# Implementing a Comprehensive and NFPA Compliant Pre-Incident Plan Program at Avondale Fire & Medical

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## Certification Statement

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

Signed 

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## Abstract

In an effort to better prepare Avondale Fire & Medical (AFM) personnel for potential emergency responses within its jurisdiction, ways were sought in how to improve and update the quantity and quality of pre-incident plan information available to responders. The problem identified was that AFM lacked a pre-incident plan program that adheres to the National Fire Protection Association's (NFPA) 1620 Standards For Pre-Incident Planning and thus placed citizens and firefighters at greater risk of injury or death. The purpose of this applied research project was to identify relevant procedures that work in successful pre-incident plan programs used at other fire departments, to identify strengths and weaknesses within AFM's current practices in pre-incident planning, and to develop a pre-incident plan program that adheres to NFPA 1620. The action research method was chosen so that a newly written department administrative policy and procedure for pre-incident planning could be presented to AFM administration and personnel as a potential solution. The research sought to answer four questions: (a) What were the current pre-incident plan efforts employed by AFM? (b) How did the efforts comply or fail to comply with NFPA 1620? (c) What processes did other departments use in successful pre-incident planning? (d) What obstacles existed in implementing a similarly successful program at AFM? Procedures for this project included a literature review, internal and external surveys, and interviews of pertinent stakeholders. The results identified fallacies within the current program that can be remedied by the recommendation of a written policy and procedures for a functional pre-incident plan program.

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Fighting fire can be likened to a military battle. That said, timeless military theory can directly apply to how fire departments prepare for and battle fire. The famous Chinese military general and strategist, Sun Tzu, once wrote, "If you know the enemy and know yourself, you need not fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained, you will also suffer a defeat. If you know neither the enemy or yourself, you will succumb in every battle" (Giles, 1910, p. 52).

In firefighting, battling our enemy can take place in seemingly any occupancy at any time. To increase our chances of success, it is imperative that we know as much about the occupancy as possible, including layout, fire control systems/structures, water availability, and access, just to name a few. This is where the critical function of the pre-incident plan comes into play. The compiling of building information and the subsequent use of that information during an emergency incident is one of the most significant skills a fire ground commander and his or her crew can possess (Lee, 2009).

Avondale Fire & Medical Department (AFM) was able to adequately create and distribute pre-incident plan information in1998, when the population was 27,239 (U.S Census Bureau, 2015). Today, with population approaching 80,000 and limited resources, AFM is unable to keep up with the growth the city has seen. The result is lack of or outdated pre-incident plan information on buildings within the department's jurisdiction.

The problem is that AFM lacks a pre-incident plan program that adheres to the National Fire Protection Association's (NFPA) 1620 Standards for Pre-Incident Planning thus placing citizens and firefighters at greater risk of injury or death due to unknown hazards or occupancy unfamiliarity.

The purpose of this research paper is to identify relevant procedures that work in successful pre-incident plan programs at other fire departments, identify strengths and weaknesses within AFM's current practices in regards to the subject, and finally, develop and implement a pre-incident plan program that adheres to NFPA 1620 thus improving the safety for our citizens and firefighters on the emergency scene.

The action research method was utilized with the desired intent to be the development of new procedures for occupancy information gathering, processing, and distribution that follow NFPA 1620 recommendations. To achieve this goal, the following questions had to be addressed: (a) What are AFM's current practices in completing and maintaining pre-incident plans? (b) What is the NFPA 1620 Standard for Pre-Incident Plans and how does AFM currently comply or fail to comply? (c) How do other fire departments address their pre-incident plan needs and what innovative ideas are being used? (d) What organizational obstacles exist within AFM that may prevent implementing and maintaining a successful program?

## Background and Significance

Avondale Fire & Medical is a 100% full-time, career organization that provides fire suppression, Emergency Medical Services (EMS), technical rescue, fire prevention (community risk reduction), and life safety education to the citizens of Avondale and surrounding communities. This is accomplished through the hard work of 75 dedicated personnel (City Of Avondale, 2015). AFM's administration includes one fire chief supported by one deputy chief, three division chiefs, and one financial & administrative assistant. Three personnel led by the fire marshal address fire prevention activities that include regular fire code inspections and fire investigations. AFM has one public education specialist who coordinates department public

education activities and engages with local public and private schools, youth/adult groups, and citizens. A total of 63 personnel are in operations and respond to more than 8000 calls per year out of four fire stations (City Of Avondale, 2014).

The city of Avondale itself is a suburban community within the Phoenix metropolitan area, which has a total population of just over 4 million people (U.S. Census Bureau, 2014). In order to most efficiently serve the millions of residents who call the "Valley of the Sun" home, the Phoenix Fire Department coordinates regional fire & EMS dispatch through inter-governmental agreements with participating neighbor cities. Through these agreements, the Phoenix Fire Department Regional Dispatch Center provides automatic aid dispatch for 29 different fire jurisdictions covering an area of more than 2000 square miles (City Of Phoenix, 2016).

These agreements allow the Phoenix Fire Department to install and maintain Mobile Computer Terminals (MCTs) in every apparatus belonging to participating agencies. Through Computer Aided Dispatch (CAD), fire and EMS units are able to share radio communication channels and any information that can be transmitted via the MCTs, including pre-incident plan information. The software that is used on the MCTs is a GIS-based software developed by the Phoenix Fire Department and operated by the personnel staffing the Phoenix Fire Department Regional Dispatch Center. Submitting pre-incident plan information that can be displayed on the MCTs is the responsibility of each respective jurisdiction.

In order to take advantage of the information sharing benefits that CAD MCTs provide, the researcher began utilizing AutoCad software in 1997 to create and re-create pre-incident maps for apartments, mobile home parks, and schools within city limits. This endeavor represented a significant upgrade to the hand-drawn maps placed inside 3-ring binders that

existed prior. From 1997 to about 2008, the responsibility for creating, maintaining, distributing, and uploading pre-incident plans lay exclusively with the researcher and was limited to strictly maps. From 2008 to 2010, newly created pre-incident maps began to include an additional form that contained basic pre-incident plan information such as building construction, contact information, hazardous materials information, and square footage. These forms were called "Fireground Factors" and were accessible along with the site maps through the MCTs.

Some efforts were made in 2010 to assign pre-incident plan visits to on-duty crews. The prioritization of occupancies where pre-incident plans were needed was achieved through input from the Fire Marshal and was based primarily on square footage and tax revenue potential. "Big box" commercial buildings such as Costco or Home Depot were then subsequently added to the list of occupancies having pre-incident plans available.

Today, however, the flow of pre-incident plan information, from gathering data in the field to providing a map and pre-incident plan for use on the MCTs, is marred by a bottleneck caused by insufficient availability of dedicated personnel to administer and maintain the program. Inefficient use of personnel and resources has prevented AFM's pre-incident plan efforts from being able to keep up or keep ahead of the growth. Nobody else has been trained on the use of AutoCad nor the procedures for managing or uploading information. Funding is not available to hire qualified personnel capable of administering a program. Moreover, the researcher's job responsibilities have changed significantly over the last five years thus forcing pre-incident planning to be an afterthought.

The lack of pre-incident plan efforts has had a direct effect on Insurance Service Office (ISO) Fire Suppression Rating Schedule evaluations for the department. An entity's ISO rating may have an impact on insurance rates within its jurisdiction since fire insurance premiums may

be affected by the overall ISO score (ISO, 2016-a). The evaluation focuses on communication, fire department response capabilities, water supply, and community risk reduction efforts, which also includes pre-incident plan efforts (ISO, 2016-b). During the last ISO evaluation requested by AFM, the department received zero points for pre-incident plans due to them being outdated, insufficient in quantity, and not maintained on an annual basis.

Another more serious consequence of insufficient or outdated pre-incident information is the danger that it poses to civilian and firefighters. Not having the correct information may be as dangerous as not having any information at all. Firefighting and rescue efforts may be planned and executed in the least efficient and most dangerous manner without prior planning. With no current policy or procedure in place to address this deficiency, lives are literally at greater risk.

This applied research project's purpose of establishing a comprehensive and NFPA compliant pre-incident plan program for AFM fulfills one of the National Fire Academy's goals for the Executive Fire Officer Program's (EFOP) Executive Development curriculum. It does so by seeking to improve the researcher's ability to lead effectively and efficiently within a dynamic and complex organization by enhancing the development of teams and the application of research (FEMA, 2013).

This project also meets the United States Fire Administration's Operational Goal number 1 of reducing fire and life safety risk through preparedness, prevention and mitigation (USFA, 2014).

## Literature Review

A literature review was conducted which included a review of resources available at the National Fire Academy's Learning Resource Center in Emmitsburg, Maryland. These resources included fire-related journals and publications, the most current collection of NFPA standards,

and applied research projects from current and former Executive Fire Officer Program students that discuss similar issues in their respective departments. The Internet was also a valuable source of information, allowing the researcher to explore related content that may have been presented from the perspective of somebody outside of the fire service, such as the law enforcement or military. Another source of information was the Emergency Reporting records management software used by AFM. This Internet based software is used to log incident information, maintenance of equipment and apparatus, personal protective equipment inventory and inspection, and occupancy information.

