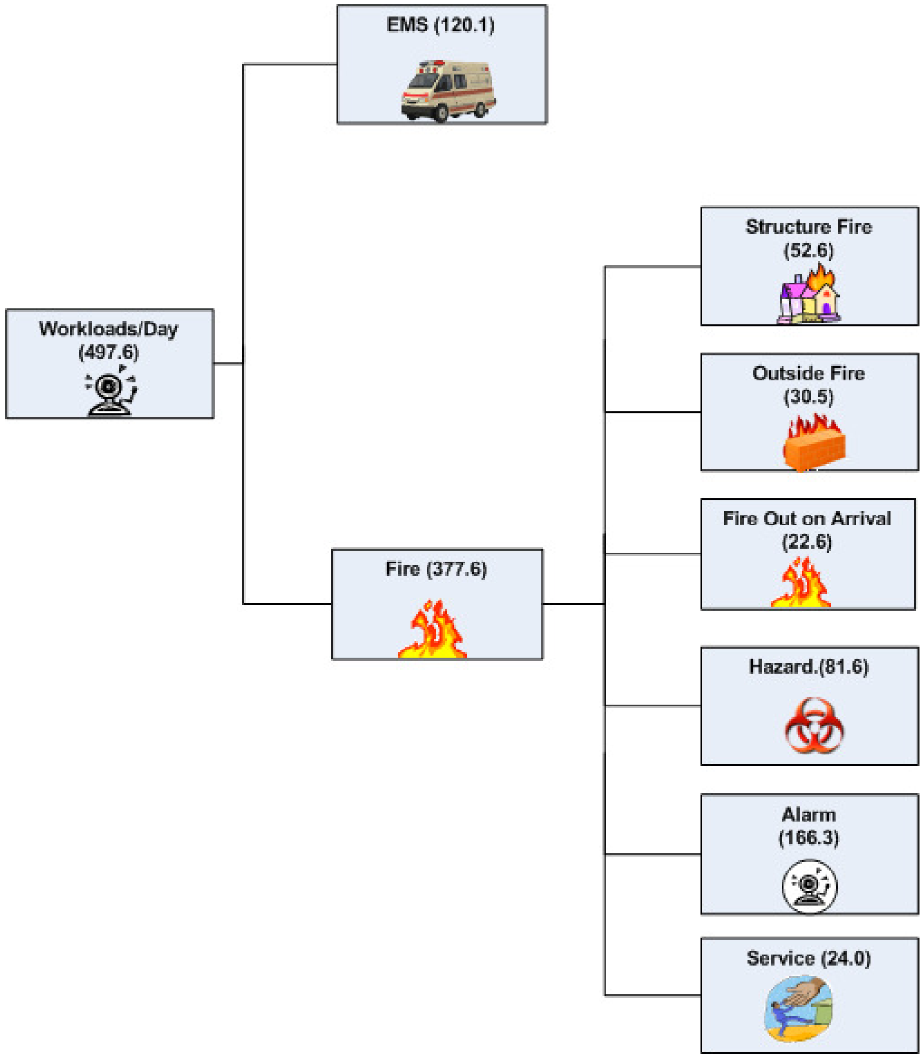
Table 6. Annual Total Deployed Time by Call Type Excluding Cancelled Units

Non-cancelled runs	Avg. deployed minutes/call	Total deployed hours	Percent total hours	Avg. deployed minutes/day	# of runs	Avg. runs / day
EMS	**28.7**	**732**	**24.1**	**120.1**	**1,533**	**4.2**
Structure fire	75.1	321	10.6	52.6	256	0.7
Outside fire	44.3	186	6.1	30.5	252	0.7
Fire out on arrival	22.6	138	4.5	22.6	366	1.0
Hazard	35.9	498	16.4	81.6	832	2.3
Alarm	23.0	1,014	33.4	166.3	2,641	7.2
Service	43.3	147	4.8	24.0	203	0.6
Fire total	**30.4**	**2,303**	**75.9**	**377.6**	**4,550**	**12.4**
Total	**29.9**	**3,036**	**100.0**	**497.6**	**6,083**	**16.6**

Observations:

- All units were deployed a combined 3,036 hours, excluding cancelled units. The average total department workload per day was 8.3 hours.
- There were 6,083 runs, an average of 16.6 runs per day.
- The average time spent on an EMS call was 29 minutes.
- Structure and outside fire calls combined were 16.7 percent of the workload. Average time spent on a structure fire call was 75 minutes, and average time spent on an outside fire call was 44 minutes.
- Fire out on arrival calls accounted for 4.5 percent of the workload. Average time spent on a fire out on arrival call was 23 minutes.

Figure 7. Department Total: Average Deployed Minutes per Day by Call Type



Observations:

- All units combined spent 6.3 hours per day on fire category calls. This includes 52.6 minutes for structure fire calls, 30.5 minutes for outside fire calls, and 22.6 minutes for fire out on arrival calls.
- The various units spent 2 hours per day on EMS calls.

Table 7. Call Workload by Unit

Station	Unit ID	Unit type	Deployed min. per run	No. of runs	No. of runs / day	Deployed min. / day	Total deployed hours
1	FE1	Engine	29.3	1310	3.6	105.1	639.4
	FLAD1	Ladder	25.2	823	2.3	56.9	346.1
	FBAT1	PU truck	31.8	1220	3.3	106.4	647.5
	FTRK1	PU truck	43.9	76	0.2	9.2	55.7
2	FE2	Engine	29.2	912	2.5	72.9	443.3
	FTRK2	PU truck	36.9	15	0.0	1.5	9.2
3	FE3	Engine	35.1	290	0.8	27.8	169.4
	FTRK3	PU truck	55.3	13	0.0	2.0	12
4	FE4	Engine	25.9	803	2.2	57.0	346.6
	FTRK4	PU truck	46.6	5	0.0	0.6	3.9
5	FE10	Engine	37.5	2	0.0	0.2	1.3
	FE5	Engine	29.4	118	0.3	9.5	57.8
	FLAD2	Ladder	35.6	447	1.2	43.5	264.9
	FTRK5	PU truck	44.6	47	0.1	5.8	35
PS Admin	FCHF1	PU truck	107.5	2	0.0	0.6	3.6

