Requirements for Implementing a Pre-Incident Planning Software System in the Henrico County (Va) Division of Fire.

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Certification Statement

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

Signed: _______________________________
Abstract

The Henrico County Division of Fire was unable to consistently develop, maintain, and access pre-incident plans as required to assure the safety of residents and firefighters. Descriptive research identified desired performance requirements and other considerations for the implementation of a pre-incident planning software system. The research questions were: (a) what benefits can be derived from using pre-incident planning software, (b) what type of data collection and retrieval capacity should the software provide, (c) what are the technical parameters under which the new software must be able to operate, and (d) is a customized software package preferable to a generic product.

A survey was used to describe the capabilities and performance of pre-incident planning software systems used by 124 fire departments across the country. Analysis revealed that systems with built-in graphics capabilities were more effective than those without. The most effective systems allowed suppression personnel to enter data themselves and then access that data quickly when needed. Most systems allowed for the storage of digital media such as photos. Agencies that also used Geographic Information Systems (GIS) considered it important that both systems be interoperable. The results were inconclusive in determining whether customized software was preferable to generic products.

Based on this research, it is recommended that Henrico County pursue a software-based pre-incident planning system that allows trained suppression personnel to enter pre-incident planning data themselves and then retrieve it quickly when needed. This system should provide graphics capabilities, allow for storage and manipulation of digital media, and be interoperable with existing network/hardware requirements, including GIS.
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Introduction

In the face of rapid urban development, the Henrico County Division of Fire has been unable to consistently develop, maintain, and access pre-incident plans as required to assure the safety of residents and firefighters. The existing pre-incident planning concept relies solely on paper plans stored in binders carried on first-due engine companies. Moreover, the Division does not have either a written policy or standards for developing pre-incident plans. As a result, the department struggles with widespread variation in the quality and availability of pre-incident plans. A example of one of the Division’s current pre-incident plans is attached as Appendix A.

The lack of effective pre-incident planning has been cited as a contributing factor in firefighter line-of-duty deaths (Moore-Merrell, Zhou, McDonald, Fisher, & Moore, 2008). This underscores the need for the Division of Fire to improve its pre-incident planning practices in order to safeguard lives, limit its exposure to liability, maximize efficiency, and assure the best possible operational performance.

The Division is currently considering a move away from its traditional use of hand-drawn pre-incident plans, in favor of a software-based, automated pre-incident planning system. This research effort will support that decision by identifying important performance requirements and other considerations for the successful implementation of a new system. It will use a “descriptive” method to identify the desired specifications and performance requirements for a pre-incident planning software package. The
research questions driving this effort were: (a) what benefits can be derived from using pre-incident planning software, (b) what type of data collection and retrieval capacity should the software provide, (c) what are the technical parameters under which the new software must be able to operate, and (d) is a customized software package preferable to a generic product.

Background and Significance

In order to place Henrico County’s pre-incident planning practices in context, it is helpful to understand the basic history and make-up of the organization. Henrico County is one of the oldest local governments in the United States, having been established as one of the eight original Shires of Virginia. As stated in the Division’s recent accreditation re-application, the “Shire of Henrico” was established by the King of England in 1611 (Henrico County Division of Fire [HCDOF], 2008). The jurisdiction encompasses 240 square miles and surrounds the City of Richmond on three sides. The County is home to approximately 300,000 permanent residents, and its land uses range from high density mixed urban development to rural farmland, although the former is quickly overtaking the latter (HCDOF, 2008).

The Division of Fire is an all-hazards emergency services agency that was formed as a government agency in 1930. The Division is staffed with 535 career members who provide fire prevention and suppression, emergency medical services, environmental protection, and technical rescue. Physical resources include 20 fire stations, 20 pumper engines, five aerial tower trucks, three heavy rescue squads, and 13 advanced life support ambulances. Geographically, the county is divided into three districts, each with its own 24-hour battalion or district chief. All members are cross-trained as firefighters and
Emergency Medical Technicians, and all operational members share fire and EMS responsibilities (HCDOF, 2008).

The Division’s current pre-incident planning practice is to use paper-based plans, stored in three-ring binders that are carried on the first-due engine companies. Each engine company carries plans for selected structures in its first-due response area only. Therefore, if an engine responds to a fire outside its normal first-due area, it will not have a pre-incident plan for that building.

Battalion chiefs do not carry pre-incident plans; they must retrieve them from the first-due engine, if that engine is present. Truck companies, heavy rescues, and fire medic units do not carry pre-incident plans. If one of these apparatus is first to arrive at an incident, it will have no access to the pre-incident plan. Consideration has been given to making copies of the preplans for comprehensive distribution, but there is not enough room in the apparatus cabs to store the binders that would have to be carried.

Responsibility for developing pre-incident plans rests with the individual fire stations. Each of the 20 stations has a station captain who is responsible for overseeing the pre-incident planning efforts of that station. However, there is no policy on how frequently these plans are to be conducted, or how many of them there should be, or what types of occupancies are required for analysis. There are, in fact, no departmental requirements regarding pre-incident plans. Instead, these needs are determined individually by each station captain using his or her judgment.

Because there is no standard for the completion of pre-incident plans, the quality and scope of the plans varies widely from one station to another. Some pre-incidents plans have pencil-drawn site sketches while others have complex, detailed floor plans.
copied and reduced from the actual architectural plans. Others have no diagram at all.
Similarly, the information collected on the accompanying information data sheet varies widely.

The Division of Fire does provide a Microsoft Word™ template document for companies to use in completing the information page of their preplans. However, stations are not required to use this template, and several have opted instead to use a customized format designed by the station captain. There is no departmental-approved or sanctioned software for creating diagrams of structures. The most common method used is a hand-drawn sketch that is kept, along with a printout of the information page, in a binder. In most cases there is no electronic version of these hand-drawn plans; if they get lost, a new plan must be made from scratch. Some members have used programs such as Microsoft PowerPoint™ (on their own initiative) to create floor-plans or diagrams that can be stored – and shared – electronically. However, this is the exception rather than the rule.

In some cases the pre-incident plan information sheet, when completed using Microsoft Word™, is stored on a workstation’s hard drive or on a fire department file server. There is no standardized manner of indexing or identifying these files. In some stations, individual firefighters have taken hand-drawn sketches to their home computers, and scanned the image into a file that can be saved onto a disk and transferred to the station’s computers. Again, there is no standard for how or when this should be done; it is left to individual discretion. As a result of these variations, there are widespread differences in the availability and quality of pre-incident plans.
All front-line apparatus are equipped with mobile computers, but these are not currently used for storing pre-incident plans.