The literature review began with seeking answers to the question: why is pre-incident planning such a significant issue when it comes to civilian and firefighter safety? The National Institute for Occupational Safety and Health (NIOSH) provides some answers. Administered by the Center for Disease Control, NIOSH investigates firefighter line of duty deaths (LODD) and publishes recommendations based upon each individual case. NIOSH reports for firefighter LODD in the United States involving traumatic injuries during emergency operations from 2000 to 2014 were researched. A total of 119 investigative reports were reviewed. Of those 119 reports, 28 involved firefighter fatalities where NIOSH recommended that the department conduct pre-incident planning inspections of buildings in their respective jurisdiction in order to facilitate the development of safe fire ground tactics and strategies. There were a total of 53 firefighter fatalities in these 28 incidents, many of which involved commercial occupancies (Center For Disease Control, 2016).

Another reason for aggressive pre-incident planning is the rate at which new building construction is driving fire behavior. Greg Jakubowski, a fire chief for Lingohocken Fire Company in Pennsylvania and a fire protection engineer with more than 35 years of experience

in the fire service, notes that entrepreneurs, engineers and architects aren't waiting for fire departments to catch up with familiarization in their respective jurisdictions. The wheels of development continue to roll and they are constantly thinking of new ways to construct buildings with new materials with a common goal of reducing costs. This makes it imperative for firefighters to get out into their communities and monitor what is being built (Jakubowski, 2013). With little or no knowledge of these buildings, firefighters are at a distinct disadvantage when choosing strategy and tactics, thus increasing the chance of unnecessary structural damage or even firefighter/civilian injury or death (Jakubowski, 2014).

While effective pre-incident planning may offer greater safety for firefighters and more efficient mitigation during emergency incidents, it is also a professional requirement and expectation of company officers. NFPA 1021 Standard for Fire Officer Professional Qualification requires company officers to have knowledge of fire behavior, building construction, fire protection systems, fire suppression systems, and codes and ordinances with the intent of being able to complete a pre-incident plan for various occupancies within the officer's jurisdiction (National Fire Protection Association, 2014). Since this is a recommendation by the NFPA, many textbooks used to train new company officers also stress the importance of pre-incident planning and include instruction on why, when, and how to conduct site visits and interact with the public (Carter & Rausch, 2008).

Another benefit of pre-incident planning is the positive public perception that comes with fire crews investing time and effort in interacting with community business owners/managers. By visiting businesses in the community with the expressed intent of trying to best protect their property, employees, and patrons, strong personal relationships are created and customer/citizen confidence and perception are fostered (Carter & Rausch, 2008).

Beyond the fire service, law enforcement agencies may find great benefit in fire department pre-incident plans and collaborating in creating those plans. There has been an alarming trend in recent years where violent, mass-casualty incidents with one or more active shooters occur in public places. These criminals or terrorists have chosen elementary schools, colleges, or even convention centers as stages for their violent acts. Due to these types of places having a large, complex layout and a capacity for a large amount of people, they are likely to also be included as fire department target hazard occupancies for the same reasons. In instances where an active shooting is taking place, law enforcement personnel will want as much intelligence on the facility as possible. Such information may include floor plans, access, and staging locations. Codino (2009) notes that pre-incident plan collaboration between the fire department and police department in Canby, Oregon has had many positive benefits. He specifically cites an incident where the Canby Police used the available pre-incident plan information of an apartment complex to safely raid a methamphetamine lab.

The city of Los Angeles and surrounding area have taken integrating fire/EMS pre-incident plan information with anti-terrorism efforts to a new level. By creating Terrorism Early Warning Groups (TEW), local emergency response agencies work together to broaden the information available on fire-based pre-incident plans to include information that could be used across disciplines in the event of a terrorist attack (U.S. Department Of Homeland Security, n.d.-a). The Los Angeles model places target hazard sites into one of three tiers with Tier 1 being considered the most susceptible to being a target for a terrorist attack and requiring a greater amount of comprehensive information and inter-agency collaboration (U.S. Department Of Homeland Security, n.d.-b).

Another important component of the literary research was seeking information on what innovative procedures other fire departments have employed in implementing their pre-incident plan program. The variety of different approaches departments take is seemingly equal to the number of different departments that are out there. There were three particular departments that had innovative approaches that may provide direction for AFM in implementing a successful pre-incident plan program of its own.

The Palo Alto (CA) Fire Department has created a brochure that is made available to business owners/operators within their jurisdiction (City Of Palo Alto, n.d.). The brochure contains educational information on why pre-incident plans are important and how they are used by the fire department. Business owners are instructed to utilize an existing evacuation or building site plan of their business as a pre-incident plan map and place the map symbol stickers provided in the brochure on the their site plan to show where pertinent features are located. These features may include key box locations, utility shut offs, fire suppression systems, fire hydrants, etc. The business owners/operators then scan or fax the plan to the Palo Alto Fire Department where they are added to their Emergency Response Information System.

The Phoenix Fire Department (PFD) relies heavily on crews selecting target hazard occupancies. PFD has a pre-incident plan policy & procedure in place where on duty companies select occupancies in their respective first due response areas for pre-incident planning (City Of Phoenix, 1997). Each company selects and visits the occupancy and fills out the appropriate forms and maps with the required information. This information is then passed up the chain of command and shared with PFD fire prevention personnel who compile it with their own data and information and update the plan as necessary. These plans are then uploaded into a premise

management system and shared with participating CAD departments. AFM participates in this same CAD system and utilizes the premise management software for its own pre-incident plans.

Another fire department collaborates with non-fire service personnel within its city to ensure information sharing is done efficiently. Wilson Fire/Rescue Services (WF/RS) of North Carolina utilizes GIS personnel with the City of Wilson's GIS department to coordinate information sharing and to assist with the use of GIS software (Oliver, 2011). Three times a week, an analyst from Wilson's GIS department visits with the WF/RS personnel to assist with entering pre-incident plan information into the city's GIS system. This inter-department cooperation not only helps fire department personnel to properly and efficiently upload their information, but also strengthens the amount of overall GIS data that is available to the city as a whole. It also makes existing geo-spatial layout information such as streets, hydrant location, and structural footprints available to the WF/RS thus preventing duplication of work.

The frequency of which a pre-incident plan is updated is important to ensure information is up to date. For example, a business may not only have a change in ownership, but a complete change in type of occupancy. To ensure plans are updated regularly, the Prince George County Fire Department in Maryland prioritizes site visit frequency based upon the occupancy type as listed in NFPA 101 Life Safety Code. For instance~~;~~ healthcare, correctional/detention, and hazardous materials facilities receive annual updates. Assembly, educational, industrial and storage occupancies have plans updated every three years. Multi-family residential occupancies like apartments and mercantile occupancies with an area of greater than 5000 square feet will be revisited every five years. Finally, mercantile occupancies of less than 5000 square feet are updated as needed (Rogers, 2006).

There exists a plethora of different stakeholders in undertaking a successful pre-incident plan program: fire prevention, fire operations, water distribution, private sector, public sector, regulatory agencies, law enforcement, and business owners just to name a few. Each has their own piece of data to contribute. A place for plan guidance on how to compile all of the information is provided by the NFPA. Why is the NFPA such a reliable source for guidance on the subject? The answer lies in how NFPA codes and standards are created. Since 1896, the NFPA has been developing codes and standards covering just about every facet of the fire service. These standards are a result of the collaborative effort of approximately 6000 volunteers sitting on more than 200 technical committees. The NFPA aims to eliminate firefighter deaths, economic loss, personal injury, and property damage through its development of codes and standards, public outreach, professional development, publications, and advocacy (National Fire Protection Association, n.d.-a). Its influence in fire service safety reaches beyond the United States and into other countries, including Latin America (National Fire Protection Association, n.d.-b). In regards to the specific standards recommended for pre-incident planning, the NFPA created 1620, the Standard for Pre-Incident Planning. First developed in 1998 and last updated in 2015, NFPA 1620 calls on the technical expertise of 34 members from both the public and private sector of the fire service and related fields to create the recommendations (National Fire Protection Association, 2015-b).

While a document that provides guidance is a great help, pre-incident plans don't create themselves. There is an increasing reliance on technology to help compile information, create the pre-incident plan, and distribute the information so it can be readily available to emergency responders. A successful program involves efficient use of software/hardware, human capital to

gather and prepare information, and subsequent training based upon the findings of the pre-incident plans.

Utilizing available software can greatly increase the efficiency in which pre-incident plans can be completed and shared (Codino, 2009). McDowell (2008) notes that there are several favorable characteristics that software used in pre-incident planning should include:

- It should be field useable by suppression personnel. The software should be user friendly when used to both create the pre-incident plan as well as access it when needed on the emergency scene. This should include having relatively good graphics capability for creating site plans.
- It should be easy to use. There is little time or patience in having to learn new, complicated software. The user interface should be intuitive with as little new training or instruction required as possible.
- The software should have a degree of interoperability. There should be multiple layers of information and the ability to use that information for other reasons such as hazardous material plume tracking or population density. The information should be available and useable to other entities.
- Ability to insert standardized symbols. The NFPA 170 Standard for Fire Safety and Emergency Symbols provides standardized map symbols for fire and emergency documents. It is important to have a standardized set of map symbols to improve communication, eliminate confusion, and provide consistency between emergency responders (National Fire Protection Association, 2015-a). The software used for pre-incident plans should have the ability to use these standardized symbols.