Observations:

- Two engine companies, FE1 and FE2, were deployed the greatest amount of time, averaging more than 1-1/2 hours per day for FE1 and about 1-1/4 hours per day for FE2.
- Engine company FE1 was deployed 639 hours, averaging 3.6 dispatches and 1 hour and 45 minutes per day.
- Engine company FE2 was deployed 443 hours, averaging 2.5 dispatches and 1 hour and 13 minutes per day.
- Engine company FE3 was deployed 169 hours, averaging 0.8 dispatches and 28 minutes per day.
- Engine company FE4 was deployed 347 hours, averaging 2.2 dispatches and 57 minutes per day.
- Engine companies FE5 and FE10 combined were deployed 59 hours, averaging more than 2 dispatches per week and about one hour per week.
- Ladder truck FLAD1 was deployed 346 hours, averaging 2.3 dispatches and 57 minutes per day.
- Ladder truck FLAD2 was deployed 265 hours, averaging 1.2 dispatches and 44 minutes per day.
- PU truck FBAT1 was deployed 648 hours, averaging 3.3 dispatches and 1 hour and 46 minutes per day.
- The other 5 PU trucks (FTRK1, FTRK2, FTRK3, FTRK4, FTRK5) combined were deployed 166 times with a total workload of 120 hours in a year.

Table 8. Engine and Ladder Units: Total Annual and Daily Average Runs by Call Type

Runs	Engine					Ladder	
	FE1	FE2	FE3	FE4	FE5	FLAD1	FLAD2
EMS	**412**	**246**	**77**	**236**	**30**	**96**	**131**
Structure fire	42	41	12	28	7	43	18
Outside fire	55	44	17	12	7	22	24
Fire out on arrival	70	53	17	43	5	58	28
Hazard	198	97	60	107	25	106	62
Alarm	503	418	97	370	40	469	170
Service	30	13	10	7	6	29	14
Fire total	**898**	**666**	**213**	**567**	**90**	**727**	**316**
Fire calls %	**68.5%**	**73.0%**	**73.4%**	**70.6%**	**75.0%**	**88.3%**	**70.7%**
Total	**1,310**	**912**	**290**	**803**	**120**	**823**	**447**
Avg. runs / day	**3.6**	**2.5**	**0.8**	**2.2**	**0.3**	**2.2**	**1.2**

Note: FE10 was counted as FE5.

Observations:

- For every unit, alarm calls accounted for more than 40 percent of fire category calls. In some cases, nearly two-thirds of a unit's fire category calls were alarms.
- Engine FE1 responded to 898 fire category calls (69 percent of the calls to which it responded), including 97 structure and outside fire calls and 70 fire out on arrival calls.
- Engine FE2 responded to 666 fire category calls (73 percent of the calls to which it responded), including 85 structure and outside fire calls and 53 fire out on arrival calls.
- Engine FE3 responded to 213 fire category calls (73 percent of the calls to which it responded), including 29 structure and outside fire calls and 17 fire out on arrival calls.
- Engine FE4 responded to 567 fire category calls (71 percent of the calls to which it responded), including 40 structure and outside fire calls and 43 fire out on arrival calls.
- Ladder FLAD1 responded to 727 fire category calls (88 percent of the calls to which it responded), including 65 structure and outside fire calls and 58 fire out on arrival calls.
- Ladder FLAD2 responded to 316 fire category calls (71 percent of the calls to which it responded), including 42 structure and outside fire calls and 28 fire out on arrival calls.

Table 9. Engine and Ladder Units: Daily Average Deployed Minutes by Call Type

Avg. minutes / day	Engine					Ladder	
	FE1	FE2	FE3	FE4	FE5	FLAD1	FLAD2
EMS	**33.1**	**18.2**	**6.7**	**17.9**	**2.1**	**5.7**	**13.2**
Structure fire	9.3	8.3	2.8	4.4	1.6	7.9	3.9
Outside fire	5.3	5.3	3.2	1.6	0.5	1.9	3.8
Fire out on arrival	4.6	3.7	1.0	2.5	0.2	3.1	1.7
Hazard	17.5	10.5	7.8	8.5	3.3	8.0	7.9
Alarm	33.9	25.8	5.6	21.0	1.7	27.2	10.4
Service	1.4	1.0	0.8	1.2	0.3	3.1	2.6
Fire total	**72.0**	**54.6**	**21.2**	**39.1**	**7.6**	**51.2**	**30.3**
Fire calls %	**68.5%**	**74.9%**	**76.3%**	**68.6%**	**78.4%**	**90.0%**	**69.7%**
Daily average	**105.1**	**72.9**	**27.8**	**57**	**9.7**	**56.9**	**43.5**
Yearly deployed hours	**639.4**	**443.5**	**169.1**	**346.8**	**59.0**	**346.1**	**264.6**

Observations:

- Every unit averaged less than 15 minutes per day deployed at actual fires, whether structure or outside.
- Engine FE1 was deployed 72 minutes per day on fire category calls (69 percent of its daily average deployed minutes), including 14.6 minutes on structure and outside fire calls and 4.6 minutes on fire out on arrival calls. Alarm calls accounted for 34 minutes of this 72 minute total.
- Engine FE2 was deployed 55 minutes on fire category calls (75 percent of its daily average deployed minutes), including 13.6 minutes on structure and outside fire calls and 3.7 minutes on fire out on arrival calls.
- Engine FE3 was deployed 21 minutes on fire category calls (76 percent of its daily average deployed minutes), including 6 minutes on structure and outside fire calls and 1 minute on fire out on arrival calls.
- Engine FE4 was deployed 39 minutes on fire category calls (69 percent of its daily average deployed minutes), including 6 minutes on structure and outside fire calls and 2.5 minutes on fire out on arrival calls.
- Ladder FLAD1 was deployed 51 minutes on fire category calls (90 percent of its daily average deployed minutes), including 9.8 minutes on structure and outside fire calls and 3.1 minutes on fire out on arrival calls.
- Ladder FLAD2 was deployed 30 minutes on fire category calls (70 percent of its daily average deployed minutes), including 7.7 minutes on structure and outside fire calls and 1.7 minutes on fire out on arrival calls.