Geographic Information Systems (GIS) serve as an excellent tool for use in developing pre-incident plans (Rogers, 2006; also see Galvin, 2005; Parrow, 2003; Codino, 2004). Henrico County has extensive GIS data, accessible on all fire department computers, both workstations and mobile computers. Unfortunately the Division is not able to make full use of this at the engine company level capability (J. Manville, personal communication, September 9, 2008). GIS has been a useful tool for the Division in planning for major events, and even during major weather events when the Emergency Operations Center (EOC) is staffed, but the Division has not acquired the necessary software and training to allow firefighters to manipulate the GIS data while creating pre-incident plans (J. Griggs, personal communication, September 11, 2008). For example, firefighters creating pre-incident plans can access very basic GIS data, such as aerial photos, building footprints, and roads, but they do not have the software necessary to integrate those data into the preplans. Further, while they can print out GIS images, they cannot save those images into files that can be updated on an electronic preplan. Therefore it is desirable that any effort to implement a pre-incident planning system take full advantage of existing GIS employed by the county.

This pre-incident planning problem was selected not only because of its importance to the organization, but also because of its relevance to the National Fire Academy’s Leading Community Risk Reduction curriculum. The Leading Community Risk Reduction course focuses heavily on leading changes in organizations and the importance of the executive’s role in reducing community risk. Since pre-incident
planning is a critical tool to reduce property loss and prevent deaths and injuries, it is directly relevant to the goals of the Leading Community Risk Reduction curriculum.

The topic is related to two of the U. S. Fire Administration operational objectives. The first is to “reduce the loss of life from fire of firefighters,” and the other is to “respond appropriately in a timely manner to emerging issues” (USFA, 2002, ¶ 4).

Literature Review

A pre-incident plan is defined by the National Fire Protection Association (NFPA) as “a written document resulting from the gathering of general and detailed data to be used by responding personnel for determining the resources and actions necessary to mitigate anticipated emergencies at a specific facility” (NFPA 1620, p. 6). The process of pre-incident planning has been described as “one of the most vital aspects of a fire department’s charter” (Codino, p. 157).

While the importance of pre-incident planning has been strongly supported by most fire service texts (NFPA, 1997; International Fire Service Training Association [IFSTA], 1998), it is a relatively new activity. According to the late professional engineer and noted fire service author Francis Brannigan (1992), “there was no organized pre-fire planning prior to World War II … [and] most chief officers relied solely on experience” to make critical decisions (p. 3). Brannigan himself authored the first published article on the topic, titled “Surveys aid in preparation for handling large fires,” published in Fire Engineering in January 1948. In the years since that article, pre-incident planning has become a core competency for fire officers (NFPA, 1997).
Benefits derived from the use of pre-incident planning software

If pre-incident planning benefits a fire department, then automation of those plans is a multiplier that enhances those benefits (Hoffman, 2003; Klaene, 2000; Bailer & Ruetz, 2005; Parrow, 2003; Codino, 2004; White, 2003). As Codino summarizes, “there is no better time for fire departments to take the . . . high tech path for pre-fire planning” (p.160). The utilization of pre-incident planning software allows data to be stored in digital formats accessible to multiple users in a much faster manner than in a traditional paper-based storage system (White, 2003; Galvin, 2005). In addition, some of the pre-incident planning software packages include the ability to create graphics, which allows more accurate depictions of site plans and floor plans (White, 2003; Galvin, 2005).

Advantages of automation over any manual process are may be intuitive in the information age. However, in order to assess the true benefits of pre-incident planning software, it is necessary to explore the benefits of pre-incident planning in general, because the automation of these plans seeks to take those benefits and make them more readily available to incident commanders (Rogers, 2006). The extent that these benefits can be expanded through software and automation is an important question that requires an understanding of the basic purpose of pre-incident planning.

Firefighter safety. One of the most readily cited reason for conducting pre-incident planning is to enhance the safety of firefighters (National Institute for Occupational Safety and Health [NIOSH], 1999; also see Moore-Merrell et al. (2008); Klaene, 2000; Bailer & Ruetz, 2005; Codino, 2004). Specifically, when firefighters are aware of hazards that exist in structures, they are able to take precautions to avoid injuries or death (Klaene, 2000). Pre-incident planning allows personnel to identify safety issues
in advance, record those issues, and share that information with other responders (Klaene, 2000). As noted by Bailer and Ruetz (2005), “a lack of preplanning can spell disaster . . . the more we know about buildings, the more likely it is we will fight fire in those structures safely” (p. 127). With the proliferation of hazardous materials and lightweight construction, preplanning is an important tool in identifying toxic hazards and dangerous construction aspects (Codino, 2004).

**Efficiency and effectiveness.** Pre-incident planning improves a fire department’s effectiveness and efficiency during firefighting operations and results in more property saved (Bailer & Ruetz, 2005). As Brannigan (1992) noted, “to be effective and safe we needed to minimize surprises on the fireground by learning everything possible about potential problems ahead of time” (p. 4). Klaene (2000) notes that pre-incident planning is “essential to successful operations in large and complex buildings” (¶ 2). Without pre-incident plans, incident commanders have limited information and cannot make well-informed decisions (Klaene, 2000). The use of valuable information assures a quicker fire attack (Galvin, 2005).

**Training benefits.** Pre-incident planning serves as a useful training tool for firefighters. “Benefit can be derived from prefire plans by using them as a basis for simulation drills” (Didactic Systems, p. 211). Bachman notes that exercises are an inherent part of preplanning (2007).

**Improved community relations.** As Brannigan (1992) notes, the process of pre-incident planning, and the effective use of preplans to limit fire damage, yields positive public relations with the business community. However, he also cautions that pre-incident planning should be separated from code enforcement, which is seen as a police
action, whereas pre-incident planning is seen as a proactive, inclusion program between businesses and their local firefighters (Brannigan, 1992).

*Data collection and retrieval capacity the software should provide.*

The NFPA (1998) outlines in Standard 1620 what should be included in a pre-incident plan. While minor variations and opinions can be found in the literature, there is general agreement regarding the expected contents of plans.

*Site plan.* A site plan or basic diagram of the site and building(s) is considered a critical component of the pre-incident plan (NFPA, 1998). “Sometimes, the most useful component of a pre-incident plan is a drawing of the property” (Klaene, 2000, ¶ 9). Photos are also a very useful addition to the site plan (Bailer & Ruetz, 2005; Furey, 2008). Aerial photos in particular are helpful and 3-D pictometry offers “tremendous improvement over the conventional 2-D maps” (Parrow, 2003, p.95). Whether in the form of a photo or a sketch, a site plan “helps the viewer develop familiarity with the building and its location” (Bailer & Ruetz, 2005, p.127).