- Accessibility. The pre-incident plan information needs to be accessible to primarily three types of users. These users include firefighters at the stations, command staff that are at the scene of an emergency, and company officers while they are responding to the emergency.

The implementation of a successful pre-incident plan program is not a one-person job. Many people both inside and outside the organization need to have their fingerprints on it. NFPA 1620 Standard for Pre-Incident Planning states that the plan shall be a "cooperative effort among the pre-incident plan developer, facility management and operations staff, and responding personnel" (National Fire Protection Association, 2015-b, pg. 8). There initially needs to be personnel to identify and prioritize target hazard occupancies. This may be accomplished using on-duty crews, as practiced by the Phoenix Fire Department, or by means of a calculation method such as the Occupancy Vulnerability Assessment Profile (OVAP). An OVAP is an occupancy specific assessment that assigns a score to multiple occupancy parameters including the number of occupants, presence of fire suppression/detection systems, water availability, building use, building construction, number of stories, overall square footage, level of hazard, and overall importance to the community (Stouffer, 2015). Occupancies can then be rated on a scale from low to high risk and pre-incident plans assigned accordingly. A lot of the information required in an OVAP cannot solely be obtained through site visits. The organization's fire prevention personnel need to have fire suppression/detection information available as well as information on possible hazardous materials permitting. The water department might have information on water flow capability and the building department on building construction or recent built on additions.

The actual pre-incident program itself needs somebody to manage the program with competence and familiarity of the information that is required for a pre-incident plan (National Fire Protection Association, 2015-b). It should also involve all personnel involved in fire suppression on a continual basis which may include plan creation, company training, and revisiting when needed (Carter & Rausch, 2008).

The completion of a pre-incident plan should act as a catalyst for training and preparation for the types of responses that may occur. In many instances, as is the case for the Phoenix Fire Department, it is the on-duty crews that are conducting the site visits and playing a significant role in pre-incident plan development. When these on-duty crews take the pre-incident plan information and begin performing practical drills based upon their new awareness of potential emergency situations, the maximum benefit of pre-incident planning is achieved (Carter & Rausch, 2008). NFPA 1620 also recommends that training and education should be provided by the jurisdiction where unique or unusual operations are part of the emergency response plan (National Fire Protection Association, 2015-b).

## Procedures

An inadequate and inconsistent history of completing pre-incident plans is the heart of the issue concerning AFM's current pre-incident plan shortfalls. Consistency can be found in establishing a standard and finding ways to follow that standard by identifying obstacles within the organization, removing those obstacles, and finding new and innovative ways to reach an organizational goal. An action research method was chosen for this problem because the desired end result was a new pre-incident plan policy and procedure that guides AFM, is efficient from a labor and budgetary perspective, and helps prevent firefighter and civilian injury or death.

Like all fire departments across the nation, AFM is already subject to several NFPA standards that provide both mandates and guidelines on how to operate. These standards apply to everything from firefighter health and wellness and personal protective equipment to what type of striping has to be on an apparatus. The NFPA standard that provides guidance for pre-incident planning, NFPA 1620, seems to be a logical measuring stick for any success a new pre-incident plan program might have at AFM. Therefore, the research included a comparison of how AFM performs pre-incident planning currently to the standard set by NFPA1620.

Along with content insufficiencies, AFM pre-incident plans also lack an efficient process for which they are assigned, created, and distributed. To explore what processes other departments utilize, a survey was sent out to chief officers who were members of the Arizona Fire Chiefs Association and also to participants or former participants of the Executive Fire Officer Program (Appendix B). The survey was created using SurveyGizmo, an internet based survey creating service, and distributed using a hyperlink provided in an email. The survey questions chosen for this survey were aimed at measuring how the participant's department gathered and processed data. It also sought input on what other stakeholders or outside agencies participated in their respective pre-incident programs. Close-ended questions were chosen to allow for a better statistical analysis of the survey responses. Some open-ended responses were permitted in cases where none of the provided choices were applicable to the participant's situation. The survey was created on January 4, 2016 and distributed by January 24, 2016. The number of people solicited to complete the survey was underdetermined due to the manner in which it was distributed which may have been by email or a link in a publication. There were 44 respondents from across the United States and Canada.

A successful program must rely on the on-duty crews to conduct pre-incident plan visits, gather information, and play a role in the plan development. The most integral facet of these efforts lies with the company officers at AFM. In order to gauge what information they feel is important and what time constraints their crews may have in completing the work, a survey was sent out to every company officer in AFM (Appendix C). Again, the survey was completed using SurveyGizmo and sent out on January 4, 2016 via email with a hyperlink to the online survey. The survey questions asked were aimed at determining what level of detail site plans should include, how much time they feel they need in training on the pre-incident plan process, and what kind of work load they feel they can incorporate into their shift routines. To allow for a better statistical analysis, close-ended questions were asked with occasional input for participant clarification. A total of 16 surveys were distributed with 10 being returned for a response rate of 62%.

In addition to the two surveys that were distributed, three interviews were conducted with individuals who work for the City of Avondale. Chief Roger Parker, AFM's fire marshal, was initially interviewed since he is a subject matter expert on efficiently compiling fire system information using commonly available technology and existing software. Parker and his two inspectors have compiled basic site plans, fire system/suppression information and contact information on almost every occupancy in the city, with the exception of single-family residences. The interview took place on January 4, 2016 in his office (Appendix D). Questions asked of Parker revolved around ways the Fire Prevention Division and Intervention Service Divisions could collaborate on sharing data, how existing software and hardware could be utilized for cost efficiency, and how crews can use the software and hardware to do the majority of the data collection and processing.

A second interview was conducted with Greg Beard, the GIS specialist for the City of Avondale (Appendix E). Beard is the lead GIS specialist in the city and coordinates the compilation and storage of various GIS data for the city's public works department, economic development, and police department using ArcGIS. Beard was interviewed to see what resources could be shared between his department and AFM to avoid duplication of work, improve efficiency, and increase the amount and type of data the city as a whole had access to. Beard was interviewed on January 7, 2016.

A third interview was conducted with Lieutenant Albert Bates of the Avondale Police Department (APD). Bates has worked works very closely with AFM in matters of emergency management. He was interviewed mainly to introduce the current concept and status of AFM's pre-incident plan program and discuss its future direction and how it may be of use to APD. The questions asked of Bates revolved mainly around what kind of information AFM can include in pre-incident plans that would be of use to APD, what training AFM crews might need to be able to identify critical information needed by law enforcement, and how future collaboration between AFM and APD can be incorporated into pre-incident planning. The interview was conducted on February 11, 2016 (Appendix F). Finally, AFM's records management software, Emergency Reporting, was accessed in order to obtain quantitative data on occupancies with AFM's jurisdiction.

Limitations of the study include the number of survey respondents for the outside AFM survey. Although unknown, the number of solicitations for that particular survey can possibly be in the thousands. The 44 people that did respond to the survey undoubtedly represent a small percentage of those solicited and may skew the results as it relates to the fire service as a whole. A second limitation may be in the manner in which personal interviews were conducted. Each

interview was informal in nature with the answers to questions recorded in a manner to maintain brevity. Although the answers do not represent direct quotes made by the interviewee, they do represent the intent of the interviewee's response. All recorded responses were read back to the interviewee to ensure their true intent was captured.

## Results

Research Question 1: What are AFM's current practices in completing and maintaining pre-incident plans? Currently, there are no formally written policies or procedures that dictate how AFM is to go about creating and maintaining pre-incident plans. The researcher assumed the responsibility for all AFM pre-incident plan efforts in 1997 and continued creating the pre-incident plans without any assistance until 2010 when AFM's fire marshal, Chief Roger Parker, assisted with identifying target hazard occupancies. Seeking further assistance in 2010, the researcher tried to reduce the workload by assigning on-duty crews to conduct site visits and create hand drawn site plans. Once the occupancies were chosen and site visits conducted, the researcher was tasked with drawing the site plans on AutoCad and transferring pre-incident plan information to a "Fireground Factors" form, a document created on Microsoft Word (Appendix A). Each newly added target occupancy would have these two documents available to all fire companies to view on their MCTs once they were uploaded into the CAD system premise manager.

Prior to 2010, AFM pre-incident plans consisted of an occupancy site plan only. These plans were mainly for schools, apartments, and mobile home parks. After 2010, AFM began to include the Fireground Factors form in order to provide more occupancy information such as building construction, contact information, and hazardous materials information. While AFM

crews managed to complete most of the assigned pre-incident plan visits and submit their information, the process of going from occupancy selection to site visit to plan creation hit a bottleneck when it came to recreating the site plans in AutoCad and uploading the information into the CAD premise manager. This is likely due to the level of detail used in the maps, which includes interior door locations and roof mounted Heating-Ventilation-Air Conditioning (HVAC) locations and skylights.

At the time of this research, there was no consistent way to assign pre-incident plan visits to crews and no process in place to avoid the work bottleneck of taking the field drawn site maps and creating a computer drafted copy for distribution. Moreover, there was no pre-incident plan collaboration between Fire Prevention and Intervention Services, nor was there any collaboration with any other department in the city.