Table 10. PU Truck Units: Total Annual and Daily Average Runs by Call Type

Runs	PU truck					
	FBAT1	FTRK1	FTRK2	FTRK3	FTRK4	FTRK5
EMS	**266**	**24**	**2**	**1**	**1**	**10**
Structure fire	53	5	3			4
Outside fire	63	5		1		1
Fire out on arrival	89	1	1			1
Hazard	113	21	5	10	3	25
Alarm	548	16	4	1	1	4
Service	88	4				2
Fire total	**954**	**52**	**13**	**12**	**4**	**37**
EMS calls %	**21.8%**	**31.6%**	**13.3%**	**7.7%**	**20.0%**	**21.3%**
Total	**1,220**	**76**	**15**	**13**	**5**	**47**
Avg. runs / day	**3.3**	**0.2**	**0.0**	**0.0**	**0.0**	**0.1**

Note: A total of 2 runs of FCHF1 are not included.

Observations:

- PU truck FBAT1 responded to 266 EMS calls (22 percent of the calls to which it responded), 116 structure and outside fire calls, and 89 fire out on arrival calls (17 percent of the calls to which it responded). Alarm calls accounted for 78 percent of its runs.

Table 11. PU Truck Units: Daily Average Deployed Minutes by Call Type

Avg. minutes / day	PU truck					
	FBAT1	**FTRK1**	**FTRK2**	**FTRK3**	**FTRK4**	**FTRK5**
EMS	**19.3**	**2.9**	**0.3**	**0**	**0**	**0.7**
Structure fire	10.9	2.1	0.6			0.9
Outside fire	8.2	0.3		0.3		0.1
Fire out on arrival	5.7	0.1	0.1			0
Hazard	10.1	1.7	0.5	1.6	0.6	3.7
Alarm	39.6	1.2	0.1	0	0	0.2
Service	12.6	0.8				0.2
Fire total	**87.1**	**6.3**	**1.2**	**1.9**	**0.6**	**5.1**
Fire calls %	**81.9%**	**68.5%**	**80.0%**	**95.0%**	**100.0%**	**89.5%**
Daily average	**106.4**	**9.2**	**1.5**	**2**	**0.6**	**5.7**
Yearly deployed hours	**647.3**	**56.0**	**9.1**	**12.2**	**3.7**	**34.7**

Observations:

- PU truck FBAT1 was deployed 19.3 minutes on EMS calls (18 percent of its daily average deployed minutes), 19.1 minutes on structure and outside fire calls, and 5.7 minutes on fire out on arrival calls (23 percent of its daily average deployed minutes). Alarm and service calls accounted for almost 50 percent of the total.

Table 12. Total Workload by Activity Type

Activity	No. of activitie s	Activities / day	Total deployed hours	Percent of total hours	Avg. deployed min. / run	Avg. deployed min. / day	No. of Runs	Avg. runs / day
Administrative duties	761	2.1	989	13.4	76.1	162.2	781	2.1
Fire drill	172	0.5	125	1.7	35.6	20.4	212	0.6
Hydrant detail	178	0.5	640	8.7	197.8	104.9	195	0.5
Special assignment	1,929	5.3	3,911	53.0	100	641.1	2365	6.5
Training	457	1.2	1,718	23.3	105.1	281.6	982	2.7
Total	**3,497**	**9.6**	**7,382**	100	**98.2**	**1,210.2**	**4,535**	**12.4**

Observations:

- All units were deployed a combined 7,382 hours for all types of activities. The average department activity workload per day was 20 hours.
- Special assignments (often used instead of supply detail or training) and training activities combined accounted for 76.3 percent of the activity workload total. Average time spent on a special assignment or training activity was more than 1 hour and 40 minutes per activity.
- There were 761 administrative duty activities (including pre-fire planning, station rounds, and cemetery details) in a year, averaging 2.1 per day. Average time spent on an administrative duty activity was 76 minutes.
- There were 172 fire drill activities in a year, averaging 3.3 per week. Average time spent on a fire drill activity was 36 minutes.
- There were 178 hydrant detail activities in a year, averaging 3.5 per week. Average time spent on a hydrant detail activity was 3 hours and 18 minutes.

- The number of runs includes multiple units assigned to the same activity. Training most often involved multiple units.

Table 13. Activity Workload by Unit

Unit type	Unit	No. of runs	No. of runs / day	Total deployed hours	Deployed min. / day	Deployed min. / run
Car	FCAR1	1	0.0	4	0.6	222
	FCAR4	43	0.1	119	19.5	165
	FCHF2	1	0.0	5	0.9	325
Engine	FE1	443	1.2	548	90.1	74
	FE10	18	0.0	73	12	244
	FE2	573	1.6	876	144	92
	FE3	491	1.3	798	131.2	98
	FE4	566	1.6	882	144.9	94
	FE5	92	0.3	296	48.6	193
Ladder	FLAD1	352	1.0	455	74.8	78
	FLAD2	443	1.2	899	147.7	122
PU truck	FBAT1	204	0.6	283	46.5	83
	FCHF1	1	0.0	6	0.9	344
	FTRK1	943	2.6	1231	202.3	78
	FTRK2	116	0.3	301	49.5	156
	FTRK3	73	0.2	163	26.9	134
	FTRK4	13	0.0	38	6.2	174
	FTRK5	162	0.4	407	66.9	151

Observations:

