Implementing a Successful Pre-Incident Planning Program for the Bend Fire and Rescue

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Certification Statement

I hereby certify this paper constitutes my own product, what 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.

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Abstract

Research was conducted with the intent to aid in the implementation a successful pre-incident survey program at the Bend Fire Department (BFD). The problem was Bend Fire and Rescue does not have a pre-incident planning program, resulting in the lack of vital building information needed to make critical decisions during emergency calls. The purpose of the research was to identify best practices and industry standards of pre-plan programs, and use this information to create a pre-plan program and standard operating procedure for the Bend Fire Department. Action methodology was used to guide the following research questions: (a) What financial and cultural obstacles may impede implementation of a successful pre-incident planning program? (b) What information should be collected for an effective pre-incident survey? (c) What are key elements found in successful pre-incident planning programs currently used in similar sized departments? (d) How should Bend Fire Department identify which target hazards should be prioritized when first implementing the program? Data was gathered through internal and external surveys and interviews. The procedures were surveys of BFD personnel and outside departments, and interviews with BFD personnel. The results identified the importance of quick access and adequate detail to pre-plans en route to calls, organization of target hazards, and thorough training of personnel on pre-plan procedures. The recommendations are the Bend Fire Department should implement pre-plan program, utilize NFPA 1730 to identify target hazards, develop a comprehensive pre-plan training program and have pre-planning be a department priority for the next several years to insure it is integrated into the operational culture of the department.

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Introduction

An ancient Chinese philosopher and military strategist Sun Tzu once said, “Plan for what is difficult when it is easy, do what is great while it is small” (Cleary, 1988, p. xiii). Although this statement was made in reference to war, the sentiment could not be more fitting for the fire service. Rescue workers respond to emergencies daily, and although these calls are never planned, crews have been preparing extensively for that very moment.

Firefighters dedicate countless hours of training to be prepared when the alarms sound. The techniques practiced for firefighting such as: (a) hose pulling, (b) ladder throwing, and (c) forcible entry are vital skills used for efficient operations during structure fires. Additionally, preparing for structure fires can also take a more didactic approach. This method of preparation has crews walk through various buildings in their first due area recording specific information about the structure. This simple, yet important practice, is called pre-incident planning. Pre-incident planning is the process where fire personnel visit buildings in their response area with a critical eye, analyze the buildings, and gather vital information about the structure to aid them in making decisions during firefighting operations. Pre-incident planning provides firefighters information helping them make effective tactical decisions, and more importantly, improves fire ground safety (Murphy, 2009; Naum, 2012). When the alarm bell sounds, the building’s information may be just as important to the firefighter’s safety as the technical skills they have spent hundreds of hours honing.

The problem is Bend Fire and Rescue does not have a pre-incident planning program, resulting in a lack of vital building information needed to make critical decisions during emergency calls, thus placing its firefighters and citizens at greater risk during emergencies. The

purpose of this research was to identify best practices and industry standards of pre-plan programs, and use this information to create a pre-plan program and standard operating procedure for the Bend Fire Department. Action methodology was used to guide the following research questions: (a) What financial and cultural obstacles may impede implementation of a successful pre-incident planning program? (b) What information should be collected for an effective pre-incident survey? (c) What are key elements found in successful pre-incident planning programs currently used in similar sized departments? (d) How should Bend Fire Department identify which target hazards should be prioritized when first implementing the program?

Background and Significance

Bend Fire Department (BFD) is a career fire department providing emergency medical service (EMS), structural fire protection, special rescue operations, hazardous material, wild land and interface response to the City of Bend and surrounding rural area. The BFD covers a response area of 164 square miles in the Fire Service Area (FSA) and 1450 square miles in its Ambulance Service Area (ASA) (Bend Fire and Rescue, p. 8). The department serves approximately 116,00 people, when combining the rural and city areas.

The BFD has five fire stations to respond to the city's core and rural areas. The BFD has a total of 103-uniformed personnel/first responders providing: (a) fire, (b) EMS, and (c) fire prevention services, (d) 21 administrative and support staff, (e) seven fire prevention personnel and 18 support volunteers. The stations are staffed 24 hours a day with 28 personnel, who operate five ALS engine, three dedicated ALS ambulances, two BLS ambulances, one-person quick response vehicle (QRV) and one-person support response vehicle (SRV) for fire prevention and fire alarms and one battalion chief.

Although the BFD runs a myriad of different types of emergency calls, medical calls are the majority response for service. In 2016, the BFD ran approximately 10,000 calls and 81% of these calls were for emergency medical service (EMS). Even though the majority are EMS calls, the fire calls should not be discounted. In 2016, the crews responded to 356 fire alarms, an average of one fire alarm per day (Mohan, 2017). In 2017, fire responses continued to increase. The data collected from January to August 2017 showed BFD responded to 313 fire calls, with an average of 1.29 fire alarms per day (Mohan, 2017).

The City of Bend is located in Central Oregon, east of the Cascade mountain range. Bend is the largest city east of the Cascades, and although it started as a small logging town, the area has developed into an outdoor recreational hub. The 20,000 daily visitors (Trejbal, 2016, p. #1) are drawn to the area for the abundant outdoor activities such as skiing, biking, fishing and golfing. Tourism is the backbone of the Bend's economy (Visit Bend Business Plan and Budget, 2015/1016), but economic development has diversified over the years and now includes several other business models such as healthcare, micro-breweries, and technology.

Bend has experienced explosive growth over the past couple years, with the population increasing 4.9% from just a year earlier (Njus, 2017, p. #1). In 2016, due to the growth of the population and local economy, Bend was named the top performing small metro in the nation by the Milken Institute. This title was based on wage gains, job creation and technological industrial development (Devol, Lee, and Ratnatunga, 2016). Another strong indicator of growth was the building statistics of new and commercial property. Building permits for single and multi-family dwellings increased by 54% since May of 2015 and commercial building was predicted to increase by 11% in 2016 (Williamson, 2016, p. #1). The increased population growth and building boom was confirmed when examining the building permits issued by the

City of Bend for years 2015 and 2016 (City of Bend (2015-2016). These reports showed, over a two-year period, that 1,171 permits were issued for new construction of single family residence, 54 for multi-family residence, and 46 for commercial/industrial buildings (City of Bend, 2015-2016, p. #2).

The building boom impacted Bend and the Bend Fire Department (BFD) in a multitude of ways. The economic and population growth forced the Bend City Council to expand the urban growth boundary (UGB) to include 2,380 additional acres to accommodate 30,000 residences expected to move into Bend in the next decade (City of Bend, 2017a). Additionally, the City began building higher density housing and multi-family dwellings to accommodate the population growth (City of Bend, 2017b). The rapid building development has resulted in the fire department mapping system not being able to keep up with the infrastructure development. The result was fire crews are often unaware of new commercial occupancies and sometimes even entire neighborhoods. Although the BFD expanded its staffing and resources to address the increased call volume, the department recognized the need to develop a pre-incident planning program to account for the large number of newly constructed occupancies.

Over the last 17 years, the BFD has not had a consistent pre-incident planning program. Historically, pre-incident planning has been intermittent and managed by individuals passionate about the issue. Pre-incident plans were stored in three ring binders on fire apparatus and focused on significant target hazards in individual response areas. Because plans were collected and maintained by individuals, the information wasn't consistent or even available for all engine companies. Battalion Chief Dave Howe (personal communication, July 26, 2017) summed up the historic department attitude regarding pre-plans by stating "Our fire department has never had a culture that pushed towards pre-planning. We have had an add-hock culture with the

attitude that we will figure it out when we get there." Pre-plans eventually became outdated and fell by the wayside as the department focused on other issues.

In 2003, BFD placed mobile computer terminals (MDT) on all apparatus giving crews access to digital mapping and computer aided dispatch (CAD). The MDT provided the department a platform to transition the outdated paper pre-plans to a more accessible digital format. Although the idea was discussed, updating the pre-incident plans never came to fruition. Even though the department recognized the need for pre-plans, the lack of staffing to build an updated digital program became the limiting factor. Additionally, the 911-dispatch center intended to buy software that would encompass pre-plan capabilities. Given this information, the BFD elected not to invest time or money into building a pre-plan program of their own. Unfortunately, the 911-dispatch center pre-plan software was never purchased and the BFD continued without a pre-plan program.

In 2016, BFD began researching several programs for a pre-incident planning. In 2017, the administration team learned of a promising computer program called Intterra). The program had pre-planning capabilities, as well as excellent mapping software and data analytics. Additionally, several other departments in Oregon were already using this software platform. Given the capabilities of Inttera and the fact other departments in Oregon were already using the system, BFD decided to partner with eight other fire departments in the Central Oregon to buy the program. This collaboration with the other local departments allowed for cost sharing as well as the benefit of information sharing between the departments. An agreement was made with 911-dispatch to buy Inttera and administer the program for the Central Oregon agencies.

Although BFD has moved in a positive direction by choosing a software program that will support a pre-incident survey program, the department does not have an implementation plan or

details of how best to integrate the program into the department to ensure its success. Without an implementation plan or pre-planning policy, the program is in jeopardy of not being integrated into the culture of the department and is at risk for being another failed attempt at a pre-planning program.

The lack of pre-incident planning has serious consequences for the Bend Fire Department. The foremost being firefighter and civilian safety. With no occupancy pre-incident plans, firefighting tactical decisions are made without critical building information. Secondly, BFD is not following recommended industry standards from the National Fire Protection Agency (NFPA) ((National Fire Protection Association, 2015), which could open the department up to liability. Lastly, the absence of a pre-incident planning program has an effect on BFD Insurance Suppression Rating (ISO), which has a direct impact on insurance rate premiums for the residents of Bend.

The purpose of this applied research paper is to create a pre-plan program and standard operating procedure for the Bend Fire Department that fulfills the National Fire Academy's class goal for the Executive Analysis of Fire Service Operations in Emergency Management. It does so by proving the researcher's ability to analyze fire service operations in the Bend Community and better prepare the City of Bend for large-scale and multiagency incidents (Federal Emergency Management Agency 2016). This research paper also meets the United States Fire Administration's (USFA) Goal number one of "reducing fire and life safety risk through preparedness, prevention and mitigation" (USFA, 2014, p. 1).

Literature Review

A literature review was conducted by researching articles that focus on the purpose and importance of pre-incident surveys, industry standards, and recommended components of successful pre-incident programs. Information was collected from fire trade journals and publications, books, NFPA standards, and former Executive Fire Officer papers discussing development and implementation of pre-planning programs.

Pre-incident planning is the process of collecting and storing critical site data on target hazards by fire crews and/or prevention staff so the information can be accessed and used during emergency responses (Department of Homeland Security, n.d.). The purpose of pre-plans is to collect specific standardized information about target hazards the responding crews can use during an emergency to aid in tactical decision-making.

The research first focused on what factors make pre-planning programs valuable and pertinent for fire departments. Several articles reviewed discussed pre-plans and pre-planning programs as being essential for fire firefighter and scene safety (Department of Homeland Security, n.d.; Blue Card Command, n.d.; Murphy, 2008; Naum 2013). Pre-plan programs give crews an opportunity to: (a) walk through buildings in advance of an emergency and understand the building layout, (b) construction features, (c) contents, (d) hazards and potential challenges, and (e) risks they may encounter during an emergency (Naum, 2012, p. #3). The gathering of "building intelligence" (Jakubowski, 2011) provides crews with valuable information, which may aid them in predicting fire behavior and aid the incident commander (IC) in anticipating the needs of the crews and to make more effective tactical decisions. The more information emergency crews and IC's have in their arsenal, more effective and safer decisions can be made during firefighting operation (Murphy 2009).

The discussion of pre-plans and overall firefighter safety is not just a theoretical discussion, but was referenced by the National Institute for Occupational Safety and Health (NIOSH) (NIOSH 2017;NIOSH, 2002) in investigations of firefighter line of duty deaths (LODD). NIOSH is an organization administered by the Center for Disease Control (CDC) and funded by Congress to investigate firefighter line of duty deaths. Their purpose is to make recommendations and create initiatives with the intent to prevent future death and injuries in the firefighting profession. When investigating LODD deaths caused by trauma on the fire ground, NIOSH has listed pre-plans as one of their key recommendations in several documents. In a LODD in Colorado, when a firefighter fell through a roof, one of NIOSH's key recommendations was "Fire departments should conduct pre-incident planning inspections of buildings within their jurisdictions and include this information in computer-aided dispatch systems to facilitate development of safe fire ground strategies and tactics" (NIOSH, 2017, p. ii). In another tragedy in an Arizona supermarket that claimed the life of a firefighter, NIOSH stated in its summary "Ensure pre-incident plans are established and updated on mercantile occupancies in their district" (NIOSH, 2002, p. 1). These reports are just two of multiple reports where NIOSH stresses the lack of or limited pre-incident plans as a contributing factor to deaths on the fire ground.

While pre-planning programs are critical for fire ground safety and contribute to effective strategies and tactics on fire scenes, pre-plan programs also affect the monetary cost to the communities protected by the fire department. Insurance Suppression Ratings (ISO) give pre-plan programs significant weight for fire departments in the operations portion of each community's rating. When ISO assesses fire departments, the organization audits three major components: (a) fire alarm communication center, (b) general fire department operations, and (c)

available water supply (Waters, 2008). Based on how these components are rated, the fire department will be awarded a public protection service classification (PPC) from 1-10. A community with a rating of 1 is recognized as having superior fire protection capabilities, whereas a fire department rating of 10 is known to have poor to no fire protection. Pre-incident plans are one criteria that contributes to the fire department's overall rating and are used by insurance companies to compute resident's insurance rates (Waters, 2008). Therefore, a vibrant fire department pre-plan program could have direct impact on the insurance rates charged to the residents and commercial building owners covered by the fire department.

Pre-planning programs are also a recommended practice for fire departments by the National Fire Protection Association (NFPA) (National Fire Protection Association, 2015). The NFPA is an international non-profit organization comprised of industry representatives that develop codes, standards and recommended best practices to improve fire ground safety. The recommendations made by NFPA are regarded as the performance and safety standard against which local and state fire policies are measured (Blyer & Hartwell, n.d.; Murphy, 2008). Although compliance of NFPA standards is voluntary, unless adopted by state code, the standards may be used in a civil lawsuit against the department for a violation of known and accepted fire department standards (Murphy, 2008, p. #2).

In 1998, the NFPA developed a document providing minimum requirements for developing pre-incident plans called "NFPA 1620 Recommended Practices for Pre-Incident Planning." The purpose of NFPA 1620 was to develop a comprehensive "best practices" pre-incident planning manual for fire departments. It was meant to help in the development of pre-plans and identifying "critical factors of structures" to use when managing emergencies. NFPA 1620 states, "The pre-incident plan should be a foundation for the decision-making process during an

emergency situation and provide important data that will assist the incident commander in developing appropriate strategies and tactics for managing the incident" (National Fire Protection Association, 2015, p. 17).

Although NFPA 1620 is specifically focused on criteria for pre-plans, other NFPA documents reference pre-plans as part of best practices for fire departments. In NFPA 1021, Standard for Officer Professional Qualifications, one required skill for both NFPA Fire Officer 1 and Fire Officer two is "Supervising multi-unit emergency operations, conducting pre-incident planning, and deploying assigned resources according to the following job requirements" (National Fire Protection Agency, 2013, p. 12). The pre-planning process is one of the core standards for Fire Officer qualifications.

Pre-plans offer other benefits for departments and communities. Pre-plans provide fire crews an opportunity to have positive contacts with business owners and general residents in the community they serve. During the pre-plan process crews have the opportunity to meet with business owners and building managers, discussing fire safety and the importance of pre-plans (Blue Card Command, n.d.). This not only shows the business owner fire department personnel care about their business, but this also gives the crews an opportunity to educate the business owners about general fire safety issues impacting the owner, customers, and firefighters. Additionally, crews are getting out in their first due districts and critically thinking about building strategy and tactics. This opportunity for training is invaluable for fire ground safety.