Research Question 2: What is the NFPA 1620 Standard for Pre-Incident Plans and how does AFM currently comply or fail to comply? NFPA 1620 is a comprehensive standard on pre-incident planning that provides guidance as to the administration, planning, data gathering, interagency collaboration, information sharing, and presentation of pre-incident plans. The standard does not identify exactly what occupancies should be pre-planned, but rather requires consideration of the following when performing site selection (National Fire Protection Association, 2015-b, pp. 1620-8):

- Potential life safety hazard, including the safety of emergency responders
- The structure's size and complexity
- The economic impact the occupancy has on the jurisdiction
- The importance to the community
- Possible location and seasonal variations

- The presence of any hazardous materials
- The susceptibility of the occupancy to damage due to natural disasters

To determine how many occupancies within the city of Avondale would qualify as a target hazard based upon the above characteristics, AFM's record management software, Emergency Reporting, was utilized to provide quantitative data. Thanks to the hard work of AFM's fire prevention division, nearly every occupancy in the city can be ranked using Emergency Reporting's Occupancy Vulnerability Assessment Profile (OVAP) calculator. The calculator combines the following data to create an OVAP score from 0 to 100 with higher values having greater vulnerability and risk associated with them (Avondale Fire & Medical, 2016):

- General information: number of occupants, average exposure separation, number of floors, square footage, and property value.
- Life Safety: Occupancy load, occupancy access, occupant mobility, warning alarm systems, exits, and construction type.
- Risks: Regulatory oversight, human activity, experience, capacity to control, hazard index and fire load, available water flow, and fire load sprinklers.

According to AFM Emergency Reporting records, there are 261 structures in the city with an OVAP score of greater than 40, representing a risk level of "Significant" (Avondale Fire & Medical, 2016). Since Avondale is a relatively new city with most of its growth having taken place since the mid 1990's when the fire code required sprinklers in new construction, there are no structures rated a risk level of "Maximum" (an OVAP greater than 60). It is notable that many of these structures are within the same development. For instance, a multi-resident apartment complex may consist of 17 structures, which are all considered to be the same "target

hazard occupancy". Considering target hazard occupancies, Emergency Reporting records indicate that there are 73 occupancies with a level of risk considered to be "Significant" (Avondale Fire & Medical, 2016). It is these occupancies that should be the focus of AFM's pre-incident planning efforts. When considering what pre-incident plan information is currently available giving the existing program, AFM maintains some degree of information on 29 of them (39.7%).

NFPA 1620 also recommends that pre-incident plans include additional pertinent information such as:

- Physical and site considerations like construction, building features, management systems and utilities, external site conditions, security features, barriers, general condition, communications, and geospatial position.
- Occupant Considerations like general life safety, means of egress, and on-site emergency organization.
- Water supply and fire protection systems
- Hazardous materials
- Vacant or abandoned structures
- Occupancies of mass gatherings

Until 2010, pre-incident plans created by AFM consisted of a site plan only, which contained general information such as layout, hydrant location, access, fire department connections, and utilities. It wasn't until 2010 that pre-incident plans began to include more of the occupancy features recommended by NFPA 1620. This information was placed on AFM's "Fireground Factors" form. The Fireground Factors form (Appendix A) can display most of the occupancy information that NFPA 1620 recommends, however, this pertinent information is

available for only five of the 73 target hazard occupancies with level of risk considered being significant. The remaining 24 pre-incident plans for significant risk occupancies consist of site plans only. These occupancies comprise mostly of apartments and schools. At the time of this research, AFM pre-incident plans are in compliance with NFPA 1620 for only 6.8% of the city's occupancies that are at significant risk.

NFPA 1620 does allow for some flexibility in the administration of the plan. It leaves the selection of target hazards occupancies, the type of data collected, the extent of documentation, and the appropriate training up to the authority having jurisdiction (National Fire Protection Association, 2015-b, pp. 1620-5). Consequently, any statement saying that a part of an organization's pre-incident plan is "not compliant" with NFPA 1620 really means that it is so in terms of not following the guidelines in its entirety. Compliance or non-compliance is based strictly on what portions of the standard the authority having jurisdiction chooses to follow.

Research Question 3: How do other fire departments address their pre-incident plan needs and what innovative ideas are being used? The survey made available to chief officers within the state of Arizona and to EFOP students across the country, both former and current (Appendix B), was aimed at trying to get input on what other processes were being used.

According to those who responded to the survey, 61.5% of the departments utilize a completely paperless, computer-based system for their pre-incident plan documents. Since site plans are an important part of an effective pre-incident plan, the survey also sought input on what means the respondent's department uses to create the site plans. Respondents reported using the computer aided drafting functions provided in commercially available pre-incident planning software, such as Blazemark or FireZone, as their means for creating site plans in 16.5% of the cases. In these cases, on-duty crews were the ones who created the site plans using the software.

In 25.6% of the responses, software used exclusively for computer-aided drafting, such as AutoCAD, was used for creating the site plans. Of this percentage, 21.4% (7% of the entire sample of respondents) reported using a third-party service to provide the drafting instead of employees from the organization itself. One respondent stated that their department did not utilize a drafting software at all and instead preferred to "cut and paste" views (presumably aerial views) with added company notations.

The survey also sought input as to what degree of inter-department or inter-agency collaboration went into their pre-incident plan efforts. The overwhelming majority of respondents (71.4%) reported that there was no collaboration with entities outside of their respective departments. There was some reported collaboration with outside agencies including (from greatest to least) other fire departments, state/regional emergency management agencies, local law enforcement, public works, utilities, and environmental regulatory agencies. In regards to collaboration with law enforcement agencies, collaboration was typically at the local level with minimal to none at the state or federal levels.

Research Question 4: What organizational obstacles exist within AFM that may prevent implementing and maintaining a successful program? Some of the current obstacles were discussed above in answering the first research question. One obstacle included a bottleneck in the pre-incident plan workflow when it comes to recreating the site plans in AutoCad. In an effort to identify other possible obstacles, company officers within AFM were surveyed and asked questions regarding their perception of the importance of pre-incident planning and what improvements need to be made, what they feel their role should be in pre-incident planning, and what type of workload they may be able to effectively handle (Appendix C).

The survey identified that the majority of AFM company officers feel that pre-incident plans are a valuable tool in responding to emergencies, however most also believe that AFM's current pre-incident plan efforts are lacking (70%). In identifying areas of needed improvement, AFM company officers identified three predominant areas where improvement is needed:

- Policies and procedures: Three of the nine comments (33%) made by Company Officers stated that a there needs to be improved and clearly stated procedures for pre-incident plans and standardized expectations as to what information is to be compiled.
- More information: Four of the nine comments (44%) made by Company Officers felt that there is a need for more information. Specific examples provided included more roof construction information and maybe pictures.
- There was one comment requesting more training on how to use the plans.

One company officer felt that on duty crews should not perform pre-incident planning because it reflected poor customer service and had a greater potential for creating mistakes. However, 88.9% of the company officers responding to the question of whether or not on-duty crews should play a role in pre-incident plan development disagreed and felt on-duty crews should participate.

Site plan maps have been identified as an obstacle due to the amount of time required to generate them using AutoCad, primarily due to the current level of detail included. Company officers were asked what level of detail they felt was necessary in pre-incident plan site maps. Six of the ten respondents (60%) felt that a moderate amount of detail such as building footprint, hydrant locations, utilities, lock box, interior layout, apparatus access, fire suppression systems/structures, stairways and hazardous materials is necessary. Two of 10 (20%) felt that

only a building footprint with hydrant locations, utilities and lock box location is necessary. Another two of 10 (20%) felt that the current level of detail in AFM maps is required, which includes all of the above plus HVAC locations, skylights, and interior door layout.

Assigning pre-incident plan visits to on-duty companies is likely a reasonable plan of action. However, what workload do AFM company officers believed they can handle in addition to their current responsibilities of emergency response, training, and company meetings, etc? Sixty-percent of the company officers responded saying that they felt their companies could conduct one to two visits a month. Another 30% felt that they would be able to fit in three to four visits per month.

Training on what is required of the companies and how to perform the pre-incident plan visits is likely to be an important part of a successful program. Of the 10 responses, 70% felt that one to two hours of training would be sufficient. Another 20% believed that three to four hours are needed. In regards to what time of year they prefer to conduct pre-incident plan visits, the responses were greatly varied and relatively even across the calendar year.

The distribution of pre-incident plan workload among crews is another issue that needs to be addressed. Two interviews were conducted with personnel that could potentially play a major role in making such a program successful. The first was with the AFM fire marshal Roger Parker, who was interviewed with the intention of trying to identify ways to be more efficient (Appendix D). Parker and the two inspectors assigned to him have managed to collect valuable information on almost every occupancy in the city that is not a single-family residence. Fire Prevention has been able to accomplish this by collecting building information during the preconstruction and permitting process and regularly entering inspection information into the occupancy database on Emergency Reporting. Technology and apps available on iPads have

greatly improved the efficiency in which basic site plans are drawn, information is shared, and the database is updated.

Parker stated that a strong pre-incident plan program was an integral part of new efforts that is focusing the fire service in the direction of community risk reduction, specifically towards following NFPA 1730 Standard on Organization and Deployment of Fire Prevention Inspection and Code Enforcement, Plan Review, Investigation, and Public Education Operations. Based on the last ISO evaluation, Parker felt that it would be possible to improve the city's ISO rating one whole point based solely on having a more effective pre-incident plan program in place. Specifically, he recommended inspecting occupancies classified as "Significant Risk" annually and "Moderate Risk" bi-annually. With so much fire-related data available and new ways to use data analyses, Parker stated that the future of the fire service would lean heavily toward science-based decision-making. He further believed that training would be necessary to bring operations personnel up to speed given the new fire service focus on community risk reduction.