- Time spent by a unit on activities generally exceeded the time it spent on calls.
- Engine FE1 was deployed 548 hours for a variety of activities, averaging 1.2 dispatches and 1 hour and 30 minutes per day.
- Engine FE2 was deployed 876 hours for a variety of activities, averaging 1.6 dispatches and 2 hours and 24 minutes per day.
- Engine FE3 was deployed 798 hours for a variety of activities, averaging 1.3 dispatches and 2 hours and 11 minutes per day.
- Engine FE4 was deployed 882 hours for a variety of activities, averaging 1.6 dispatches and 2 hours and 25 minutes per day.
- Engine FE5 was deployed 296 hours for a variety of activities, averaging 0.3 dispatches and 49 minutes per day.
- Ladder truck FLAD2 was deployed 899 hours for a variety of activities, averaging 1.2 dispatches and 2 hours and 28 minutes per day.
- Ladder truck FLAD1 was deployed 455 hours for a variety of activities, averaging 1 dispatch and 1 hour and 15 minutes per day.
- PU truck FTRK1 was deployed 1,231 hours for a variety of activities, averaging 2.6 dispatches and 3 hours and 22 minutes per day.
- PU truck FTRK5 was deployed 407 hours for a variety of activities, averaging 0.4 dispatches and 1 hour and 17 minutes per day.
- PU truck FTRK2 was deployed 301 hours for a variety of activities, averaging 0.3 dispatches and 50 minutes per day.
- PU truck FBAT1 was deployed 283 hours for a variety of activities, averaging 0.6 dispatches and 47 minutes per day.

- PU truck FTRK3 was deployed 163 hours for a variety of activities, averaging 0.2 dispatches and 27 minutes per day.

Table 14. Engine and Ladder Units: Annual and Daily Average Runs by Activity Type

Activity runs	Engine					Ladder	
	FE1	FE2	FE3	FE4	FE5	FLAD1	FLAD2
Administrative duties	64	75	62	59	6	46	44
Fire drill	64	48	28	17		42	4
Hydrant detail	10	8	5	4	1	3	
Special assignment	141	309	262	329	77	124	247
Training	164	133	134	157	26	137	148
Total	**443**	**573**	**491**	**566**	**110**	**352**	**443**
Avg. runs / day	**1.2**	**1.6**	**1.3**	**1.6**	**0.3**	**1.0**	**1.2**

Note: FE10 is treated as reserve unit of FE1

Observations:

- Engine FE1 had 305 special assignment and training activities in a year, averaging 0.8 per day.
- Engine FE2 had 442 special assignment and training activities in a year, averaging 1.2 per day.
- Engine FE3 had 396 special assignment and training activities in a year, averaging 1.1 per day.
- Engine FE4 had 486 special assignment and training activities in a year, averaging 1.3 per day.
- Ladder truck FLAD1 had 261 special assignment and training activities in a year, averaging 0.7 per day.
- Ladder truck FLAD2 had 395 special assignment and training activities in a year, averaging 1.1 per day.

Table 15. Engine and Ladder Units: Daily Average Deployed Minutes by Activity Type

Avg. activity deployed min. / day	Engine					Ladder	
	FE1	FE2	FE3	FE4	FE5	FLAD1	FLAD2
Administrative duties	15.6	17.2	14.1	14.5	1.6	7.3	13.4
Fire drill	5.6	5.0	2.8	1.4		3.6	0.5
Hydrant detail	1.6	3.0	2.1	1.1	0.0	1.3	
Special assignment	27.8	82.6	72.8	82.9	47.9	27.5	81.3
Training	39.5	36.3	39.5	45.0	11.1	35.0	52.6
Daily average min.	**90.1**	**144**	**131.2**	**144.9**	**60.6**	**74.8**	**147.7**
Yearly deployed hours	**548**	**876**	**798**	**881**	**369**	**455**	**899**

Note: FE10 is treated as reserve unit of FE1

Observations:

- All units except FE5 averaged more than one-half hour per day on training.
- Several units - FE2, FE3, and FE4 - averaged more than an hour per day on special assignment.
- Engine FE1 spent 1 hour and 7 minutes on special assignment and training activities and 15.6 minutes on administrative duties on average per day.
- Engine companies FE2, FE3, and FE4 each spent nearly 2 hours on special assignment and training activities and around 15 minutes on administrative duties on average per day.
- Ladder truck FLAD1 spent 1 hour and 3 minutes on special assignment and training activities and 7 minutes on administrative duties on average per day.
- Ladder truck FLAD2 spent 2 hours and 14 minutes on special assignment and training activities and 13 minutes on administrative duties on average per day.

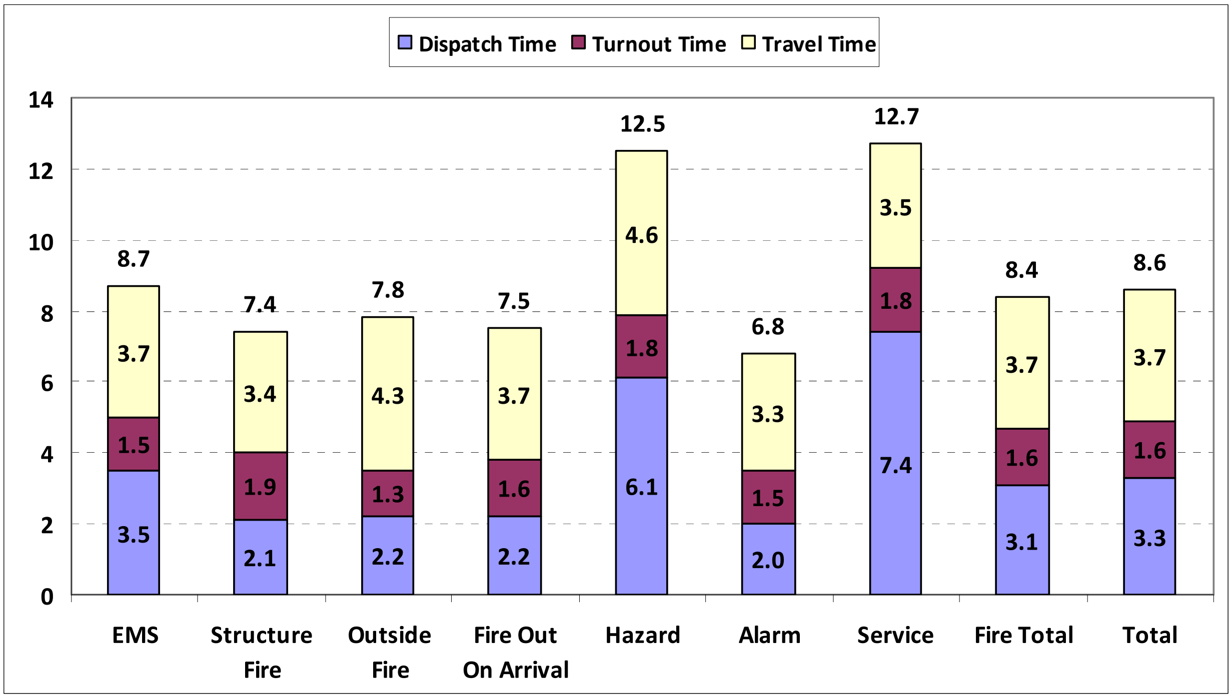
Table 16. Calls and Activities Combined: Total Workload by Type