*Building features and construction.* The pre-incident plan should provide the building layout and identify specific construction features (NFPA, 1998). The plan should identify the construction type or style, with special focus on hazards such as truss roofs (Bailer & Ruetz, 2005). Systems like HVAC, elevators, and devices that might aid in salvage efforts should also be noted (Bailer & Ruetz, 2005). Facility-generated emergency plans are often overlooked on the pre-incident plan, although in industrial facilities such facility plans are specifically designed to reduce damage and stop loss (Bachman, 2007).
Life safety considerations. A critical purpose of a pre-incident plan is to identify special hazards that may be present in a structure (NFPA, 1998). Examples include hazardous materials, holes in floors, security bars on windows, oxygen-displacing extinguishing systems, or other variable that impact the ability of firefighters to protect the lives of occupants and themselves.

Fire protection features. The pre-incident plan should identify hydrants, fire department connections, utilities, lock boxes, and other features that impact fire control (NFPA, 1998). These “details … facilitate a smooth and rapid incident setup” (Bailer & Ruetz, 2004, p.128). Particular emphasis should be made with respect to sprinkler and fire detection systems (Bachman, 2007). These systems must be supported early by the fire department, and the wrong strategies could negate the otherwise positive impact of these built-in systems (for example, supplying water to the wrong sprinkler inlet, shutting down system prematurely or in the wrong order, etc.).

Specific hazards. Occupancies often present responders with hazards that may be specific or unique to that structure, and might not otherwise be anticipated by firefighters. Bailer and Ruetz (2005) list examples including, “access problems, basements, concealed and confined spaces, hazardous materials, overhead wires, and so on” (p. 127).

Not too much information. While there are a great number of examples of data that should be included in pre-incident plans, it is also possible to overwhelm the incident commander with too much information, much of which may not be important (Klaene, 2000). Having too much information “can be as detrimental to a pre-incident plan user as a lack of information, if the user cannot easily distinguish critical information” (NFPA, 1998, p. 33). The plan should support general tactical considerations rather than specific
assignments by company (Klaene, 2000; NFPA, 1998). In addition, in order to keep the plan relevant and accurate, only information that does not frequently change should be included (Didactic Systems, 1977).

**Non-fire emergencies.** There is growing recognition that pre-incident planning is a useful tool in an all-hazards environment and should not be limited in application to fires. Coleman (2007) notes that emergencies are driven by people within a society, therefore it is essential for the fire department to include in pre-incident planning, an analysis of vulnerabilities such as social problems, crime, senior population, and special evacuation needs. He notes, “social vulnerability is behaviorally driven and every bit as important to the fire department planning process as the structural conditions in a response area” (p. 28).

**Technical parameters under which the new software must be able to operate**

Codino (2004) notes that the hand-drawn and paper-based concept is no longer sufficient given “the range of technology now available to accomplish pre-fire planning efficiently and affordably” (p. 157). We understand that these technologies allow pre-incident plans to be updated, shared, and disseminated much more quickly. As Furey (2008) noted, a pre-plan update “made by one became available to all, thereby reducing a significant amount of work formerly spent on keeping dozens of different documents current” (p. 71). He concludes “there is no better time than now for fire departments to take the … high tech path for pre-fire planning…” (p.160).

Despite this, the technology is new (Galvin, 2005) and there is very little published information regarding the success or failure of automated pre-incident planning software. In its standard number 1620, the NFPA (1998) notes that “the proliferation of
lightweight, high-speed personal computers … and other advanced information technology can support other techniques or applications” (p. 34); however, no portion of the NFPA standard references performance requirements for electronic or automated pre-fire planning. The standard’s appendix provides several examples of pre-incident plan formats and “sketches,” all of which are paper-based as opposed to graphic-user interface format.

Therefore, as a result of the “newness” of this technology and the existing software systems, the literature offers very little in terms of desired technical specifications. Despite this, some general recommendations can be discerned.

Field-usable by suppression personnel. Codino (2004) asserts it is especially important when creating preplans that personnel should be able to input data from the field. He also recommends the software allow suppression personnel to access and use the data; in this sense, the software should be field-usable in either data entry or drafting mode, and also in a display and print mode. In some cases, the pre-incident software may not provide for graphics creation, but as White (2003) notes, software has emerged to assist with creating those graphics, which would include building diagrams, floor plans, approved symbols, etc. She explains that “diagramming software also just offers a more clear and accurate pre-plan diagram” (p. 124).

Easy to learn. White also argues that in order for fire departments to have success using automated pre-incident plans, the software must be easy to learn to use, “which means no complicated instruction course, thick operator’s manuals or the need to have a computer aided design background” (p. 125).
Interoperability with other data systems. Several authors recommend that pre-incident planning software should have the ability to create or use multiple layers of information (Rogers, 2006; Klaene, 2000; Bailer & Ruetz, 2005; Furey, 2008). In this sense, it is desirable for the software to integrate GIS data, such as population details, evacuation routes, plume modeling, and other factors (Rogers, 2006).

Ability to insert standardized symbols. The NFPA lists standardized symbols for use in pre-incident plans (NFPA, 1998). It is helpful for pre-incident planning software to allow the integration of these symbols on the plans (Rogers, 2006). The symbols “provide information as quickly and simply as possible” to users (Didactic Systems, 1977, p. 207). In the case of one fire department, the software provides colors to indicate special hazards (Bailer & Ruetz, 2005).

Accessibility. Bailer and Ruetz (2005) observe that pre-incident plans should be accessible to three audiences: “(1) fire fighters preplanning at the station, (2) command staff at the scene, (3) first-arriving company commanders gathering information en route to a fire” (p. 127). They noted that firefighters and chiefs had difficulty finding a paper pre-incident plan while responding to a fire; however, using computers can make this retrieval much more feasible. Codino (2004), Rogers (2006), and Parrow (2003) recommend pre-incident software use a link to dispatch data so that plans are automatically identified and queried based on the address.

There is another component of accessibility: in order for electronic pre-incident plans to be helpful, the file must load fast enough to be retrieved in time. If the data is transmitted over the radio, the “communications links [must be] sufficiently robust to transfer large files in a few seconds or less” (Furey, 2008, p. 70). Furey notes that
another option is to use data storage devices such as CDs or external hard drives, since using these devised load data quickly and do not require use of radio band width to transmit data.

*Customized software versus a generic product*

In performing the literature review for this research, it was noted that a relatively small number of generic software packages exist for the purpose of pre-incident planning (Galvin, 2005). The literature review did not reveal any analysis addressing the advantages or disadvantages of generic versus customized packages. One article did address the success that the Tucson Fire Department had in developing its own solution using a combination of commonly-used office software, including Microsoft PowerPoint™ (Bailer & Ruetz, 2005).

Based on the dearth of information available generally regarding software solutions for pre-incident planning, and considering that this technology is still a very new concept for the fire service, there is little published information available to guide fire departments toward the right decision in terms of what type of software package to pursue.