In regards to using technology to improve efficiency in pre-incident plan creation and management, Parker demonstrated some commonly available apps that work on the iPads that allow for illustrations in PDF format to be modified in the field and then shared via a cloud-based drop box. With a little bit of set up and utilizing aerial photos available through Google Maps, he demonstrated how fire prevention personnel quickly create basic pre-incident site plans and upload them directly into Emergency Reporting's occupancy database.

The second interview was conducted with Greg Beard, the head of Avondale's GIS efforts (Appendix E). Mr. Beard indicated that his GIS folks have already been working with the police department to create maps of schools for potential active shooter calls. He stated that

public safety should be a priority for the city in terms of GIS data and that it would serve the city's best interest to include information pertinent to the fire department in its general GIS database. He demonstrated that using existing GIS map information would be sufficient enough to create base maps for the occupancy site plans needed in a pre-incident plan program. He also stated that he and his personnel could add basic interior layout information onto the maps along with commonly accepted fire department symbols to create site plans for AFM's pre-incident planning needs.

A third interview was conducted with Lieutenant Albert Bates of the Avondale Police Department (Appendix F). Knowing that the city's GIS was already working with the police department on their own pre-incident plan needs and also researching about the prudence of collaboration with law enforcement during the creation phase of pre-incident plans, the author wanted to see get a law enforcement perspective of what information they would want to see in a pre-plan.

Bates stated that APD's focus in regards to pre-incident planning has been exclusively towards schools in an effort to be prepared for potential active shooter incidents. As to be expected, the information APD seeks on schools has a law enforcement focus, such as security surveillance, location of "friendlies", utilities, and accessibility. APD's pre-incident plans seek to identify potential area of refuge for students and faculty given a potential bomb threat or active shooting event. Bomb threats tend to result in the evacuation of the schools while active shooters require a lock-down. Complicating APD's pre-incident plans is the fact that each school may have different procedures for lock down and that locking down the campus also may lock out the police department. Plans also seek to identify traffic control measures, staging

locations (which may differ between the fire department and police department), tagging for parents, and a suitable incident command post location.

Bates agreed that most of that information would best be determined by law enforcement personnel since the fire department lacks the knowledge and training to make those types of decisions. However, there was some occupancy information that Bates acknowledged would be helpful for law enforcement operations. Such information includes access and egress locations, forcible entry requirements, location of utilities, wall/ceiling breachability, roof access, and lock box locations. Bates pointed out that forcible entry options that may be available to firefighters might not be a consideration for police. Firefighters have circular saws, hydraulic tools, and an assortment of hand tools that help gain entry whereas law enforcement might be limited to opening locks, overriding electrical controls, or forcing access with hand tools only.

Bates also recognized the value of information sharing between the two departments. Many of the "Significant Risk" occupancies identified by AFM are also considered to be target hazards for APD. APD does not have the resources or personnel to focus the same level of pre-incident plan effort on other occupancies as they are currently doing for schools. He specifically stated that AFM's pre-incident information, as it would pertain if compliant with NFPA standards, would help bridge the information gap they would have with apartment complexes, places of worship, or large businesses.

Based upon the cumulative results from the surveys, interviews, and literary research, and the intent of an action research method, the researcher developed a written policy and procedure for the implementation and management of an NFPA 1620 compliant pre-incident plan program (Appendix G).

## Discussion

There is little doubt as to the importance of pre-incident planning from both a community safety and firefighter safety perspective. Reviewing NIOSH reports of line of duty deaths over just the last fifteen years revealed that poor pre-incident preparation contributed, in part, to firefighter deaths. Experts in the field of pre-incident planning, like Jakubowski (2014), rightfully contend that firefighters with little or no pre-incident knowledge are at a tactical disadvantage. According to the survey, AFM personnel also see the benefits of not only having pre-incident plan information readily available, but also being the "tip of the spear" in going out to target hazard occupancies, meeting the owners/managers, and collecting pertinent information.

Fire departments are also embracing new technology that allows pre-incident information to be collected and shared more readily. The survey sent by the researcher to outside departments indicate that only 18.2% of the departments that responded still use a paper-based system while only 9.1% don't have any pre-incident plan program in place at all. That would indicate that almost three out of four departments surveyed are currently using new technologies, software, and computers to assist them in their programs. Such is the case at AFM, where a current automatic aid agreement between a consortium of more than 20 fire departments and districts in the metro-Phoenix area allows for apparatus MCTs to have common access to each other's pre-incident plan information. Tomorrow's fire service will continue to utilize technology in innovative ways; going from reactive responses (accessing pre-incident information during emergency response) to more predictive uses (determining where the next emergency will be and mitigating it). GIS will play an increasing role in these efforts and the more information that is shared, the more it will benefit all stakeholders. Literature review found that several progressive fire departments, like Wilson (NC) Fire/Rescue Services, embracing GIS

as a major part of their pre-incident plan efforts (Oliver, 2011). Through internal interviews with City of Avondale GIS personnel, it is evident that this is a major, untapped resource that could be of great benefit to AFM's pre-incident plan efforts and the city as a whole.

In regards to improved technology, the process of pre-incident planning that AFM currently uses is outdated and functions on the technological mindset of 15 to 20 years ago. Today, handheld computer tablets replace paper forms and can be taken into the field and used by crews to gather and enter occupancy information directly into the department's records management system. This same records management system is also continuously used and updated by fire prevention as they perform their annual inspections allowing for more efficient use and sharing of data. These same devices can take and upload photos of pertinent building features that can be part of a pre-incident plan. Inexpensive mobile applications can be used to create basic site plans right in the field, dragging and dropping standard pre-incident plan symbols onto the map. This essentially eliminates the need for expensive and training-intensive drafting software such as AutoCad as well as the time and effort to recreate a hand-drawn map in digital form. Based on survey feedback, traditional site plans created by AFM do not need to be as detailed as once thought. Company officers tend to prefer a moderate amount of pertinent information on a site plan, leaving the detail of the occupancy to be placed in a written format, rather than graphical. GIS capabilities within the city have also improved to the point where base maps can be created and used in place of AutoCad maps. This avoids duplication of work.

Another opportunity for improvement may exist in gathering pre-incident information during the permitting and construction phase of a new occupancy. Looking at building detail during the construction phase provides a very unique opportunity to view structural components before they are covered up and may provide valuable tactical information prior to the emergency.

Information sharing goes far beyond benefiting fire departments responding to an emergency. Other public safety players, mainly law enforcement, may find fire department pre-incident plans a major tactical asset to them as well. Codino (2009) has already seen the benefits of sharing information with law enforcement in his own jurisdiction in Oregon. Target hazard occupancies in Avondale include, and in no small part, schools and other buildings of public assembly. Mass shootings on school campuses across the United States are becoming numbingly routine and can bring multiple jurisdictions into play. It would behoove AFM to take a holistic approach to public safety and collaborate with the APD on including pertinent law enforcement information on pre-incident plans. Following the interview with Lieutenant Albert Bates, it became clear that APD would have the occupancy information they need for schools, but do not have the resources to do the same for apartments, places of worship, or large businesses. By including some extra information on AFM pre-incident plans, the gap of intelligence can be bridged. This information should include evaluating access issues from the perspective of a law enforcement agency that does not have circular saws or hydraulic tools or breachability of walls or ceilings. Normally, fire departments aren't looking for video surveillance equipment or monitoring locations but perhaps should as it may help law enforcement with gaining valuable intelligence during an active crime. Areas of refuge, staging locations, and command post locations should be decisions left up to law enforcement.

There also exists an opportunity for future inter-department training between AFM and APD. Forcible entry options available to firefighters may not be available to police. While this poses a challenge, it also poses an opportunity. First, firefighters will have to consider other methods for gaining access while conducting pre-incident plan visits. Second, it raises the opportunity to train with police on forcible entry techniques available to firefighters since it is

typically against policy and procedures for fire department personnel to be operating in a hostile environment.

Finally, it is important to have clear vision of the pre-incident plan program goals. This begins with written policy and procedures, also a suggestion of improvement by AFM company officers when asked to provide feedback. NFPA 1620 provides excellent guidelines for management and creation of pre-incident plans (National Fire Protection Association, 2015-b). Besides being the collaboration of a board of technical reviewers within the fire service, NFPA guidelines as a whole form the basis of fire service management and firefighter safety.

## Recommendations

Based upon the literary research performed during this project, peer surveys, AFM records review, and interviews, the research questions were answered. The following recommendations are aimed at helping AFM's struggling pre-incident program get back on track:

The first recommendation is to implement the written policy and procedures presented in the Results section of this research paper and included in Appendix G. Actual implementation of the proposed policy and procedures is contingent on acceptance by both AFM administration and the Avondale Professional Fire Fighters Association Local 3924 through the Employee Involvement Process (EIP). The EIP is AFM's internal process for stakeholder collaboration on all department issues and organizational planning.