	Call / activity type	No. of calls or activities	Calls or activities / day	Total deployed hours	Percent total hours	Deployed hours / day	No. of runs	Runs / day
EMS	EMS	1,118	3.1	732	7.0	2.0	1,533	4.2
Fire	Structure fire	59	0.2	321	3.1	0.9	256	0.7
	Outside fire	115	0.3	186	1.8	0.5	252	0.7
	Fire out on arrival	109	0.3	138	1.3	0.4	366	1.0
	Hazard	554	1.5	498	4.8	1.4	832	2.3
	Alarm	672	1.8	1,014	9.7	2.8	2,641,	7.2
	Service	140	0.4	147	1.4	0.4	203	0.6
Activity	Administrative duties	761	2.1	989	9.5	2.7	781	2.1
	Fire drill	172	0.5	125	1.2	0.3	212	0.6
	Hydrant detail	178	0.5	640	6.1	1.7	195	0.5
	Special assignment	1,929	5.3	3,911	37.5	10.7	2,365	6.5
	Training	457	1.2	1,718	16.5	4.7	982	2.7
Total		6,264	17.1	10,418	100	28.5	10,618	29.0

Observations:

- There were 6,264 calls and activities combined in 2008, an average of 17.1 per day.
- All units combined were deployed 10,418 hours for calls and activities. The average department workload per day was 28.5 hours.
- There were 10,618 runs, an average of 29 runs per day.

Figure 8. Average Dispatch, Turnout, Travel, and Response Time of First Arriving Units by Call Type



Note: We calculated response time as the difference between the unit on-scene time and the call received time. However, there were 1,226 calls having all the information needed (call received time, unit dispatch time, unit turnout time, unit on-scene time) to calculate dispatch time, turnout time, and travel time. Figure 8 and Table 17 are reporting only those 1,226 calls. We report results of response time analysis of all 2,767 calls beginning with Table 18.

Table 17. Average Dispatch, Turnout, Travel, and Response Time of First Arriving Units by Call Type

Call type	Dispatch time	Turnout time	Travel time	Response time	Number of calls
EMS	3.5	1.5	3.7	8.7	606
Structure fire	2.1	1.9	3.4	7.4	35
Outside fire	2.2	1.3	4.3	7.8	65
Fire out on arrival	2.2	1.6	3.7	7.5	62
Hazard	6.1	1.8	4.6	12.5	117
Alarm	2.0	1.5	3.3	6.8	316

Service	7.4	1.8	3.5	12.7	25
Fire total	3.1	1.6	3.7	8.4	620
Total	3.3	1.6	3.7	8.6	1,226

Table 18. Average Response Time and Travel-Back Time of First Arriving Units by Call Type

Call type	Response time	Travel-back time	Number of calls
EMS	8.4	8.7	1,118
Structure fire	7.0	9.0	59
Outside fire	7.4	10.3	115
Fire out on arrival	7.4	10.6	109
Hazard	7.9	9.6	554
Alarm	6.2	7.8	672
Service	8.3	9.3	140
Fire total	7.0	8.8	1,649
Total	7.6	8.7	2,767

Note: Response time calculated by subtracting just the arrival time from the receipt time. It does not consider whether or not the specific components of response time such as dispatch time and turnout time are missing from the data set.

Observations:

- The average dispatch time for those 1,226 calls with complete information of the components of response time was 3.3 minutes.
- The average turnout time was 1.6 minutes, and average travel time was 3.7 minutes.
- The average response time for those 1,226 calls was 8.6 minutes.
- On fire calls, the average response time for structure fire calls was 7.0 minutes, and for outside fire calls, 7.4 minutes.
- Response time averages shown in Table 18 are a few tenths of a minute less than reported in Table 17 for the critical call categories of EMS, structure fires, and outside fires

- For hazard and service calls, 80 percent of the response time records were incomplete.
- The average response time for all calls was 7.6 minutes.
- The average travel-back time for all calls was 8.7 minutes.