**Procedures**

Research for this study relied on a survey that was disseminated to 718 executive fire officer (EFO) program participants across the United States, focusing specifically on pre-incident planning software systems. The survey was created using “Survey Monkey,” an on-line survey management service. The on-line system allows researchers to design their surveys using formats and templates available through the website. The instrument consisted of 16 questions, including a combination of multiple choice, Likert-
scale, matrix-of-choices, and open-ended questions. The survey was designed to be completed by representatives of fire departments that use some form of pre-incident planning software.

The population of the survey consisted of 718 executive fire officer students or recent graduates, who were contacted by e-mail with a link to the survey. The exact number of emails that were fully delivered is unclear; this is due to occasional technical problems such as inaccurate addresses, server problems, and filters on the receiving end. Of the 718 recipients of the e-mail, there were 16 error messages reported, however, it is possible there were additional technical errors not reported.

A total of 124 responses were received, representing a 17% response rate. This response rate may be an indication that many of the fire departments represented on the recipient list either did not perform pre-incident planning, or if they did, they did not use automated software.

The purpose of the survey was to obtain general descriptions of issues identified by departments using pre-incident planning software systems. The survey was not intended for use in making generalizations that could be applied to all fire departments. Since it was designed to identify “best practices” in a narrow operational environment, its results were not as dependant on sample size as might be the case if a scientific hypothesis was being tested. In short, the survey was not intended to represent a scientifically valid extrapolation of the entire population, but was rather a method of gaining feedback on a relatively narrow technical issue.
Limitations of Data Collection Methods

As with any survey, a number of imperfections and limitations were present. First, it would have been helpful to ask the recipients to indicate whether their department conducted pre-incident planning at all; and if so, whether they used software programs for that purpose. This would have helped to illustrate more clearly why recipients did not complete the survey. Another limitation of the survey was revealed in the “open ended” comments section, where several respondents indicated that they were in the middle of the process of implementing such a system, or that they had started but failed to complete implementation of a pre-incident planning system. In these cases the respondents’ answers may have skewed the results toward an incomplete or inaccurate analysis. It would have been methodologically more robust to ask for respondents to only participate in the survey if they had a complete and operating pre-incident planning system.

Results

Research Question 1: What benefits can be derived from using pre-incident planning software?

The literature review helped identify characteristics of pre-incident plans that make them useful and beneficial to a fire department. In order to determine whether these benefits were achieved when using a software package, respondents were asked to identify the types of data collected by their software systems. Specifically, the survey sought to identify the relative importance of these variables based on the software used by each respondent (see Table 1).
Table 1

*Relative importance of variables for inclusion in pre-incident planning software*

<table>
<thead>
<tr>
<th>Answer Option</th>
<th>Not Important</th>
<th>Somewhat Important</th>
<th>Very Important</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall site diagrams</td>
<td>1</td>
<td>16</td>
<td>102</td>
<td>1</td>
</tr>
<tr>
<td>Floor plans</td>
<td>3</td>
<td>16</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>Occupancy information</td>
<td>0</td>
<td>30</td>
<td>91</td>
<td>0</td>
</tr>
<tr>
<td>Building construction</td>
<td>0</td>
<td>24</td>
<td>95</td>
<td>1</td>
</tr>
<tr>
<td>Special hazards</td>
<td>0</td>
<td>3</td>
<td>118</td>
<td>0</td>
</tr>
<tr>
<td>Fire protection features</td>
<td>0</td>
<td>9</td>
<td>111</td>
<td>0</td>
</tr>
<tr>
<td>Locations and types of utilities</td>
<td>0</td>
<td>23</td>
<td>98</td>
<td>0</td>
</tr>
<tr>
<td>Building residents’ evacuation plans</td>
<td>18</td>
<td>65</td>
<td>35</td>
<td>3</td>
</tr>
<tr>
<td>Building representative contact info</td>
<td>3</td>
<td>37</td>
<td>81</td>
<td>0</td>
</tr>
<tr>
<td>Required fire flows</td>
<td>8</td>
<td>45</td>
<td>64</td>
<td>4</td>
</tr>
<tr>
<td>Available water supply</td>
<td>4</td>
<td>20</td>
<td>95</td>
<td>0</td>
</tr>
<tr>
<td>Pre-developed tactical fire attack plans</td>
<td>8</td>
<td>51</td>
<td>55</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45</strong></td>
<td><strong>339</strong></td>
<td><strong>1045</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

The vast majority of respondents rated the following variables as either somewhat important or very important: (in order): special hazards, fire protection features, overall site diagrams, floor plans, the locations and type of utilities, building construction, and occupancy information. Fewer respondents were concerned with pre-developed tactical
fire attack plans, required fire flows, and available water supply. The variable which gained the smallest response in terms of rated importance was building residents’ evacuation plans.

A benefit of using software for the creation of pre-incident plans is the standardization of graphics used for the creation of diagrams, and the ability to use standardized symbols. A majority of the respondents (58%) reported that their software package included a graphics production capability. A smaller number (34%) indicated their system allowed paper-based diagrams to be scanned into their pre-incident planning software for electronic storage. Only 8% of respondents used software that did not allow the ability to insert any graphics.

Figure 1: What type of graphics creation capability does your pre-incident planning software package provide?
A very large majority of respondents, 80%, indicated that their software included standardized graphics symbols for features such as fire hydrants, fire department connections, utility shut-offs, etc.

This research showed that 92% of responding agencies’ software allows the storage of graphics within the system. Combined with the finding that most of the agencies’ software also provided standardized symbols, this research suggests that most agencies are in fact realizing the benefit of improved graphics creation and storage capabilities with their software programs.

The literature review also revealed the importance of pre-incident plans being available to initial incident commanders. A majority of respondents (65%) reported they had the ability to access their pre-incident plans from mobile computers (see Figure 2). This represents a state-of-the art advancement and a tremendous potential benefit that is not currently available in Henrico County.

Another benefit of software-based pre-incident plans is the storage of digital media such as photos, three-dimensional renderings of the structure, and the ability to model certain conditions. Again, a majority of respondents indicated their system allowed some type of digital imagery storage or manipulation (see Table 2). In most cases (63%) this capacity was limited to the storage of digital photos, which never the less offers an incident commander a true wealth of information. Other respondents had the ability to create three-dimensional models (22%), generate hazmat spill or plume analysis (10%), or model fire behavior (5%). Only 33% of respondents used software that did not allow any of these applications.
Figure 2: In what format are your pre-incident plans available to firefighters while operating at the scene?

![Pie chart showing the distribution of formats for pre-incident plans](chart)

- On mobile computers: 23%
- As a paper copy: 35%
- Both mobile computer & paper copy: 42%

Table 2
Does your pre-incident planning software allow for any of the following?