One of the key elements making pre-planning programs successful is a platform allowing firefighters and command staff to quickly access clear and accurate data on the way to an emergency (Jakubowski, 2012; National Fire Protection Agency, 2015). Mobile computer terminals (MDT) in responding apparatus with pre-plan software program is an ideal tool to

access quick and accurate building information (Jakubowski, 2012; Amodio, 2012). The program accessed on the MDT's should have capabilities to: (a) upload photos, (b) floor plans, (c) drawings, (d) hazardous material information, or (e) other pertinent information. It is also important the program can display complex building information in a manner that is easily read and understood by all personnel on the emergency scene.

Another important factor of a pre-plan program is the ability for pre-plans to be shared with other emergency responders (Glass, 2015; Amodio, 2012). This may be other mutual-aid fire departments, or other partners in safety, such as: (a) police, (b) school district officials, or (c) the public works department. Fire departments respond to a multitude of different types of emergencies where collaboration and sharing of information is essential to the outcome of the scene. One such emergency is an active shooter response. The information in pre-plans showing general building diagrams, exits and entrances and other access information could be critical information to the police and other agencies on scene. Therefore, it is important the pre-plan program have the capabilities of being shared with other resources. The sharing of pre-plan information could be as simple as printing the information, but ideally, the pre-plan information should be able to electronically upload to other mobile data terminals (Galvin, 2012). This would allow for immediate access to information on emergency scenes. There are several methods utilized and suggested but most start with departments identifying target hazards in their community.

FEMA (Stouffer, 2016) defines a target hazard as:

> Facilities in either the public or private sector that provide essential products and services to the general public, are otherwise necessary to preserve the welfare and quality of life in

> the community, or fulfill important public safety, emergency response, and/or disaster recovery functions (p. #12).

NFPA 1620 (2015) expands the topic of identifying target hazards by recommending fire departments focus on seven specific factors. Those items include "potential life safety hazards, structure size and operation complexity, economic impact, importance to the community, location, presence of hazardous materials and susceptibility to natural disasters" (p. 8). NFPA 1730 (2016) uses another system to identify target hazards. This approach categorizes buildings into high, medium and low risk occupancies. The level of occupancy risk is determined by history and frequency of fires, potential for life and economic loss and those occupancies that have a high dependency on the built-in fire protection systems (p. 9).

FEMA and NFPA have general recommendations for specifying occupancies for target hazard designation but other scoring systems have been developed to aid in determining target hazards. One such system is the Occupancy Vulnerability Assessment Profile (OVAP). The OVAP score is a method to evaluate and categorize risk in occupancies (Wolf, 2017). This scoring system uses a variety of factors to classify an occupancy. These factors include number of occupants/life safety, building construction, height of building, fire suppression systems, level of hazard and building usage. These criteria are then complied to formulate an overall score, rating occupancies from low to high risk (Stouffer, 2015; Glass, 2016). Occupancy types with higher scores will be considered high risk and will take a higher priority for pre-planning. The OVAP system removes the subjectivity from determining target hazards in a departments' response area.

Wilson Fire and Rescue in North Carolina uses Geographic information systems (GIS) to aid the department in determining target hazards (Oliver, 2011). The department uses GIS

software to map out every commercial structure in the city. The rating of occupancy risk is based on: (a) historic risk of the area and building, (b) building construction, (c) fire suppression systems, (d) hazardous material, (e) socioeconomic demographics, and, (f) homeless activity. The department then uses this information to color-code the buildings based on potential danger and hazard assessment on GIS mapping. This system allows responding crews instant macro level information on the danger assessment of the building. The department has expanded the color-coded building information to include: (a) buildings with light-weight construction, (b) heavy fire loading, (c) roofs with rapid collapse potential (RCP), and (d) vacant buildings.

NFPA 1620 (2015) gives general guidance to what data should be gathered at each occupancy during the pre-plan process but gives the fire department ultimate discretion on which buildings to pre-plan, what data to collect and how detailed to make the pre-plans NFPA recommends pre-plans be clear, concise and complete. Jakubowski (2012) echoes this recommendation and states that pre-plans should provide “rapid, key information for initial responders” (p.# 3). Although NFPA gives fire departments discretion on pre-plan content and detail, the agency outlines five aspects of site characteristics that should be considered when pre-incident planning. The characteristics are: (a) construction features, (b) building management systems and utilities, (c) external site conditions, internal and external security features and fences and other barriers (National Fire Protection Agency, 2015, p. 9). Retired Deputy Chief Murphy (2009) sums up what pre-plan data should be gathered as anything that could present major safety concerns for firefighters and occupants as well as critical building features.

One method of creating a pre-plan that gives both quickly attainable information as well as more detail, is the use of a tiered approach. The collected and displayed pre-plan should differentiate between tactical information needed by the first responding crews to make quick

decisions and the more comprehensive plans that incident commanders may need during longer operations (Jakubowski, 2012). The first layer should be information used by the initial companies who respond, which is simple and limited to the most essential information needed. The next layer should be more detailed, so if the incident expands, the incident commanders can have greater information for more complex decision-making. This tiered approach allows for key information to be given to the right people at the right stage of the incident.

For pre-plan programs to be most effective, it is imperative they are updated with the most current information about the business (Glass, 2015; Galvin, 2012;Jakubowski, 2012). Building information not being up-to date can pose a threat to firefighter safety. Out of date or incorrect information on pre-plans could be more dangerous than not having a pre-incident survey program (Glass, 2015). ISO gives maximum credit to departments who pre-plan commercial, industrial, and institutional occupancies bi-annually (Waters, 2008). This inspection criteria is at best daunting and more likely an impossible task for fire departments to complete. In NFPA 1620, no specific update or timeline is recommended, although NFPA addresses the issue of updating of pre-incident plans by stating: “Where conditions indicate that a change in a pre-incident plan is warranted, the pre-incident plan shall be updated and distributed” (National Fire Protection Agency, 2015, p. 13). In NFPA 1730 (2016), a timeline for minimum inspection frequency for fire prevention inspection and code enforcement is specified. In this document, inspection frequency is tied to: (a) occupancy risk, where high-risk occupancies are inspected annually, (b) moderate bi-annually, and (c) low risk are inspected triennially.

Re-inspection of occupancies is a continuous process, and a collaboration with property owners or managers is a helpful method in keeping pre-plans up to date with the most accurate data (Jukubowski, 2012). This can be accomplished by having pre-plans in a cloud-based

system, where business owners are able to access and update information without fire department intervention. Palo Alto Fire Department created a system where business owners are responsible for creating the pre-plans and updating pre-plans. The business owners are sent detailed instructions on drawing the floor plan and marking critical items on a diagram. The information is then sent back to the department and updated into their pre-plan system. This method offsets the work-load of site visits and re-inspections by crews (City of Palo Alto, n.d).

Although pre-plan details may differ from department to department, the pre-plans should be standardized across the fire department so the same information is gathered at each occupancy (Murphy, 2009). Additionally, the importance of pre-plan and site visit training should be consistent for the success of a pre-plan program. It is imperative that not only chief officers of the fire department support the pre-plan program and the firefighters who are conducting and imputing the information, but the administration team needs to make the pre-plan program a top priority of the department for several years to ensure the program is successful (Galvin, 2012).

After review of the literature on pre-planning programs, it became clear there is great discretion given to departments in developing a pre-plan program. Although there are plenty of resources having recommendations on content of pre-plans and ways to identify target hazards for review, there was no specific formula for developing a pre-plan program. The literature was very clear on the existence of a pre-plan program being critical to the success of a fire department's deployment plan and safe fire operations.

Procedures

Although guidelines for pre-incident planning programs have been established by NFPA 1620 (National Fire Protection Association, 2015), details of how the program is managed and

the specific information obtained by crews during occupancy site visits differ depending on the needs of the department. Because each department has different abilities to support a pre-incident planning program, given department size and budget, the research set out to find departments that were similar in size, demographics and operational complexity as the Bend Fire Department. Similar departments were found meeting the criteria by using Fire Community Assessment/Response Evaluation System (FireCARES). This program, developed by Firefighter Safety and Deployment Study, identifies risks of a community based on infrastructure, population demographics, built environment and socio-economic demographics (firecares.org). Using the information provided by FireCARES (firecares.org), 40 (Appendix-E) departments were identified that were similar to Bend Fire Department. The 40 departments were contacted by phone and asked for contact information for the person who manages the pre-incident planning program for each department. The contacts for the pre-incident planning program were then called and given a brief overview of research paper and asked to take a survey (Appendix-E) about their pre-incident planning program. Email addresses were then collected of the contacts who agreed to take the survey.

The survey was developed on September 28th, 2017 by surveyhero.com, an internet based survey service. The surveys were distributed to the contacts on October 5th, 2017 using a hyperlink provided in an email included a brief description of the research paper and estimated time commitment to complete the survey. Of the 40 departments contacted, the researcher made positive contact with 32 departments. Of those 32 departments 21.85% or seven departments did not have any pre-planning program. The 25 departments who did have a preplan program, 22 completed and returned the survey, yielding a percentage of 88% return rate**.** The survey consisted of 15-questions, (Appendix-E) all but two were closed-ended to allow for better data

analytics. The questions were designed to collect information on how the departments gather and process data as well as determine the strengths and weaknesses of each program.

An internal survey created on September 29th, 2017 by Surveyhero (Appendix-F) was sent to line fire staff, fire inspectors, and three battalion chiefs. These surveys were sent by a hyperlink in an email. The email contained a description of the survey and estimated time to complete. The survey (Appendix-F) consisted of 10 closed-ended questions. The goal of the survey was to determine: (a) line crew's opinion about the importance of pre-incident planning, (b) work-load impacts, and (c) what information would be most important to collect on occupancies. Of the 86 surveys sent out by email on October 9th, 2017, 48 surveys were completed, yielding a 55.81% return rate.

In addition to the surveys, interviews were conducted of individuals who have had past and current experience with pre-plan program efforts at the BFD. All interviews were conducted in person and were recorded and transcribed by the researcher.

The first interview was with Battalion Chief Dave Howe (personal communication, July 26th, 2017) (Appendix G). Battalion Chief Dave Howe has been with the department for 40 years and has historical knowledge of the BFD. The interview was conducted at 2:00 pm in his office in the administration building. The intention of the interview was to discuss the history of pre-incident planning at the BFD. The interview centered around past pre-incident programs and Chief Howe's perspective on why previous programs have failed.

The second interview was with Deputy Chief Bill Boos (personal communication, October 11th, 2017) (Appendix H). Chief Boos was in charge of researching a program to use for pre-incident planning and choose the program that the BFD will be using for pre-incident planning. The interview was conducted on October 11th, 2017 at 1:30 pm in Chief Boos' office at the

administration building. The interview was conducted with Chief Boos to understand the process of how and why the fire department selected Intterra for pre-incident planning.

The third interview was with Fire Marshal Medina (personal communication, October 24, 2017) (Appendix I). The interview was conducted in his office on Oct. 24th, 2017 at 10:30 am in his office at the administration building. Fire Marshal Medina is the head of the fire prevention division and has expert knowledge of occupancies in Bend and the current code inspection program. The intent of the interview was to get perspective from the prevention division of how target hazards should be organized for pre-plan planning purposes and if and how the prevention and operations division should collaborate to complete pre-plans.

There were several limitations that impacted the study. The first being the limited amount of surveys distributed to outside agencies. The researcher's intent was to survey departments similar to the BFD in size and operations, which limited the pool of departments greatly. Another limitation was the closed ended survey questions in both the internal and external surveys. Although the closed ended questions are more ideal for statistical analysis when displaying results, it limits the survey takers ability to respond to questions in detail. The surveys did not allow the researcher to capture responses that did not fit into the limited answers given to the survey takers.

Results

The results were targeted toward four specific questions the researcher sought to answer through interviews and surveys. The first research question asked: What financial and cultural obstacles may impede implementation of a successful pre-incident planning program? One of the topics discussed with Deputy Chief Bill Boos (personal communication, October 11, 2017)

during the interview, was the initial and annual cost of the pre-plan program and perceived financial issues. Chief Boos did not foresee any issues current or future with the cost of the Intterra software, because of several local departments committing to use Intterra, the 911-dispatch center purchased software program. This alleviated any initial financial costs. The cost of Intterra is a significant annual expense, at $60,000 dollars a year. Chief Boos stated the initial plan when signing up for Intterra was that eight departments would be splitting the annual cost, making the per-department costs financially feasible. Additionally, there are still negotiations between the departments and 911-dispatch to pick up the annual cost of the software. Chief Boos stated that Intterra has been integrated into the annual BFD budget so he foresees no financial issue in future budgets. The results showed 61.91% spent little to no money on the software program, and 33.33% spent less than 10,000 annually. That means 95% of departments spend under $10,000 for their pre-plan program.

Examining potential cultural obstacles, the BFD could encounter after implementing a pre-incident planning program, an interview with Chief Howe (Appendix-G) looked at historic issues of BFD preplan programs and an internal survey (Appendix-F) was sent to the operational line staff to examine current attitudes. Chief Howe discussed how historically pre-plan programs were very individualistic in nature and were spearheaded and run by individuals, not by the department. Chief Howe continued by saying BFD never had a culture that pushed toward a pre-planning. To examine current attitudes of pre-planning, four questions were asked of line staff in the internal survey (Appendix-F). The questions focused on the perceived importance of pre-incident planning programs, time available to crews to complete field surveys and data entry skills. The results showed 62.50% thought pre-incident surveys were very important and 29.17%

thought they were important. Only 8.33% thought that pre-incident surveys were only moderately important to BFD operations.

Two survey questions (Appendix-F) were asked to determine if crews felt they had enough time to add pre-incident surveys into their schedule. The survey question explained to the respondent the pre-incident survey process will take three hours from occupancy site visit to imputing the data in the computer back at the station. The question asked if the respondent felt they had enough time in their schedule to complete pre-plan surveys. Given this time frame, 70% stated they did not have time in their schedule and 29.79% stated they did. The second question asked how many pre-plan surveys they felt they could complete in a month. Approximately 75% stated they could complete 1-2 surveys, 4.17% answered none, and 14.58% answered three. The next survey question asked respondents comfort level in their computer skills. Approximately 85% answered comfortable to very comfortable and only 12.50% responded not very comfortable. The second (Appendix -F) question posed by the researcher examined what data should be collected for an effective pre-incident survey. Internal and external survey questions were used to answer this question.

The second research question asked: What information should be collected for an effective pre-incident survey? An outside survey (Appendix -E) asked departments what information is collected when conducting site visits. The top seven items collected in the outside department's surveys were; (a) hydrant location, (b) Knox box key location, (c) site maps, (d) hazardous material information, (e) building utilities, (f) building fire protection system locations, (g) special hazards such as solar panels and light weight construction, and (h) building point of contact numbers. The least collected data for pre-plans was: (a) fire flow, (b) roof and floor

construction type, (c) building construction type, and (d) interior layout. Figure 1 provides an overview of the data collected by outside departments (Appendix -)

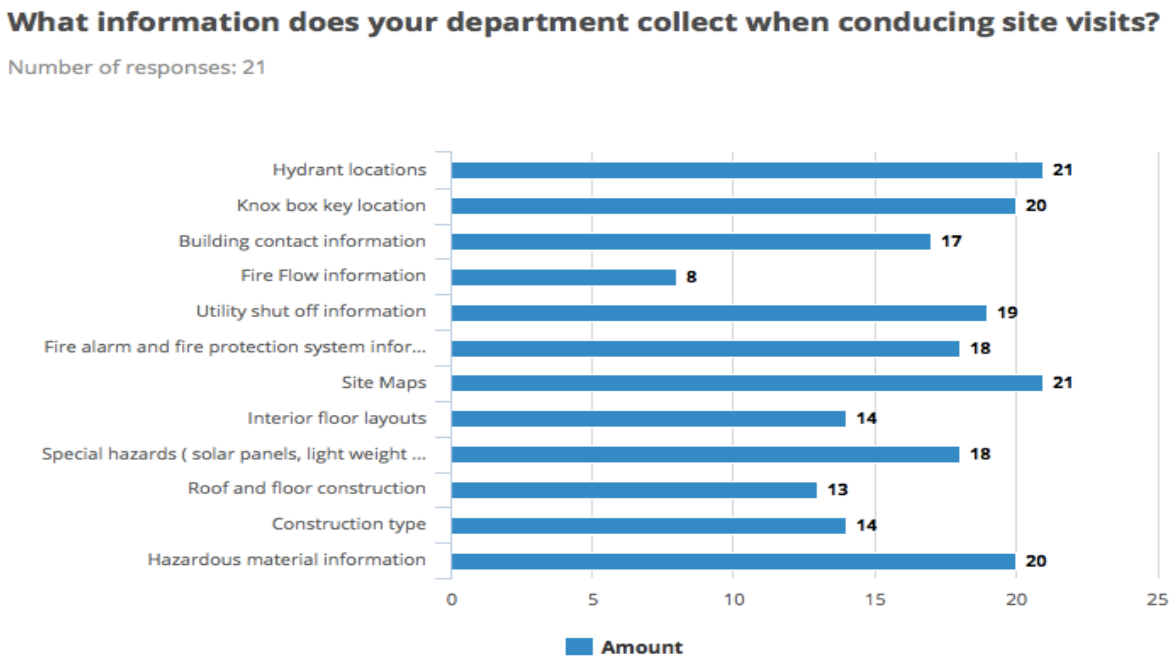


Figure 1. Pre-Incident planning information collected by outside departments during site visits.