Figure 9. Percent of Time Each Unit Arrived First by Call Type

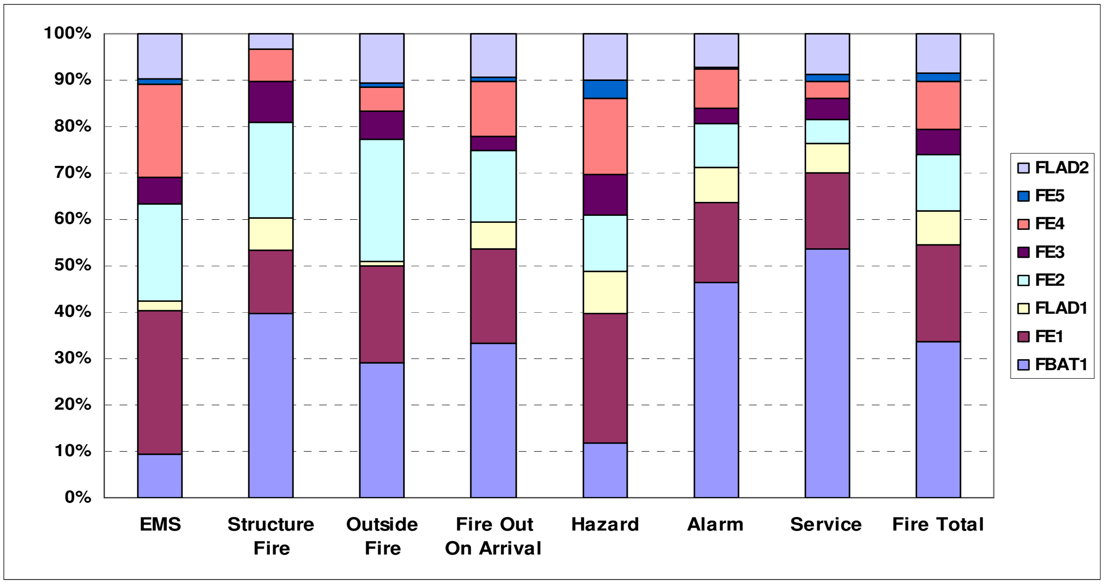


Table 19. Percent of Time Each Unit Arrived First by Call Type

Station	1			2	3	4	5	
	FBAT1	FE1	FLAD1	FE2	FE3	FE4	FE5	FLAD2
EMS	9	31	2	21	6	20	1	10
Structure fire	40	14	7	21	9	7	0	3
Outside fire	29	21	1	26	6	5	1	11
Fire out on arrival	33	20	6	16	3	12	1	9
Hazard	12	28	9	12	9	16	4	10
Alarm	46	18	8	9	3	8	0	7
Service	54	16	7	5	4	4	1	9
Fire total	34	21	7	12	6	10	2	9
Total	24	25	5	16	6	14	1	9

Observations:

- For total EMS calls, engine FE1 arrived first 31 percent of the time, followed by engine FE2, which arrived first 21 percent of the time.
- For structure fire calls, engine company FE2 was the first unit to arrive 21 percent of the time, followed by engine company FE1, which arrived first 14 percent of the time.
- For outside fire calls, engine company FE2 was the first unit to arrive 26 percent of the time, followed by engine company FE1, which arrived first 21 percent of the time.

Figure 10. Average Dispatch Time, Turnout Time, Travel Time, and Response Time of First Arriving Units by Hour of the Day for EMS, Structure Fire, Outside Fire, and Fire Out on Arrival Calls

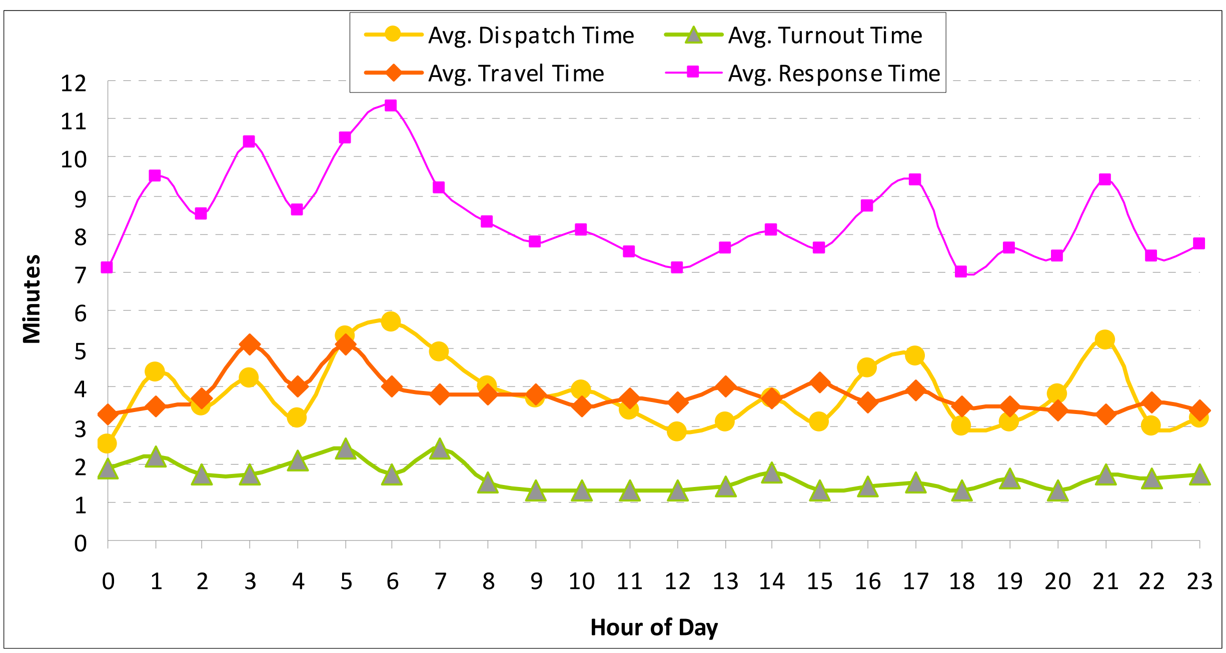


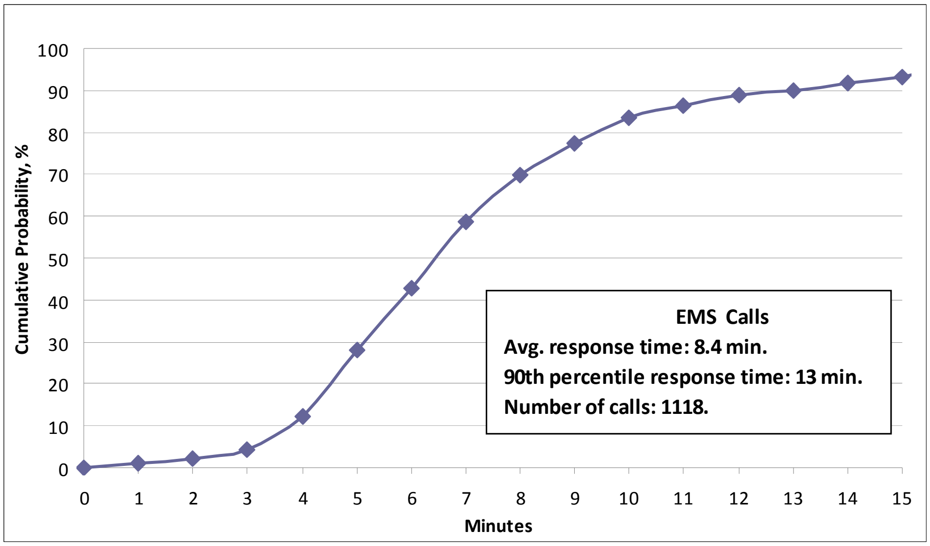
Table 20. Average Dispatch Time, Turnout Time, Travel Time, Response Time, and Travel-Back Time of First Arriving Units by Hour of the Day for EMS, Structure Fire, Outside Fire, and Fire Out on Arrival Calls