<table>
<thead>
<tr>
<th>Answer options</th>
<th>Response Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage of digital photos</td>
<td>63%</td>
</tr>
<tr>
<td>3-Dimensional modeling of structures</td>
<td>22%</td>
</tr>
<tr>
<td>Modeling of fire behavior</td>
<td>5%</td>
</tr>
<tr>
<td>Hazmat spill or plume analysis</td>
<td>11%</td>
</tr>
<tr>
<td>None of the above</td>
<td>33%</td>
</tr>
</tbody>
</table>
Research Question 2: What type of data collection and retrieval capacity should the software provide?

As noted in the literature review, one of the critical issues in designing a data collection process for pre-incident planning software is identifying who enters the data into the system (Codino, 2004). This is an especially important issue for large, metropolitan fire departments with a large number of members (and a large number of pre-incident plans). A majority of the survey respondents (64%) indicated that the same suppression personnel who conduct the site survey also enter the data directly into the system (see Figure 3). For a sizable number of departments (29%), this data entry task is handled not by the firefighters, but instead it is handled by personnel in a central office, after the data has been collected on site.

Figure 3: Who enters site plans and floor plans into your software
These responses were then qualified further by asking respondents how effective the data entry process seems to work for the agency. In those agencies where suppression personnel enter the data, 82% of respondents described the process as either “mostly” (35%) or “somewhat” (47%) effective, while only 18% reported their data entry process was either “somewhat” (10%) or “mostly” (8%) in-effective (see table 3). By contrast, in those agencies where the data were entered by central office personnel, only 72 percent of the respondents described the process as either “mostly” (34%) or “somewhat” (38%) effective. Finally, in those departments where central officer personnel enter the data, 38% reported the process as either “somewhat” (25%) or “mostly” (3%) in-effective. This would seem to suggest that the departments that allow firefighters to enter the data have more success with the final product than agencies that use central office personnel.

Table 3

_In thinking about how the site plans and floor plans are entered into the software, how well does this process work for your agency?_

<table>
<thead>
<tr>
<th>Entered by suppression personnel</th>
<th>Entered by central office personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mostly effective</td>
<td>35%</td>
</tr>
<tr>
<td>Somewhat effective</td>
<td>47%</td>
</tr>
<tr>
<td>Somewhat in-effective</td>
<td>10%</td>
</tr>
<tr>
<td>Mostly in-effective</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>3%</td>
</tr>
</tbody>
</table>
When considering data collection and data entry options, it is important to once again focus on how graphics are handled. As noted earlier, 58% of respondents indicated their software provides graphics tools that allow users to create site plans and layouts using within the software, while a smaller percentage, 34%, reported they scan or digitize paper copies of site plans into the software. Respondents were asked to rate the effectiveness of these different methods (see Table 4). An overwhelming percentage of respondents (96%) who used graphics packages within the software rated the result as either “mostly” or “somewhat” effective, compared with 85% of respondents who scanned or digitized their images. Even more telling, the agencies that used graphics packages built in to their pre-incident planning systems rated the graphics as “mostly effective” in 45% of the responses, as opposed to only 21% of the respondents who scanned or digitized images.

Table 4

In assessing your software’s graphics capabilities, how well does the software work for your agency?

<table>
<thead>
<tr>
<th>Graphics created within the system</th>
<th>Graphics scanned or digitized into system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mostly effective</td>
<td>45%</td>
</tr>
<tr>
<td>Somewhat effective</td>
<td>51%</td>
</tr>
<tr>
<td>Somewhat in-effective</td>
<td>3%</td>
</tr>
<tr>
<td>Mostly in-effective</td>
<td>2%</td>
</tr>
</tbody>
</table>
Research Question 3: What are the technical parameters under which the new software must be able to operate?

A primary consideration for any automated pre-incident planning system is that it must be easy for users to learn how to operate the software (White, p. 126). The survey indicated this was a problem for a number of personnel (see Table 5). While 35% of respondents indicated most their personnel were able to use their pre-incident planning software without difficulty, another 22% indicated that most personnel required assistance or frequently made mistakes using the software. The largest proportion of respondents (40%) indicated that only a minority of personnel are able to use the software effectively. This suggests that training of personnel will be an important component in the success or failure of the effort, and it may be desirable to identify a cadre of personnel to undertake this training and responsibility.

Table 5

How easy is it for personnel to learn how to input data into the system?

<table>
<thead>
<tr>
<th>Answer options</th>
<th>Response Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most personnel use the software without difficulty</td>
<td>35%</td>
</tr>
<tr>
<td>Most personnel require assistance and there are frequent mistakes</td>
<td>22%</td>
</tr>
<tr>
<td>Only a minority of personnel are able to effectively use the software</td>
<td>40%</td>
</tr>
<tr>
<td>Our software requires highly proficient, highly trained personnel</td>
<td>4%</td>
</tr>
</tbody>
</table>
In specifying pre-incident planning software, one of the decisions that must be made is how the data will be stored on mobile computers. Respondents were asked to indicate the type of storage device they used (see Figure 4). The majority (79%) of departments used individual hard drives of the mobile computers to store the data, while a smaller number either transmitted the data over the air (14%) or used other external storage devices (6%).

*Figure 4: How does your agency store pre-incident plan data*

![Pie chart showing data storage methods](chart.png)

The advantages of using software over three-ring binders will be lost if the system does not operate quickly enough for personnel to access the data when it is needed. Therefore, respondents were asked to rate the speed of their systems. Of those departments that used pre-incident plans on mobile computers, 67% indicated their systems were quick enough for initial company officers to retrieve the data during their response to the location. Another 26% reported that their system was not quick enough
for initial company officers, while 7% reported their system had unreliable speed (see Figure 5).

This suggests two things: first, that it is possible to utilize these kinds of systems in a very time-sensitive manner. Second, the response suggests that not only is the technology fast enough, but that the human element also worked. In other words, the company officers worked effectively with these systems, as intended.

![Figure 5: How fast does your system allow users to access pre-incident plans on mobile computers](image)

The last survey item under this research question dealt with integration of Geographic Information System (GIS) data into pre-incident planning software. Of the respondents that used GIS data, the strong majority indicated it was either “very important” (53%) or “somewhat important” (35%) for the GIS and pre-incident planning systems to be compatible with each other (see Table 6).
How important is it to your agency to have pre-incident planning software that is compatible with your GIS system(s) and GIS data?