A second recommendation is that pre-incident plans for occupancies that are identified as "Significant Risk" according to the Occupancy Vulnerability Assessment Profile (OVAP) should be updated annually by operations personnel and added to the data collected by fire

prevention personnel during the course of their regular annual code inspections. Occupancies identified as “Moderate” should be updated bi-annually and completed by the fire prevention personnel during the course of their normal bi-annual code inspections. Information collected for pre-incident plans should be entered into Emergency Reporting’s records management software and printed up in a format that can be uploaded and displayed on MCTs participating in the Phoenix Fire Department Regional Dispatch Center’s CAD system.

A third recommendation is for pre-incident plan site visits and information gathering to be performed by on-duty crews. Occupancies of “Significant Risk” should be equally assigned among the AFM companies based upon the first due assignment. Six occupancies should be assigned to each company to be complete over a three-month period. The quantity of occupancies to visit may change as the city grows and develops.

The fourth recommendation is that the administration of the pre-incident plan program be the responsibility of the AFM Division Chief in charge of EMS & Training.

Recommendation number five focuses on providing company training to AFM personnel on pre-incident plans. The training should include:

- How to establish a positive working relationship with AFM customers by working together to protect property and the public.
- What to look for when performing site visits.
- How to use existing iPads and apps to enter information into Emergency Reporting
- How to create site plans and forward them to GIS personnel so the data can be incorporated into the City’s GIS information database.

The sixth recommendation involves training APD on the availability, content, use, and access to AFM pre-incident plans so they know that additional information is available to them. The interviews conducted revealed that there exists a lot of duplication of data within Avondale's public safety. A lot of this duplication can be avoided if stakeholders are aware of what information is available and where to find it.

Lastly, both AFM and APD should seek out joint training opportunities aimed at improving communication as well as improving tactics in gaining occupancy entry through the use of tools and/or techniques currently only used by fire personnel.

In concluding this research, a great potential was discovered for future police and fire cooperation and collaboration. The types of major emergency incidents that public safety personnel are responding to are less likely to be considered exclusively the domain of fire/EMS or law enforcement. Active shooter incidents or acts of terrorism require both fire/EMS and law enforcement to work side by side with almost seamless communication. Violent incidents and assaults on the responding firefighters may necessitate fire personnel carrying non-lethal weapons or firearms. Police might find it beneficial to have a vehicle with dedicated hydraulic or gas powered tools on board for breaching. Future research into liaison opportunities might lead to fire and police personnel sharing the same mobile command post for incidents of varying magnitude. At a time when local government budgets are scrutinized, sharing resources might make greater fiscal sense.

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Appendix A

AFM Fireground Factors Pre-Incident Plan Form

**Avondale Fire-Rescue – Occupancy Fireground Factors**

| | | | | |
|---|---|---|---|---|
| *Occupancy Name:* | | | | *Rev. Date:* |
| *Address:* | | *Use:* | | *Total Square Footage:* |
| *Hours of Operation:* | | *# of Occupants: Day:* | | *Night:* |
| **Construction:** | | | | |
| *Type:* | *# of Floors:* | *Max. Height:* *ft.* | *Year Built:* | *Additions Built:* |
| *Roof Type:* | | | | |
| *Roof Material:* | | | | |
| *Roof Access:* | | *Skylights:* | | *Turbine Vents:* |
| *Roof Support:* | | | | |
| *Roof Loading and Location:* | | | | |
| *Exterior Walls:* | | *Interior Walls/Supports:* | | |
| *Loc. & Rating of Fire Walls:* | | | | |
| *Ceiling:* | | *Floors:* | | |
| **Building Features:** | | | | |
| *Exits:* | | *Stairwells:* | | |
| *Elevators:* | | *Floors Served:* | | |
| *Elevator Type:* | | *Elev. Keys Location:* | | |
| *Roll-Up Doors/Location:* | | | | |
| *Smoke/Heat Venting:* | | | | |
| *Basement:* | | | | |
| *Other Features:* | | | | |
| **Access:** | | | | |
| *Gated:* | *Method of Opening Gate:* | | | *Gate Code:* |
| *Lock Box Location:* | | | *Type:* | |
| *Areas Accessed by Keys:* | | | | |
| *Access Comments:* | | | | |
| **Water Supply and Fire Alarm/Suppression Systems:** | | | | |
| *Closest Hydrants:* | | | *Approx. Flow Capacity:* | |
| *FDC Locations:* | | | | |
| *Areas Served:* | | | | |
| *Standpipe Connection Locations:* | | | | |
| *Fire System Valve Type:* | *Valve Location:* | | | |
| *Main Fire Alarm Control Panel Location:* | | | | |
| *Remote Fire Alarm Panel Location:* | | | | |
| *Fire Pump Location:* | | *Fire Pump Type:* | *Fire Pump Rating:* | |
| **Responsible Party:** | | | | |
| *Name:* | *Phone:* | *Name:* | *Phone:* | |
| **Utilities:** | | | | |
| *Electric S/O Location:* | | *Gas S/O Location:* | | |
| *L.P. Gas S/O Location:* | | *Other:* | | |
| **Special Considerations:** | | | | |
| | | | | |
| **Hazardous Materials:** | | | | |

| | | |
|---|---|---|
| *Name:* | *Name:* | *Name:* |
| *ERG #:* *Qty.:* | *ERG #:* *Qty.:* | *ERG #:* *Qty.:* |
| *Cas #:* | *Cas #:* | *CAS #:* |
| *Container:* | *Container:* | *Container:* |
| *Location:*   | *Location:* | *Location:* |

Appendix B

Results of Pre-Incident Plan Survey for Outside Agencies

*1. Which one of the following pre-incident plan programs best applies to the one your department currently utilizes?*

| Value | Percent | Count |
|---|---|---|
| There is no program currently in place | 9.1% | 4 |
| A paper-based system with hard copy pre-incident plans maintained in a binder | 18.2% | 8 |
| A computer-based system with hard copy pre-incident plans maintained in a binder | 11.4% | 5 |
| A computer-based system with pre-incident plans available on the internet | 4.6% | 2 |
| A computer-based system with pre-incident plans available on MDTs/MCTs | 36.4% | 16 |
| A computer-based system with pre-incident plans available in hard copy, on internet, and/or on MDTs/MCTs | 20.5% | 9 |
| | Total | 44 |

| Statistics | |
|---|---|
| Total Responses | 44 |

*2. How does your department identify target occupancies in need of a pre-incident plan?*

| Value | Percent | Count |
|---|---|---|
| Companies choose which occupancies in their first due are in need of a pre-incident plan | 27.3% | 12 |
| Chief Officers choose which occupancies are in need of a pre-incident plan | 9.1% | 4 |
| The Fire Prevention Bureau/Division chooses which occupancies are in need of a pre-incident plan | 18.2% | 8 |
| The selection of target occupancies is a collaborative effort throughout the department | 31.8% | 14 |
| Other (please specify) | 13.6% | 6 |
| | Total | 44 |

| Statistics | |
|---|---|
| Total Responses | 44 |

| Responses "Other (please specify)" | Count |
|---|---|
| Left Blank | 38 |
| Not formally done, some companies will conduct in-service training in the form of pre-planning | 1 |
| Standard of cover | 1 |
| We are a small enough department that all of our district buildings have pre-plans established | 1 |
| a community risk assessment identified target hazards | 1 |
| all occupancies are preplanned | 1 |
| all of the above | 1 |

3. *How is pre-incident plan information gathered in your department?*

| Value | Percent | Count |
|---|---|---|
| By on-duty crews | 54.6% | 24 |
| By personnel in the Fire Prevention Bureau/Division | 2.3% | 1 |
| By both on-duty crews and personnel in the Fire Prevention Bureau/Division | 40.9% | 18 |
| The occupancy owner/manager submits the information | 2.3% | 1 |
| By a contracted third party | 0.0% | 0 |
| | Total | 44 |

| Statistics | |
|---|---|
| Total Responses | 44 |

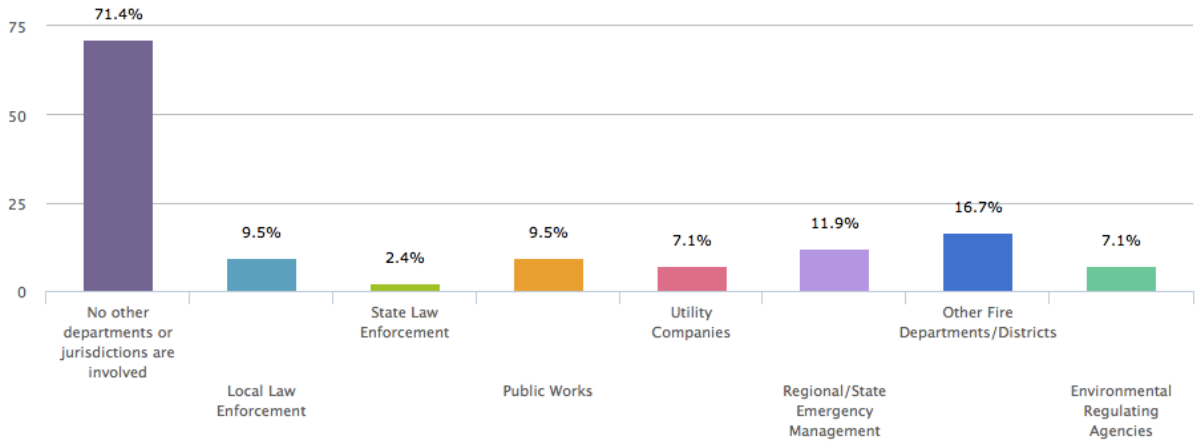
4. *NFPA 1620 Standard for Pre-Incident Planning recommends that sketches and site plans be part of the pre-incident plan information. How are these site plans created in your pre-incident plan program?*

| Value | Percent | Count |
|---|---|---|
| They are hand drawn by on-duty crews and included as part of the pre-incident plan | 27.9% | 12 |
| Site plans are obtained from the occupancy owner/manager, scanned/copied, and included in the pre-incident plan. | 16.3% | 7 |
| They are drawn by on-duty crews using pre-incident planning software (FireZone, Blazemark, or in-house equivalent, etc.) and are included in the pre-incident plan. | 16.3% | 7 |
| They are created by a drawing software, Computer Aided Drafting (CAD) or GIS trained personnel within the organization | 25.6% | 11 |
| They are created by third-party CAD or GIS trainined personnel/services | 7.0% | 3 |
| Other (please specify) | 7.0% | 3 |
| | Total | 43 |

| Statistics | |
|---|---|
| Total Responses | 43 |

| Responses "Other (please specify)" | Count |
|---|---|
| Left Blank | 41 |
| Cut and Paste views and marked up by crews | 1 |
| N/A | 1 |
| all of the above | 1 |