Hour	Avg. dispatch time	Avg. turnout time	Avg. travel time	Avg. response time	Avg. travel-back time	# of calls
0	2.5	1.9	3.3	7.1	5.9	29
1	4.4	2.2	3.5	**9.5**	5.9	35
2	3.5	1.7	3.7	**8.5**	9.2	39
3	4.2	1.7	5.1	**10.4**	9.4	26
4	3.2	2.1	4.0	**8.6**	5.6	23
5	5.3	2.4	5.1	**10.5**	11.5	22
6	5.7	1.7	4.0	**11.3**	5.5	32
7	4.9	2.4	3.8	**9.2**	14.3	47
8	4.0	1.5	3.8	8.3	7.5	68
9	3.7	1.3	3.8	7.8	11.3	72
10	3.9	1.3	3.5	8.1	11.2	64
11	3.4	1.3	3.7	7.5	10.2	81
12	2.8	1.3	3.6	7.1	9.2	97
13	3.1	1.4	4.0	7.6	9.7	95
14	3.7	1.8	3.7	8.1	11.2	71
15	3.1	1.3	4.1	7.6	13.2	77
16	4.5	1.4	3.6	8.7	8.6	88
17	4.8	1.5	3.9	9.4	9.9	80
18	3.0	1.3	3.5	7.0	9.4	71
19	3.1	1.6	3.5	7.6	7.2	62
20	3.8	1.3	3.4	7.4	7.2	72
21	5.2	1.7	3.3	9.4	6.3	56
22	3.0	1.6	3.6	7.4	5.5	56
23	3.2	1.7	3.4	7.7	6.2	38
	3.8	1.6	3.7	8.2	9	1401

Observations:

- Dispatch time was between 2.5 and 5.7 minutes.
- Turnout time was between 1.3 and 2.4 minutes.
- Travel time was consistently between 3.3 and 5.1 minutes.
- Average response time peaked between 1 AM and 8 AM. At times the average exceeded 10 minutes.

Figure 11. Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit for EMS Calls



Reading the CDF Chart

The vertical axis is the probability or percentage of calls. The horizontal axis is response time. For example, with regard to EMS calls, the 0.9 probability line intersects the graph at a time mark at about 12.8 minutes. This means that EMS units responded to 90 percent of these calls in less than 13 minutes.

Table 21. CDF of Response Time of First Arriving Unit for EMS Calls

Response time	Response time code	Frequency	Cumulative percent
1 min	1	10	0.9
2 min	2	11	2.0
3 min	3	26	4.4
4 min	4	83	12.3
5 min	5	167	28.0
6 min	6	156	42.8
7 min	7	168	58.6
8 min	8	118	69.8
9 min	9	80	77.3
10 min	10	66	83.6
11 min	11	30	86.4
12 min	12	25	88.8
13 min	13	14	90.1
14 min	14	16	91.6
15 min	15	16	93.1
15-20 min	16	32	96.1
>= 20 min	17	41	100.0

Observations:

- The average response time for EMS calls was 8.4 minutes.
- For 43 percent of EMS calls, the response time was less than 6 minutes.
- For 90 percent of EMS calls, the response time was less than 13 minutes.

Table 22. Average Response Time of First Arriving Units for Structure Fire, Outside Fire, and Fire Out on Arrival Calls

First arriving unit	Outside fire		Structure fire		Fire out on arrival		Total	
	Avg. response time	# of runs	Avg. response time	# of runs	Avg. response time	# of runs	Avg. response time	# of runs
FE1	6.7	33	6.3	23	6.9	36	6.7	92
FE2	1.0	1					1.0	1
FE3	6.7	24	5.1	8	6.2	22	6.3	54
FE4	7.5	30	10.7	12	6.3	17	7.9	59
FE5	10.1	7	6.8	5	9.0	3	8.8	15
FLAD1	7.8	6	5.0	4	6.4	13	6.5	23
FLAD2	13.0	1			36.0	1	24.5	2
FBAT1	9.0	1	5.7	4	6.8	6	6.7	11
FCHF1	8.8	12	7.0	2	11.5	10	9.8	24
FTRK1					3.0	1	3.0	1
FTRK5			5.0	1			5.0	1
Total	7.4	115	7.0	59	7.4	109	7.3	283

Observations:

- Engine FE1 and FE3 had the shortest average response time, 6.7 minutes, for outside fire calls when either of these units arrived first.
- Ladder truck FLAD1 had the shortest response time, 5 minutes, for structure fire calls when it arrived first (FTRK5 only had one run).
- The average response time of the first arriving fire unit for outside fire calls was 7.4 minutes.
- The average response time of the first arriving fire unit for structure fire calls was 7 minutes.