<table>
<thead>
<tr>
<th>Answer options</th>
<th>Response Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very important</td>
<td>53%</td>
</tr>
<tr>
<td>Somewhat important</td>
<td>35%</td>
</tr>
<tr>
<td>Not very important</td>
<td>10%</td>
</tr>
<tr>
<td>Unimportant</td>
<td>3%</td>
</tr>
</tbody>
</table>

*Research Question 4: Is a customized software package preferable to a generic product?*

The survey sought to identify the performance differences between the various software types. These design types included: customized commercially-produced software, generic (“off the shelf”) packages, software developed in-house, and common office software that was adapted for use in pre-incident planning. In order to evaluate the differences in these types of designs, multiple variables were cross-referenced by software type. The variables included: effectiveness of graphics capabilities, ability of users to insert symbols, ease of use, speed, and ability to store multiple media images. The results of this multi-variable analysis are provided in Table 7.
Table 7

*Software performance by type of system*

<table>
<thead>
<tr>
<th></th>
<th>Standardized software</th>
<th>Customized software</th>
<th>Developed in-house</th>
<th>Modified common</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response Count *</td>
<td>61</td>
<td>11</td>
<td>11</td>
<td>31</td>
</tr>
</tbody>
</table>

What type of graphics capability does your software provide?

- Created from scratch using the software: 64% | 46% | 80% | 50%
- Scanned or digitized into the software: 27% | 54% | 20% | 43%
- Does not have capability to insert graphics: 9% | 0% | 0% | 7%

Assess your software's graphics capabilities?

- Mostly effective: 32% | 64% | 55% | 20%
- Somewhat effective: 55% | 27% | 36% | 63%
- Somewhat ineffective: 8% | 9% | 9% | 7%
- Mostly ineffective: 5% | 0% | 0% | 10%

Does your software allow you to electronically insert symbols?

- Yes: 83% | 91% | 100% | 73%
- No: 17% | 9% | 0% | 27%

How well does the graphics data entry work for your agency?

- Mostly effective: 27% | 36% | 64% | 33%
- Somewhat effective: 45% | 55% | 18% | 37%
- Somewhat ineffective: 20% | 9% | 0% | 17%
- Mostly ineffective: 8% | 0% | 18% | 13%

How easy is it for personnel to learn how to input data?

- Most personnel use the software without difficulty: 36% | 27% | 45% | 31%
- Most personnel often require assistance / frequent errors: 23% | 18% | 18% | 21%
- Only a minority of personnel are able to use effectively: 38% | 55% | 27% | 41%
- Requires highly proficient, highly trained personnel: 3% | 0% | 9% | 7%

How fast can members access pre-plans on mobile computers?

- Initial company officers can access while responding: 66% | 89% | 67% | 55%
- Initial company officers cannot access while responding: 32% | 0% | 22% | 30%
- Speed of access is unreliable: 2% | 11% | 11% | 15%

Does your software allow for (Check all that apply):

- Storage of digital photos: 70% | 64% | 64% | 52%
- 3-Dimensional modeling of structures: 21% | 64% | 18% | 14%
- Modeling of fire behavior: 7% | 0% | 9% | 3%
- Hazmat spill or plume analysis: 12% | 9% | 9% | 14%
- None of the above: 26% | 18% | 36% | 45%

* Note: 10 respondents did not indicate what type of system they use; their responses were excluded from this table
In terms of effectiveness of graphics capabilities, respondents rated the customized software the highest, with 64% of users rating the graphics capabilities as “mostly effective.” Most respondents indicated their software allowed for the insertion of symbols on pre-incident plans, regardless of the type of system. With regard to the ease of entering graphics, once again, the users of customized software packages rated the effectiveness of the software “mostly effective” or “somewhat effective” higher than the users of the other types of software. Responses to ease of use showed no clear advantage of one type of software over another; they all indicated that only a minority of personnel were able to effectively use the software (or that this job is only given to a minority of personnel). Users of customized software reported the best results in terms of accessing data quickly while en route to incidents. There was no clear winner in the category of ability to store and manipulate digital imagery.

Discussion

The value of effective pre-incident planning is discussed in numerous texts (NFPA, 1997; also see IFSTA, 1998; Hoffman, 2003; Klaene, 2000; Bailer & Ruetz, 2005; Parrow, 2003). The literature review identified specific advantages offered by pre-incident planning. Chief among those are firefighter safety, improved efficiency and effectiveness, training benefits, and improved community relations. While these benefits have always been derived from the use of pre-incident plans, Rogers (2006) provides the most summative argument that automation of pre-incident planning increases these benefits by making the plans more accurate, more readable, more up to date, and easier to access.
In order to achieve these benefits and to ensure an effective pre-incident planning system, the Henrico County Division of Fire needs to overhaul its old methods. The organization is committed to improving its pre-incident planning system in a manner that will meet the future needs of the Division while ensuring the safety of firefighters and residents (HCDOF, 2008).

Across the country, advancing technologies are defining the new industry standard and establishing best practices (Codino, 2004; Furey, 2008). The survey used in this research effort identified 124 fire departments that were using various types of automated pre-incident planning software. Having embraced and implemented this new technology, these organizations are setting the standard for others to follow. Their ability to use computers to store, retrieve, and utilize pre-incident plan data gives those fire departments a distinct advantage over departments that still rely on paper-bound technologies (White, 2003; Codino, 2004; Galvin, 2005).

The use of a software solution for pre-incident planning will eliminate many of the inconsistencies present in the Division’s current methods. For instance, the Division does not currently have standards for the creation of graphics to support pre-incident plans; however, the majority of software solutions surveyed in this research (58%) provided automated graphics solutions as part of the package. Even more (80%) of these products utilized standardized symbols. Even when the software did not allow for the creation of graphics, the vast majority (92%) did allow the storage of some type of graphical site plan. Further, many systems (63%) allowed the storage of digital photos, which is not even an option using the Division’s current paper-based methods.
Another inconsistency with the Division’s current practice is that plans are frequently not available except on the first-due engine company. Of the surveyed agencies that use mobile computers, 67% indicated that pre-incident plans can be retrieved by the company officers (using their mobile computers) prior to arriving on scene. This offers a tremendous advantage to each responding company. White (2003) notes the significant advantage such technology offers: “on the way to a fire call, the incident commander can have a copy of the pre-fire plan diagram generated with the software . . . this enables the [officer] to study the floor plan and determine the best strategy for responding crews” (p.124).

Another problem with Henrico’s current process is that there is no standard method of storing pre-incident plans. Most plans exist only on paper, and even then, generally only one copy exists. While individual firefighters may sporadically store pre-incident plans on a computer, these plans are not indexed according to any particular method. The use of a single software system would require the data to be stored in a methodical manner, which in turn will make it easier to access, use, and update plans in a systematic method (Codino, 2004).