The same research question was asked in the BFD survey (Appendix -F). The intent was to find out what the line staff believe is important when conducting a site visit. The BFD respondents showed 70.83% wanted to see moderate detail in pre-plans. The components included in a pre-plane with moderate detail was: (a) building footprint, (b) entrances/exits, (c) hydrants, (d) utilities, (e) Knox-box location, (f) apparatus access info, (g) interior layout, (h) fire suppression systems, (i) stairways, and (j) hazardous materials. The elements the respondents felt were important to include on the pre-plans were: (a) Knox-box location, (b) building utilities, (c) hazardous material information, (d) building point of contact numbers, (e) building fire protection system location, (f) exits and entrances, and (g) occupancy construction type. The

least important information to collect for pre-plans were: (a) interior doors, (b) interior layout, (c) fire flow information, and (d) roof and floor construction information. Figure 2 identifies the BFD responses to what would be collected during a site visit.

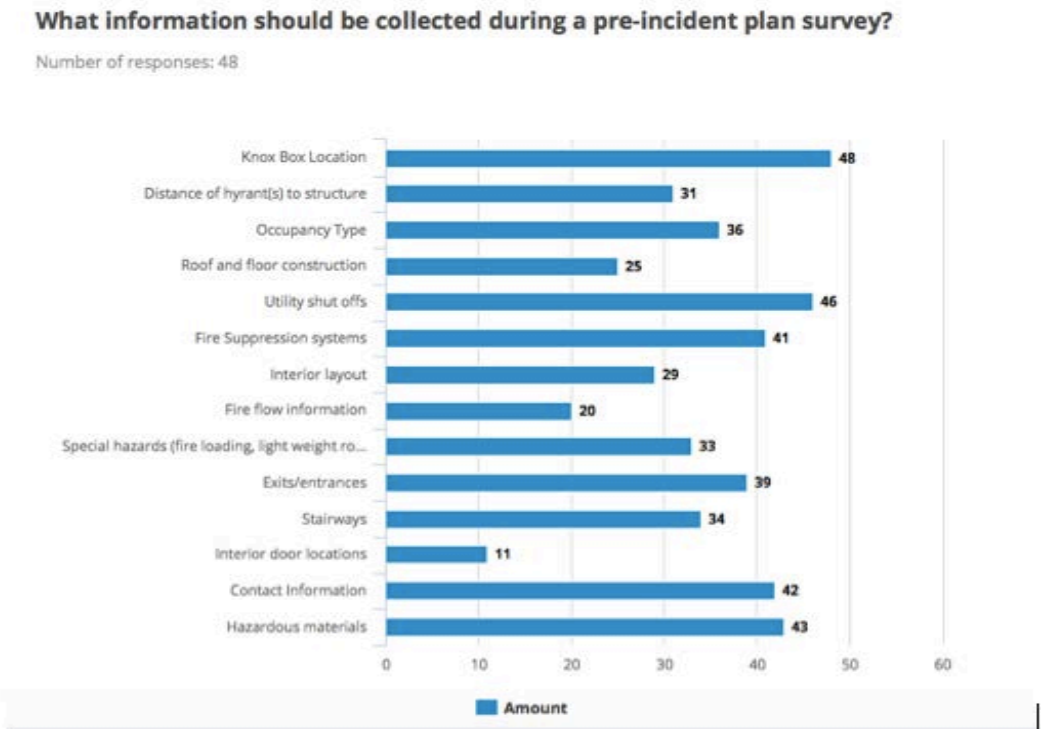


Figure 2. Pre-plan information BFD believes should be collected during site visits.

The third research question asked: What are key elements found in successful pre-incident planning programs currently used in similar sized departments? To answer this question, the survey (Appendix -E) data from outside departments pertaining to specific ways they manage their programs were reviewed. Questions were asked to determine: (a) how information is accessed by responding crews, (b) who conducts on site pre-incident surveys and inputs data, (c) how often surveys are completed, and (d) the strengths and weaknesses of department's programs. The survey results showed, 80.95% of the departments use a system where pre-plans

are entered into a software program and are available on MDT's in responding apparatus. Data was sought on who conducted site visits for pre-plans and who imputed the data into the computer program. The responses showed 100% of the departments use duty crews to conduct site visits, although 16 of the 21 responding departments also use the fire prevention division to assist duty crews with the occupancy visits. A minority of the departments, five of the 21, also use chief officers to assist duty crews and prevention staff with site visits. The workload of imputing pre-plan data is also distributed among line crews and fire prevention, with 14 responses showing crews input results and 10 responses stating fire prevention inputs data. Of the 21 departments, six had a program manager that imputed all data from site survey visits.

Another key element found that 13 departments have a program manager ensuring information is accurate and consistent. The other departments without a program manager, do not have a dedicated person insuring information is accurate and relies on the crew or person imputing the information for accuracy.

Survey questions also asked if crews had a minimum number of pre-incident surveys required to complete a month and how often pre-plans are updated. The majority of the departments, 57.14% do not have a minimum number of pre-plan surveys required to be completed each month. Of those departments that do have a minimum number of pre-plans required, 14.29% had to complete one to two reports a month, 4.76% had two to three reports to complete, and 23.81% had to complete four or more reports a month. The departments were asked if there was a set schedule on updating exiting pre-plans. The responses showed 57.14% of the departments had no schedule, 23.8% update once a year, 4.76% update every two years and 14.29% update more than every two years.

The next two questions in the survey (Appendix -E) were directed toward outside departments and asked what elements lead to the success of their pre-incident planning program, and conversely what elements challenge the program. The survey showed: (a) easily accessible pre-plans, (b) sufficient detail on the pre-plans for responding crews and IC, as well as (c) easy to manipulate computer program were key factors making the program successful. The other factor shown to be important for a successful program was strong management support. Figure 3 shows the elements of a successful pre-incident program.

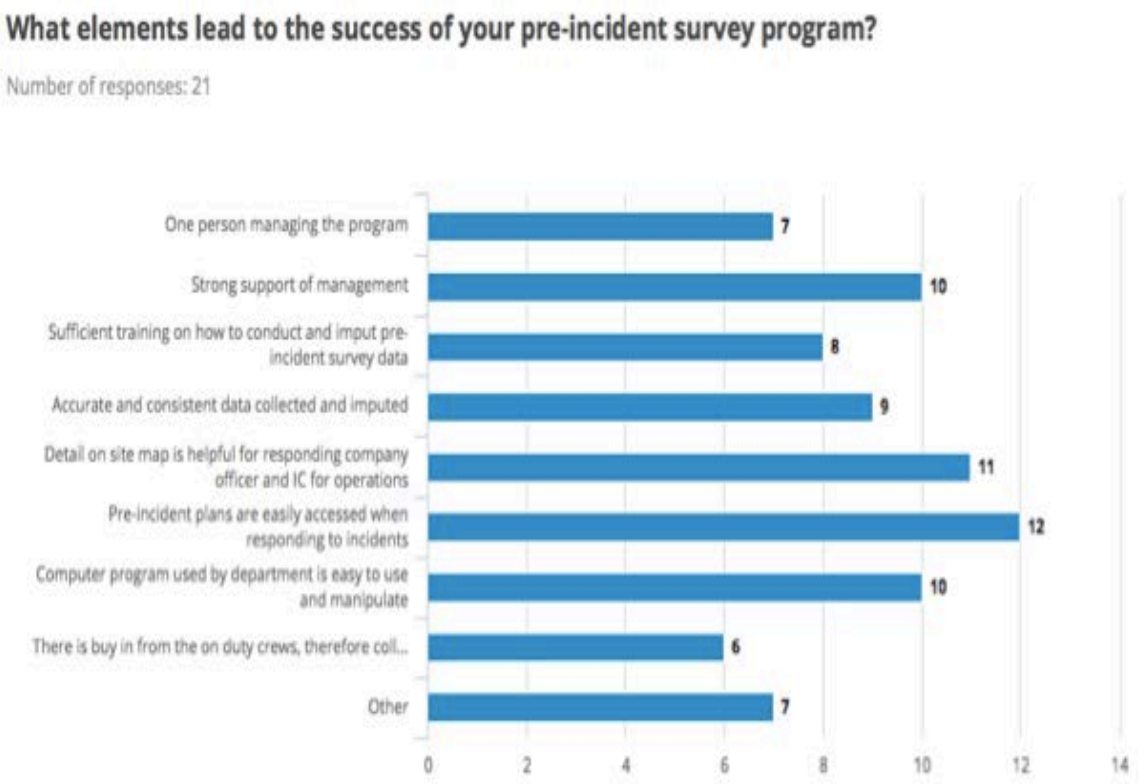


Figure 3. Elements leading to a successful pre-Incident program in outside departments.

The factors creating challenges for department's pre-incident surveys were lack of organization and direction of the program and insufficient training conducting site visits and

inputting of information into the pre-plan program. Figure 4 lists the challenges to pre-incident planning programs.

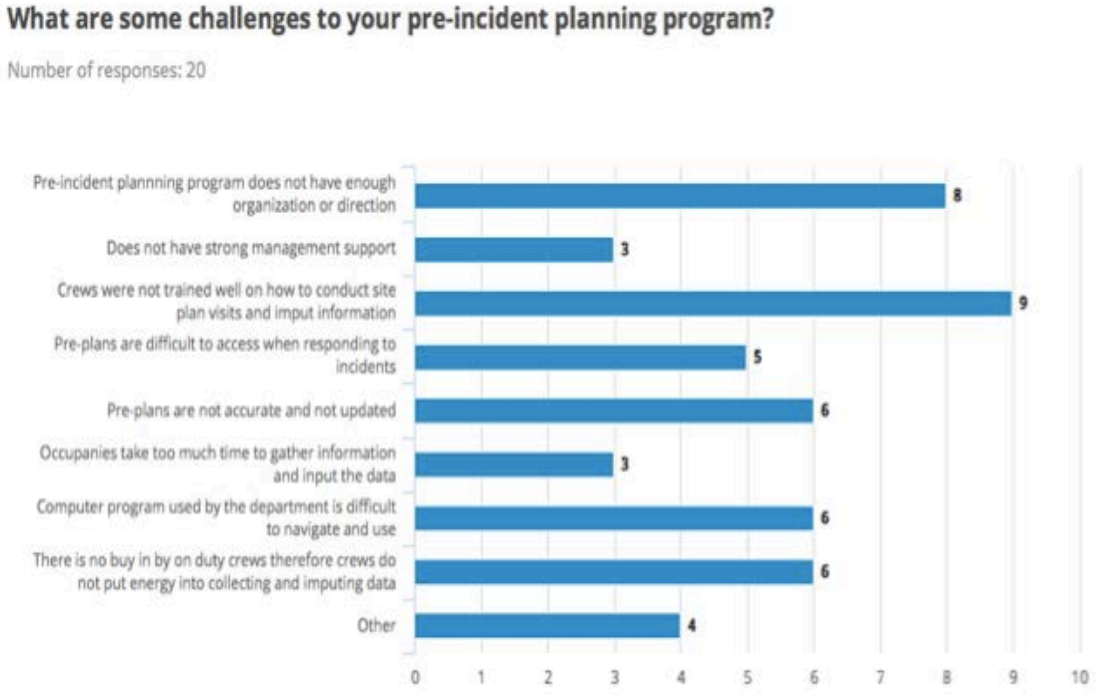


Figure 4. Challenges to pre-incident planning programs in outside departments.

The fourth research question asked: How should Bend Fire Department identify which target hazards should be prioritized when first implementing the program? Of the outside departments (Appendix -E), 71.43% do not utilize a software program to assist them in prioritizing target hazards for pre-planning. When prioritizing target hazards, 61.90% of the departments have crews, fire prevention staff and chief officers collaborate in deciding which occupancies to pre-plan. In the other responses 14.29% of the departments have the fire crews decide on target hazards in their first due area and 14.29% have fire prevention division prioritize occupancies. The BFD responses (Appendix -F) showed 65.96% of respondents believed the

operations division should assign target hazard occupancies and 34.04% of the respondents believe crews should choose the occupancies to be pre-planned.

The question of organizing target hazards was also discussed with Fire Marshal Medina (personal communication, October 24, 2017). Medina recommended the BFD adopt NPFA 1730 (National Fire Protection Association, 2016) recommendations to organize the target hazards into low, moderate and high-risk occupancies. Medina further recommended the department focuses, in the beginning, on the high-risk occupancies until those are completed and then expand pre-plans to moderate risk occupancies. He cautioned against having crews decide on occupancies to pre-plan in their first due areas and believes having a department-wide plan to pre-plan target hazard would be more conducive to long-term success of the program.

The purpose of this paper was to develop a pre-incident standard operating guideline (SOG) for the Bend Fire Department. Best practices and industry standards for pre-incident planning programs were used in the development of BFD SOG. This SOG can be found in Appendix-A, along with pre-incident occupancy data form (Appendix-B) and site plan drawing form (Appendix-C).

Discussion

The literature review established the importance of pre-plans for firefighter safety and operational effectiveness from the perspective of different agencies and leaders in the fire industry. NFPA developed 1620 (2015) solely focused on the pre-incident planning. This document emphasizes pre-plans should be “the foundation for the decision-making process during an emergency situation” (p. 17). The BFD personnel survey supported this perspective showing over 90% indicated pre-plans were important to very important to the safety of BFD operations. The importance of pre-plans in fire department operations is uncontested, therefore

the researcher focused a majority of the research on best practices of collecting and managing pre-plan information to aid in the development of a pre-plan program for the Bend Fire Department.

One of the key elements found in a successful pre-incident planning program from departments surveyed (Appendix-E) was having the pre-plans easily accessible when responding to emergencies. This data was supported by Jukubowski (2012) who indicated a key element to a successful pre-incident planning program is the ability for firefighters to access accurate building information en route to an emergency call. Mobile computer terminals (MDT) in responding apparatus are ideal for responding crews to quickly access pre-plans and have critical building information on the way to emergency scenes. A majority of surveyed (Appendix -E) departments, utilize MDT's to get pre-plan data en route to emergency calls. Additionally, these departments stated having the pre-plans easily accessible when responding to emergencies was the most important factor to the success of their pre-plan program. The BFD already has MDT in all responding apparatus, therefore access to pre-plans will be easy to provide once a pre-plan program is implemented.