Table 23. Average Response Time of All Arriving Fire Units for Structure Fire, Outside Fire, and Fire Out on Arrival Calls

All arriving units	Outside fire		Structure fire		Fire out on arrival		Total	
	Avg. response time	# of runs	Avg. response time	# of runs	Avg. response time	# of runs	Avg. response time	# of runs
FE1	7.3	60	8.8	44	7.7	74	7.9	178
FE2	8.3	46	10.5	45	8.1	57	9.0	148
FE3	10.4	17	10.6	12	9.3	17	10.2	46
FE4	11.4	16	8.8	31	7.9	47	8.8	94
FE5	10.5	7	31.0	8	36.0	5	26.5	20
FLAD1	12.0	25	8.0	44	8.9	62	8.8	131
FLAD2	10.9	24	9.5	20	11.0	30	10.5	74
FBAT1	8.0	65	9.0	54	7.7	92	8.2	211
FCHF1	1.0	1					1.0	1
FTRK1	37.0	5	45.0	6	3.0	1	36.7	12
FTRK2			37.7	3		1	37.7	4
FTRK3	45.0	1					45.0	1
FTRK5		1	26.3	4	6.0	1	22.2	6
Total	9.1	268	11.1	271	8.3	387	9.4	926

Note: This table includes all runs of fire units.

Observations:

- Engine FE1 had the shortest response time, 7.3 minutes, for outside fire calls.
- Ladder truck FLAD1 had the shortest response time, 8 minutes, for structure fire calls.
- For outside fire calls, the average response time of the first arriving unit was 7.4 minutes. The average of all units sent to the same call was 9.1 minutes.
- For structure fire calls, the average response time of the first arriving unit was 7 minutes. The overall average response time of all fire units sent to the same call was 11.1 minutes.

Figure 12. CDF of Response Time of First and Second Arriving Fire Units for Structure Fire, Outside Fire, and Fire Out on Arrival Calls

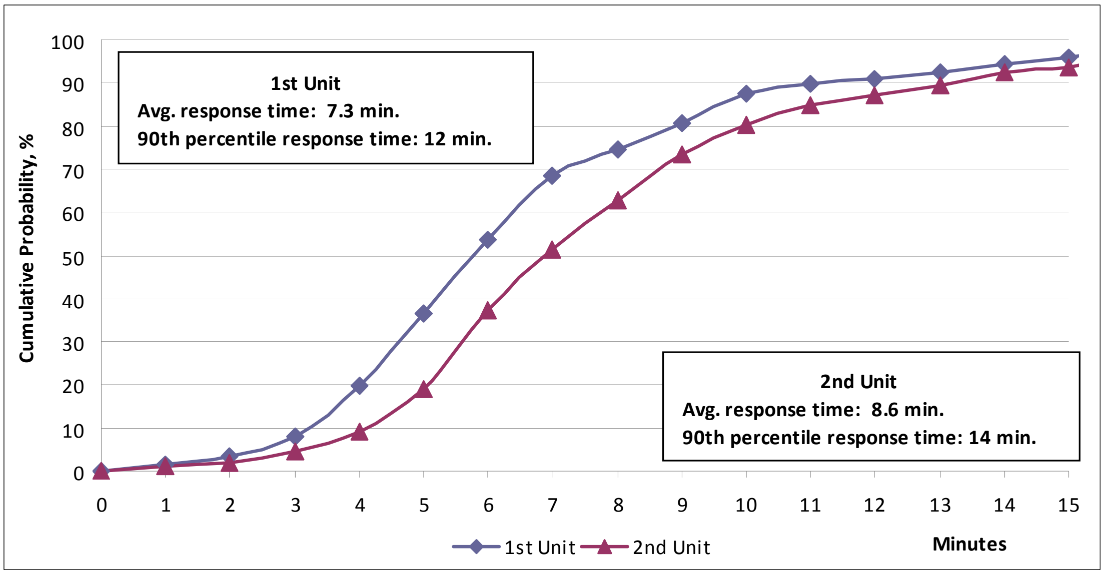


Table 24. CDF of Response Time of First and Second Arriving Fire Units for Structure Fire, Outside Fire, and Fire Out on Arrival Calls

Response time	Response time code	1st unit		2nd unit	
		Frequency	Cumulative percent	Frequency	Cumulative percent
0 min	0	0	0.0	0	0.0
1 min	1	4	1.5	2	1.2
2 min	2	5	3.4	1	1.7
3 min	3	12	7.8	5	4.7
4 min	4	32	19.8	8	9.3
5 min	5	45	36.6	17	19.2
6 min	6	46	53.7	31	37.2
7 min	7	39	68.3	24	51.2
8 min	8	17	74.6	20	62.8
9 min	9	16	80.6	18	73.3
10 min	10	18	87.3	12	80.2
11 min	11	6	89.6	8	84.9
12 min	12	4	91.0	4	87.2
13 min	13	4	92.5	4	89.5
14 min	14	5	94.4	5	92.4
15 min	15	4	95.9	2	93.6
15-20 min	16	6	98.1	5	96.5
>= 20 min	17	5	100.0	6	100.0

Observations:

- The average response time of first arriving fire units for structure and outside fire calls was 7.3 minutes.
- The first fire unit arrived on scene within 6 minutes or less 54 percent of the time.
- The first fire unit arrived on scene within 12 minutes 91 percent of the time.
- The response time pattern of the second arriving unit on average was 1.3 minutes longer than the first arriving unit.

Appendix. Summary of Extinguishment Methods Applied for Structure and Outside Fire Calls

Extinguish Method	Outside Fire	Structure Fire
1 3/4 HANDLINE	41	19
1 3/4 HANDLINE ELEVATED MASTER STREAM	1	
1 3/4 HANDLINE FIRE BREAK FIRE FLAPS & RAKES	2	
2 1/2 HANDLINE		1
2 1/2 HANDLINE MASTER STREAM		1
BOOSTER LINE	37	2
BOOSTER LINE EMULSIFIER	1	
CARBON DIOXIDE		1
DRY CHEMICAL	3	8
DRY CHEMICAL EMULSIFIER		1
EMULSIFIER	9	4
EMULSIFIER FIRE FLAPS & RAKES	1	
EXTINGUISHMENT NONE 1 3/4 HANDLINE		1
EXTINGUISHMENT NONE EMULSIFIER		1
FIRE FLAPS & RAKES	2	
MASTER STREAM 1 3/4 HANDLINE		1
TURNED OFF ELECTRICITY	2	4
WATER EXTINGUISHER	3	2