Henrico County utilizes very robust and reliable mobile computers on every piece of fire apparatus. These computers are replaced on a three-year cycle with state of the art “rugged” machines. An analysis of the hardware requirements of an automated pre-incident planning system was not within the scope of this research; however, it is reasonable to expect that the county’s existing hardware platform should support most of the commercially available software packages.
A focus of this research was the user of automated pre-incident plans. Codino (2004) and White (2003) discussed the importance of pre-incident software being field-usable by suppression personnel and easy to learn. Based on the survey responses, this appears to be a challenge. While 64% of respondents indicated that graphics data is entered by field personnel, their efforts were described as “mostly effective” only 35% of the time, and either “somewhat” or “mostly” ineffective 18% of the time. Interestingly, for those departments who use administrative personnel to enter graphics data, the results were even worse. With regard to learning how to use the system, responses were mixed, but not completely encouraging. Only 35% of respondents indicated that “most personnel” were able to use the software without difficulty. Clearly, training of personnel and careful selection of users for data entry will be an important consideration in implementing a new system.

The research also sought to identify advantages of different types of software, comparing generic (or “canned”) software packages with highly customized products, software designed in-house, and common office software that was modified for use in pre-incident planning. The results did not reveal a clear advantage to any one type of system. The data did suggest some slight advantages of customized software over the other types, especially in the areas of graphics capabilities, and in speed of accessing data while responding. Again, these data were not strongly conclusive, especially in light of the small number of respondents using customized software (n=11) and software developed in house (n=11).
Recommendations

Recommendation 1: The Division Should Purchase and Implement a Pre-Incident Planning Software System.

The literature review and survey indicated that automation of pre-incident planning has become the new industry standard. The Division has identified the problem that its personnel can no longer continue to rely on the manual, hand-drawn methods that were implemented in the 1970s. Given the rapid growth of the county, especially in the commercial and multi-family construction market, the Division must look to new technologies in order to stay ahead of the pre-incident planning curve.

This research effort has shown that the Division can expect great value and benefits from the implementation of an automated pre-incident planning system. All of the traditionally accepted benefits of pre-planning are enhanced when using an automated system: data is standardized, graphics are more reliable, and the plans are more accessible.

The research also reiterated that pre-incident planning provides a foundation for sound decision-making and improved firefighter safety. In an age where fires are becoming less frequent but more dangerous, these benefits cannot be understated.

Recommendation 2: The Division’s Pre-Incident Planning System Should Allow Suppression Personnel to Input and Access Standardized Data Elements.

This recommendation combines two findings of the research. The first finding is that certain types of data should always be collected and included in the pre-incident plan. These data should be collected, analyzed, and presented in a standardized manner. The data that should always be collected (as identified through literature review and
Pre-Incident Plans

Survey responses (special hazards, fire protection features, overall site diagrams, floor plans, the locations and type of utilities, building construction, and occupancy information. In addition, the software selection process should give preference to systems that allow the storage of digital media, and manipulation of the data for modeling fire or plume behavior.

The second finding that supports this recommendation is that pre-incident plans should be created by suppression personnel, who will in turn become the users of the plans during emergencies. The software must therefore be field-usable to allow data entry during site visits, as well as in the fire station environment. The software will need to be compatible with mobile and desktop computers used by the Division of Fire.

Recommendation 3: The Division’s Pre-Incident Planning System Should Include Graphics Capabilities to Support Creation of Diagrams and Symbols.

Survey respondents that used software with graphics creation capabilities had greater success with their product than respondents that scanned in paper images or created graphics by hand. Using a standardized graphics package as part of the software will result in all pre-incident plans having a similar “look and feel,” as well as standardized symbols, scale, and other features. In addition, since these graphics will be stored digitally with the pre-incident plans, they will be more likely available for future manipulation should the structure be expanded or changed in some way.

Recommendation 4: The Division’s Pre-Incident Planning System Should Interface with the County’s Geographic Information System (GIS).

The County’s GIS provides tremendous opportunities for data analysis and modeling. In the event of a hazardous materials incident, flood, evacuation, or other
large scale incident, the ability to overlay GIS data with existing pre-incident plans will be paramount. Of the surveyed departments that use both automated pre-incident plans and GIS systems, the strong majority (88%) indicated it was important for these systems to be compatible with each other. Providing this compatibility will ensure that both systems meet the needs of the Division well into the future.

Recommendation 5: During the Implementation of its Automated Pre-Incident Planning System, the Division Should Fully Train Selected Personnel to use the System.

The research focused on users of pre-incident planning systems. The literature indicated that not all users will be comfortable working in the digital age, and the survey responses seemed to verify this. Therefore, in order to ensure the success of the new system, the Division should select an adequate number of personnel who have an interest and the capacity to use the software, and provide them with the training necessary to fully use the software. These personnel, in turn, would form a core group of users who would become “trainers” in the field. Periodic classes should be offered for new users or those personnel who gain an interest in learning the system. It will be important to ensure that enough personnel are selected that each shift has at least one person trained in the system. A similar approach was used successfully to implement new incident reporting software during 2007-2008; that successful process should form a reasonable model for the Division to follow with pre-incident planning software.

Recommendation 6: In Selecting a Software Vendor, the Division of Fire Should Include Performance Requirements for the Speed of Data Access and Retrieval.

As indicated in the research, a pre-incident plan is only helpful if it can be accessed by incident commanders when it is needed. A majority of respondents (67%)
indicated their systems were fast enough to allow initial company officers to access plans while responding. This suggests the technology exists to a degree where this level of performance can be expected and required as part of the technical performance specifications of the software.

In conclusion, achievable opportunities exist for the Division of Fire to improve its pre-incident planning system by implementing an automated, software-based system. Such a system can be expected to improve fire department performance in safeguarding the lives of citizens and members of the department. This technology is relatively new, and as time goes on, the rather thin body of knowledge about automated pre-incident planning will undoubtedly grow. However, given the nature of the problems faced by the Division with its current planning methods, the organization should move forward now with the recommendations outlined above, rather than waiting for more perfect data to be published.
References


Henrico County Division of Fire. (2008, May 8). *Fire and emergency services self assessment manual*. (Available from Henrico County Division of Fire, P.O. Box 27032, Richmond, VA 23273)


Appendix A

Sample of an Existing Henrico County Pre-Incident Plan

(Please be aware that the page is a sample of an existing pre-incident plan and does not represent any actual incident or fire event.)