Several journal articles (Blue Card Command, n.d.; Naum, 2012; Amodio,2012; Jakubowski, 2012) discussed the importance of having the fire crews visit the occupancies to gather pre-plan data. The authors discuss that when crews visit occupancies, it increases the firefighter's awareness and familiarity with the building and this knowledge could be critical information when working in the building during fire conditions (Blue Card Command, n.d.; Amodio, 2012). Although the journal articles recommends duty crews preform site visits, the data indicated (Appendix-E) the majority of outside departments surveyed work in collaboration with their prevention division when completing site visits. The belief that site surveys should be

a collaborative effort with the fire prevention division was also seen in the data collected from BFD survey (Appendix-F). Fire Marshal Medina (personal communication, October 24, 2017) supported this idea, stating one of the major benefits of a pre-incident survey program is the coordination of efforts between operations and prevention divisions when completing the site visits. Medina believes the fire inspectors can and should aid in collecting information for pre-plans during code enforcement visits, although he also maintains line crews should be predominantly responsible for pre-plan site visits. Medina expanded on this point by explaining that even if a business is code-compliant, fire crews may find additional issues in the occupancy that could make fire operations challenging. Having prevention and operations walk through the same business with different focuses could be beneficial for code enforcement and fire operations.

The literature identifies several recommended approaches to organize occupancies to pre-plan, although most systems start the classification process with high-risk target hazards (Stouffer, 2016; National Fire Protection Agency, 2015; National Fire Protection Agency, 2016; Wolf, 2017). The data showed (Appendix-E) most of the surveyed departments do not use software program to assist them in identifying occupancies to pre-plan. Over half of the departments surveyed (Appendix-E) use a collaborative process between fire crews, prevention staff and chief officers to decide on what occupancies are to be pre-planned. A majority of BFD line personnel (Appendix-F) felt the operations division should decide on what target hazards should be pre-planned and assign the occupancies to the crews.

Currently, the BFD does not have a plan for organizing or assigning target hazards. The current idea is to have crews decide which buildings to pre-plan (B. Boos, personal Communications, October 11 2017). In the interview with Fire Marshal Medina (personal

communication, October 24, 2017), he cautioned against having crews choose target hazards and recommended using a systematic risk assessment matrix to organize buildings for pre-planning. In the prevention division, inspectors have autonomy to organizing code inspections in their district. Each of the five inspectors have developed their own method of organizing buildings for code inspection, each different from the next. Medina believes this is a contributing factor as to why code inspections do not get completed for every occupancy. Medina would like to see his division adopt a common system utilized by all inspectors for organizing code inspections. Given this experience in prevention division, Medina advocates using NFPA 1730 standard to arrange occupancies into high, moderate and low risk target hazards for the pre-plan program. After the occupancies have been organized, crews can focus on high-risk occupancies when starting the pre-plans site visits.

Determining what information should be collected and the recommended level of detail for pre-plans was another focus of the research. Although NFPA 1620 recommends pre-plans document five different site characteristics for occupancies, NFPA leaves ultimate discretion to each department (NPFA). NFPA 1620 and several other trade journals advocate pre-plans need to be clear, concise and easy to read (NFPA 1620, Jukubowski, 2012; Murphy, 2009). When pre-plans are too detailed it is difficult for crews to pull out the essential information when responding to an emergency (Glass, 2015). The data from outside departments and BFD personnel (Appendix-E, Appendix-F) supported these findings. The surveys from outside departments (Appendix-E) indicated sufficient detail on pre-plans for tactical decision making was a key element in the success of the departments pre-plan programs. In the BFD survey (Appendix-F), respondents indicated they wanted moderate detail in pre-plans, including information such as interior layout of building, hydrants, Knox-box location, exits and entrances,

fire suppression systems, utilities, and special hazards to firefighters. To accomplish getting the the right amount of detail for different people on scene, Jakubowski (2012) recommended layering information for pre-planning. The first layer would allow for a quick- tactical pre-plan information for responding crews and additional layers would give incident commanders more detailed information for longer operations. The Intterra pre-plan program allows for hyperlinks, so this layered approach of displaying information is possible.

Innovative approaches to displaying pre-plan information were discovered from the data, such as the program at Wilson Fire and Rescue (Oliver, 2011). This department utilized GIS technology to color code occupancies that could present major safety hazards to firefighters. The color coding shows occupancies with light weight construction, basements, and dangerous fire loading. This approach allows crews to quickly see occupancies with major firefighter safety issues and make cursory tactical decisions before detailed pre-plans have been accessed. These advanced pre-plan programs show the direction the BFD could develop to help with fire ground safety.

Researching the details of pre-plans programs from trade journals articles, fire service experts and recommendations from fire departments, it is important to guide the BFD toward success when launching their pre-plan program. Just as important as the details, is examining the overarching themes and attributes of specific programs that make programs succeed or fail.

The survey data indicated (Appendix-E) one of the most important aspects of a successful pre-plan programs was easily accessible pre-plans while responding to incidents and adequate detail on the plans to help in tactical decision making. The other key to a successful program was strong management support. The concept of management support was also echoed in literature review (Gavin, 2012). Gavin (2012) stated a successful pre-planning program involves

a commitment from the entire organization and must be a top priority of the administration team for several years for the pre-plan program to be successful. The survey data showed (Appendix-E) the most significant challenge for pre-plan programs are crews are not trained thoroughly on how to conduct site plans and input information into the computer. Another challenge indicated in existing pre-plan programs (Appendix-E) was lack of organization and direction.

The Bend Fire Department has lacked a pre-plan program for over ten years. The purchase of Intterra and the movement towards developing a pre-plan program is encouraging. The details of the program and subsequent management of the system will be vitally important to its success. A commitment from the management team is critical for the pre-plan program to take root into the culture of the BFD and develop into a program that will impact the safety and operations of the BFD and the citizens of Bend.

Recommendations

Based on the results of the study, the following recommendations are presented to the Bend Fire Department:

1. Ensure the pre-incident planning is a department priority for several years to help integrate the program into the culture and operations of the department.
2. Implement the Occupancy Pre-Planning Standard Operating Guideline presented in Appendix A and data form sheet in Appendix B.
3. Adopt NFPA 1730 to identify target hazards in the City of Bend.
4. Collaborate with the Prevention Division and utilizing NFPA 1730, identify all high-risk target hazards in the City of Bend and assign those occupancies to engine crews for site visits.
5. Assign a designated number of pre-plans engine crews must complete every month. This should be re-evaluated every six months to ensure work-load is sustainable. Assignment of pre-plans should be adjusted as needed.
6. Include special hazards into pre-plans that pose a significant risk to fire fighter safety such as light-weight truss systems, basements and fire loading.
7. Work in collaboration with Prevention Division to have all high-risk target hazards updated annually by duty crews and prevention staff.
8. Develop a program, similar to Palo Alto Fire Department, where business owner's complete pre-plans on their own businesses. Utilize this program for low to moderate risk businesses for initial pre-plan development (Appendix-D)

9. Assign a person to manage the pre-incident planning program to assure pre-plan documents are completed correctly, timely and are consistent among all crews
10. Develop a thorough training program for engine crews that would include how to interact with business owners, what information to include during site visits, how to draw site-plans and how to input information into the Intterra system.

After completion of the study, the following recommendations are recommended for readers planning to replicate the study:

1. Focus more questions to outside departments on how they share pre-incident plans with outside agencies.
2. Have more pointed questions on how outside departments organize target hazards and how they keep pre-plans up to date.
3. Interview departments with innovative pre-plan programs to capture more details of the program.

References

Amodio, D. (2012, April 23). An introduction to Pre-Planning for Fire Calls. *Carolina Fire Rescue EMS Journal.* Retrieved from http://www.carolinafirejournal.com/Articles/Article-Detail/ArticleId/2073/An-introduction-to-Pre-Planning-for-fire-calls

Bend Fire Department Bend. (2011). *Bend Fire and Rescue Deployment Plan*. (2011-2013). Retrieved from City of Bend website: www.bendoregon.gov/home/showdocumment?id=6919

Blue Card Command. (n.d.). Continue Education-Size Up Review, module #12. Retrieved from https://www.bshiftv5.bshifter.com/course/

Byer, D., & Hartwell, R. (n.d.). *Structural Fire Preplans*. Unpublished Manuscript, Worcester Polytechnic Institute, Worcester, MA.

City of Bend. (2015-2016). *Application by Census Report Category for Permits Issued.* Retrieved from https://www.bendoregon.gov/services/advanced components/document/central/-parent-5352/-folder-328/-npage-2

City of Bend. (2017-a). *Adopted Biennial Budget.* Retrieved from https://www.bendoregon.gov/home/showdocument?id=32159

City of Bend. (2017-b). *Comprehensive Plan- A Codification of the General Ordinances for the City of Bend, Oregon*. Retrieved from http://www.codepublishing.com/OR/Bend/?BendDCNT.html

City of Palo Alto. (n.d.). *City of Palo Alto Fire Department Pre-Incident Plan Guide*. Retrieved December 23, 2015, from http://www.cityofpaloalto.org/civicax/filebank/documents/7933

Cleary, T. (1988). *Sun Tzu- The Art of War*. Boston, Massachusetts: Shambhala Publications.

Department of Homeland Security. (n.d.) Best Practice Pre-Incident Planning: Overview. Lessons Learned Information Sharing. Retrieved from https://www.hsdl.org/?view&did=765434

Devol, R., & Lee, J., & Ratnatunga, M. (2016). 2016-Best Performing Cities. Retrieved from http://www.best-cities.org/2016/best-performing-cities-report-2016.pdf

FEMA (Ed.). (2016). *Executive Analysis of Fire Service Operations in Emergency Management Student Manual* (7th ed.). Washington, DC: FEMA.

Galvin, B. (2012). Small Pennsylvania Fire Department Creates Extensive Pre-Fire Plan Database. *Fire Rescue magazine*, 7(10), 1-5. Retrieved from http://www.firerescuemagzine.com/articles/print/volume-7/issue-10/ Small-Pennsylvania-Fire-Department-Creates-Extensive-Pre-Fire-Plan-Database.html

Glass, A.J. (2015) *Implementing a Comprehensive and NFPA Compliant Pre-Incident Plan Program at Avondale Fire & Medical* (Executive Fire Officer Program Applied Research Project). Emmitsburg, MD: National Fire Academy.

Jakubowski, G. (2012). Your Get-Started Preplanning Guide. *Fire Rescue Magazine*, 8(2), 1-5. Retrieved from http://www.firerescuemagazine.com/articles/print/volume-8/issue-2/your-get-started-preplanning-guide.html

Mohan, Sarah. (2017). [Bend Fire Department Standard of Cover Data]. Unpublished raw data.

Murphy, J.K (2008). Fire Service court: On Standards. *Fire Engineering*. Retrieved from http://www.fireengineering.com/articles/2008/11/fire-service-court-on-standards.html

Murphy, J.K. (2009). Are You Preplanning Your Buildings? *Fire Engineering*. Retrieved from http://www.fireengineering.com/articles/print/volume-162/issue-1/features/are-you-preplanning-your-buildings?

Naum, C.J. (2015). *Predictability and Performance of Buildings and Today's Fireground.* Retrieved from http://www.firegroundleadership.com/2015/03/24/predictability-of-building-performance-on-todays-fireground/

National Fire Protection Association, (2013). *Standard for Fire Officers Professional Qualifications (NFPA 1021).* Quincy, MA: NFPA

National Fire Protection Association, (2015). *Standard for Pre-Incident Planning (NFPA 1620).* Quincy, MA: NFPA

National Fire Protection Association, (2016). *Standard on Organization and Deployment of Fire Prevention Inspection and Code Enforcement, Plan Review, Investigation and Public Education Operations (NFPA 1701).* Quincy, MA: NFPA

National Institute for Occupational Safety and Health (2002, July). Supermarket Fire Claims the Life of One Career Fire Fighter and Critically Injures Another Career Fire Fighter – Arizona. (Report F2001-13) Retrieved from https://www.cdc.gov/niosh/fire/pdfs/face200113.pdf

National Institute for Occupational Safety and Health (2017, January). *Career Fire Fighter/Engineer Dies After Falling Through Translucent Corrugated Roof Panel While Searching for Fire Extension—Colorado*. (Report F2015-13) Retrieved from https://www.cdc.gov/niosh/fire/pdfs/face201513.pdf

Njus, E. (2017, May 25). New Population Estimates put Bend Among the Nation's Fastest-Growing Cities. *The Oregonian/OregonLive*. Retrieved from http://oregonianlive.com

Oliver, D. (2011). Using GIS to Visualize Risks and Hazards. FireRescue Magazine. Retrieved from http://www.firerescuemagazine.com/articles/print/volume-6/issue-11/technology-and-communications/using-gis-to-visualize-risks-and-hazards.html

Stouffer, J.A. (2016). Community Risk Assessment Guide. *Vision 20/20- National Strategies for Fire Loss Prevention*. Retrieved from http://riskassessment.strategicfire.org/wp-content/uploads/2016/03/Community-Risk-Assessment-Guide-v1.5.pdf

Trejbal, C. (2016). Too Many Tourists? Retrieved from www.bendsource.com

Visit Bend Business Plan and Budget. (2015/2016). Retrieved from www.visitbend.com/FY2016-Business-Plan-April-9-WEBRES.pdf

Waters, M. (2008) Simple Ways to Improve Your Community's ISO Classification. *FireRescue Magazine.* Retrieved from http://www.firerescuemagazine.com/articles/print/volume-3/issue-6/firefighting-operations/simple-ways-to-improve-your-community-s-iso-classification.html

Williamson, J. (2016) *Building What matters.* Retrieved from https://bendchamber.org/member-announcements/building-what-matters/

Wolf, M. (2017) Calculating the OVAP Score for an Occupancy. Emergency Reporting. Retrieved from https://emergencyreporting.zendesk.com/hc/en-us/articles/

USFA. (2014). *America's Fire & Emergency Services Leader - Fiscal Years 2014 to 2018.* Retrieved January 6, 2016, from https://www.usfa.fema.gov/downloads/pdf/publications/strategic_plan_2014-2018.pdf

Appendix A

Bend Fire and Rescue
Standard Operating Guidline

Pre-Incident Planning

Purpose: Pre-incident planning can provide valuable information about an occupancy which can improve the ability of firefighters to respond effectively to a fire or other emergency at that location. Pre-incident planning addresses vital fire protection concerns such as: structural layout, access, construction details, types and locations of fire protection systems. It includes data which can have an impact on decisions or actions during an emergency.

Procedure:

1. Administration of pre-incident plan program

    1.1 The Bend Fire Department Operations Chief will have the responsibility of coordinating and administrating the pre-incident program.

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

    1.3 The BFD Operations Chief will coordinate with Deputy Fire Marshal, Training Chief and program manager to help administer and manage program.

        1.3.1 The Operations Chief will work in Coordination with Fire Marshal to select target hazards for pre-planning.

1.3.2 The Operations Chief will work in coordination with Training Chief to provide all relevant pre-incident plan training through to BFD personnel.

1.3.3 The Operations Chief will select a program manager to insure all pre-plans are accurately imputed and completed in a timely manner.

2 . Selection of Target Hazards

2.1 NFPA 1730 guidelines will be used to identify occupancies considered "significant risk".

2.2 Information and data required to determine occupancies as "significant risk" will be collected and imputed by the Fire Department Prevention using guidelines set for in NFPA 1730.

3 Assignment of target hazard occupancies

3.1 On duty crews 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 crews by the fire prevention division.

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

3.2.2 Visits to target hazards will be coordinated by Company Officer.

3.2.2.1 Company officer will contact business and schedule a site visit.

3.2.2.2 Every effort will be made to make pre-plan data collection site visits a coordinated effort between BFD crew and business contact.

3.2.2.3 Pre-incident assignments will be completed within a week of pre-plan site visit.

4 Recording and distributing site plan information

4.1 All data recorded during site visits will be imputed on Pre-Incident Occupancy Data Forms accessed on engines Ipad.

4.2 Basic site plans will be drawn by engine crews or occupancies emergency floor plans can be used if plan is accurate and has adequate detail.

4.3 Information to be collected on site plans should include:

4.3.1 Location of hydrants

4.3.2 Basic in interior layout with appropriate labels

4.3.3 Location of access and egress

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

4.3.5 Structural fire containment features such as fire doors or walls

4.3.6 Basement

4.3.7 Utility shut off locations

4.3.8 Knox box locations

4.3.9 Fire alarm panel locations

4.3.10 Roof access

4.3.11 Stairway and elevator locations

4.3.12 Special hazards such as light weight roof construction, solar panels or unusual fire loading

4.3.13 Hazardous Materials

4.3.14 Responsible party contact information

4.4 Once site plans and data are recorded and uploaded into Inttera software, the completed pre-incident will be forwarded to the designated program manager

5 Frequency of pre-incident plan updates

5.1 Pre-incident plans for occupancies that are considered to be at “significant risk” will be updated annually

5.1.1 Updating of pre-plans will be a coordinated effort between duty crews and prevention staff.

5.1.2 Prevention division will update any pre-plan information during code inspections and insure it is reflected on pre-plans.

5.1.3 Pre-incident plans for occupancies that are considered to be “Moderate Risk” will be updated bi-annually be the prevention division.

Appendix B

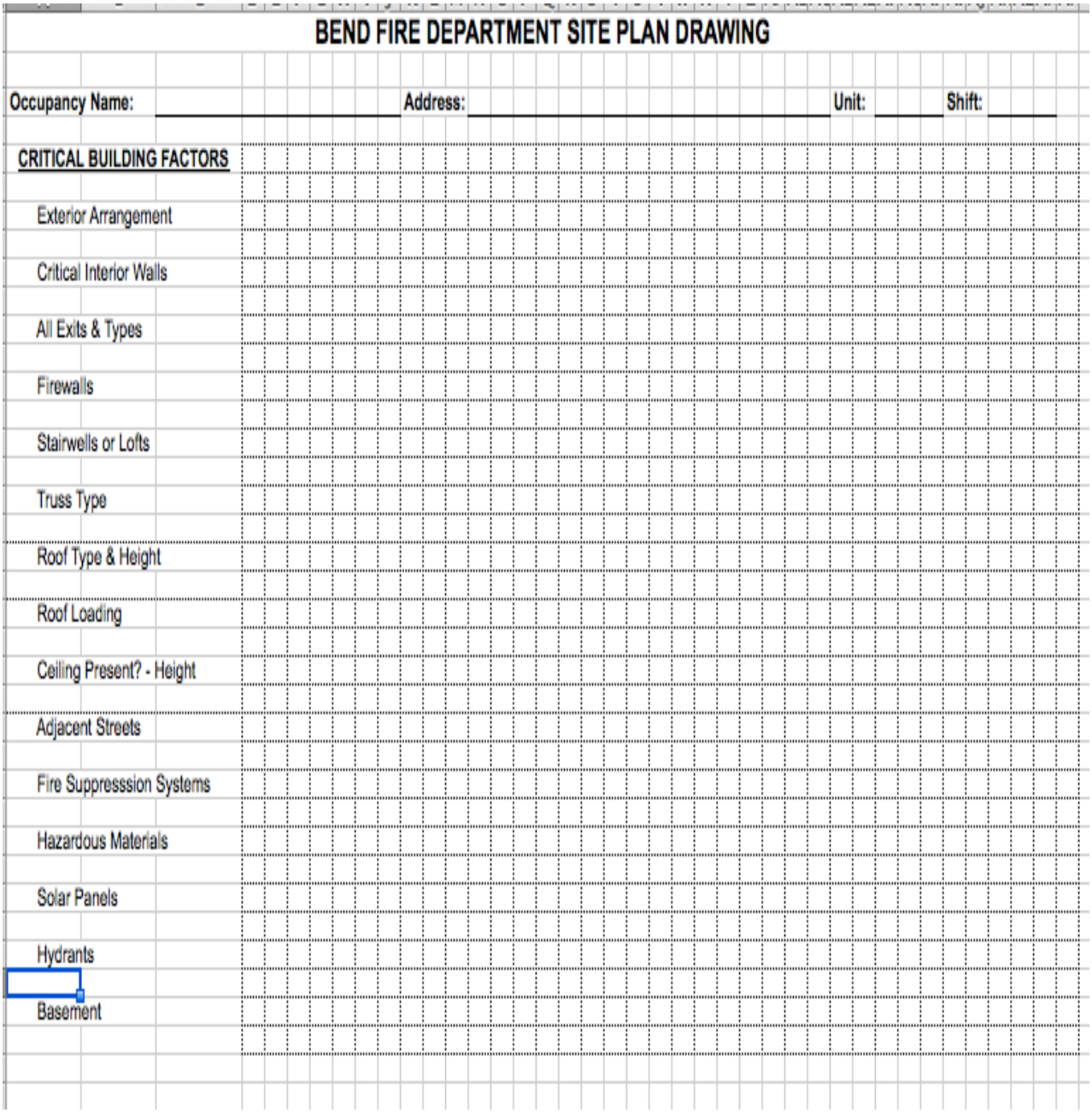
Bend Fire Department – Pre-Incident Occupancy Data Form

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 Access:			*Skylights:*	*Solar Panels:*	
Roof Support:					
Roof Loading and Location:					
Exterior Walls:			*Interior Walls/Supports:*		
Loc. of Fire Walls:					
Ceiling:			*Floors:*		
Building Features:					
Exits:			*Stairwells:*		
Elevators:			*Floors Served:*		
			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: *I.D. #:* *Qty.:* *Container:* *Location:*	*Name:* *I.D. #:* *Qty.:* *Container:* *Location:*	*Name:* *I.D. #:* *Qty.:* *Container:* *Location:*

Appendix C



BEND FIRE DEPARTMENT SITE PLAN DRAWING

Occupancy Name: _____ Address: _____ Unit: _____ Shift: _____

CRITICAL BUILDING FACTORS

- Exterior Arrangement
- Critical Interior Walls
- All Exits & Types
- Firewalls
- Stairwells or Lofts
- Truss Type
- Roof Type & Height
- Roof Loading
- Ceiling Present? - Height
- Adjacent Streets
- Fire Suppresssion Systems
- Hazardous Materials
- Solar Panels
- Hydrants
- Basement

Appendix D

*Sample Letter to provide business owners to help with pre-planni*ng. (Letter should include a symbol sheet for business owner to use when drawing pertinent items on graph sheet for department).

Bend Fire Department
1212 SW Simpson Ave
Bend, OR. 97702

Dear Business Owner,

The Bend Fire Department is asking your help to keep your business and our firefighters safe. We would like to request your assistance in collecting information on your business that will be used for our pre-planning program. Pre-incident planning provides valuable information about your occupancy which can improve the ability of our firefighters to respond effectively to your business in case there is a fire or other emergency. If you could provide the information below on the attached paperwork, it would help our emergency response to your business.

Enclosed is graph sheet to draw an outline of your building. If you have an emergency floor plan this will suffice. On your drawing please include the following items:

1. Basic in interior layout
2. Location of exit and entrance doors
3. Location of utilities
4. Location of any fire suppression systems
5. Fire alarm panel
6. Roof Access
7. Stairwell and elevator location
8. Knox box location
9. Indicate if your business has a basement
10. Contact information for your business

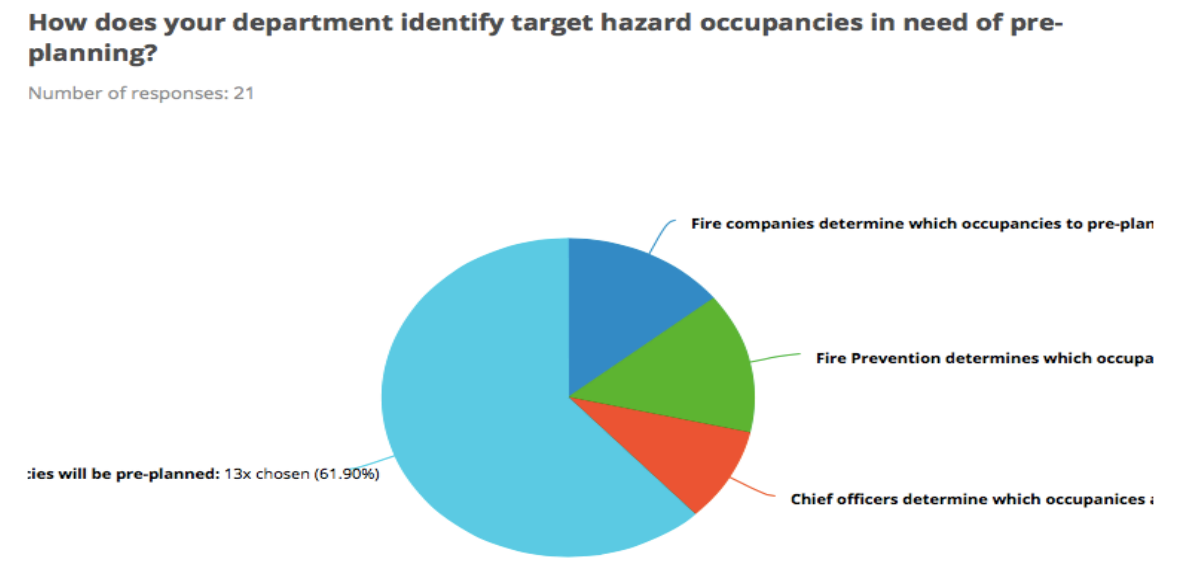
Thank you for your help. This information will be invaluable to our firefighters. If you have any questions about this letter or the pre-plan program please call the administration building at 541-322-6300. Please return the pre-plan drawing to:

Bend Fire Department
1212 SW Simpson Ave
Bend, OR. 97702

Appendix E

Results of Pre-Incident Plan Survey to Outside Departments

1.



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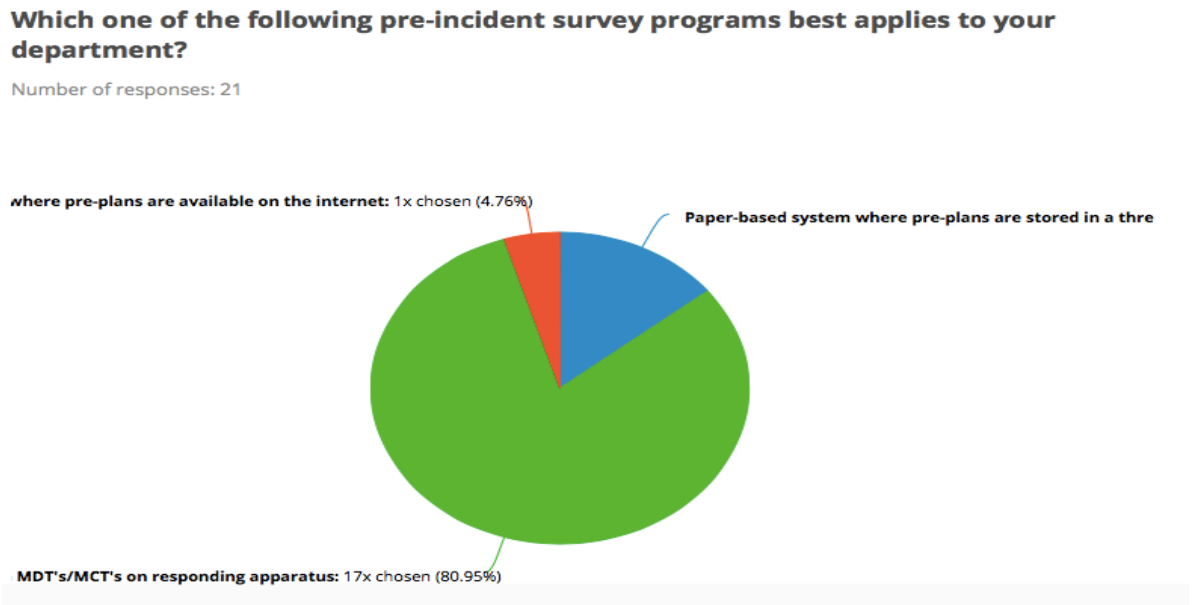
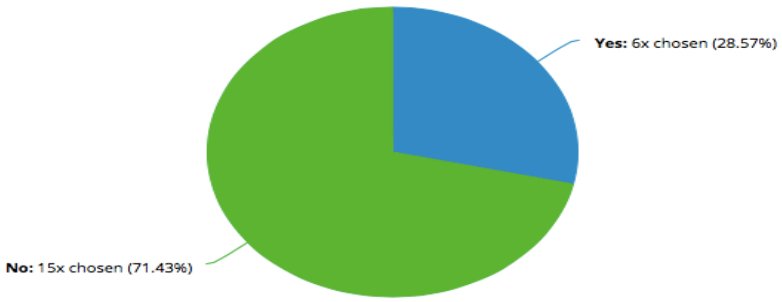


3.

Does your department utilitze a software program to help identify target hazards?

Number of responses: 21



4.

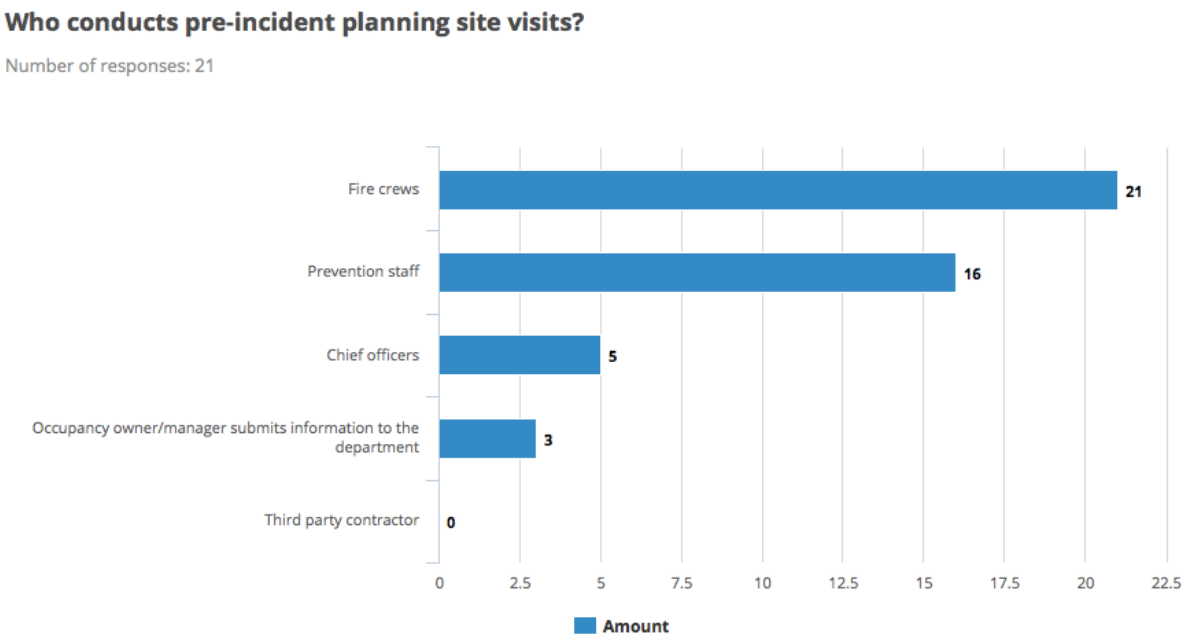
If yes, which one?

Number of responses: 7

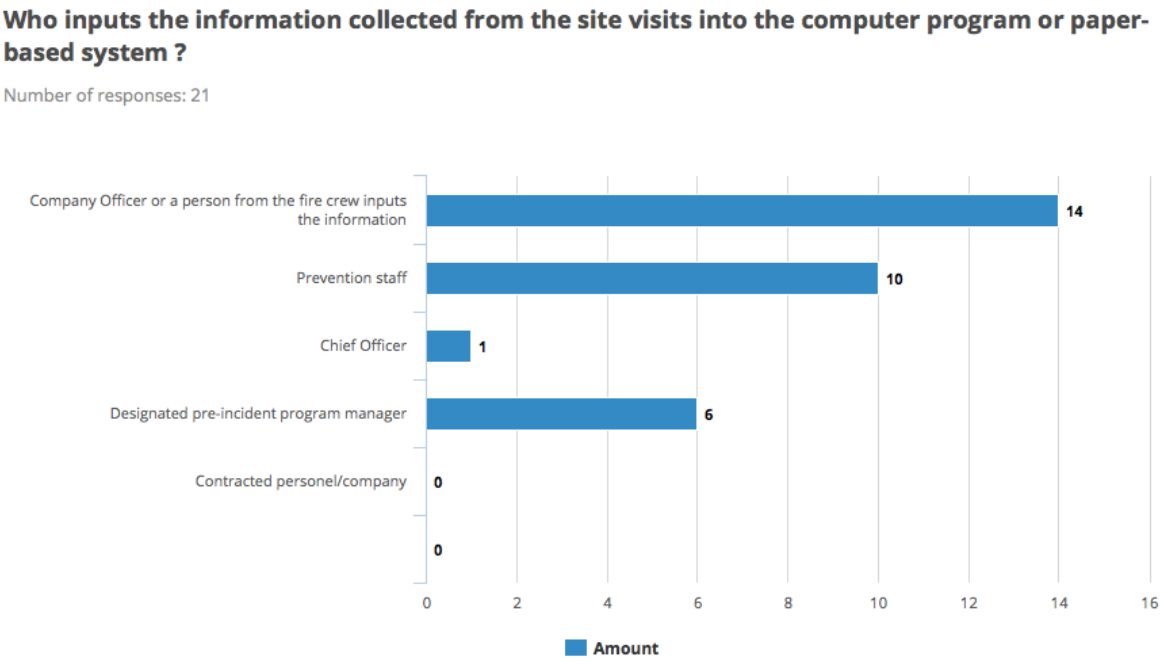
Text answers:

- Firehouse to some extent - GIS mapping and all our preplans are on mobile I Pads
- ERS currently through our Inspection program
- not sure, it's with the Community Risk Division
- HIgh Plains/Fire Manager
- Avenza Maps and ESRI ArcMAp software
- n/a
- Emergency Reporting's OVAP

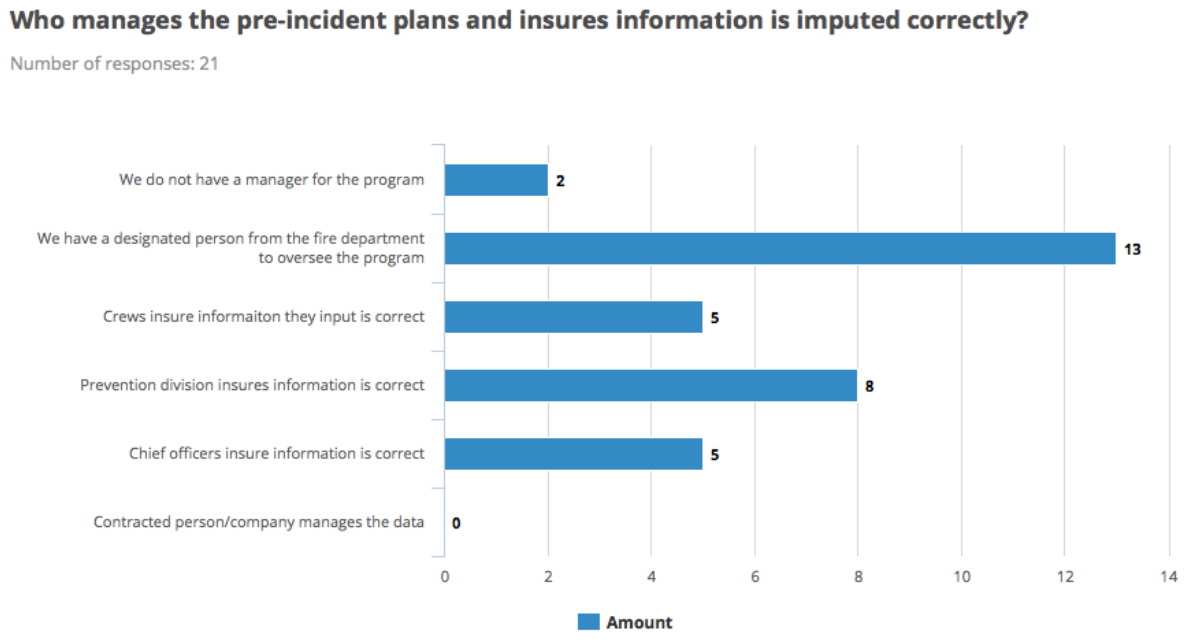
5.


Who conducts pre-incident planning site visits?
Number of responses: 21
Fire crews
21
Prevention staff
16
Chief officers
5
Occupancy owner/manager submits information to the department
3
Third party contractor
0
0
2.5
5
7.5
10
12.5
15
17.5
20
22.5
Amount

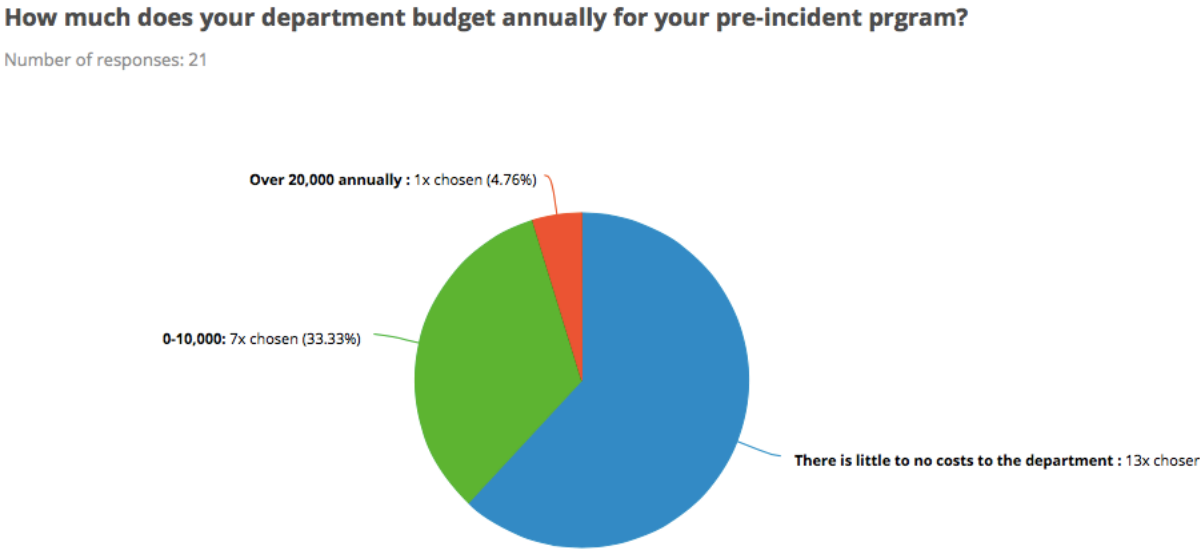
6.


Who inputs the information collected from the site visits into the computer program or paper-based system ?
Number of responses: 21
Company Officer or a person from the fire crew inputs the information
14
Prevention staff
10
Chief Officer
1
Designated pre-incident program manager
6
Contracted personel/company
0
0
0
2
4
6
8
10
12
14
16
Amount

7.


Who manages the pre-incident plans and insures information is imputed correctly?
Number of responses: 21
We do not have a manager for the program
2
We have a designated person from the fire department to oversee the program
13
Crews insure informaiton they input is correct
5
Prevention division insures information is correct
8
Chief officers insure information is correct
5
Contracted person/company manages the data
0
0
2
4
6
8
10
12
14
Amount

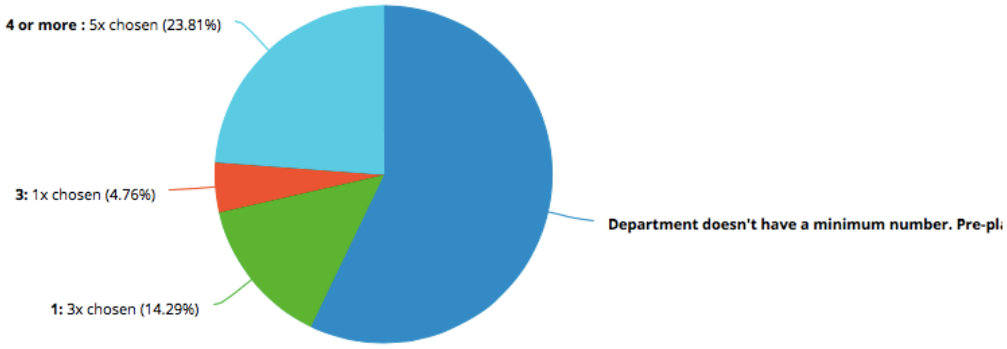
8.


How much does your department budget annually for your pre-incident prgram?
Number of responses: 21
Over 20,000 annually : 1x chosen (4.76%)
0-10,000: 7x chosen (33.33%)
There is little to no costs to the department : 13x choser

9.

How many pre-plan site visits does your department assign per month?

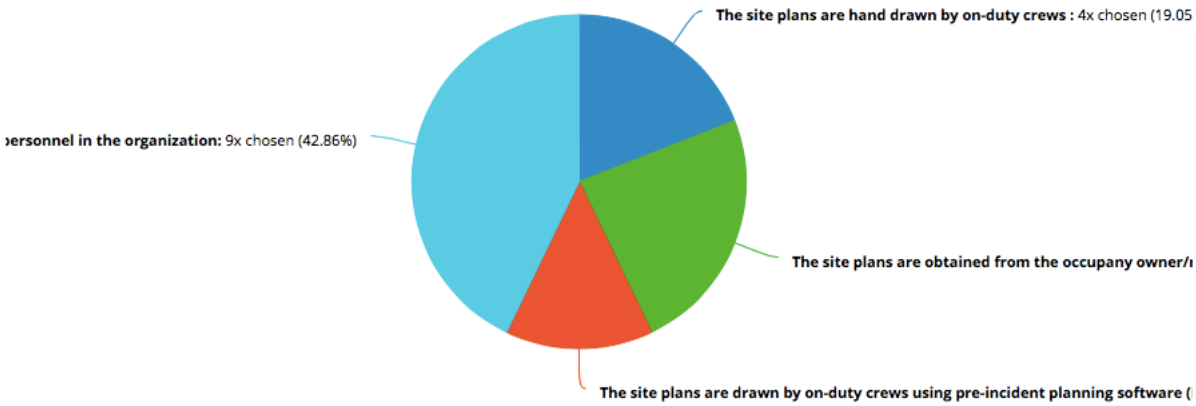
Number of responses: 21



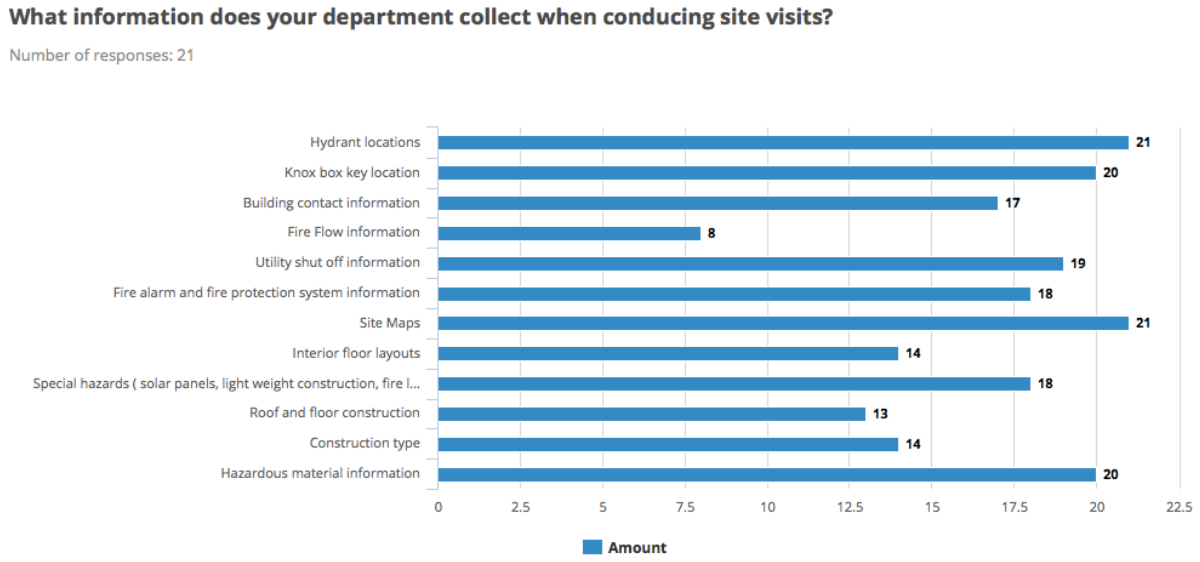
10.

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

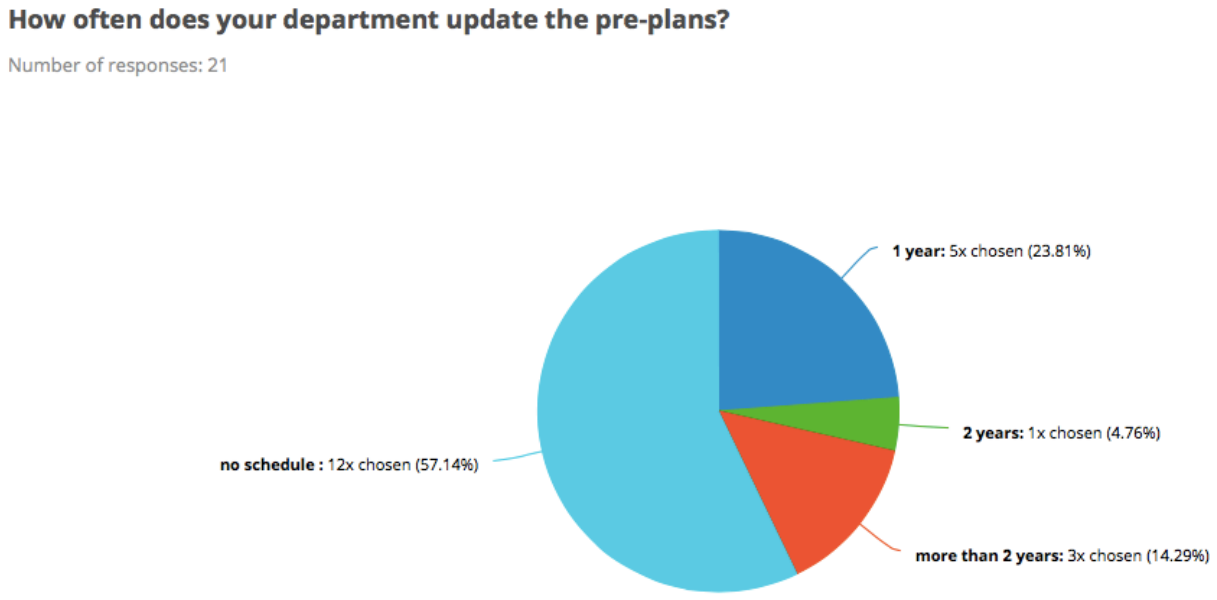
Number of responses: 21



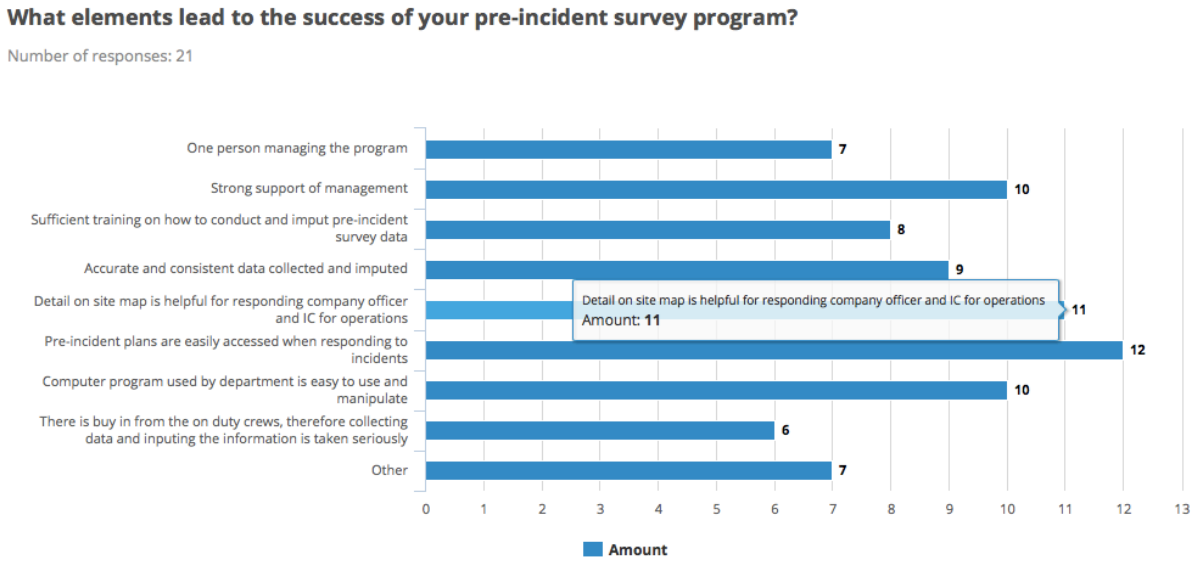
11.


What information does your department collect when conducing site visits?
Number of responses: 21
Hydrant locations
Knox box key location
Building contact information
Fire Flow information
Utility shut off information
Fire alarm and fire protection system information
Site Maps
Interior floor layouts
Special hazards (solar panels, light weight construction, fire l...
Roof and floor construction
Construction type
Hazardous material information
21
20
17
8
19
18
21
14
18
13
14
20
0
2.5
5
7.5
10
12.5
15
17.5
20
22.5
Amount

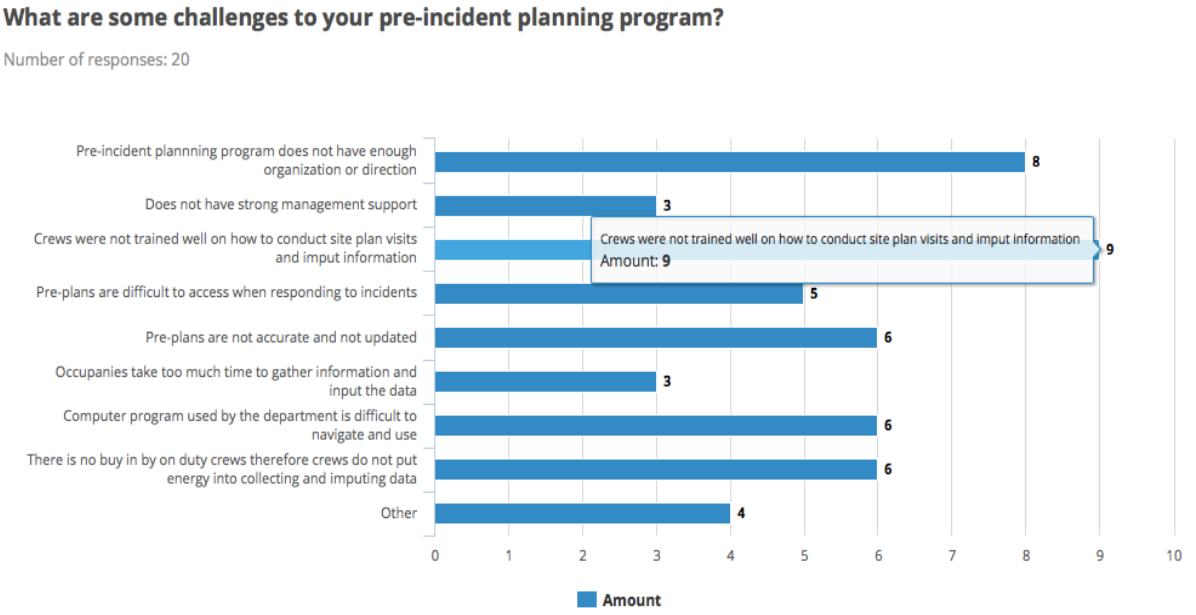
12.


How often does your department update the pre-plans?
Number of responses: 21
1 year: 5x chosen (23.81%)
2 years: 1x chosen (4.76%)
more than 2 years: 3x chosen (14.29%)
no schedule : 12x chosen (57.14%)

13.


What elements lead to the success of your pre-incident survey program?
Number of responses: 21
One person managing the program
Strong support of management
Sufficient training on how to conduct and imput pre-incident survey data
Accurate and consistent data collected and imputed
Detail on site map is helpful for responding company officer and IC for operations
Pre-incident plans are easily accessed when responding to incidents
Computer program used by department is easy to use and manipulate
There is buy in from the on duty crews, therefore collecting data and inputing the information is taken seriously
Other
7
10
8
9
Detail on site map is helpful for responding company officer and IC for operations
Amount: 11
11
12
10
6
7
0 1 2 3 4 5 6 7 8 9 10 11 12 13
Amount

14.

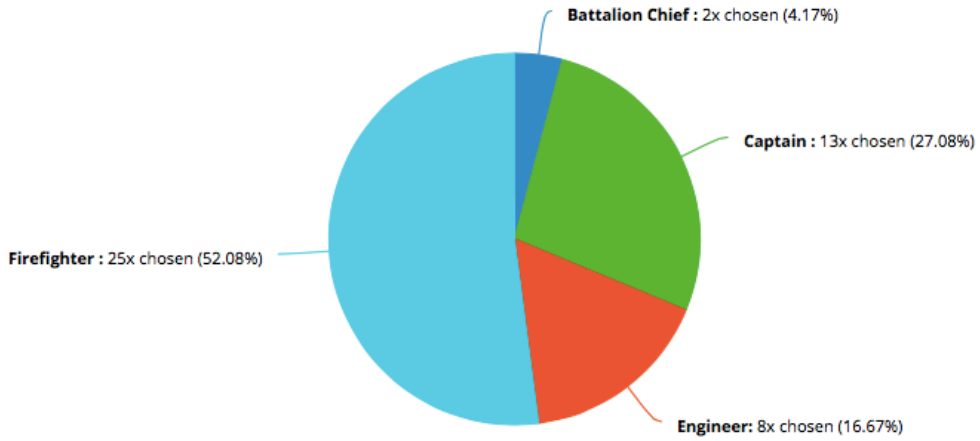

What are some challenges to your pre-incident planning program?
Number of responses: 20
Pre-incident plannning program does not have enough organization or direction
Does not have strong management support
Crews were not trained well on how to conduct site plan visits and imput information
Pre-plans are difficult to access when responding to incidents
Pre-plans are not accurate and not updated
Occupanies take too much time to gather information and input the data
Computer program used by the department is difficult to navigate and use
There is no buy in by on duty crews therefore crews do not put energy into collecting and imputing data
Other
8
3
Crews were not trained well on how to conduct site plan visits and imput information
Amount: 9
9
5
6
3
6
6
4
0 1 2 3 4 5 6 7 8 9 10
Amount

Appendix F
Results of Pre-Incident Plan Survey with BFD Personnel

1.

What is your position in the fire department ?

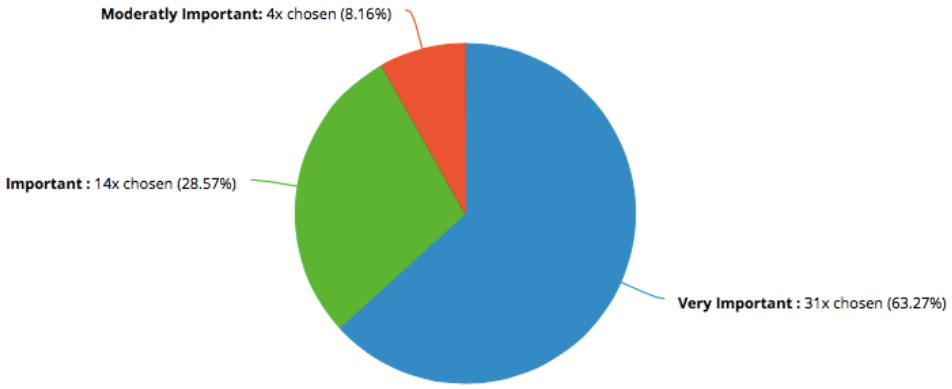
Number of responses: 48



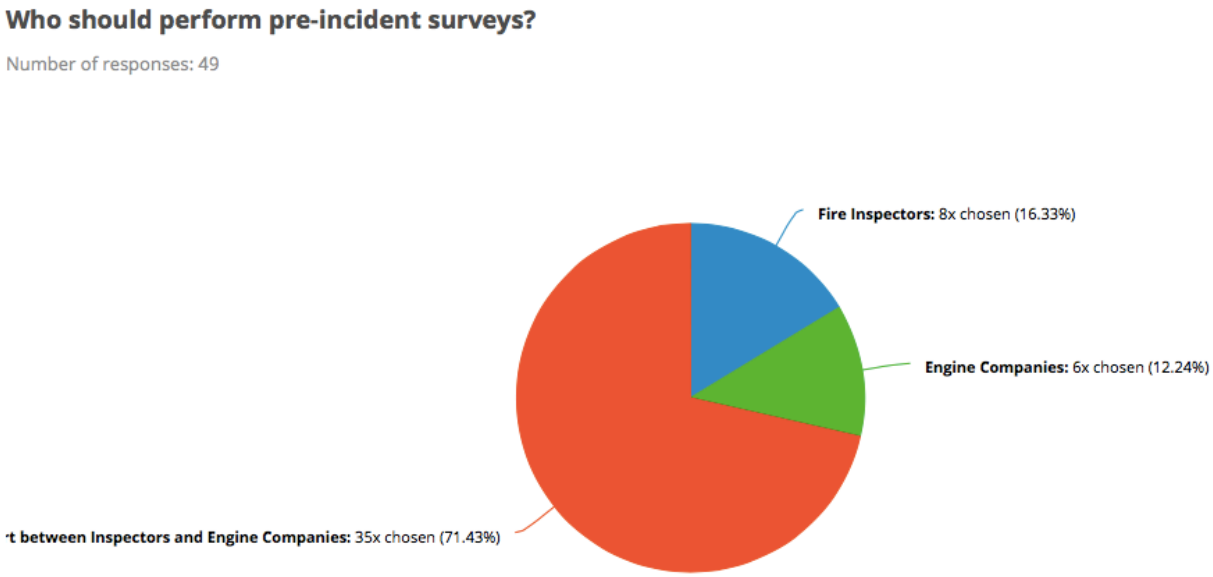
2.

How important do you think a pre-incident planning program is to the safety of our operations?

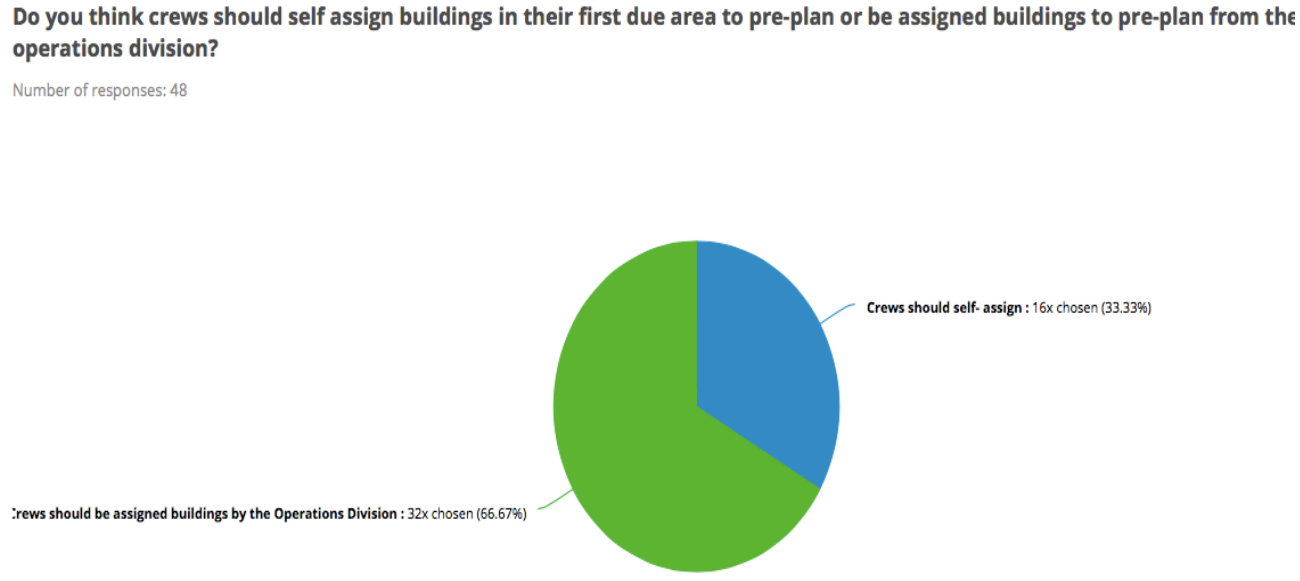
Number of responses: 49



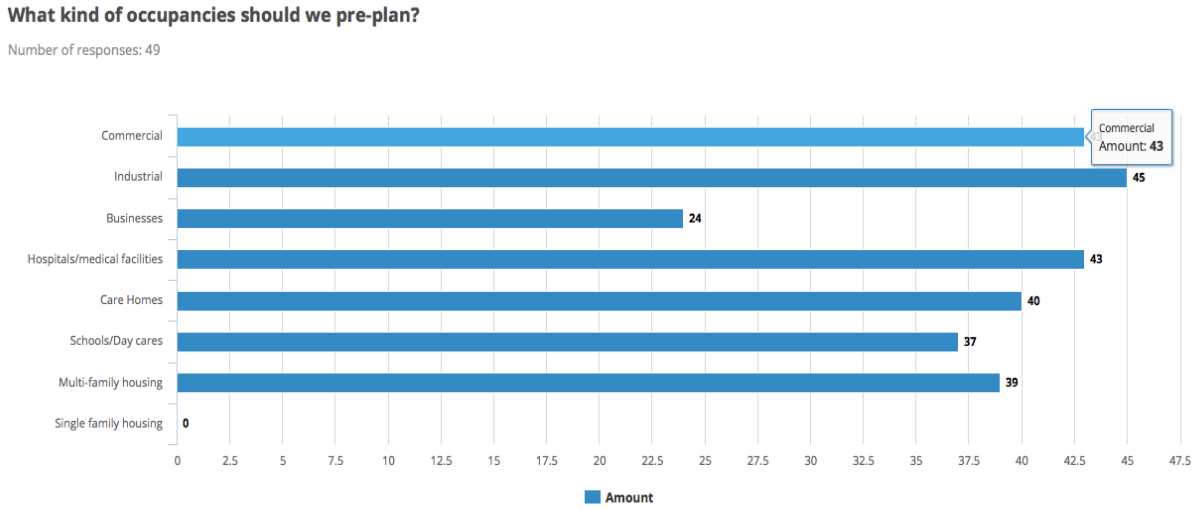
3.


Who should perform pre-incident surveys?
Number of responses: 49
Fire Inspectors: 8x chosen (16.33%)
Engine Companies: 6x chosen (12.24%)
t between Inspectors and Engine Companies: 35x chosen (71.43%)

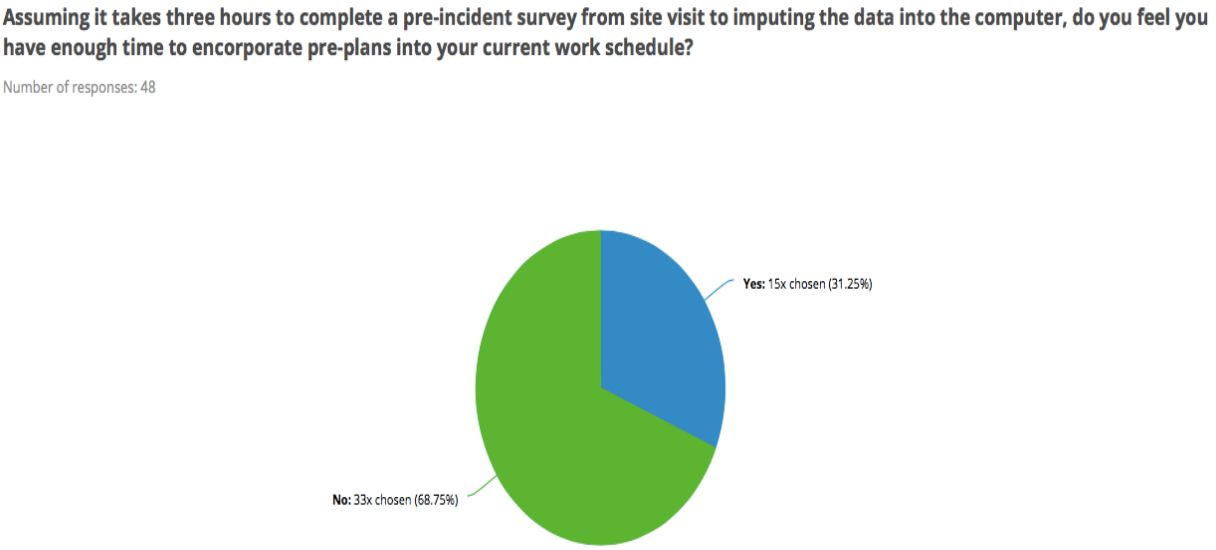
4.


Do you think crews should self assign buildings in their first due area to pre-plan or be assigned buildings to pre-plan from the operations division?
Number of responses: 48
Crews should self- assign : 16x chosen (33.33%)
rews should be assigned buildings by the Operations Division : 32x chosen (66.67%)

5.


What kind of occupancies should we pre-plan?
Number of responses: 49
Commercial
Industrial
Businesses
Hospitals/medical facilities
Care Homes
Schools/Day cares
Multi-family housing
Single family housing
Commercial
Amount: 43
45
24
43
40
37
39
0
0 2.5 5 7.5 10 12.5 15 17.5 20 22.5 25 27.5 30 32.5 35 37.5 40 42.5 45 47.5
Amount

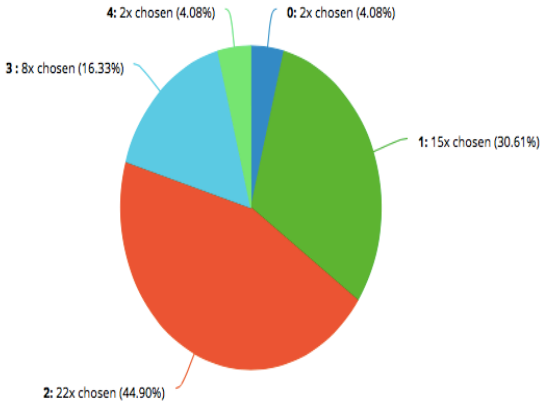
6.


Assuming it takes three hours to complete a pre-incident survey from site visit to imputing the data into the computer, do you feel you have enough time to encorporate pre-plans into your current work schedule?
Number of responses: 48
Yes: 15x chosen (31.25%)
No: 33x chosen (68.75%)

7.

Assuming it takes three hours to complete a pre-incident survey from site visit to imputing the data into the computer, how many surveys do you think you can accomplish in one month?

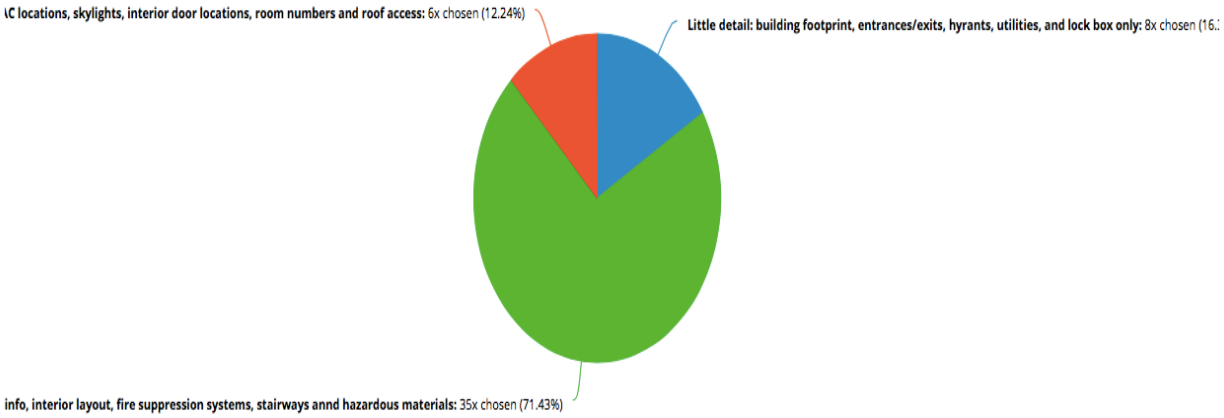
Number of responses: 49



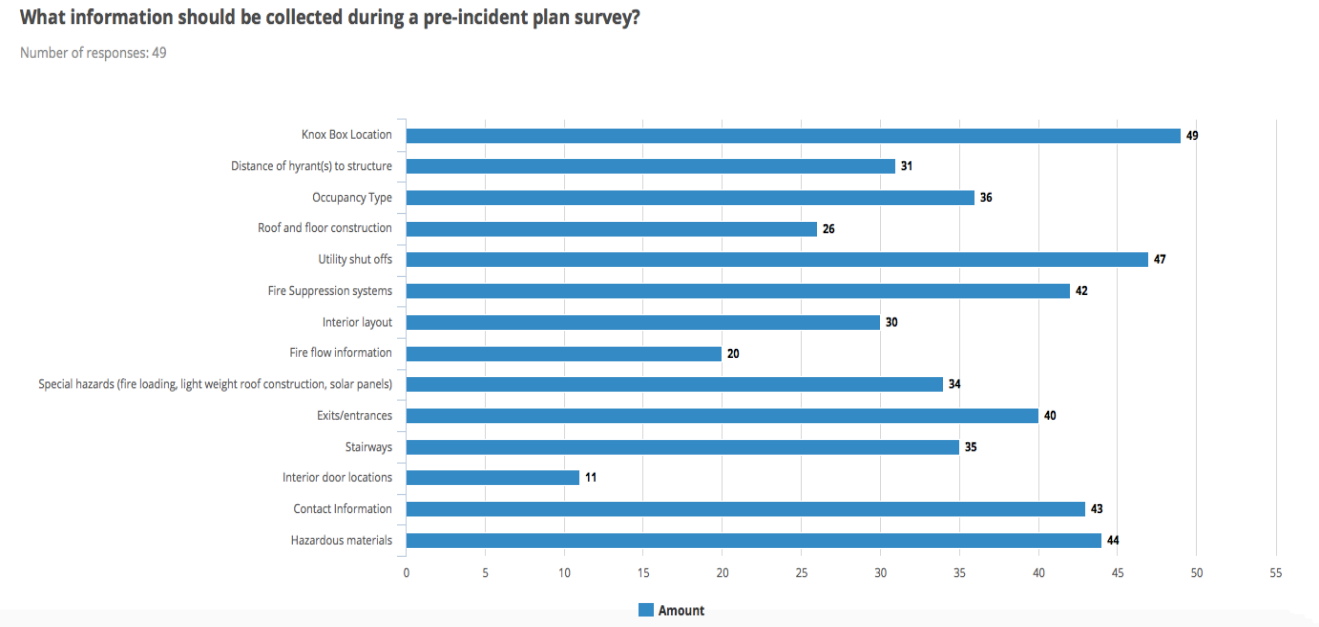
8.

When responding to an incident, how much detial do you need in a pre-incident site map?

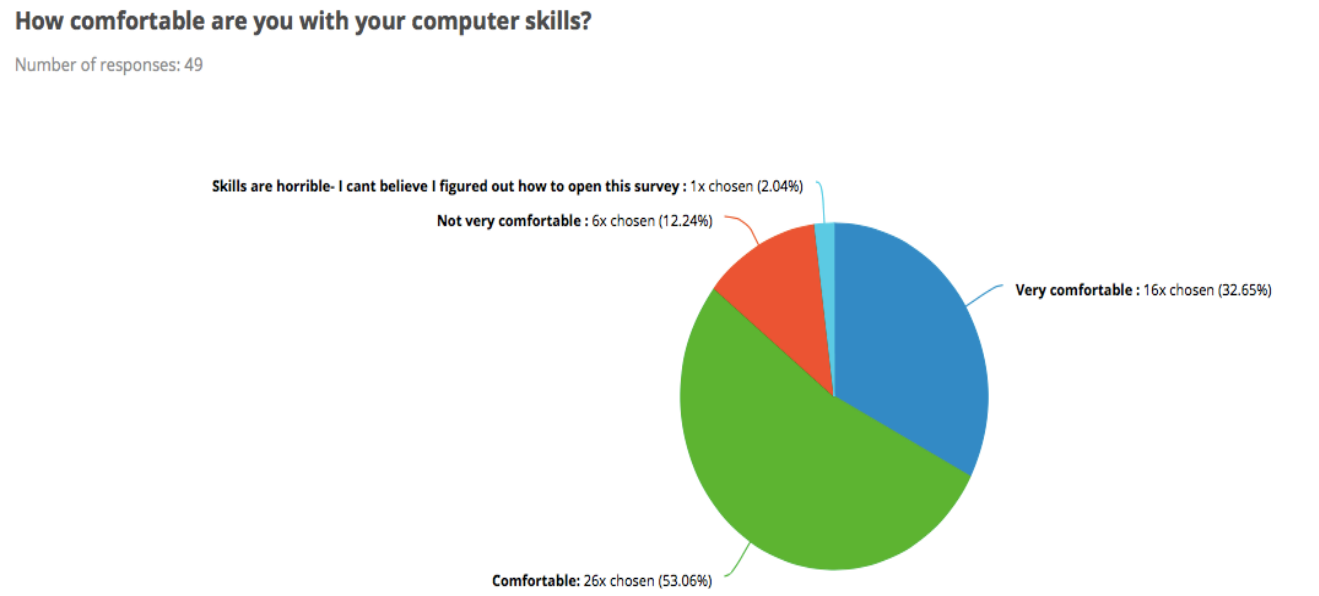
Number of responses: 49



9.


What information should be collected during a pre-incident plan survey?
Number of responses: 49
Knox Box Location 49
Distance of hyrant(s) to structure 31
Occupancy Type 36
Roof and floor construction 26
Utility shut offs 47
Fire Suppression systems 42
Interior layout 30
Fire flow information 20
Special hazards (fire loading, light weight roof construction, solar panels) 34
Exits/entrances 40
Stairways 35
Interior door locations 11
Contact Information 43
Hazardous materials 44
0 5 10 15 20 25 30 35 40 45 50 55
Amount

10.


How comfortable are you with your computer skills?
Number of responses: 49
Skills are horrible- I cant believe I figured out how to open this survey : 1x chosen (2.04%)
Not very comfortable : 6x chosen (12.24%)
Very comfortable : 16x chosen (32.65%)
Comfortable: 26x chosen (53.06%)

Appendix G

Transcript of Interview with Dave Howe

July 26th, 2017 at 12pm

1. *Can you tell me what you remember about our past Pre-Incident program at the Bend Fire Department?*

There have been several programs over the years. The last program we had I believe was started by Captain Olsen who is now retired. He brought it to Bend Fire when he got hired here from a department in California. I guess I would say he was the one that managed the program. Crews would go out in their first due areas and hand draw buildings they deemed as target hazards. The drawings were kept in three ring binders in the engines. Those binders were taken off the engines over 15 years ago. I don't think we have had an official program for about 20 years.

2. *How were pre-plans assigned to crews?*

   I don't remember them being assigned. I think it really was up to the crew's discretion to get out in their districts and pre-plan buildings. Really it was up to the Captain and the crew. It was very individualistic in nature. Our fire department has never had a culture that pushed towards pre-planning. We Bend have had an add-hock culture with the attitude that we will figure it out when we get there.

3. *Were the pre-plans distributed to every station?*

   I think we would try to get them out to the other stations for their binders but this didn't

always get done. Eventually those binders became out of date and that's why we took them off all the engines. I think there may still be binders still up in the Tumalo station attic where we keep our historical items.

Appendix H

Transcript of Interview with Chief Bill Boos

October 11th, 2017 at 1:30pm

1. *Why did BFD pick Inttera for our Pre-Incident Planning software?*

We were looking for a program for mapping systems, data analysis and pre-plan functions. TVFR bought it, showed us the program and it met all of our needs so we started looking at it. We think the State of Oregon will probably go to the system also. Eight fire departments decided use Inttera at once; our department, Redmond, La Pine, Sunriver, Sisters, Black Butte, and Crooked River Ranch. I also think the southern departments like Klamath Falls are going to start using it.

2. *Can we share our pre-plans with the other departments?*

Yes. We can easily share information to the other departments if they are working in the Intterra system. That was one of the selling points of the system.

3. *Can we share our pre-plans with departments, such as the police, who are not working under the Inttera system?*

No. Not if they aren't using Inttera.

4. *How much does the program cost?*

The program costs 60,000 annually. Deschutes County 911 picked up the initial cost of buying the program. Now we are either going to split the 60,000-dollar annual fee with the 8 departments who went in on the program together or 911 may just pick up the annual fee every year. We are still discussing this with them.

5. *Who will manage the pre-plan program?*

No one. Well Kenada will be the point person at first. We don't have a person long term to manage the program. Right now, we just think crews will do the pre-plans and input the data in the computer.

6. *What, if any obstacles do you foresee with a pre-plan program at the BFD?*

Getting the correct information and not overloading the pre-plan with information. Does that make sense? Also, making sure pre-incident surveys the same across all the other departments.

7. *Do you think we should collaborate with prevention?*

Yes, definitely. They will be able to do the pre-incident surveys while they are doing inspections. If anything has changed in existing pre-plans they can update it.

8. *How do you anticipate we will organize target hazards for pre-planning?*

It will be up to every company to decide. I don't think we are targeting anything initially. We are hoping crews will be motivated to get out there and do them.

9. *Do you think we will assign a designated number of target hazards to complete per month?*

    We haven't decided. I don't think we will assign initially. We just need to figure it out.

Appendix I

Transcribed interview with Fire Marshal Medina

October 24, 2017 at 10:30am

1. *What challenges does the fire prevention division have in maintaining accurate information and code compliance in our city?*

Data collection system is our biggest hurdle. Most of the stuff we are using is shadow systems. The accuracy of the system is as good as the person who is putting it in. We have a lot of data to extract but it's hard for it to be meaningful. It's dependent upon who is imputing the data- and we know that when some info is missing or people don't know the answer, they just make information up. We don't have a third party looking at the accuracy of our imputing.

2. *Is the prevention division able to get into most occupancies in our area for code enforcement?*

No, we are not getting into the occupancies now. The biggest problem is we leave it up to the individual for the inspection schedule and we also let the inspector decide what target hazards are most important to inspect. We have five districts and each are being inspected in 5 different ways. One inspector organizes the occupancies in alphabetical order and starts with the A's during inspections. Due to work load he doesn't complete the visits. Another inspector organizes inspections by geographically. We have not adopted a system yet that uses a system that uses a risk assessment matrix so all inspectors are organizing inspections with the same logic in mind.

3. *Do you feel a pre-planning program will benefit the BFD? If so, in what way?*

I do. The program will allow for a coordination of information with the prevention division and operations. The information prevention comes across during inspections can be shared with fire operations for their pre-incident planning forms. Even though prevention may be gathering key information for pre-incident plan forms during their code visits- I still think it is important the crews get out to the business and occupancies and visit the sights. This is a good opportunity for the crews to communicate the needs of the fire crews to the business owner. They can explain what they need from an operational perspective instead of a code-compliant angle. The crews may find that even if a business is code-compliant, they may see things that make the business a high challenge response and be able to communicate that to the business owner and the prevention division.

4. How do you feel the BFD should organize target hazards for pre-plans?

I think we should use the recommendation's from NPFA 1730 to organize the target hazards into low, moderate and high-risk occupancies. Then when this is determined, focus on the high-risk occupancies until those are completed.