*5. What other departments or jursdictions does your organization work with in developing pre-incident plan information?*



Appendix C

Results of Pre-Incident Plan Survey for AFM Company Officers

1. *How important do you think it is to have pre-incident plan information when responding to emergency calls? (0 – not important; 10 – extremely important)*


2. *How would rate the effectiveness of Avondale Fire & Medical's pre-incident plans in providing you the information you need on an emergency scene? (0 – not important; 10 – extremely important)*


3. *Where could AFM's pre-incident plans use improvement?*

| Count | Response |
|---|---|
| 1 | Improvements could be made on training and proper use of these plans. |
| 1 | More detailed layout info on buildings Scheduling of walk-throughs Pictures accessible on MCT |
| 1 | More information on the occupancy |
| 1 | Structured methods and scheduling. Standardized reporting. |
| 1 | Roof construction & layout (determines if vertical ventilation or trench cuts are worthy tactics) Preplan all facilites, not just schools, apartments Identify buildings that will be difficult to reach the seat of the fire Process Improvement: preplans should begin in the plans review process and finalized soon after the building receives its certificate of occupancy |
| 1 | New builds,better communication with fire alarm protection systems with automatic alarms,mapping and layouts of our largest buildings |
| 1 | The personnel assigned to perform the plans should not be be from a unit expected to respond to an incident. It is poor customer service and creates a higher potential for mistakes. |
| 1 | Company Officers and crews need to understand the importance of pre-plans. Even if they never open them on an emergency scene, the opportunity to develop them by on-site visits pays dividends when responding to buildings in your district/city. |
| 1 | Consistency. An established schedule with clear expectations of what AFM is looking for and where the information is sent. |

4. *Do you think AFM companies should have a role in pre-incident plan development?*

| Value | Percent | Count |
|---|---|---|
| Yes (why?) | 88.9% | 8 |
| No (why?) | 11.1% | 1 |
| | Total | 9 |

| Statistics | |
|---|---|
| Total Responses | 9 |

| Responses "Yes (why?)" | Count |
|---|---|
| Left Blank | 2 |
| As stated, knowledge gained just from the on-site visits are invaluable. | 1 |
| At the minimum, it reinforces how important area familiarization is. | 1 |
| Become more familiar with structures in their respective first due areas. | 1 |
| Crews need to see the building (hands-on) | 1 |
| First due familiarization. | 1 |
| Walk throughs with coordinater and added input | 1 |
| We will be first responding units to these buildings, we need to know what to expect | 1 |
| Physically seeing and developing plans provides crews with first hand knowledge and converstation. | 1 |

| Responses "No (why?)" | Count |
|---|---|
| Left Blank | 10 |

5. *If on-duty companies were to be assigned occupancies to conduct a pre-plan visit, how many do you think you can incorporate into your normal workload per month?*

| Value | Percent | Count |
|---|---|---|
| none | 10.0% | 1 |
| 1 - 2 | 60.0% | 6 |
| 3 - 4 | 30.0% | 3 |
| 5 - 6 | 0.0% | 0 |
| 7 - 8 | 0.0% | 0 |
| more than 8 | 0.0% | 0 |
| | Total | 10 |

| Statistics | |
|---|---|
| Total Responses | 10 |
| Sum | 15.0 |
| Average | 1.7 |
| StdDev | 0.9 |
| Max | 3.0 |

6. *If your company were to be assigned to conduct a pre-incident plan visit to occupancies in your first due, what time of year would you prefer?*

| Value | Percent | Count |
|---|---|---|
| none | 10.0% | 1 |
| January | 40.0% | 4 |
| February | 40.0% | 4 |
| March | 30.0% | 3 |
| April | 50.0% | 5 |
| May | 20.0% | 2 |
| June | 40.0% | 4 |
| July | 30.0% | 3 |
| August | 30.0% | 3 |
| September | 30.0% | 3 |
| October | 40.0% | 4 |
| November | 30.0% | 3 |
| December | 20.0% | 2 |
| | Total | 10 |

| Statistics | |
|---|---|
| Total Responses | 10 |

7. *How much training do you think you and your crew need in performing a pre-incident plan visit and recording the necessary information?*

| Value | Percent | Count |
|---|---|---|
| No training is needed | 0.0% | 0 |
| 1 - 2 hours | 70.0% | 7 |
| 3 - 4 hours | 20.0% | 2 |
| More than 4 hours | 10.0% | 1 |
| | Total | 10 |

| Statistics | |
|---|---|
| Total Responses | 10 |
| Sum | 13.0 |
| Average | 1.4 |
| StdDev | 0.8 |
| Max | 3.0 |

8. *As a responding Company Officer, how much detail do you need in a pre-incident site map?*

| Value | Percent | Count |
|---|---|---|
| No site maps are necessary | 0.0% | 0 |
| Little detail: building footprint, entrances/exits, hydrants, utilities, and lock box location only | 20.0% | 2 |
| Moderate detail: All of the above plus apparatus access info, interior layout, fire suppression systems/structures, stairways and hazardous materials | 60.0% | 6 |
| Very detailed: All of the above plus HVAC locations, skylights, interior door locations, room number/labels, roof access | 20.0% | 2 |
| | Total | 10 |

| Statistics | |
|---|---|
| Total Responses | 10 |

Appendix D

Transcript of Interview with Roger Parker

January 4, 2016; 1430

- *What challenges does Fire Prevention/Community Risk Reduction have in maintaining accurate information/code compliance within our jurisdiction?*

Limited resources. Community risk assessment is helping prioritize resource allocation.

- *What benefits do you see in having a pre-incident plan program that meets NFPA 1620?*

Firefighter safety. Community safety. We got zero points for pre-incident plans in our last ISO report. If we had a more functional pre-incident program, we may be able to go from a class 4 to class 3. Part of the improvement could come from annual to bi-annual inspections. Another could be under the new ISO scoring system, if public works were to change their record keeping system in accordance with ISO, we might even be able to qualify for class 1.

- *How do you see Fire Prevention personnel and Operations personnel working together to achieve our common goals in regards to prevention and pre-incident plans?*

Training first to bring operations up to speed in regards to Fire Prevention to Community Risk Reduction transition and what it really means (NFPA 1730). Pre-incident planning will be an important part of community risk reduction due to it being heavily data dependent. "Science-based decision making" is going to be the future of the fire service. Using data to predict where the next emergencies will happen. Law enforcement is already using it to predict crime. Utilizing data will help the fire service appropriate resources and make better decisions.

- *Enforcing Fire Code requires special training and certifications. Do you expect Operations personnel to be able to conduct annual Fire Code inspections?*

No. I would rather Ops prioritize pre-plan. My experience has shown that it has proven to be difficult to have ops trained personnel be code enforcement as well. Serious code violations should be reported but not a thorough code inspection completed. Fire prevention has the personnel to keep up with the necessary fire inspections.

*- With limited budgets, how can we use existing software/hardware to achieve our data collection and dissemination goals?*

Using Community Risk Assessment process and calculation function in our current records management software to determine pre-incident plan priorities. Use apps available on iPads to help with documentation. Here is a list of potentially helpful and inexpensive apps:

- Esri
- PDF Expert
- Drop box
- *Cam scanner*
- *Photo pin*

Appendix E

Transcript of Interview with Greg Beard

January 7, 2016 at 1000

- *What physical resources does the City have that can assist with compiling information and creating site plans?*

The City utilizes ArcGIS as its GIS platform. Public Works is the main user of GIS, uploading water and sewer infrastructure information. Obviously, we also have streets and development information as well. The Police Department is also utilizing ArcGIS to create "Beat Maps" and site plans for schools and apartments. Our GIS Department is under IT and assists the Police with creating their plans. Currently, we have almost all of the footprints for every building in Avondale with some of them including interior layout as that information becomes available. Most interior layouts come from Fire Department maps (created by the author) or by interior layouts provided by the Police Department. The maps are not as close to scale as maps created in AutoCad and dimensions are approximated but scales are close enough to be used for site plan purposes. (Mr. Beard proceeds to show the author how the GIS maps are set up, describe how GIS works as opposed to working with AutoCad, and give examples of what maps they provide to the Police Department)

- *What human resources does the GIS department have that can assist the Fire Department?*

We have four people, including myself, working on GIS related projects. If we were to print up building footprints for Fire and even create a Fire Department symbol layer for Pre-Incident plans, it wouldn't be too much trouble. That type of assistance is not very time consuming. However, drawing very detailed interior layouts with interior door locations, direction of door swing, or other details like that may be time consuming. I think combining

public safety related data into our GIS system should be a priority so we should try to make time to help both Fire and Police with these types of projects. (The author proceeds to show Mr. Beard the maps that the Fire Department has built. Mr. Beard realizes that some of these maps fill in data gaps that both the City and Police need. These files are transferred from the author's thumb drive onto Mr. Beard's computer)

- *How can we share data so it benefits everyone?*

The maps that you (the author) just provided are an excellent start. There is no reason why the Police Department, the Fire Department, and we should use three different systems to store geo-spatial data. It would be far more efficient to all use the same system. And we want to help you guys out too. It's in the best interest of the City.

- *What suggestions can you make to help us in achieving our goals?*

We can create a layer dedicated to Fire Department symbols since they seem to be pretty standard based on what I see in your existing maps. We can print up a footprint, which can include roadways, parking lots, walkways, etc., and give it to your people to edit. Your companies can place the appropriate symbols in the approximate location on the map. Once the rough draft of the map is finished, our folks can place the symbols on the appropriate layer and finalize the site plan for you. You can then upload it as you do now. Time permitting, we may be able to draw some interior layouts as well or rubber sheet existing plans/drawing as needed. I think we should start by prioritizing the schools first since we have some data gaps.

Appendix F

Transcript of Interview with Lt. Albert Bates

February 11, 2016; 1200

- *What efforts is APD making in creating and maintaining pre-incident plans?*

Currently, doing something similar as the Fire Department but geared more towards active shooter events. We want to look at utilities, special hazards, location of potential "friendlies", security cameras, etc. Our efforts are currently focused on schools. We want to know how to establish the quickest access, door breach requirements, security features, staging areas (fire and police may have different staging requirements), staging for parents, traffic control considerations or the location of a command post. Pre-planned events (SWAT call outs) use mostly Google maps for single-family residences. We are also looking for grant opportunities to begin a Knox Box program, same as the Fire Department. Looking to place Knox keys into patrol cars with special PIN access system for accountability reasons.

Specific to schools, we are looking at student count, where teachers are in what classrooms, special needs. We are about 75% the way through this school pre-plan program. Looking to update once per year. School information can be shared with the fire department if needed. One problem we are finding is that every school has different lock-down procedures so our pre-incident planning needs to also include what lock down procedures the school has.

- *Do you feel there would be a benefit to APD's tactical operations if the Fire Department shared their pre-incident plans?*

Absolutely. Since our focus is on schools, we don't have the time or resources to focus the same efforts on apartments or churches. The Fire Department's efforts could definitely bridge that information gap.

- *If the Fire Department were to make pre-incident plans available to you, what information would you like to see included?*

Security features (roll down security gates, automatic closing gates, bullet proof glass, security camera/monitoring features) what will hinder police in gaining access? We don't carry the forcible entry equipment that firefighters do so our entry options might be different. We would like to know if we can breach the walls. Is there attic access? Are there windows that can provide access? Are there any HazMat considerations? What PPE would our officers need? When intel is found, what access options are available (key, contact security monitoring company, electrical bypass). Where are good areas of refuge after an evacuation for bomb threats? Active shooters require a lock down. That will likely require LE personnel to evaluate rather than firefighters.

- *What training, if any, do you think would be necessary for firefighters to be able to capture pertinent law enforcement information on their pre-incident plans?*

Not much training would likely be needed. For security barriers, look at other way to gain access other than forcible entry. Ways the police department might have to use. Possible future training on use of circular saws and other breaching tools/techniques might be needed since firefighters won't be in the area of a hostile situation. There is probably some training

opportunities between our two departments on how to use forcible entry tools, like circular saws, to force doors.

- *Do you feel that occupancies deemed as having "Significant Risk" based on AFM's OVAP calculations also meet APD's classification of the same?*

Yes. We have done SWAT raids at apartment complexes. Churches and big businesses have also been the scenes of mass shootings in the recent past. Medical facilities are sometimes the scene of domestic terrorism.

Appendix G

Proposed AFM Policy & Procedure for Pre-Incident Planning

Policy: It is the policy of Avondale Fire & Medical Department that a clearly defined pre-incident plan program that follows the guidelines set forth in NFPA 1620 Standard for Pre-Incident Planning (2015 Edition) be established.

Scope: This administrative policy applies to all members of the organization and to the implementation and maintenance of Avondale Fire & Medical Department's pre-incident plan program.

Procedure:

1. Administration of pre-incident plan program

1.1 The AFM Division Chief of EMS/Training will have the responsibility of coordinating and administering the pre-incident program.

1.2 In the event of organizational restructuring, the administrator of the pre-incident plan program will be made at the discretion of the Fire Chief.

1.3 The pre-incident plan program will follow the guidelines set forth in NFPA 1620 Standard for Pre-Incident Planning (2015 Edition). As the authority having jurisdiction, AFM will elect to follow the guidelines that are most appropriate allowing the program to be as comprehensive and practical as possible.

1.4 The pre-incident planning program administrator will provide or coordinate all relevant pre-incident plan training necessary for AFM personnel or other pertinent stakeholders, such as the Avondale Police Department.

2. Selection of target hazard occupancies

2.1 Target hazard occupancies are occupancies identified as being at "Significant Risk" as calculated by Emergency Reporting's Occupancy Vulnerability Assessment Profile (OVAP). OVAP scores of 40 to 50 are considered to be "Significant Risk".

2.2 The information and data required in determining an occupancy's OVAP will be collected and input by AFM's Community Risk Reduction Division.

2.2.1 When possible, the necessary information to calculate an occupancy's OVAP will be collected and input during the permitting phase and prior to construction whenever possible.

2.2.2 The Community Risk Reduction Division will advise AFM personnel of any occupancy of new construction that falls within the OVAP of "Significant Risk". AFM companies within the new occupancy's first due will make efforts to review and observe the occupancy, when possible, during the construction phase.

3. Assignment of target hazard occupanices

3.1 On duty companies will be tasked with conducting pre-incident plan visits to target hazard occupancies.

3.2 Target hazard occupancies will be assigned to the on-duty companies by the pre-incident planning program administrator

3.2.1 Target hazard occupancies will be assigned primarily based on first due area of responsibility.

3.2.2 All efforts will be made to equally distribute target hazard occupancy assignments amongst the AFM companies and shifts.

3.3 Visits to target hazard occupancies will be coordinated by the Company Officers and their respective on-duty crews.

3.3.1 This is to include contacting the responsible party and scheduling a site visit.

3.3.2 Every effort will be made to make this visit a cooperative effort between AFM and its customers and relevant stakeholders.

3.3.3 On duty company visits to target hazard occupancies should not be scheduled in conjunction with any code inspections by the Community Risk Reduction Division.

3.4 All pre-incident plan assignments will be assigned and are to be completed by the companies during the months of March through May

3.5 Occupancies considered to be at “Moderate Risk” as scored by OVAP will be assigned to personnel in the Community Risk Reduction Division for the input of any pre-incident plan information. Such occupancies are not considered to be a target hazard and will not have any information available through CAD but will through Emergency Reporting.

4. Recording and distribution of information

4.1 Basic site plans and building footprints will be obtained from the City of Avondale GIS database whenever possible.

4.2 All information will be recorded in Emergency Reporting as appropriate using available hardware such as iPads.

4.3 Companies conducting the site visit will create the occupancy's site plan using the appropriate apps or software.

4.4 Information to be collected or recorded on the site plans should include:

4.4.1 Location of nearby hydrants

4.4.2 Basic interior layout with appropriate labels

4.4.3 Locations of access and egress

4.4.4 Occupancy fire suppression systems and their locations such as fire department connections, riser rooms, standpipes, post indicator valves, and fire pumps.

4.4.5 Structural fire containment features such as fire doors or firewalls

4.4.6 Utility shut off locations

4.4.7 Lock box locations

4.4.8 Fire alarm panel locations

4.4.9 Roof access locations

4.4.10 Stairway and elevator locations

4.4.11 Location of hazardous materials

4.5 Once the site plans are completed and information recorded into Emergency Reporting, the site plans will be forwarded to the pre-incident program administrator via digital drop box or other approved method

4.6 The program administrator will in turn forward the site plans to the appropriate City of Avondale GIS personnel for input into the City of Avondale GIS database and finalization of the site plan drawing

5. Uploading of Pre-Incident Plans to CAD

5.1 Once completed, the pre-incident planning program administrator will upload the appropriate pre-incident plan forms and site plan into the CAD system's database where it will be available to participating CAD partners

5.2 Plans completed for the annual cycle must be uploaded by the end of June

6. Frequency of pre-incident plan updates

6.1 Pre-incident plans for occupancies that are considered to be at "Significant Risk" will be updated annually

6.2 Pre-incident plans for occupancies that are considered to be at "Moderate Risk" will be updated bi-annually