**Quick Access Pre-Fire Analysis**

**Circuit City**

<table>
<thead>
<tr>
<th>Address: 11732 W Broad</th>
<th>Initial Resources Required:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building Description:</strong> Type III building Construction</td>
<td>3 Engines, 2 Trucks, 1 Squad, 1 Batt</td>
</tr>
<tr>
<td><strong>Roof Construction:</strong> Metal deck with membrane (rubber)</td>
<td><strong>Floor Construction:</strong> Concrete</td>
</tr>
<tr>
<td><strong>Occupancy Type:</strong> Commercial</td>
<td><strong>Hazards to Personnel:</strong> Steel truss, 8 1/2 ft parapets on roof, two drop ceiling areas, Gas lines running to HVAC on roof (painted green).</td>
</tr>
<tr>
<td><strong>Location of Water Supply:</strong></td>
<td><strong>Available Flow:</strong></td>
</tr>
<tr>
<td>Primary: 120ft of AB Corner</td>
<td>16’ main</td>
</tr>
<tr>
<td>Secondary: 60ft of AB Corner</td>
<td>Short Pump town center water loop</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Estimated Fire Flow</th>
<th>25%</th>
<th>50%</th>
<th>75%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Estimated Fire Flow</strong></td>
<td>3208</td>
<td>6416</td>
<td>9624</td>
<td>12833</td>
</tr>
</tbody>
</table>

**Fire Behavior Prediction:** building Brick\Block; Contents largest fire hazards

**Projected Strategies:** 1st Eng Hydrant behind Jared’s; 2nd Eng support FDC

**Problems Anticipated:** Steel Truss, Parapets Wall

<table>
<thead>
<tr>
<th>Standpipe?</th>
<th>Sprinklers?</th>
<th>Alarm Co:</th>
</tr>
</thead>
<tbody>
<tr>
<td>One in warehouse area</td>
<td>Yes, entire structure</td>
<td>Vector</td>
</tr>
</tbody>
</table>

**FD Connection Location:** BC corner 40 ft away

**Additional Comments:** contacts Brian Smith 757-651-8158, Matt Roddenberry 804-733-7633, Barckly Anderson 804-426-6428

**Site plan is on back of page**
Appendix A

Sample of an Existing Henrico County Pre-Incident Plan

(Page 2 of 2)
Appendix B

Survey Instrument

(Page 1 of 4)

### Pre-Incident Planning Software

1. **Default Section**

   This survey is part of an applied research project for the executive fire officer program. In addition, my agency is researching pre-incident planning software, and the results of this survey will help us identify the desired performance specifications of that software.

   The survey should only take a few minutes to complete. Thanks for your assistance.

   Tony McDowell
   Captain, Henrico County (VA) Division of Fire
   Richmond, Virginia

1. **Which of the following best describes your pre-incident planning software?**

   - [ ] It is a standard product purchased from a vendor with limited customization
   - [ ] It is a highly customized product purchased from a vendor
   - [ ] We developed our own software specifically for this purpose
   - [ ] We use commonly available software we have customized for pre-incident planning (example, Microsoft Power Point, Word, etc).

   Please identify the name and version of the software you use:

2. **Please rate the importance of the following components for inclusion in your pre-incident planning software:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Not important</th>
<th>Somewhat Important</th>
<th>Very Important</th>
<th>Don't know / not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall site diagrams</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor plans</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupancy information</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special hazards</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire protection features</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locations and types of utilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building residents' evacuation plans</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact information for building representatives</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required fire flows</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Available water supply</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tactical plans (pre-developed fire attack plans)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Pre-Incident Planning Software

3. What type of graphics creation capability does your pre-incident planning software package provide?
   - [ ] Site or floor plans are created from scratch using graphic tools within the software
   - [ ] Site or floor plans are obtained on paper and scanned or digitized into the software
   - [ ] Our software does not have capability to insert graphics
   
   Other (please specify): ________________

4. In assessing your software's graphics capabilities (#3 above), how well does the software work for your department?
   - [ ] Mostly effective
   - [ ] Somewhat effective
   - [ ] Somewhat in-effective
   - [ ] Mostly in-effective

5. Does your pre-incident planning software allow you to electronically insert symbols into diagrams, such as fire hydrants, fire department connections, utility shut-offs, etc?
   - [ ] Yes
   - [ ] No
   
   Other (please specify): ________________

6. Are your site plans / floor plans entered into the software by:
   - [ ] Suppression personnel who conduct the pre-incident survey
   - [ ] In a central office, after information has been collected by others
   - [ ] Site plans / floor plans are not entered into the software
   
   Other (please specify): ________________

7. In thinking about how the site plans and floor plans are entered into the software (#6 above), how well does this process work for your agency?
   - [ ] Mostly effective
   - [ ] Somewhat effective
   - [ ] Somewhat in-effective
   - [ ] Mostly in-effective
Appendix B

Survey Instrument

(Page 3 of 4)

<table>
<thead>
<tr>
<th>Pre-Incident Planning Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. How easy is it for personnel to learn how to input data into the system?</td>
</tr>
<tr>
<td>- Most personnel use the software without difficulty and can use it effectively</td>
</tr>
<tr>
<td>- Most personnel often require assistance and there are frequent errors</td>
</tr>
<tr>
<td>- Only a minority of personnel are able to effectively use the software</td>
</tr>
<tr>
<td>- Our software requires highly proficient, highly trained personnel to use it properly</td>
</tr>
</tbody>
</table>

| 9. In what format are your pre-incident plans available to firefighters while they are operating at the scene of an emergency? |
| - On mobile computers |
| - As a paper copy |
| - Both on mobile computer and paper copy |

| 10. How does your agency store the pre-incident plan DATA? |
| - Stored on individual hard drives |
| - Stored on an external device such as a CD, DVD, or thumb drive |
| - Transmitted over the air |
| - We do not use pre-incident plans on mobile computers |
| Other (please specify) |

| 11. If your pre-incident plans are available via computer, how fast does your system allow users to access them? |
| - Quick enough for initial company officers to retrieve the data while responding |
| - Not quick enough for initial company officers to retrieve the data while responding |
| - The speed of retrieval is very un-even, making its retrieval unreliable |
| - We do not use pre-incident plans on computers |
| Other (please specify) |

| 12. Does your pre-incident planning software allow for any of the following (Check all that apply): |
| - Storage of digital photos |
| - 3-Dimensional modeling of structures |
| - Modeling of fire behavior |
| - Hazmat spilt or plume analysis |
| - None of the above |
Appendix B

Survey Instrument

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Pre-Incident Planning Software

13. How important is it to your agency to have pre-incident planning software that is compatible with your GIS system(s) and GIS data

☐ Very important
☐ Somewhat important
☐ Not very important
☐ Unimportant
☐ We do not have GIS

14. Do you work (or have you worked) with any of the following kinds of departments within your jurisdiction to develop pre-incident planning software and/or data?

☐ Law enforcement
☐ Public utilities
☐ Separate fire/FMS agencies (including mutual aid)
☐ None
☐ Other (please specify)

15. After you implemented your current pre-incident planning software, did you identify any additional needs that the software fails to meet? Please list:

16. Can I contact you for additional questions or clarification? Please provide your name and contact information below: