RESIDENTIAL FIRE ALARM SYSTEMS: THE VERIFICATION AND RESPONSE DILEMMA

EXECUTIVE ANALYSIS OF FIRE SERVICE OPERATIONS IN EMERGENCY MANAGEMENT

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ABSTRACT

Over the past decade, the Vineland, New Jersey, Fire Department, like most fire departments has experienced a significant increase in the number of responses to automatic fire alarm systems, especially systems located in one and two family dwellings. Responses to residential alarm systems increased dramatically in mid 1998, when the City Council approved local amendments to the New Jersey Uniform Fire Code, one of which prohibited verification of residential fire alarms prior to notification of the fire department. The practical effect of this action was to eliminate the exception to immediate notification of the fire department from household fire warning equipment, found in chapter 2-4.9.2 of NFPA 72, National Fire Alarm Code, 1996 edition.

Being a combination fire department, this increase in responses eventually began to take a toll on the department's volunteers, some of whose companies were responding to more than 400 incidents per year. As a result, the city administration began to reconsider the prohibition on alarm verification. They also began to explore other solutions to the problem such as implementing some type of fines and/or penalties for repeat false and/or nuisance alarms.

The senior staff of the fire department acknowledged that the growing number of alarm responses was a problem, however, they were opposed to allowing verification since they felt that this may compromise public safety. It was their belief that all other avenues should be explored, and, options exhausted, prior to permitting any verification of residential fire alarm systems.

The problem, which prompted this research, was a significant increase in the number of responses, being made by the department, to automatic fire alarm systems originating from one and two family dwellings. While accurate statistics are not available, very few of these alarm activations were caused by uncontrolled fire situations.

The purpose of this research was four fold. The first objective was to evaluate how other fire departments, serving communities that are similar in size to Vineland, are handling the issue of verification and response to residential fire alarm systems. The second objective was to determine if the department opted to permit verification of these alarms, would residents' insurance rates, or, the city's ISO rating be affected. The third objective was to obtain input from homeowners, the taxpaying customers of the department, who had experienced an alarm activation(s), that resulted in a response by the department, regarding how they felt about the issue of alarm verification. The final objective was to determine how the NFPA arrived at the exemption found in NFPA 72, that permits verification, only of residential fire alarms. The evaluative and historical research methods were utilized. The following research questions were posed:

1. What are the primary causes of residential fire alarm activations, and, what percentage of time does the fire department provide some type of service at these incidents?

2. How many fire departments, which serve communities similar in size to Vineland, permit verification of residential fire alarm systems, prior to dispatch of the fire department?

3. How do fire departments, serving communities similar in size to Vineland, view the potential conflicting liabilities associated with responding to, or not responding to, activations of residential fire alarm systems?

4. How do fire departments, serving communities similar in size to Vineland, respond to activations of residential fire alarm systems?

5. How do fire departments, serving communities similar in size to Vineland, deal with repeat false alarm offenders?

6. Do most homeowners who experience a fire alarm activation, try to stop the response of the fire department, and, if so, why?

7. If the fire department adopted a limited response policy, would homeowners be more receptive to response by the fire department to all alarm activations?

8. Do homeowners feel differently about verification of residential fire alarms if they have children who stay home alone?

9. Are insurance rates affected in any way by the verification and response policies of the fire department?

10. Since residential fires still account for nearly 70 percent of all fires, and, a similar percentage of fire injuries and deaths, why are residential fire alarms the only alarms that can be verified according to NFPA Standard?

An extensive review of pertinent literature was conducted to determine what had already been written on the various issues related to this subject. Two survey instruments were developed to gather information from fire departments, and, homeowners, on the subject of residential fire alarms. The first survey was developed to determine the verification and response policies of fire departments, in the United States, that serve communities that are similar in population to Vineland. This survey was mailed to the fire department in every city with a population between 47,000 and 67,000, according to the United States Census Bureau.

Of the 203 surveys mailed to departments in 43 states, two were returned as being undeliverable, while 81 were completed and returned by fire departments. Of these, 67 were evaluated for this paper. The survey indicated that 77.6 percent of the fire departments that answered the question, do not permit verification of residential fire alarms prior to response, and of those, 60 percent enforce this prohibition through a fire department policy. Nearly two thirds of the departments surveyed (61.9 percent), felt that allowing untrained civilians to decide if they had a problem when their alarm system activated presented a greater liability than placing apparatus and personnel on the street for every alarm, even those that may be false. More than

93 percent of the fire departments responded that protection of property, and, minimizing property damage were both important functions of alarm systems.

On the issue of normal apparatus response to residential fire alarms, 41.8 percent of departments dispatch two engines, one ladder and one chief, while 19.4 percent dispatched only a single engine company. Most fire departments, 64.6 percent, have all units respond at emergency speed, that is with lights and sirens, although 27.7 percent have the first engine respond at emergency speed, and, all other units respond at reduced speed, that is no lights or sirens. When additional information is received subsequent to dispatch, that the alarm may be false, or, was activated accidentally, 87.5 percent of departments modify their response. Of these, 57.1 percent return all units except the first due engine.

Most fire departments surveyed, 64.2 percent, attempt to educate homeowners regarding detector placement, system maintenance, etc., if they believe that repeat false alarms are becoming a problem. About one in four departments (25.4 percent), issue citations or violation notices under the local fire code, and, 31.3 percent issue fines or penalties if necessary. Of 30 departments that report that they issue fines or penalties after a predetermined number of false alarms, 43.3 percent do so after three in a twelve-month period.

A second survey instrument was developed to obtain input from homeowners in the City of Vineland who had experienced a fire alarm activation that had resulted in a response by the fire department. A total of 101 surveys were mailed out to homeowners who accounted for 175 total responses by the fire department in the previous 12-month period. Of these, four were returned as being undeliverable, and, 53 were completed and returned by the homeowners, all of which were utilized for this research.

An overwhelming majority of respondents, 84.3 percent, tried to stop the response of the fire department when their alarm activated. Nearly two thirds of those surveyed, 64.2 percent, reported that the fire department provided no tangible service when they responded. However, when presented with a list of potential services that the fire department could provide, more than half (52.1 percent) of those who answered the question, stated they would want the fire department to respond to make sure that everything was OK. An even greater number of respondents, 68.8 percent, stated that they would want the fire department to respond to make sure that everything was OK, if they responded with one engine with no lights or sirens. More than three quarters (76.2 percent) of those who responded, answered that they would not want their children, who stay home alone, to be able to cancel a response by the fire department, if their alarm activated.

The research also found that insurance companies generally provide a discount on homeowners' insurance policies for a monitored fire alarm system. However, the discount is not affected by the verification or response policies of the fire department that serves the residence. The Insurance Services Office (ISO) also does not prohibit fire departments from verifying residential fire alarms prior to response. They do, however, require response of at least two engines, and, one ladder or service truck, to all structural incidents, including fire alarm activations. Therefore, the response policies and procedures of the fire department can have a

significant impact on the credit earned, for engines and ladders, during an ISO evaluation, and, ultimately affect the community's overall ISO rating.

Recommendations made to the Vineland Fire Department, and, the City of Vineland include the implementation of a comprehensive, multi-faceted program to address the overall issue of residential fire alarms, not just one small component that will make the problem go away. These recommendations include an aggressive public education campaign targeted to encourage homeowners to maintain their systems; requirements for comprehensive plan review, and system inspection, testing, and approval prior to new systems being placed on line; registration, servicing and upgrading requirements for existing systems; and, adoption of an ordinance to assess fines or penalties for repeat false, or, nuisance alarms. The recommendation was also made that until the effectiveness of the other program components can be evaluated, that the Fire department should continue to prohibit verification of these alarms. The final recommendation was for the city to respond to these activations with two engines and one ladder to satisfy the requirements of ISO. These responses should be primarily made in a reduced speed mode. The Department's SOP on response to automatic fire alarms should be modified to reflect these changes as well.

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INTRODUCTION

Over the past decade, the Vineland Fire Department, like most fire departments, has experienced a significant increase in the number of responses to automatic fire alarm system activations, especially systems located in one and two family dwellings. In 1999, the Department responded to a total of 1,973 fire-related responses, of which 968 or 49.1 percent were for automatic fire alarm activations (R. Strain, intradepartmental report, January 31, 2001). In 2000, responses totaled 2,056 of which 1,033 or 50.2 percent were for automatic fire alarm systems (R. Strain, intradepartmental report, January 31, 2001). Fire Department records indicate that approximately 35 percent of these fire alarm activations are for systems that are located in one and two family dwellings (L. Tramontana, personal communication, September 22, 2001).

The increase in alarm system responses being felt nationwide, if not worldwide, was accelerated somewhat in Vineland, in mid 1998, after City Council approved local amendments to the New Jersey Uniform Fire Code. Among these amendments was a provision that required central station monitoring services to immediately notify the Vineland Fire Department of any fire alarm activation, that was not previously scheduled, such as for system maintenance, drills, etc. (City of Vineland Ordinance #98-42, 1998, A.M. Barsotti, personal communication, November 20, 2001). The practical effect of this provision was to eliminate any verification of fire alarm activations, even from residential occupancies, such as that which is permitted in Chapter 2-4.9.2 of NFPA 72, National Fire Alarm Code, 1996 edition.

This change in policy, which was supported by the city's Director of Fire and Fire Chief, at that time, was intended to be a proactive response to several incidents where verification of alarm systems nearly resulted in a much more serious incident. The change resulted in an immediate increase in overall responses, from 1,631 in 1998 to 1,973 in 1999 (L. Tramontana, personal communication, September 22, 2001). It also initiated debates on the amounts, and types, of apparatus that should be dispatched to residential fire alarms, and, how these units should respond, particularly in cases were the alarm activation had been reported as "false."

Few fire service professionals would be able to argue with any honesty or credibility that automatic fire alarm systems have not been a tremendous asset to the fire service. In fact, the fire service as a whole has championed these systems as key components of a comprehensive fire service prevention and delivery system. Early detection of fires, coupled with automatic suppression, if appropriate, have combined to provide fire departments with potent weapons to counteract the significant challenges of our era, such as, reduced staffing on apparatus, lightweight construction, and, heavier fire loading in structures. Although these effort have, for the most part, been successful, they have in some instances created a double edged sword, that is a reduced number of actual fires, but, significantly increased overall responses.

The problem, which prompted this research, was a significant increase in the number of responses, being made by the department, to automatic fire alarm systems originating from one and two family dwellings. While accurate statistics are not available, very few of these alarm activations were caused by uncontrolled fire situations. In fact, in the vast majority of cases, a second call was received by the communications center, prior to arrival of the fire department at

the incident location, reporting that the alarm was "false." This situation resulted in instances when the first due engine was responding to investigate an alarm system activation that had been reported as "false," while more distant units were being dispatched to a reported structure fire or rescue assignment in another part of this company's first due district. Compounding the problem is the fact that, as a combination fire department, there was a mounting chorus of concern from the volunteer companies that these "unnecessary" responses were straining their members, hurting morale, and, making it harder for them to recruit and retain new members. Questions had also risen, once again, over the proper number of apparatus to dispatch to residential alarm activations, how this apparatus should respond, and, the ramifications of not responding at all.

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The results of this research will be utilized to make recommendations to the Vineland Fire Department, and, ultimately the Mayor and City Council, on whether the city should allow verification of residential fire alarm systems, prior to dispatch of the fire department, as part of a comprehensive program to deal with the number of alarms being generated. The results will also provide information that the fire department will be able to utilize as it evaluates, and, if necessary, revises internal procedures on response to these types of alarms. Publishing the results of this research will add additional data, and, another perspective to the fire service debate over how to best handle the ever increasing number of fire alarm activations. The evaluative and historical research methods were used. The following research questions were posed:

1. What are the primary causes of residential fire alarm activations, and, what percentage of time does the fire department provide some type of service at these incidents?

2. How many fire departments, which serve communities similar in size to Vineland, permit verification of residential fire alarm systems, prior to dispatch of the fire department?

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BACKGROUND AND SIGNIFICANCE

The life saving benefits of early detection and warning of a fire situation are indisputable. Since the mid 1970's, when residential smoke detectors first became widely available, fire deaths in the United States have declined dramatically. However, as early as 1960, the Los Angeles Fire Department was analyzing data on residential fires, and, by 1963 was evaluating the potential benefits that could be derived from residential smoke detectors (Bryan, 1974). According to Bryan (1974), in 1965, the NFPA had approved development of a standard on household fire warning equipment. However, it took nearly seven years, until 1972, before the standard was adopted (Bryan, 1974).

In 1979, after two young children died in an apartment fire, the previous year, that was basically out upon arrival of the fire department, the Vineland City Council adopted an ordinance requiring the installation of smoke detectors in all residential properties in the city (City of Vineland Ordinance #1150, 1979, A.M. Barsotti, personal communication, November 20, 2001). This was followed in 1991, by the State of New Jersey requiring smoke detectors in all residences occupancy (N.J.S.A. 52:27D-198.1). The state requires an inspection or certification that all detectors are in place and operational prior to any resale of the property, or, change in occupancy occurs (N.J.S.A. 52:27D-198.2).

As the benefits of smoke detectors became more apparent, and, the technology became more sophisticated, the application of these life saving devices began to change. In 1978, BOCA required the installation of at least one hardwired, smoke detector installed on each level of each new dwelling constructed (K. Kirchner, personal communication, October 2001). These detectors were required to be interconnected. Simply stated, if one detector was activated, all detectors sounded. In 1993, the smoke detector requirement was expanded further, requiring an interconnected smoke detector to be located in each bedroom, in addition to those previously required (K. Kirchner, personal communication, October 2001).

As America became much more security conscious in the 1980s, and, began installing security systems in our homes, it was only a short time before smoke detectors were offered as options and were thus included in these systems as part of a comprehensive safety and security system. Today, the addition of a fire alarm system is the option most often requested by customers of Slomins Security, who are looking to upgrade, or, add on to their basic system (T. Bossong, personal communication, Summer 1998). Fire alarm systems are often offered as a standard component of security systems offered by new homebuilders.

The Vineland Fire Department rarely responded to fire alarm systems of any type until after July 1984. Prior to that time, when any fire alarm was received by the Department, the standard procedure was to contact the premises for verification. Even if no contact could be made, response was not always guaranteed, as the decision was left up to the subjective judgment of the Fire Director, or, the on duty Captain (J. Carr, personal communication, October 16, 2001). In July 1984, a new Fire Director was appointed (there was no Chief of Department at this time), who ordered the department to respond immediately to all activated fire alarms (J. Carr, personal communication, October 16, 2001).

Over the next dozen years, responses by the department climbed gradually from 1,123 in 1985 to 1,490 in 1997. It is important to note that not all of the increased response activity was attributed to alarm systems. While accurate statistics are not available, the increased requests for service covered a wide spectrum. However, by 1997, the fire department administration was becoming increasingly aware of problems with verification of fire alarms, and, the potential that existed for a serious situation to develop as a result of a premature report of "false alarm or no problem." At this time, if a fire alarm was received by the Cumberland County Communications Center, which dispatches Vineland Fire, and, a second call was received prior to dispatch reporting a "false alarm," the dispatch of fire units would be aborted.

In the summer of 1997, an incident occurred that convinced the administration that a change was needed. The incident started when the county communications center received a report of an activated fire alarm at Olivio Towers, an eight-story senior citizen apartment building. While preparing to dispatch a full first alarm assignment, which was normal for this complex, a second call was received from a female employee stating that the alarm was false, and, the fire department was not needed. Consequently units were not dispatched. Approximately 15 minutes later the same person called again stating the alarm kept going off, they did not know why, and, that the fire department should respond. A first alarm assignment was dispatched. A subsequent investigation revealed that a fire had been started in a fourth floor trash room, and, had been extinguished by several elderly residents of the building.

During this same time, the administration of the Fire Department was preparing revisions to the City's fire prevention ordinance, which allows local amendments to the New Jersey Uniform Fire Code. The solution for commercial occupancies was relatively simple. NFPA Standard Number 72, titled "National Fire Alarm Code" addresses, and provides recommendations, regarding all facets of automatic fire alarms from installation, to maintenance, to receipt and retransmission of alarms. NFPA 72 requires that fire alarms received at a central monitoring station be immediately retransmitted to the fire department.

The situation is somewhat more complex when addressing the issue of verification of fire alarms originating from one and two family dwellings. Chapter 2-4.9.2 of NFPA 72, 1996 edition, states:

> On receipt of an alarm signal from household warning equipment, the supervising station shall immediately (within 90 seconds) retransmit the alarm to the public fire communications center. (NFPA 72, 1996, p. 31)

However, the standard provides an exception to the above requirement, stating:

> The supervising station shall be permitted to contact the residence for verification of an alarm condition and, where acceptable assurance is provided within 90 seconds that the fire service is not needed, retransmission of an alarm to the public service fire communications center shall not be required. (NFPA 72, 1996, p. 31)

On May 26, 1998, the city council passed amendments to the Uniform Fire Code that, among other things, required:

> All persons and/or agencies responsible for monitoring automatic fire alarm and/or fire suppression systems located within the City of Vineland shall immediately notify the Vineland Fire Department upon activation of said alarm. It shall be a violation of this ordinance for any person to investigate or verify said alarm prior to notification of the Fire Department. This requirement shall not apply to fire drills and routine testing and maintenance being conducted on said system. (City of Vineland Ordinance #98-42, 1998)

This change, supported by the fire department administration, and, passed unanimously by the council now exceeded NFPA by prohibiting any type of verification prior to notification of the fire department. This change caused an immediate increase in the number of responses by the department.

On November 1, 2000, at the request of the volunteer companies of the department, a meeting was held to discuss this issue. Present at the meeting were representatives of the Fire Department, the Fire Prevention Division, the Department of Licenses and Inspections, who oversees installation of new systems, various alarm system installers, and, central monitoring station representatives. Among the issues discussed were the applicable NFPA, Uniform Construction Code and Uniform Fire Code requirements, and, the pros and cons of monitored systems, and, verification of alarms originating from those systems. The sentiment at this meeting was heavily against the local requirement that alarm companies immediately notify the fire department, prior to attempting verification.

A second meeting was held on January 23, 2001. This meeting produced a somewhat more balanced discussion; yet, it was still tilted toward allowing verification. This meeting also reinforced a more troubling undercurrent, that certain members of the department were turning this issue into a career versus volunteer issue. Insinuations were made that the only departments in the area that did not allow verification were career departments, and, that not allowing verification was nothing more than an effort by the career department to obtain more staff.

In May 2001, a third meeting was held to discuss the issue. Participants at this meeting included only the Fire Director, Fire Chief, Deputy Chief (the author), City Solicitor, and, an Assistant Business Administrator. A draft ordinance was presented for review that included among other provisions, a repeal of the no verification requirement. This was unacceptable to the Chief and Deputy Chief. After a lengthy, and at times animated discussion, it was agreed by all parties that additional research was needed before a final decision could be made. That decision provided the catalyst for the research now being conducted.

City of Vineland

The City of Vineland is located in Cumberland County in southern New Jersey. Covering an area of 69.1 square miles, it is the largest city, in area, in the state, and, the economic hub for several southern counties. The city has a 2000 resident population of 56,271 (United States Census Bureau, August 8, 2001). Vineland was incorporated as a city on July 1, 1952, culminating the consolidation of the Borough of Vineland and surrounding Landis Township (A.M. Barsotti, personal communication, May 1998; Finley, 1999). The city is the largest component of the Vineland, Millville, Bridgeton Metropolitan Area (United States Census Bureau, August 8, 2001).

The physical demographics of the city cover a broad spectrum. The downtown/central core area is typical of those found in most other northeastern cities. It consists of a struggling commercial and shopping district, and, closely spaced two and three story wood frame dwellings, many of which have been converted from single family to multi family use. There are several high rise apartment buildings and a number of garden apartment complexes, many of which provide subsidized housing. In addition, an inventory of vacant factories and warehouses provide silent testimony to the city's previous role as a leading clothing manufacturing center (J. Carr, personal communication, July 1999; Finley, 1999).

Surrounding this central core in all directions is a rather large area whose development trends are typically suburban. This area of the city has tree lined residential streets in long established neighborhoods as well as a significant number of newer tract developments. Several large shopping centers, including a covered mall, numerous smaller strip malls, garden apartment complexes and a growing number of professional office complexes are located in this area. There are also a number of extremely successful industrial parks that cater to a growing number of light and medium duty manufacturing operations. The outermost areas of the city still support a significant number of working farms and undeveloped woodland (J. Carr, personal communication, July 1999; Finley, 1999).

Vineland Fire Department

The Vineland Hook and Ladder Fire Company, formed on July 23, 1872, is the original ancestor of the Vineland Fire Department. The department made the transition from a fully volunteer to a combination department in 1931 when the first career firefighters were appointed ("History of the Vineland Fire Department," 1976).

The department, in its present form, was established on May 26, 1953 when the City Council passed Ordinance #76, *"An Ordinance to Establish, Regulate and Control the Fire Department of the City of Vineland, to Regulate and Define the Officers and Members Thereof, Their Duties and Compensation"* (City of Vineland Ordinance #76, 1953, A.M. Barsotti, personal communication, May 1998; Finley, 1999). This ordinance consolidated the three independent fire companies from the Borough of Vineland with the four from Landis Township into a municipally operated fire department (A.M. Barsotti, personal communication, May 1998; J. Carr, personal communication, July 1999).

Today the department operates from six stations, one staffed by career personnel and the remaining five staffed by volunteer personnel, who respond to the station upon receipt of an alarm. There are no requirements for duty crews, or, in station hours. Current staffing consists of 27 career personnel, and, approximately 140 volunteers. The department operates twelve engines, of which three are quints, two ladders, two rescues (non-EMS), three brush units, and, a hazardous materials response unit (Finley, 1999). A 1997 survey of the department by the Insurance Services Office, resulted in recommendations for three additional stations (C.F. Shaner, letter, September 8, 1997). In 2000, the department answered 2,056 calls for assistance (R. Strain, intradepartmental report, January 31, 2001).

The primary purpose of this research is to provide information that the Vineland Fire Department will utilize to analyze and assess its policies and procedures regarding verification of residential fire alarms, proper response assignments, and modes, for this type of incident, and, whether some type of enforcement procedure should be implemented to deal with repeat false alarms. The research will be used to concurrently satisfy the applied research project requirements associated with the *Executive Analysis of Fire Service Operations in Emergency Management* course, a component of the Executive Fire Officer Program at the National Fire Academy. The research relates to Unit 4, Community Risk Assessment, by analyzing the relative risks vs. benefits, to both firefighters and civilians, associated with policies that require automatic response to residential fire alarm systems, or, conversely, that permit verification of these alarms prior to response. This analysis will also examine the issues relative to how the fire department responds to these incidents, and, if there would be benefits to enacting some type of enforcement procedure against homeowners whose alarms generate repeat false alarms.

The results of this research are of great significance to the Vineland Fire Department since the Mayor will make a decision, probably in late 2001 or early 2002, on whether to request that city council rescind the requirement, that central station monitoring facilities immediately notify the fire department of any residential fire alarm activation, prior to any attempt to verify the cause of the alarm. This research will provide the Vineland Fire Department, and, the City of Vineland with statistics and information that will assist them with deciding whether or not to allow verification of residential fire alarms, how the department should respond to these incidents, and, if some type of enforcement procedure is necessary. The research may prove to be beneficial to other fire departments as they struggle with the conflicting issues associated with an ever-increasing number of automatic fire alarm responses.

LITERATURE REVIEW

The issues of reliability and preventing false alarms have long been a recognized as key components of an effective residential fire detection system. In 1973, Christian and Dubivsky wrote that there are eight key benchmarks to achieve in the ideal residential, or as they describe them, household fire detection system. These benchmarks are:

> ...(1) provides early warning and maximum coverage of potential fire source areas; (2) is not overly subject to false alarms; (3) is reliable; (4) has a long useful life; (5) is self supervising; (6) requires little or no maintenance and can easily be tested by the homeowner; (7) can easily be installed in existing buildings and is easily movable within and between buildings; and (8) is low in cost. (Christian & Dubivsky, 1973, p. 61)

Just a year later, Bryan (1974) wrote that, "Fire data indicates that a significant reduction in deaths and injuries could be effected if fire detection systems, preferably of the smoke detector type, were installed in single and two family dwellings" (Bryan, 1974, p. 307). Bryan also reported on the results of research conducted by the National Fire Protection Association (NFPA) involving 400 fires, which resulted in 1,201 deaths. Among other findings cited in this study, was an indication that in 68 percent of these fires, delayed discovery of the fire was a significant factor (Bryan, 1974, p. 307).

Bryan also writes that, "Local alarm systems, which are detection or automatic extinguishing systems without connections to the fire department, are the primary cause of delayed alarm reporting to the fire department" (Bryan, 1974, p. 298). He goes on to state, "When a structure is not always occupied, the local system is a part-time arrangement, since there may be no one present to transmit the alarm. Automatic notification requires no human action at the time of the fire" (Bryan 1974, p. 298).

The writings of Christian, Dubivsky, and, Bryan influenced this research by providing some perspectives on the early issues involving fire detection systems. Reliability of detection systems, minimizing the number of false alarms generated, and, reducing or eliminating potential delays in detection of a fire, and, providing an automatic response by the fire department were issues of concern that were being discussed and studied more than a quarter of a century ago. While Bryan's writings on local alarm systems, and, automatic response by the fire department do not specifically address residential occupancies, the concerns that he expressed have validity for all occupancies, and, the potential consequences of delayed notification of the fire department would be the same.

A number of studies have been conducted over the past ten years to determine smoke detector coverage in various communities across the country. Seal (1992), Gardiner (1994), Anderson (2000), and, Martin (2000), all conducted research on smoke detector installation and operability rates in their respective communities, in association with the Executive Fire Officer Program.

In 1992, Seal, writing on a study conducted in Bloomington, Minnesota found that between 93 and 99 percent of homes in that city had smoke detectors. In addition 91 percent of the homeowners surveyed reported that they test their detectors on a regular basis. While not validated by testing, an assumption could be made that if detectors are being tested, that inoperable detectors are being repaired or replaced. Seal states that his results compared very favorably to the nationally accepted average of 75 to 80 percent smoke detector coverage.

Martin's (2000) research from Madison Heights, Michigan, also indicated a high level of compliance in that community. His results showed 2.24 percent of homes in Madison Heights did not have smoke detectors and approximately 4.38 percent of detectors in place were not operational. Citing Ahrens in 1997, and the National Fire Safety Council in 1999, respectively, Martin reports that 94 percent of American homes now have smoke detectors, however, 20 percent of them may not be operational.

On the other hand Gardiner (1994), reported that 9.21 percent of the homes surveyed in Fairfield, Connecticut had no detectors. In an additional 18.91 percent of the homes, the detectors were found to be inoperable. The total of 28.12 percent of homes with no working detectors places his statistics somewhat higher than the reported national averages.

Anderson (2000) also found coverage in his community, Coos Bay, Oregon, to be below the national average. He wrote that 85 percent of the homes in Coos Bay had smoke detectors placing them 7 percent below the national average (Anderson, 2000, p. 3). He reported an additional 13 percent of the detectors were found to be inoperable, placing his statistics on par with Gardiner's Connecticut study.

The writings of Seal, Gardiner, Anderson and Martin influenced this research by providing background on how effective the fire service campaign promoting smoke detectors has been. Martin (2000) wrote, "Perhaps not since motorized fire apparatus replaced horse-drawn steamers has a single invention had such a profound effect on fire safety as has the residential smoke detector" (Martin, 2000, p. 5). Yet more than twenty-five years after smoke detectors became widely available, nearly one in four homes still lacks operational smoke detectors. The works of these four authors also raises an important question. Rather than focusing our efforts on eliminating responses from alarm systems that obviously work, although they may have malfunctioned, or have some other problem, should we not be concentrating our efforts on the large number of homes who still have no protection what so ever?

Schrire (1995) listed three general categories of false fire alarms: accidental, malicious or malfunction. He states, " ... the incidence of accidental and malicious alarms can be reduced by better design (the right type of device in the right location) and user training" (Schrire, 1995, p. 21). He further offers that, "Malfunctions can be reduced by increasing equipment reliability, system monitoring, the use of approved equipment and most importantly, by regular testing and maintenance of Automatic Fire Detection (AFD) systems" (Schrire, 1995, p. 21). He concludes, "A fire alarm system may be converted from an asset to a liability if not adequately and regularly maintained" (Schrire, 1995, p. 23).

In 1995, Cholin and Moore wrote that increasing alarm system reliability involves maintaining strict quality assurance over each of the four principal elements that make up the system. These elements are, "...equipment, system design, system installation, and system maintenance" (Cholin & Moore, 1995, p. 50).

The writings of Schrire, Cholin and Moore were influential on this research by providing a correlation between the alarm system itself, and, it's reliability. In other words, a system that is well designed, uses quality components, is properly installed, and, is properly maintained, should operate trouble free and not generate false or unnecessary alarms. The owner of the alarm system, for the purposes of this research, the homeowner, must also have a thorough knowledge of how to operate the system.

An article published in the December 1997 issue of Sprinkler Age magazine titled "Most Americans Ignore Fire Alarms," reported on a study conducted by the National Fire Protection Association (NFPA). The study indicated:

> Although 39% of respondents had had home smoke detectors go off in the past year, only 4% reacted immediately as though there might be a fire. Of the majority (81%) who assumed it was a nuisance alarm, 22% reacted by disabling the detector which is "a highly hazardous action to take," according to Dr. (John) Hall (NFPA assistant Vice president for Fire Analysis and Research). (*Sprinkler Age*, 1997, p. 28)

Quoting Meri-K Appy, NFPA vice president for public education the article states, "Tragically, people often distrust the sound of a fire alarm and assume it's a false alarm, especially in public settings" (*Sprinkler Age*, 1997, p. 28).

The influence of the *Sprinkler Age* article on this research was to reinforce the need for reliable systems that minimize false or unintentional alarms. If we are going to educate the public that they should take every fire alarm seriously, we must ensure that our message does not tell one story, while alarm system performance tells a different one.

Spahn (1990) argues firefighters must be careful not to perpetuate the notion that most, if not all, alarm system activations are false. He writes,

> ... firefighters can not always readily identify the real causes of alarms. They may list "false alarm" or "faulty detector" as the cause when in fact there was a legitimate reason for the activation. Friendly fire and smoke can cause legitimate system trips--this does not imply system problems. (Spahn, 1990, p. 69)

Spahn influenced this research by concluding that although they may not be readily apparent, many legitimate activations of fire alarm systems do occur. In a residential setting these system trips can be caused by smoke from cooking, steam from a shower, etc. In these situations, issues such as system design or installation, discussed by previous authors, may play a role, but the system activated as it was ultimately designed to do.

In 1993, Wieder wrote that the argument made by some in the fire service, that in order to reduce false alarms, the fire department should respond only to confirmed fires, is misguided. He argues:

> This philosophy defeats the purpose of having an alarm system. The primary advantage of an automatic fire alarm is that it provides early detection of fire conditions so that corrective action may be taken before substantial damage occurs. This is particularly true in unoccupied buildings. History has shown time and time again that one of the most significant factors in the development of large loss fires is a delay in the transmission of the alarm to the fire department. (Wieder, 1993, p. 6)

Wieder continues to build his case for response, stating, "Fire departments can not afford the risk of waiting for confirmation of a working fire before responding to an alarm activation" (Wieder, 1993, p. 6). Among the reasons he presents are, "An incipient fire may grow into an uncontrolled fire in the time it takes the fire department to respond" (Wieder, 1993, p. 6). He also discusses various options with regard to response assignments and response modes that departments employ for responding to activated fire alarms, and, presents some advantages and disadvantages of each.

Wieder addresses yet another issue that is central to the debate in Vineland: how do you handle the situation of a call, from a building occupant, reporting a false alarm, that is received prior to arrival of the fire department? He concludes that, "At least one company should be sent to the scene to confirm that there is no emergency present. This may be done at a non-emergency rate" (Wieder, 1993, p. 7).

Wieder influenced this research by reinforcing the notion that prompt notification of the fire department is an essential component of any fire detection system. Having a system that activates, yet does not alert the fire department, is placing the property at risk and significantly increases the possibility that the fire will cause significant damage. Wieder also exerted influence by his advocacy that the decision that the fire department needs to make is not whether they should respond or not, but rather how much apparatus and personnel they should dispatch, and, how those resources should respond.

Earlier this year, Brannigan, (2001), weighed in on the issue when he wrote:

> I believe that the fire department should require notification of all alarms. Perhaps a reduced assignment could be sent initially and could be built up to a full assignment when the fire is confirmed. This might satisfy management's objection to having a huge response to an accidental alarm. Some will object: "We always go out on the first notification." The difficulty with that position is that the first notification might be when a fully involved fire attracts attention from several blocks away. (Brannigan, 2001, p. 155)

The influence provided on this research by Brannigan was significant by virtue of his stature as one of the fire service's foremost experts on building construction, and, its relationship to fire operations. He states in the same article a quote that has become his signature, *"The*

building is your enemy. Know your enemy" (Brannigan, 2001, p. 155). It would not be difficult to conclude that the best way to deal with the "enemy" is to ensure that whenever possible, we stack the deck in our favor by ensuring prompt detection of the fire, and, immediate response by the fire department. In this way fire situations can be mitigated before the issues inherent to building construction, and, the destructive effects of fire on that construction, become significant.

Hershfield (1995) states, "Fire officials don't always agree on everything, but they are unanimous on at least one point: False alarms are a big problem" (Hershfield, 1995, p. 46). She states that more than one third of the more than one million false alarms that fire departments respond to annually are the result of malfunctioning automatic alarm systems. She goes on to discuss the quandary that faces many fire service leaders: how to deal with an ever increasing number of responses from fire alarm systems whose installation the fire service has encouraged, and, in some cases mandated.

Hershfield also discusses the hazards associated with response to fire alarm activations that ultimately are determined to be false. From 1984 through 1993, 26 U.S. firefighters were killed while responding to false alarms. Eleven fatalities were the result of alarm malfunctions, and, five were for other unintentional incidents (Hershfield, 1995, p. 48).

Hershfield presents some solutions to the false alarm problem, most notably the issuing of fines or penalties for repeat false alarm activations. She also writes on a radical solution, proposed by Denver, Colorado Fire Chief Rich Gonzalez who was considering a "no response" policy. Under Chief Gonzalez's proposal, the Denver Fire Department would not respond to a fire alarm activation, unless it also received a call reporting a fire. Chief Gonzalez stated, "We conducted a survey and 100 percent of the time we got alarms with no confirming calls, they were false alarms. Every time we got a confirming phone call, it was a real fire" (Hershfield, 1995, p. 48).

Hershfield's influence on this research was significant because she provided different perspectives on some of the issues regarding responses to automatic alarm systems. While several authors have presented the risk factors associated with no response or delayed response to alarm systems, she presents the risks associated with response, including some sobering statistics on firefighter fatalities, a concern that certainly can not be taken lightly. She also discussed, among other strategies for reducing alarm responses, a radical solution under consideration in Denver. This segment of the article is significant in that although she mentions this option, Hershfield does not state that she advocates this approach, and, the article does not state whether this procedure was ever implemented in Denver. Finally, she was the first writer to discuss using fines or penalties as an enforcement tool for dealing with repeat false alarm offenders.

Lobeto, (1996), wrote on the dangers associated with fire departments falling victim to "the boy who cried 'wolf'" syndrome (Lobeto, 1996, p. 93). He poses the questions, "Have we in the fire service fallen for the same scenario with regard to automatic fire alarm responses?" and, "Do we casually answer these electronic calls for help after growing used to the many times we have responded and there was no emergency?" (Lobeto, 1996, p. 93). He advocates that becoming more familiar with the different alarm systems we may encounter, including those in

private residences, "... will make us better prepared to mitigate automatic fire alarms within these occupancies" (Lobeto, 1996, p. 93).

Peeples, (2000), put a tragic face on Lobeto's concern, writing about a fire in a Memphis apartment building that resulted in two firefighter fatalities. The fire alarm from the building, scene of numerous previous false alarms, started as a trouble alarm, not even a full-blown alarm activation. Unfortunately, a real fire, coupled with firefighter complacency, conspired to produce a deadly result.

Peeples makes a number of recommendations that he concludes will go a long way toward preventing reoccurrences of tragedies such as this. Among them:

> *Treat all automatic alarm activations as potentially life-threatening emergencies.* At some point in your career, one will be. This means, among other things, wearing SCBA, carrying the appropriate tools, placing apparatus correctly, and adhering to predetermined job assignments. (Peeples, 2000, p. 14)
>
> *A risk/benefit analysis may demonstrate that non-emergency response to automatic alarms is prudent.* However, it is unwise to reduce the number of firefighters and apparatus responding below that necessary to place an attack line in operation and perform all necessary truck functions. A single pumper responding with three members cannot begin to perform all the necessary tasks. (Peeples, 2000, p. 14)
>
> *The fire department should not tolerate multiple false alarms.* Alarms are only effective if the public and the fire service take them seriously (Peeples, 2000, p. 16).

Lobeto and Peeples were influential on this research by raising a warning flag with regards to the dangers associated with fire department complacency during response to automatic fire alarm systems. They present strategies and recommendations on how to prevent and/or overcome these risky tendencies. Yet, as with many of the other writers, the issue comes down to ensuring that systems are well maintained, and, function as they were intended to.

Hassan (1999) concluded that adoption of an ordinance, which would assess monetary fines for excessive false fire alarms, would provide an effective remedy to the problem in Prince Georges County, Maryland, a large, combination department. While his paper was not specific as to the number of alarms necessary to trigger fines, or, the amount that would be assessed, he did stress that fines would be only one part of a multi-pronged approach, one of the other key components being public education.

In 1993, Dennis concluded that a false alarm ordinance which assessed a fine of $100 per occurrence for all fire alarm activations beyond three per year, and, $200 per activation after seven in a year, would be an effective part of a multi-faceted program to deal with escalating false alarms in his community, Lake Havasu City, Arizona. Other components of his system include better documentation of the causes of alarm activations, cooperation between various

parties such as installers, system owners, etc., and, evaluation of existing codes regarding installation of detectors. One noteworthy aspect of the Lake Havasu ordinance is that once a fine is assessed, if the owner submits an affidavit that the system was repaired, only an administrative fee of 25 percent of the fine is mandated.

Barnes (1995) recommended that the City of Oneonta, New York adopt a false alarm ordinance to combat the strain being placed on his department by responses to false fire alarms. His seven point program included fines ranging from $50 for the fourth false alarm in a year, to $100 per activation for every alarm over six in any given year. The other points of his program include ensuring that any false alarm ordinance defines avoidable and unavoidable false alarms, as well as clearly differentiates between residential and commercial systems; mandating the registration of all alarm systems prior to the system going on line; requiring that plans for new systems be submitted prior to installation, that installation be completed only by a licensed alarm installer, and, an inspection be performed by the fire department prior to the system being registered; and, that preventative maintenance inspections be performed and appropriate preventative maintenance certificates filed with the Code Enforcement office (Barnes, 1995, p. 20). The most interesting recommendation that he makes with regards to his proposed ordinance is his recommendation #2 which states, "Include within the structure of any ordinance incentives that encourage citizens to continue to install and maintain alarm systems that will enhance the community public protection system. This as opposed to strictly a punitive approach to enforcement of the ordinance" (Barnes, 1995, p. 20).

Hoover (1997) also recommended that an ordinance be adopted in Fargo, North Dakota to charge for nuisance alarms. The fees that he proposed range from $100 for the fourth activation to $500 for every activation from the sixth and above. He states, however, "The purpose of charging for nuisance alarms is not to generate revenue, but to encourage owners to fix or update problem systems" (Hoover, 1997, p. 20). As with the other writers, Hoover advocates the assessment of penalties as part of an overall strategy to reduce false, or, nuisance alarms. These strategies include increased public education regarding the problems and dangers associated with responses to false fire alarms; better collection and analysis of data associated with responses to automatic fire alarms; and, reducing the fire department's response to alarm system activations, not accompanied by a confirming phone call, to a single engine company.

Response to false fire alarms, and, the search for solutions to this problem is not just limited to the United States. In 1998, Killalea, reported that 43.7 percent of incidents responded to by the Tasmania, Australia Fire Service, in 1996/97, were false alarms. He proposes a ten point program to address this issue, one component of which is to levy fines for false alarms against both the system owner and system maintenance company (Killalea, 1998, p. 26). He further advocates that the fines assessed should, "... be increased to reflect the true cost of responding to false alarms" (Killalea, 1998, p. 26). Like the other authors, Killalea's proposals include increased public education efforts; training and licensing alarm installers; encouraging building owners to update their systems; and, better data collection and analysis with an eye toward further risk management assessments. He also advocates a more proactive research role for the fire service, in cooperation with alarm manufacturers and installers, in developing improved alarm systems

The writings of Hassan, Dennis, Barnes, Hoover, and, Killalea influenced this research by adding the perspective of using the imposition of fines or penalties as a motivational or enforcement tool to deal with locations which generate multiple false, or, nuisance alarms. All of these writers, with the exception of Hassan, also emphasized the fact that the imposition of fines or penalties must be just one component of a multi-faceted approach to dealing with a multi-faceted problem. Interestingly, none of these authors reported how effective their false alarm ordinances have been, perhaps, because in most cases the ordinance was either at the recommendation or proposal stage, or, had only recently been enacted so no comparative data was yet available.

In conclusion, the literature review makes it crystal clear that increasing responses generated by automatic fire alarms, and, false alarms in particular, are a complex yet troubling issue for the fire service. However, certain common threads seem to run through most of the works that have been written on the subject. First, a properly designed and installed system, that uses quality components, and, is installed by a qualified installer is critical. Second, system owners must be thoroughly knowledgeable in the operation of their systems, and, must ensure that they are properly maintained. Third, the fire department must have a good knowledge of these systems, must thoroughly document the causes of all activations, and, must work to better educate the public and system installers and maintainers on the importance of reliable systems. Fourth, motivational or enforcement procedures must be in place to address problem systems. Finally, the fire service must respond promptly to these fire alarm activations as if they were an actual fire, although, some type of modified response procedure may be warranted if there is no confirming phone call, or, if a call is received reporting a false alarm.

PROCEDURES

The research process used in preparing this report began with a comprehensive literature review to determine what had already been written on the subject of fire department response to residential fire alarms. The research involved reviewing fire service textbooks, fire service trade journals and magazines, newspapers, applied research projects on related topics, and, other pertinent sources of information. The literature review commenced at the Learning Resource Center (LRC), at the National Emergency Training Center (NETC), in April 2001. Additional material was obtained from the LRC through the United States Postal Service in August 2001. A second research visit to the LRC on the NETC campus was made in October 2001. Additional literature reviews were conducted at the Vineland Fire Department, Cumberland County Fire Training Center, and, in the author's personal library between May and September 2001.

Anne Marie Barsotti, Deputy City Clerk, City of Vineland, provided background information on the legal establishment of the city and the fire department. This interaction had occurred in May 1998, in conjunction with a previous educational endeavor.

John W. Carr, retired Captain, Vineland Fire Department, and, the unofficial department historian, was interviewed in July 1999 to obtain background information on the city, and, the fire department, and, again on October 16, 2001, on the evolution of alarm system responses by the department.

Kevin Cimeno, Community Mitigation Analyst for the Insurance Services Office (ISO), Marlton, New Jersey field office was interviewed by telephone on October 24, 2001 regarding ISO's position and/or regulations related to fire department response to residential fire alarm systems, and, whether the fire department's policy on this issue could impact the community's ISO rating. George Castellini, New Jersey licensed insurance provider, a Certified Protection Professional (CPP), and, the owner of U.S. Central Systems, an alarm system installer, was interviewed by telephone on October 30, 2001 as to whether the discount offered to homeowners, by insurance companies, for monitored fire alarm systems, was affected by the response policies of the fire department. Additional insight on alarm system installation and maintenance was also provided.

George Miller, Bureau Chief, Fire Code Enforcement, New Jersey Division of Fire Safety was interviewed by telephone in late September 2001 to determine if the Division of Fire Safety had a formal position on this issue. Heather Schafer, Executive Director, National Volunteer Fire Council was contacted, through e-mail, on September 29, 2001 also to determine if her organization had formal position on this issue. Mark Light, Deputy Executive Director, International Association of Fire Chiefs was posed the same question(s) during a phone interview on November 15, 2001. At the author's request, this question was also posed to Robert Brower, Executive Vice President, New Jersey State Fireman's Mutual Benevolent Association (FMBA), by Vineland Fire Department Captain Fred Mastrogiovanni, on November 7, 2001, while discussing unrelated issues.

Kevin Kirchner, Construction Code Official, City of Vineland provided background information on BOCA code requirements regarding residential smoke detectors, in October 2001. Larry Neibauer, President and Executive Director of the Automatic Fire Alarm Association was interviewed by phone on November 1, 2001, to obtain additional information, and, insight into the entire issue of residential alarm systems including detector selection, replacement, and, verification of alarm systems. Tom Bossong, Central Station Manager for Slomins Security provided information, by telephone, in the Summer of 1998, regarding the frequency of fire alarm system upgrades during installation of basic security systems.

Andy Fritz, Supervisor, National Fire Incident Reporting Unit, New Jersey Division of Fire Safety was interviewed while he and the author attended a class together at the Atlantic County New Jersey Fire Training Center on October 2, 2001. A follow-up phone interview occurred in late October 2001. The purpose of these discussions was to determine what statistical information might be available from NFIRS relative to this subject.

Kenny Heitzman, Fire Marshal, Midwest City, Oklahoma Fire Department provided information on the effectiveness of reducing alarm responses by issuing penalties for repeat false alarm offenders during a phone interview on November 15, 2001. This interview was conducted during a follow-up phone call in reference to the first survey referenced below.

Lee Richardson, National Fire Protection Association Staff Liaison for NFPA 72 was interviewed by phone on November 21, 2001 regarding the rationale that supported the decision by which the verification provision in that document was adopted. A follow-up phone call occurred on November 27, 2001. Daniel Andrus, Fire Marshal, Salt Lake City, Utah Fire

Department, and, member of the NFPA 72, Technical Committee on Household Fire Warning Equipment was interviewed by phone on November 26, 2001 to gain additional insight into the committee's rationale behind permitting verification only of residential alarm systems.

J. Curtis Varone, Deputy Chief, Providence, Rhode Island Fire Department and Attorney at Law provided information on several occasions, via telephone and e-mail, in reference to the legal implications of fire department verification and response policies.

Two survey instruments were utilized to gather information for this research, from two vastly different groups. The first instrument titled "Residential Fire Alarm Verification and Response Survey" was developed to gather information from other fire departments on their procedures, practices, and, experiences, relative to response to residential fire alarm systems (see Appendix A). In addition to standard background data, the information sought included: the percentage of overall fire responses that were for automatic fire alarm activations; more specifically, the percentage of those responses that were for residential systems; what the primary causes of residential fire alarm activations were; how often the department performed some type of service at these incidents; whether the department permitted verification of residential alarm systems prior to fire department notification along with additional follow-up questions on this topic; whether response to every alarm, or, verification presented the greater liability; how the department responds to residential fire alarm activations; and, how the department deals with repeat false alarm offenders.

The Web site of the United States Census Bureau was consulted to obtain all cities in the United States whose population is between 47,000 and 67,000. This range was chosen because it provided information on departments that serve communities that are similar in size to the City of Vineland. Using communities that are similar in size to Vineland should add additional credibility to the results, and, will assist with refuting arguments that we are not Philadelphia or New York, if larger cities were used as the basis for the survey. Names of fire chiefs and addresses for the fire departments being surveyed were obtained from the National Directory of Fire Chiefs and EMS Administrators.

A total of 203 surveys were mailed out to fire departments in 43 states, of which 201 are assumed to have been delivered. Two surveys were returned as undeliverable. A total of 81 surveys (40.3 percent) were returned. Of these, 67 (82.7 percent of those returned, and, 33.3 percent of those mailed) were evaluated for this research. The 14 surveys that were not evaluated (17.3 percent), were excluded because the population that the fire department reported in Question #1B did not fit within the established population criterion. Of the surveys excluded, the population on 12 of the surveys exceeded 67,000, while two surveys listed a population less than 47,000. Appendix B provides further demographic information about the fire departments responding to the survey.

The second survey instrument, which was titled "Residential Fire Alarm--Homeowner Input Survey" was prepared to gather essential elements of information from homeowners in the City of Vineland, who had required a response by the fire department to their home alarm system (see Appendix C). In addition to basic background data, the information requested in the survey included: whether the homeowner had tried to stop the fire department's response; and, if so,

why; whether the fire department provided any service to the homeowner during the incident; if the homeowner knew that the fire department could provide certain services would their opinion regarding mandatory response be different; whether they would be more receptive to a limited response by the department; and, if they had children who stayed home alone, would they want them to be able to stop a response by the fire department.

According to National Fire Incident Reporting System (NFIRS) records, in the one-year period from September 26, 2000 to September 25, 2001, the Vineland Fire Department responded to 303 residential fire alarm activations. Of these, 51 locations experienced more than one activation, accounting for a total of 125 responses. The number of responses to these locations ranged from two to five. All of these residents received a survey. Ten additional addresses were randomly selected from each of the five engine company first due districts in the city. Each of these addresses also received a survey.

In all, a total of 101 surveys were mailed out. While these surveys were sent to a total of 101 residents, they accounted for 175 of the 303 residential alarm responses. Of the 101 surveys mailed out, four were returned as undeliverable. Of the 97 surveys assumed to have been delivered, 53 (54.6 percent) were returned. All were evaluated for this research. Background information obtained from these surveys is provided in Appendix D.

The results of the surveys were entered into a computerized database program (Microsoft Access), tabulated and analyzed. The results of the fire department survey were utilized to assist with answering research questions one through five. The results of the homeowner survey were utilized to help answer research questions one, and, six through nine.

LIMITATIONS

Several factors proved to be limiting factors with regards to conducting this research. First, the majority of research that has been written on the subject of automatic fire alarm systems addresses the subject in broad general terms rather then specifically addressing the issue of residential systems. While the issues, problems, and, solutions may be the same, or, at least similar, there is one critical difference, that is NFPA allows verification only of residential systems. This could provide an opportunity for an authority having jurisdiction to address the problems associated with residential alarm systems simply by choosing to ignore them since they may not have to respond to them.

The first survey instrument, Residential Fire Alarm Verification and Response Survey proved to have several flaws. First, a number of respondents indicated that their fire reporting, or, statistical programs could not separate out residential fire alarm systems from other alarm system responses, and, in a number of cases they could not provide statistics on the primary causes of residential fire alarm activations. This was very surprising considering the amount of information that can be easily extracted from the National Fire Incident Reporting System (NFIRS).

Second, Question #9 proved to be somewhat ambiguous and thus unclear to a number of respondents. This resulted in responses that did not follow logically. As an example, one would not expect the same respondent to state that section 2-4.9.2 of NFPA 72 prevents unnecessary responses, may compromise firefighter safety, and, should be deleted from the standard. The assumption would be that if the respondent felt that the exception prevented unnecessary responses, they would not feel that it should be deleted from the standard. There were several surveys whose responses to this question did not appear to be consistent.

Question #10 was missing the word "and" between apparatus and personnel. This error had no impact on the question. This error has been corrected on the survey (Appendix A) included with this paper.

The survey should have asked an eighteenth question, to determine from respondents if the imposition of fines and/or penalties had been effective at reducing the number of false and/or nuisance alarms. This information would have proved very beneficial to the City of Vineland as it explores whether to enact some type of a false alarm ordinance.

The smaller than expected percentage of surveys returned, could have a statistical impact on the accuracy of the data collected in relation to the overall population being sampled. There are several potential explanations for this situation, both related to the tragic events of September 11, 2001. First, many fire chiefs and fire departments have been devoting significant resources to evaluating and improving their department's capability to respond to and deal with terrorist incidents. As a result, completing a survey on residential fire alarms, for lack of a better term, a relatively routine response, may not be high on the priority list. Second, the City of Vineland is serviced by the United States Postal Distribution Center in Bellmawr, New Jersey. This facility has been closed on several occasions due to anthrax contamination. This closure coupled with the closure of a similar facility in Hamilton Township, New Jersey has impacted mail flow in this area. As a result, it is possible that an unknown number of surveys being returned are sitting in mail that is suspected of being contaminated.

The "Residential Fire Alarm--Homeowner Input Survey" was sent to a nonrandom population, that is homeowners whose alarm systems had activated within the previous twelve months, resulting in a response by the fire department. Because they had experienced an activation of their system that resulted in a response by the fire department, their responses may tend to be more subjective. More reliable statistical information could have been obtained had the much larger population of all homeowners who have alarm systems been sampled. However, there is no way, at the present time, to obtain this broader statistical base of information. The results, therefore, should not be construed as being representative of residential fire alarm system owners in general, or, the overall population of the City of Vineland.

Both survey instruments ask respondents to provide input on whether they consider specific causes of alarm system activations, such as smoke from cooking/burnt food, to be false alarms. Respondents had to answer yes or no to each choice. In retrospect, the choices should have been identical on both surveys, rather than somewhat different. It was assumed for instance that fire service personnel would consider an alarm system malfunction to be a false alarm, therefore, that question was not posed to them, but, it was to the homeowners. Statistically, this

difference was not significant to the research results. However, had both surveys asked the identical questions, additional statistical comparison would have been possible.

DEFINITIONS

Residential Fire Alarm System. An automatic fire alarm system, installed in a one or two family dwelling, and, which, when activated into the alarm mode, transmits an alarm signal or message to a central monitoring station, or, an emergency services dispatch center.

False alarm. An alarm that is transmitted for no apparent or justifiable reason due to a system or component malfunction, a maintenance problem such as dirty detectors, or, a malicious action.

Accidental alarm. An alarm that is activated by a legitimate cause other than an uncontrolled fire situation. Activations which may fall into this category include smoke from cooking, candles, fireplace, etc., steam from the shower, or, accidental activation of a panic button on an alarm panel.

Nuisance alarm. Any alarm, either accidental or false, that results in multiple responses by the fire department for the same problem, or, cause of activation.

Emergency speed response. Fire department units responding with all audible and visible warning devices in operation.

Reduced speed response. Fire department units responding with no audible or visible warning devices in operation. Units travel with the normal flow of traffic, and, obey all traffic laws.

RESULTS

1. What are the primary causes of residential fire alarm activations, and, what percentage of time does the fire department provide some type of service at these incidents?

The "Residential Fire Alarm Verification and Response Survey," and, the "Residential Fire Alarm--Homeowner Input Survey" were both utilized to answer this question. According to the first survey, the primary causes of fire alarm activations are, in descending order: malfunction of the system, smoke from cooking or burnt food, accidental activation not otherwise specified, smoke from fireplaces or candles, steam from the shower, and, actual fires. Table 1 provides details on the minimum, maximum and average percentages of alarm responses by category reported by the survey respondents. It is important to note that not all departments surveyed provided this information, and, those that did used various methods to calculate and report the data.

Table 1
Causes and Percentages of Residential Fire Alarm Activations Reported by Fire Departments

Cause of alarm activation	Minimum %	Average %	Maximum %
Actual fire	0%	2.8%	30%
Smoke from cooking/burnt food	0%	26.5%	98%
Steam from a shower	0%	3.7%	25%
Smoke from fireplace, candles, etc.	0%	4.1%	20%
Other accidental activation	0%	23.8%	100%
Malfunction of system	0%	31.2%	90%

Table 2 identifies the causes of alarm system activations responded to by the Vineland Fire Department, as reported by the homeowners who responded to the "Residential Fire Alarm--Homeowner Input Survey." Smoke from cooking or burnt food accounted for 56.4 percent of the 101 total responses reported. Other causes included system malfunction 18.8 percent, steam from a shower 11.9 percent, other activations 9.9 percent, performing system maintenance 2 percent, and, actual fire 1 percent.

Table 2
Causes of Fire Alarm Activations Reported by Homeowners

Actual fire	1
Smoke from cooking/burnt food	57
Steam from a shower	12
Alarm system malfunction	19
Performing system maintenance/cleaning	2
Other activation	10

Of the fire departments who responded to the survey, the percentage of time that they provided some type of service during a response to a residential fire alarm activation ranged from 0 percent to 100 percent of the time with 68.7 percent of responses being the average (see Appendix B).

According to the homeowners who responded to the survey, 19 of 53 respondents (35.8 percent) reported that the fire department provided some type of service to them, while 34, (64.2 percent) reported that the fire department did not provide any service. Table 3 provides details

on the types of service that the fire department may have provided. Homeowners could select more than one choice to properly reflect instances when more than one service was provided.

Table 3
Fire Department Services Provided to Homeowners

Fire Department provided some type of service		19
	Type of service provided	
	Extinguish fire, or, check for extension	2
	Assist with removing smoke/ventilating	3
	Assist with determining cause of alarm activation	12
	Assist with restoring system to proper working order	5
	Educate homeowner and provide information on proper placement of detectors to minimize unintentional activations	5
	Provide loaner smoke detectors if alarm system was placed out of service	0
Fire Department provided no service		34

Surprisingly, when homeowners were asked a follow-up question regarding if they knew that the fire department could provide such services, would they or would they not want them to respond, a slight majority, 25 of 48 (52.1 percent), who answered the question stated they would want the fire department to respond to make sure that everything was OK. The remaining 23 respondents (47.9 percent) stated they would still want to be able to decide if a fire department response was necessary.

Table 4
Homeowners Opinion on Service Based Response

Homeowners surveyed who would want the fire department to respond to make sure that everything was OK	25
Homeowners surveyed who would still want to be able to decide if a response by the fire department is necessary	23

2. How many fire departments, which serve communities similar in size to Vineland, permit verification of residential fire alarm systems, prior to dispatch of the fire department?

The results of the "Residential Fire Alarm Verification and Response Survey" showed that of the 58 fire departments whose surveys provided an answer to this question, 45 (77.6 percent) reported that they do not allow verification of residential fire alarms prior to response,

as permitted in the 1996 edition of NFPA 72. Of those departments, 27 (60 percent) enforce this prohibition by fire department policy, 7 (15.5 percent) utilize some type of statute or ordinance, 3 (6.7 percent) indicated that the prohibition was found in the locally enforced fire code, and, 4 (8.9 percent) stated that enforcement was by some other means. Four departments (8.9 percent) did not specify how they enforced their prohibition.

Thirteen fire departments (22.4 percent) allow verification of residential fire alarms prior to response. Of these, only 1 (7.7 percent) reported that they had ever had a fire that caused significant property damage due to verification of a residential alarm system. None of the departments that permit verification reported ever experiencing a serious firefighter or civilian injury or death as a result of a fire that involved a verified fire alarm. Table 5 provides a breakdown on the verification policies and experiences of departments surveyed.

Table 5
Fire Department Policies and Experiences With Verification of Residential Fire Alarms

Departments that do not permit verification of residential alarms		45
	How departments enforce this prohibition	
	Fire Department policy	27
	Statute or ordinance	7
	Locally enforced fire code	3
	Other method(s)	4
	Did not answer	4
Departments that do permit verification of residential alarms		13
	Departments which allow verification and experienced a serious fire as a result of an incident that was initially verified as "no problem," or, "no need for the fire department to respond."	
	Fire that caused significant property damage	1
	Serious civilian injury	0
	Civilian fatality	0
	Serious firefighter injury	0
	Firefighter fatality	0

3. **How do fire departments, serving communities similar in size to Vineland, view the potential conflicting liabilities associated with responding to, or not responding to, activations of residential fire alarm systems?**

Of the 63 departments whose surveys reflected an answer to this question, 39 (61.9 percent) responded that they felt that allowing untrained civilians to determine if they had a problem when their alarm activates presented a greater liability to their department. Twenty-four

departments (38.1 percent) felt that responding to every call, even those reported to be false, was a greater liability, since they had personnel and apparatus on the street in a response mode. Table 6 provides the breakdown discussed above.

Table 6
Fire Department Responses on Conflicting Liabilities

Departments that feel that allowing untrained civilians to decide if they have a problem when their alarm activates is a greater liability.	39
Departments that feel having apparatus and personnel on the street in a response mode, responding to every alarm activation, including those that are reported to be false, presents the greater liability.	24

The departments who responded to the survey overwhelmingly felt that protection of property was an important part of the function of a residential fire alarm system. The question was posed to those surveyed asking if they felt that once an alarm system activates and notifies the occupants of a residence of a potential problem, as long as they escape, that it has performed it's job, and, reducing or eliminating property damage through a prompt response by the fire department is not a consideration because the insurance company will pay without question. Fifty-six departments (93.3 percent) reported they did not agree with this position, while only 4 (6.7 percent) stated that they agreed. Table 7 reflects responses to this question.

Table 7
Fire Department Responses on Property Conservation Function of Alarm Systems

Departments surveyed that feel that the purpose of alarm systems is only to alert occupants of a fire and allow them to escape.	4
Departments surveyed that feel that the purpose of alarm systems is to alert occupants of a fire and allow them to escape, and prevent or minimize property damage.	56

Departments were also queried on how they felt about the notification exception found in Chapter 2-4.9.2 of NFPA 72, 1996 edition. Table 8 provides details regarding whether departments felt that this exception prevented unnecessary responses, may compromise firefighter and public safety, and, whether it should or should not be deleted from the standard.

Table 8
Fire Department Opinions on Chapter 2-4.9.2 of NFPA 72, 1996 Edition

Chapter 2-4.9.2 of NFPA 72:	YES	NO
Prevents unnecessary responses	31	12
May compromise firefighter and public safety by potentially delaying response by the fire department to actual fires	33	13
Should be deleted from the standard	20	25

The answers to this question yielded some of the more interesting results of the study. Forty-three departments answered the question on unnecessary responses, with 72.1 percent of them stating that they felt the standard prevented unnecessary responses, while 27.9 percent felt that it did not. Yet (71.7 percent) of the 46 departments who responded to the question on whether the standard compromised firefighter and public safety stated that they believed it did, while only 28.3 percent felt that it did not. Regarding whether this section should be deleted from the standard, the results were much closer with 44.4 percent of the 45 departments who answered the question responding yes, and, 55.6 percent responding no. While it is impossible to clearly interpret the intentions of the departments that provided a response to this question without further follow-up research, the variations, and, apparent inconsistencies in the answers help to illustrate the complexities that surround this issue.

4. How do fire departments, serving communities similar in size to Vineland, respond to activations of residential fire alarm systems?

Of the 67 fire departments that responded to the survey, 28 (41.8 percent) normally dispatched two engines, one ladder, and, one chief on residential fire alarm activations, while one department (1.5 percent) dispatched the same apparatus but with no chief officer (see Table 9). Eighteen departments (26.9 percent) dispatched some type of assignment other than the choices listed in Table 9, although a number of those departments that selected this choice indicated that they dispatched two engines, and, either a squad or a rescue in place of a ladder. Thirteen fire departments (19.4 percent) dispatch a single engine, five departments (7.5 percent) dispatch one engine and one ladder, and, two departments (3 percent) respond with one engine, one ladder and one chief. No departments reported that they sent only a chief officer, or, the police department to investigate.

Table 9
Apparatus Normally Dispatched to Residential Fire Alarms

1 Engine	13
1 Engine, 1 Ladder	5
1 Engine, 1 Ladder, 1 Chief	2
2 Engines, 1 Ladder	1
2 Engines, 1 Ladder, 1 Chief	28
Chief or other officer only	0
Police Department response only	0
Other	18

Table 10 provides details on what type of response mode fire departments utilize when responding to residential fire alarms. The largest percentage of departments, 42 out of 65, (64.6 percent) have all units respond at emergency speed, that is using audible and visible warning devices. Eighteen departments (27.7 percent) report that the first due unit responds at emergency speed while all other units respond at reduced speed. Two departments (3.1 percent) require all units to respond at reduced speed, and, three respondents (4.6 percent) indicated that they responded in some other manner.

Table 10
How Fire Departments Reported that They Respond to Residential Fire Alarms

All units at emergency speed (lights and siren)	42
First due unit at emergency speed, all other units at reduced speed (no lights or sirens)	18
All units at reduced speed	2
Other	3

When units are responding to a residential fire alarm activation, and, were subsequently notified that the alarm had been activated accidentally, or, was false, 49 departments (87.5 percent) reported that they modified their response, while 7 departments (12.5 percent) did not modify their response. Table 11 provides additional details on how departments modify their response when they receive updated information. It is important to note that several departments listed more than one possible option for modifying their response, usually based on the discretion of the first due or chief officer responding.

Table 11
How Fire Departments Modify Their Response if Additional Information is Received

Departments that modify their response based upon additional information received that the alarm is accidental or false			49
	How departments modify their response		
	First due engine continues at emergency speed, all other units reduce speed	11	
	All units proceed at reduced speed	3	
	Return all units except first due engine	28	
	Return all apparatus, chief proceeds in to investigate	1	
	Return all units, no further response or investigation	6	
	Other	4	
Departments that do not modify their response when additional information is received while enroute			7

5. How do fire departments, serving communities similar in size to Vineland, deal with repeat false alarm offenders?

The first step in answering this question is to determine what fire departments surveyed consider to be a false alarm. Of 54 departments which answered this question on the survey, 48 (88.9 percent) do not consider smoke from cooking or burnt food a false alarm, while the remaining six (11.1 percent) do. The difference in opinion is not as great for smoke from candles, fireplaces, etc. Thirty-eight respondents (70.4 percent) stated that they did not consider these activations to be false alarms. Sixteen departments (29.6 percent) would classify an activation caused by these kinds of smoke as a false alarm. Conversely, only 17 departments surveyed (31.5 percent) do not consider steam from a shower to be a false alarm, while 37 (68.5 percent) would classify this situation as false. Table 12 illustrates these figures.

Table 12
How Fire Departments Classify Residential Fire Alarm Activations

Cause of Activation	False	Not False
Smoke from cooking/burnt food	6	48
Smoke from candles, fireplace, etc.	16	38
Steam from a shower	37	17

The question of how to handle repeat false alarm offenders produced a range of answers and solutions as detailed in Table 13. For this question, departments could select multiple answers as may be applicable to their situation, or, if they used a progressive system to deal with problem alarms. Also, a number of departments who listed that they issue a citation or violation under a local fire code or ordinance also checked a specific number of false alarms that they permitted before assessing penalties. A breakdown of false alarms permitted prior to issuance of penalties is shown in Table 14.

Several results found in Tables 13 and 14 are interesting. First, only 43 of 67 departments surveyed (64.2 percent) reported that they educate residents on proper detector placement, system maintenance, etc. It would seem logical, that if a department had an alarm system that seemed like it was, or could become, problematic, that educating the system owner would be an important first step in addressing the problem. Yet more than one out three respondents (35.8 percent) either did not answer this question, or, did not select this option. Second, 30 departments (44.8 percent) utilized fines or penalties to address repeat false alarm offenders. This could indicate that hitting owners in their wallets is an effective remedy, when education or gentle coaxing fail. Finally, not a single department surveyed answered that they would discontinue response to a location because of excessive false alarms. One could draw a definite inference from this result that no matter how many false alarms a system has generated, the fire department still has a duty to respond, and, would face significant liability if they did not, and, that activation was the one caused by a real fire.

Table 13
How Fire Departments Handle Repeat False Alarm Offenders

Educate resident(s) regarding detector placement, system maintenance, etc.	43
Issue citation/violation notice under local fire code or ordinance	17
Issue fines/penalties	21
Reduce response to that location	1
Discontinue response to that location	0

Table 14
Number of False Alarms Fire Departments Permit Prior to Assessing Fines/Penalties

None	2	Six	3
One	2	Seven	0
Two	2	Eight	1
Three	13	Nine	0
Four	3	Ten	0
Five	1	More than ten	3

6. Do most homeowners who experience a fire alarm activation, try to stop the response of the fire department, and, if so, why?

The vast majority of homeowners who answered this question on the "Residential Fire Alarm--Homeowner Input Survey," 43 of 51 respondents (84.3 percent), reported that they tried to stop the fire department's response to their alarm activation. A number of homeowners also made it a point to put a note on their survey asking that they be permitted to decide if a fire department response is necessary. Table 15 details the reasons why homeowners stated they did not want the fire department to respond. Survey recipients could make more than one selection from this list.

Table 15
Homeowners Who Did/Did Not Try to Stop Fire Department Response and Reasons for This Action

Homeowners surveyed that attempted to notify their alarm company that an alarm was "false," and, stop the response of the fire department		43
	Reasons homeowners surveyed tried to stop fire department response	
	Did not want to inconvenience firefighters	35
	Did not want to tie up fire department on a minor incident	34
	Embarrassment of having fire trucks in front of their home	9
	Fear of being penalized	11
	Belief that they are entitled to decide if a response by the fire department is necessary	14
Homeowners surveyed that did not try to stop the response of fire department.		8

7. If the fire department adopted a limited response policy, would homeowners be more receptive to response by the fire department to all alarm activations?

This question provided the most surprising results obtained from the homeowner's survey. The question was posed to homeowners that if the fire department responded to their home with only one engine, with no lights or sirens, would they, or, would they not, want them to respond to make sure that everything was OK. As shown in Table 16, of forty-eight homeowners who answered this question, 33 (68.8 percent) stated that they would want the fire department to respond. Only 15 homeowners (31.2 percent) stated that they would still not want them to respond.

Table 16
Homeowner Responses on Fire Department Limited Response Policy

Homeowners surveyed that would want the fire department to respond to their home with one engine, with no lights or sirens, to make sure that everything is OK	33
Homeowners surveyed who would still want to decide if a response by the fire department is necessary.	15

8. Do homeowners feel differently about verification of residential fire alarms if they have children who stay home alone?

Table 17 shows the breakdown of responses by homeowners regarding whether they feel that children who are home alone should be able to stop a response by the fire department if the fire alarm system activates. Forty-two people answered this question, with 32 (76.2 percent) stating they would not want children to be able to stop a response by the fire department. Ten of those surveyed (23.8 percent) answered that they would not have a problem with children stopping the response of the fire department.

Table 17
Homeowner Responses Regarding Allowing Children to Stop Fire Department Response

Homeowners surveyed that would want children who are home alone to be able to stop a response by the fire department if they activated their alarm	10
Homeowners surveyed that would not want children who are home alone to be able to stop a response by the fire department if they activated their alarm	32

9. Are insurance rates affected in any way by the verification and response policies of the fire department?

Most insurance companies provide some type of discount on a homeowner's insurance policy for homes that have a fire alarm system (G. Castellini, personal communication, October 30, 2001). These discounts typically range between two percent and fifteen percent depending on the company, with the average being five to ten percent (G. Castellini, personal communication, October 30, 2001). One company that services southern New Jersey provides a rate reduction of two percent if the home has smoke detectors; a discount of five percent if the detectors are hardwired; and, a ten percent discount if the home's fire alarm system is monitored through a central station (G. Castellini, personal communication, October 30, 2001). However, a

number of other factors come into play such as the age of the residence, construction type, and, available water supply (G. Castellini, personal communication, October 30, 2001).

In order for a homeowner to receive the full discount for a monitored automatic fire alarm system, they must present a "Certificate of Monitoring" from their alarm company to their insurance carrier (G. Castellini, personal communication, October 30, 2001). Once this certificate has been presented, the system is considered to be monitored (G. Castellini, personal communication, October 30, 2001). The insurance companies generally do not care if there is verification of the system, prior to response of the fire department (G. Castellini, personal communication, October 30, 2001).

The Insurance Services Office (ISO), likewise does not have any specific regulation or standard that prohibits verification of residential fire alarms, prior to response by the fire department (K. Cimeno, personal communication, October 24, 2001). As a result, the city's ISO rating would not be directly affected by permitting verification, provided that this fact was not reflected on incidents reports that would be reviewed during an ISO evaluation (K. Cimeno, personal communication, October 24, 2001). In short, ISO's position is that if the fire department does not ever receive the call, there is no penalty; however, if they receive notification of a fire alarm activation, they must respond (K. Cimeno, personal communication, October 24, 2001).

ISO does, however, require a minimum response of two engines and one ladder or service truck on all structural incidents, including activated fire alarm systems (K. Cimeno, personal communication, October 24, 2001). There is no distinction between residential and commercial systems (K. Cimeno, personal communication, October 24, 2001). Failure to follow this requirement can result in a sizable reduction, up to 50 percent in some cases, in credits for engines and ladders during an ISO evaluation, depending on the percentage of overall incidents that do not comply with the standard (K. Cimeno, personal communication, October 24, 2001). Compliance with this requirement is determined through review of incident reports for the twelve-month period preceding the evaluation (K. Cimeno, personal communication, October 24, 2001). As long as two engines and one ladder are initially dispatched, the second engine and the ladder can be held in station, or returned, if information received subsequent to dispatch indicates that the alarm is false (K. Cimeno, personal communication, October 24, 2001). This fact and the units that were initially dispatched, and, were held in station, or returned, must be documented on the incident report (K. Cimeno, personal communication, October 24, 2001).

10. Since residential fires still account for nearly 70 percent of all fires, and, a similar percentage of fire injuries and deaths, why are residential fire alarms the only alarms that can be verified according to NFPA Standard?

The 1996 edition of NPFA 72 was the first edition of the standard to contain the provision that permits verification of residential fire alarms prior to retransmission of the alarm to the fire department (L. Richardson, personal communication, November 21, 2001). The focus of the Technical Committee on Household Fire Warning Equipment seemed to be on reducing the number of false or nuisance alarms being generated by these systems, rather than on the fire incident history of residential occupancies.

Several persons involved in the technical committee's deliberations on this subject provided insight into the committee's thinking, and, rationale. Residential fire alarm systems have traditionally been plagued by false alarms, and, it was felt that these unnecessary alarms place firefighters at risk during response (L. Richardson, personal communication, November 21, 2001). The catalyst for the verification provision was the proliferation of residential fire alarm systems, and, the number of nuisance alarms being generated by those systems (D. Andrus, personal communication, November 26, 2001).

The substantiation documentation for the proposal itself made perfectly clear the rational being used to support the verification provision. According to the Report on Proposals prepared for the NFPA's 1996 Annual Meeting:

> The majority of dispatches of public service fire companies to alarms from residential fire alarm systems are false. Screening of calls to determine the cause of the alarm and eliminate those from causes such as smoke detector response to burnt toast, etc. is not presently specifically permitted in the National Fire Alarm Code and there is a growing tendency to require off-premises monitoring stations to retransmit all alarms regardless of their veracity. This places an unnecessary burden on the public fire service and, in some jurisdictions, a financial penalty either on the homeowner for excessive responses to false alarms or on the monitoring station for not retransmitting an obvious false alarm. This proposal is an attempt to address the problem and is based upon the presently accepted practice in many parts of the country. (NFPA 72--A96 ROP, Log #275, p. 154)

Although there was discussion on alternative viewpoints, such as requiring the alarm to be retransmitted to the fire department (D. Andrus, personal communication, November 26, 2001), when voted upon by the full committee the proposal was accepted on a 12-0 vote with one abstention (NFPA 72--A96 ROP, p. 154).

The committee provided additional rationale in support of its decision in the substantiation for another comment, on what actions should be required of a monitoring station after it receives a residential fire alarm, whether or not the alarm is being retransmitted to the fire department. The comment reads:

> The dispatches of these false alarms place an unneeded and unnecessary burden on the communities' fire fighting ability and could result in delays in responding to actual alarms. Since verification calls could be accomplished with a minimum loss of time, it is believed that the substantial reduction in false dispatches could result in enhancing the fire fighting capabilities within each community. The verification call would add a small delay in dispatching on an actual fire condition. However, it is believed that this delay would, on balance, be small and would not affect the outcome significantly (four rings takes about 16 seconds). (NFPA 72--A96 ROP, Log #303, p. 154)

DISCUSSION

Response to a growing number of fire alarm systems is an issue that is confronting fire departments, large and small, career, combination and volunteer, from coast to coast. Trying to achieve a delicate balance between fulfilling our mission to protect the citizens we are charged with protecting, and, reducing what some in the fire service consider to be unnecessary responses is a challenge that many of today's fire chiefs must struggle with. The problem, and its associated issues are multi-faceted and complex, and, the proper solution(s) will be likewise, if not downright elusive. Trying to stretch limited resources, especially the precious commodity of the time of volunteer personnel, is an extraordinarily difficult challenge. However, we must never lose sight of the fact that the two primary objectives of the fire service, the very reason for our existence, are: 1) To save lives, and, 2) Protect property.

According to Ahrens (2000), the technology for widespread use of smoke detectors was developed during the 1960's. Ahrens reports that in 1970, 4 percent of homes in the United States were equipped with some detectors, a figure that rose to 67 percent by 1980, and, 94 percent by 1997. In 1985, McLoughlin wrote that the basic building code administered by BOCA (Building Officials and Code Administrators International) was amended, in 1975, to require smoke detector protection near the bedrooms of all residential properties, one, two, and, multi-family (McLoughlin, 1985, p. 858). This code has been revised several times since with hardwired, interconnected smoke detectors required on each level of the dwelling in 1978, and, hardwired, interconnected detectors required in each bedroom in 1993. The BOCA requirements apply to new construction.

The City of Vineland went further, in February 1979, when City Council adopted Ordinance #1150 "*An Ordinance Requiring the Installation and Maintenance of Automatic Smoke Detectors in Existing Single-Family Detached and Attached Dwellings, Mobile Homes, ..., and Any Other-Type of Dwelling Existing in the City of Vineland;...*". In 1991, the New Jersey Uniform Fire Safety Act (N.J.S.A. 52:27D-192 et seq.), was amended to require smoke detectors in all one and two family dwellings (N.J.S.A. 52:27D-198.1), with, a requirement that a certificate of compliance be obtained prior to any sale, lease, or, change in occupancy occurs (N.J.S.A. 52:27D-198.2).

As America became more security conscious in the 1980's and 1990's, it was only logical that part of a comprehensive home security system would involve the inclusion of smoke detectors that would automatically summon the fire department when activated. Many new homes include complete fire and burglar systems as a standard feature, and, several alarm installers have reported that the installation of a fire system is the number one requested upgrade option, for new home security systems. The problem, however, is that many times, once a system is installed, little thought is given to ongoing maintenance, or, system upgrades, unless there is a problem. This conclusion is supported by the research of Halas (1991), and, Dennis (1993), both of whom concluded that system malfunctions were a leading cause of alarm system activations.

It would seem logical then, that the first area to explore with regards to reducing the number of accidental, false, and, nuisance alarms would be to examine the installation and maintenance of the equipment that has been, or, is being installed. The literature review found

concerns regarding system reliability, and, excessive false alarms, as early as 1973, when Christian and Dubivsky wrote on the subject. Schrire (1995) stated, " ... the incidence of accidental and malicious alarms can be reduced by better design (the right type of device in the right location) and user training" (Schrire, 1995, p. 21). He further offers that, " Malfunctions can be reduced by increasing equipment reliability, system monitoring, the use of approved equipment and most importantly, by regular testing and maintenance of Automatic Fire Detection (AFD) systems" (Schrire, 1995, p. 21). Cholin and Moore (1995) concurred when they wrote that increasing alarm system reliability involves maintaining strict quality assurance over each of the four principal elements that make up the system. These elements are, "...equipment, system design, system installation, and system maintenance" (Cholin & Moore, 1995, p. 50).

Bertschinger (1988) wrote that false alarms, particularly from smoke detectors are often the result of an application for which they are not suited. Dennis's study in Lake Havasu, as well as, the general experience of the Vineland Fire Department, indicates that detectors are often placed in locations where they will experience unwanted activations. Smoke detectors placed just outside of a bathroom door will be susceptible to steam from the shower activations. Likewise, a detector placed in close proximity to the kitchen may be prone to cooking induced alarms.

The results of the "Residential Fire Alarm Verification and Response Survey" disclosed that of fire departments surveyed, smoke from cooking or burnt food accounted for an average of 26.5 percent of fire alarm activations, and, an additional average of 3.7 percent were caused by steam from the shower (see Table 1). Maximum percentages of activations for these categories were 98 percent, and, 25 percent, respectively. The results from the "Residential Fire Alarm--Homeowner Input Survey" were even more pronounced. Smoke from cooking or burnt food accounted for 57 of 101 (56.4 percent) alarm activations reported by those surveyed (see Table 2). An additional 12 (11.9 percent) reported an alarm activation caused by steam from the shower. Both of these totals certainly represent unacceptable numbers. Unfortunately, without a location by location survey of system installations, detector placements, etc. it is impossible to draw firm conclusions on the preventability of all of these incidents, especially those that were cooking related. However, it would be reasonable to make an assumption that a significant number of the 68.3 percent total, of these alarms, could have been prevented with systems whose detectors were better positioned to avoid cooking smoke, and, shower steam.

The 1999 edition of NFPA 72, the National Fire Alarm Code, states in Chapter 8-1.4.2:

> Initiating devices shall be located in areas where ambient conditions are within the limits specified by the manufacturer, and smoke alarms or smoke detectors shall not be closer than 3-ft (1 m) from the door to a bathroom or kitchen. Smoke alarms or smoke detectors that are located within 20 ft (6.1 m) of a cooking appliance and are equipped with an alarm silencing means or are of a photoelectric type shall be considered acceptable. (NFPA 72, 1999, Chapter 8-1.4.2)

The 1996 edition of NFPA 72 had gone even one step further, not permitting smoke detectors within 3 feet of the supply registers of a forced air heating or cooling system, and outside of the airflow from those registers (NFPA 72, 1996, Chapter 2-5.2.1.6). However, this additional requirement was not found in the 1999 edition.

Bunker and Moore (1999), advocate the use of photoelectric type smoke detectors to provide an added resistance against nuisance alarms caused by shower steam, and, cooking smoke. This advocacy is shared by the Automatic Fire Alarm Association, who recommends that old ionization type detectors be replaced with the photoelectric type (L. Neibauer, personal correspondence, November 21, 2001). According to Larry Neibauer, President and Executive Director of the Automatic Fire Alarm Association, virtually every test that has been conducted on smoke detector performance indicates that photoelectric detectors are better suited for detecting the smoke caused by smoldering, or, incipient fires, and, tend to be more immune to nuisance alarms (L. Neibauer, personal correspondence, November 21, 2001). Conversely, ionization type detectors are more adept at picking up flaming type of fires, however, they also tend to be prone to a wide range of unintended activations (L. Neibauer, personal correspondence, November 21, 2001).

Bunker and Moore (1999), however, do stress the need for locations for smoke detector placement to be carefully considered. In New Jersey, the current codes require there to be one smoke detector on each level of the dwelling unit, a smoke detector located in the vicinity of each sleeping area, and, in new construction, a smoke detector located inside each bedroom. Bunker and Moore offer that beyond these required detectors, consideration should be given to installing heat detectors in areas likely to experience frequent nuisance alarms.

The newest technology available in smoke detectors, offers a "smart sensing" system, a nuisance resistant smoke detector that can read smoke conditions ("Smoke Alarm has 'Smart Sensing'," 2001). According to Mark Devine, Vice President of Engineering for First Alert, "Cooking smoke or shower steam behaves differently than smoke from a real fire ("Smoke Alarm has 'Smart Sensing'," 2001). The new system which uses a combination of photoelectric and ionization technology analyzes whether smoke levels are rising or falling, and, then determines if a true emergency exists ("Smoke Alarm has 'Smart Sensing'," 2001). According to the article, "If cooking sets off the alarm, the homeowner just points a TV remote control at the detector and holds down any key for 5 seconds. The unit will be silenced while the smoke dissipates" ("Smoke Alarm has 'Smart Sensing'," 2001).

McHenry (2000) reported on a comprehensive fire alarm guideline and checklist that is being used by the City of Cheyenne, Wyoming to attempt to mitigate installation problems with new systems that usually result in years of nuisance alarms. The process involves insuring proper design of systems, and, a comprehensive plan review process, with approval(s), prior to system installation. Barnes (1995) proposed several of these same solutions for the City of Oneonta, New York. However, he went one step further by recommending that all new fire alarm installations be inspected by the fire department, prior to the system being registered, and, being placed on line.

There is no rational explanation why these processes should not work in the City of Vineland. If not already required by the provisions of the Uniform Construction Code, the city should explore the feasibility of requiring the issuance of a construction permit for the installation of any new fire alarm system. While potential turf issues would need to be addressed and rectified, through a cooperative effort between the Fire Department, and, the Department of Licenses and Inspections, an intensive plans review process should be initiated for all fire alarm systems, but in particular residential systems which are more likely to slip through the cracks. Every system should be subjected to a comprehensive acceptance inspection and test, prior to issuance of a certificate of approval permitting the system to go on line.

The issues of selection and placement of smoke detectors in the residential application go to the heart of the various issues that surround verification and response to these systems. It is not difficult to conclude that if systems are properly installed in the first place, using quality components, and, properly selected and placed detection devices, the incidences of nuisance alarms will be greatly reduced, and, as a result, so will fire department responses. However, insuring that new systems are properly installed is just one part of the equation. Maintenance, and, if necessary, upgrading existing systems is another important key.

The "Residential Fire Alarm Verification and Response Survey" revealed that an average of 31.2 percent of the residential alarm systems responded to, by the departments surveyed, were the result of an alarm malfunction (see Table 1). One department reported that 90 percent of these responses were for malfunctioning systems. The "Residential Fire Alarm--Homeowner Input Survey" indicated a response rate of 18.8 percent for alarm malfunctions (see Table 2). Once again, the implication appears to be that a significant reduction in responses can be made, if, the fire department, with the support of the city, takes aggressive action to identify problem systems and take corrective action.

Kirby (1998), noted:

> As for maintenance, smoke detectors tend to be more sensitive when they're dirty. A brand new detector, immune to nuisance alarms in an environment containing trace amounts of tobacco smoke when it's first installed, may become prone to such alarms as it ages, especially if it isn't cleaned. (Kirby, 1998, p. 2)

He goes on to state, "many new smoke detectors have a feature called "drift compensation" which offsets dirt buildup to maintain stable sensitivity, and many actually send a message to the control panel when they need to be cleaned" (Kirby, 1998, p. 2).

Both the 1996 and 1999 editions of NFPA 72 require that residential fire alarm systems be tested on regular basis by the homeowner. The 1996 edition adds that testing shall be in accordance with manufacturer's instructions (NFPA 72, 1996, Chapter 2-6.2.2). More importantly, both editions of the standard require that a qualified service technician test the system at least every three years. Enforcement of this provision of the standard will force homeowners to have their systems inspected, tested, cleaned, and, upgraded if necessary.

Another important provision of the 1999 edition of NFPA 72 is found in Chapter 8-3.5 which states, "... smoke alarms installed in accordance with ... but shall not remain in service longer than 10 years from the date of installation" (NFPA 72, 1999, Chapter 8-3.5). While it would take several years to realize its full benefits, this requirement, if enforced, should result in substantial reductions in nuisance alarm activations, as old detectors are replaced with newer, more sophisticated technology.

The City of Vineland already has an ordinance that requires registration of burglar and/or security systems. If this ordinance does not already include fire alarm systems, it would be a fairly simple process to amend it to do so. Perhaps even better, if the city decides to adopt a fine or penalty for repeat false alarm offenders, as will be discussed later, the registration could be included as a component of that program, which should address the residential fire alarm issue in a comprehensive manner. Since the requirement in NFPA, is for the system to be tested and inspected by a qualified service technician every three years, it would make sense to make the registration valid for three years; and, make one of the conditions for registration renewal be that a certificate of testing and inspection is presented from a certified or licensed alarm technician. Part of the inspection process could be a requirement certifying that all smoke detectors more than ten years old have been replaced.

Enforcement of the testing and inspection requirements of NFPA 72, coupled with registration of fire alarm systems, and, training fire department personnel to thoroughly investigate the alarms to which they respond, to attempt to determine an accurate cause of activation and pinpoint potential problem detectors, will not eliminate the false alarm problem, but, it should reduce it significantly. These actions, taken in conjunction with strict enforcement of installation guidelines for new systems, could potentially eliminate 87.1 percent of the alarm activations reported by the homeowner survey respondents (56.4 percent for cooking, 11.9 percent for shower steam, and, 18.8 percent for system malfunctions). This reduction equates to nearly 88 of 101 responses, or, carried out over the entire 303 residential fire alarm responses the department made in the target 12-month period, a reduction of 264 responses. If a more realistic assessment of potential impact is made, and, it is therefore assumed, that these measures eliminate 75 percent of the target responses, a reduction of 198 out of a potential 264 responses could be realized. This reduction would equate to a nearly two-thirds reduction in the overall responses to residential fire alarm systems.

The issue of complacency with regards to fire alarm activations, both from the perspective of the public, as well as, the fire department, is another area of great concern. Bertschinger (1988) wrote:

> The frequency of false alarms has become a real problem for municipal fire departments, building owners, and building occupants. Not only do they absorb fire department resources, but they also condition people to ignore the fire alarms that are triggered by a real blaze. (Bertschinger, 1998, p. 43)

This concern was echoed by Dennis (1993), and, Barnes (1995), both of whom relayed instances of inappropriate response by citizens to the activation of a fire alarm. Unfortunately, the average citizen has little confidence in the reliability of fire alarm systems, and, has almost

become conditioned to treat fire alarms as a nuisance, rather than an alarm to take seriously, and take appropriate action. This lack of confidence in the performance of fire alarm systems is one of the reasons that we need to address the entire alarm problem, not just one aspect of it.

This problem has frequently been observed in the City of Vineland as well. On numerous occasions fire companies arriving at the scene of a fire alarm activation find business being conducted as usual, residents looking out the window at arriving fire apparatus, basketball games continuing uninterrupted, etc. Focusing specifically on residential applications, there have been instances when a homeowner contacted at work, to be informed that their home fire alarm has activated, will state something to the effect, "I can't respond, but don't worry about it, it's just another false alarm." This type of attitude can be a prescription for disaster.

There are several potential concerns that need to be addressed concerning the education of the public. If we can significantly improve the reliability of residential fire alarm systems, we can begin to re-educate and re-condition the public to take these alarms seriously, and, to take appropriate action when the alarm sounds. Of equal concern is the potential for homeowners to disconnect their fire alarm systems because of repeated false alarms. If the fire department adopted a no response policy, or a verify first policy, this risky behavior may go undetected until an actual fire strikes. It is unlikely that a homeowner who disconnects, or, disables their alarm system due to repeated false or nuisance activations, would have the forethought to replace the disabled detectors, or system, with some other type of protection. This concern was noted in the 1997 *Sprinkler Age* article which reported that research conducted by the NFPA found that 22 percent of people who experienced a smoke detector activation responded by disabling the detector (*Sprinkler Age*, 1997, p. 28).

Improving the reliability of alarm systems will also assist the fire service with combating the boy who cried wolf syndrome. As was noted in the literature review, this attitude can have fatal consequences, as was tragically seen in Memphis. Dennis (1993) noted the complacency that he had observed in firefighters in his department, as they responded to fire alarm activations. He stated, "... the opinion that the fact there **might** be a working fire is not a common thought during their response" (Dennis, 1993, p. 6).

The author has likewise observed complacency among Vineland firefighters, with regards to fire alarm responses. It is not uncommon to observe firefighters arriving at the scene of a fire alarm activation not wearing full protective equipment and/or SCBA. This is despite a fire department SOP that mandates the wearing of both. Curiously, the respondents to the homeowner's survey reported almost unanimously (97.1 percent) that the firefighters who responded to their residence were in full gear, and, appeared to be ready for a fire (Appendix D).

The issue of verification of residential fire alarms prior to response by the fire department is the part of this research most likely to ignite a fierce debate over what is the proper course of action. Chapter 2-4.9.2 of NFPA 72, 1996 edition, which allows central station monitoring facilities 90 seconds to verify the cause of a residential fire alarm system activation, prior to retransmission to the fire department, was first inserted in the standard during it's 1996 revision and update (L. Richardson, personal communication, November 21, 2001). Prior to that time, the standard did not specifically address this issue. Although this chapter was rewritten in 1999,

when the format of the standard was changed from prescriptive to performance based, the new Chapter 8-4.3.2 retained the verification provision (L. Richardson, personal communication, November 21, 2001).

The catalyst for the Technical Committee on Household Fire Warning Equipment's decision was the proliferation of residential fire alarm systems, and, the number of nuisance alarms being generated by residential systems (D. Andrus, personal communication, November 26, 2001). It was felt that many residential fire alarm systems were plagued by false alarms, and, responding to these unnecessary alarms put firefighters at risk (L. Richardson, personal communication, November 21, 2001). Surprisingly, there was very little controversy over the proposal, either at the time of adoption, or, since its implementation (D. Andrus, personal communication, November 26, 2001).

None of the fire service organizations contacted by the author while conducting this research have taken a position against the practice of verification. The International Association of Fire Chiefs feels that although there is a wide variation of thought on the subject, verification policies are a local issue that should be made after a department, or community, makes a risk assessment regarding what they believe is appropriate response to emergency situations. (M. Light, personal communication, November 15, 2001). The IAFC also reported no difference of opinion on the issue between various sections in the organization such as the Metro Chiefs, or, Volunteer Chief Officers (M. Light, personal communication, November 15, 2001). The National Volunteer Fire Council also believes that the issue of verification is a decision that should be made at the local level based on the needs of the community (H. Schafer, personal communication, September 29, 2001). Likewise, the Automatic Fire Alarm Association did not take a position against verification in 1996, as the statistics available did not indicate that it would be a major problem (L. Neibauer, personal correspondence, November 21, 2001).

The policies and opinions of state organizations are not much different from the national ones. The New Jersey Division of Fire Safety does not have a formal position on the subject. However, the New Jersey Uniform Fire Code heavily references NFPA standards, and, as a recognized consensus standard they can usually provide a solid basis for decisions such as verification (G. Miller, personal communication, September 2001). The New Jersey State Fireman's Mutual Benevolent Association, the state's largest firefighters union, also does not have a position on the matter (R. Brower, personal communication through F. Mastrogiovanni, November 7, 2001).

The fire departments that responded to the "Residential Fire Alarm Verification and Response Survey" were heavily against the practice of verification. Of 58 departments which answered this question, 45 (77.6 percent) do not permit verification, while only 13 (22.4 percent) permit it (see Table 5). These findings are consistent with the information provided to the author by other chiefs in southern New Jersey who state that their departments do not allow verification. Bridgeton, Cherry Hill, Deptford, Millville, and, Mount Laurel all prohibit verification of residential fire alarms. All are combination fire departments, where, with the exception of Cherry Hill, the volunteer contingent is significantly larger than the career staff.

Most of the departments that do not allow verification do so by department policy (60 percent) while 15.6 percent do so by statute or ordinance, and, 6.7 percent address the issue through a locally enforced fire code (see Table 5).

Of the 13 departments that reported that they allow verification, only 1 (7.7 percent) stated they had ever experienced a fire that caused significant property damage. This was a fire that extended from the room of origin due to the delay in reporting. None of the surveyed departments reported experiencing a fire that resulted in a serious injury or fatality of either a firefighter or civilians. These findings are consistent with New Jersey's National Fire Incident Reporting System data, which show the same lack of significant experiences caused by fire alarm verification (A. Fritz, personal communication, October 2, 2001). However, a cautionary note is appropriate here in that an incident that was initially dispatched as a fire alarm activation, and, ended up being a fire, should be classified as a structure fire. Without some type of special study, there would be no easy way to determine how many incidents fit this criterion (A. Fritz, personal communication, October 2, 2001).

The majority of residents who answered the "Residential Fire Alarm--Homeowner Input Survey" were initially in favor of permitting verification. Of 51 homeowners who answered this question, 43 (84.3 percent) reported they had attempted to stop the response of the fire department (see Table 15). Many of these people actually placed a note on their survey asking that the alarm company call them before the fire department, or, that they be allowed to turn the fire department around, if they determined that there was no problem. Reasons cited for trying to stop the fire department's response included: not wanting to inconvenience firefighters (81.4 percent); not wanting to tie up firefighters on a minor incident (79.1 percent); embarrassment of having fire trucks in front of the house (20.9 percent); fear of being penalized (25.6 percent); and, a belief that they are entitled to decide when a fire department response is necessary (32.6 percent) (see Table 15). Only 8 residents (15.7 percent) answered that they did not try to stop a fire department response.

However, when asked follow-up questions on the issue, the opinion of the homeowners changed significantly. As shown in Table 3, and Appendix C, homeowners were asked a question regarding the service(s) the fire department provided during a response to their home. Most of the respondents (64.2 percent) reported that the fire department did not provide any service to them. When asked if they knew that the fire department could provide these services, would they then want them to respond, 25 of 48 homeowners (52.1 percent) stated they would want a response (see Table 4). Forty-seven point nine percent (47.9 percent) would still want to make the decision themselves. When queried on a limited response policy by the fire department, the number of homeowners who stated they would want the department to respond increased to 68.8 percent, or, 33 out of 48 respondents (see Table 16). More than three fourths of those surveyed (76.2 percent) would not want their children to be able to stop a fire department response (see Table 17).

While definitive conclusions can not be drawn from these statistics because the rationale behind the answers provided is unknown, it may be possible to make two assumptions from these results. First, most homeowners probably never gave this issue much thought. When they were presented with various options, and, took some time to consider the overall picture, they may

have concluded that it is better to have the reassurance of having the professionals reaffirm the homeowner's belief that the alarm activation was not the result of a serious problem. Second, in this era of customer service, once homeowners understood the service(s) that the fire department can potentially provide to them, they might have concluded that they should take advantage of the assistance that could be offered. This may be especially true in situations where the alarm system must be taken out of service. Making loaner smoke detectors available until the system can be restored to proper working order, is an important life safety service that homeowners should want to take advantage of.

One of the other issues that must be considered in relation to verification is that of liability. One of the considerations behind the exemption found in NFPA 72 was the risk posed to firefighters by making unnecessary responses (L. Richardson, personal communication, November 21, 2001). The "Residential Fire Alarm Verification and Response Survey" provided conflicting results on this matter. Of 43 departments that responded, 31 (71.1 percent) agreed that this provision of the standard prevents unnecessary responses (see Table 8). However, a similar percentage, 71.7 percent (33 of 46) feel that the standard may compromise firefighter and public safety by delaying response by the fire department. The majority of departments, 25 of 45 (55.6 percent), feel that this provision should not be deleted from the standard. While it is impossible to clearly interpret the intentions of the departments that provided a response to this question, without further follow-up research, the variations, and, apparent inconsistencies in the answers help to illustrate the complexities that surround this issue.

Of 63 departments who provided an answer, 39 (61.9 percent), stated that they felt having untrained civilians decide if they have a problem when their alarm activates is a greater liability than having apparatus and personnel on the street in a response mode (see Table 6). The other 24 departments (38.1 percent) felt that responding to every call, even those reported to be false, presented a greater liability. While the issues surrounding specific responses to residential fire alarm activations will be discussed later, smart response procedures within the department can certainly minimize the liabilities associated with these responses. "Every response creates a hazard. Emergency responders covering false alarms are at the same risk as responding to a serious fire. The question of 'judgement' becomes an important issue with a false alarm" (Paulfranz, 1992, p. 14).

If a department were to face liability for verifying a residential fire alarm that was reporting an actual fire, and, the delayed response ultimately caused damage, injuries or deaths, the verification provision in NFPA 72 would provide a strong shield of defense, but it certainly would not be guaranteed (J.C. Varone, personal communication, November 11, 2001). According to Varone:

> The question that would need to be answered is, what would a reasonably prudent fire department do under similar circumstances. Following NFPA would provide strong evidence of a reasonably prudent fire department. However, the department should also have a formal policy or procedure in place that spells out specific verification, response, and cancellation policies. (J.C. Varone, personal communication, November 11, 2001)

Those who advocate verification of alarms because they feel that the only purpose of an alarm system is to alert the occupants of the dwelling to a fire, and, allow them to escape, and that property conservation is not an issue, are certainly out of touch with what the majority of fire departments believe. Fifty-six out of 60 fire departments (93.3 percent) that answered this question felt that the purpose of alarm systems was not only life safety but property protection as well.

Surprisingly, the research did find that the insurance industry is not influenced by the verification policies of the fire department. Standard discounts are offered for monitored fire alarm systems regardless of whether the fire department responds immediately, or, verifies the alarm first. ISO likewise has not taken a stand against verification of fire alarms. Their primary concern is with the dispatch of an adequate amount of equipment, once an alarm is received.

There are several problems with the life safety only viewpoint. First, any opportunity that a fire has to increase in intensity has the potential to increase the risks to firefighters, and, this concern put us right back into life safety considerations. Second, while insurance companies may pay without question, each loss that a company experiences, increases the likelihood of rate increases that will be passed along to all of us. Third, there is the intangible emotional toll that a fire can have on those affected. A lifetime of hard work, cherished photos, and, family heirlooms are things that can not be replaced by all the insurance money in the world. Finally, while a verification policy would in all probability significantly reduce responses to residential fire alarm systems, most of the responses that would still be made would be for unoccupied residences, since when contact can not be made with 90 seconds, the alarm must be retransmitted to the fire department.

While there is certainly significant evidence that verification of residential fire alarms is a reasonable option for departments to pursue, there are other considerations to be made. Allowing verification with the attitude that if we don't know about the alarm, it is not our problem, is merely hiding from the problem, or, making it someone else's. If the fire department ignores the problem, we miss valuable opportunities to insure that systems are being properly maintained, and, upgraded if necessary. We may also miss an opportunity to educate a homeowner on fire safety, or, identify a system that the owner is going to disable because of repeated false or nuisance alarms. The potential for arson, or, insurance fraud by a homeowner who starts a fire, but does not want the fire department to respond must be considered.

If the department's strategy to address the alarm system problem is a comprehensive one, then verification becomes a much less significant issue since few nuisance alarms should be generated. Alarms caused by steam from the shower, smoke from cooking, and system malfunctions should be very few. However, in a home with a newer, properly designed, installed and maintained system, if the homeowner does end up activating the system by cooking, it would not be unreasonable to conclude that the amount of smoke in the house might require fire department assistance for removal.

The matter of assessing penalties to deal with repeat false or nuisance alarms is an issue, which is gaining support in the fire service. It was also one of the issues considered by the NFPA when deciding to permit verification of residential alarm systems. Thirty of the 67

departments surveyed (44.8 percent) assess fines or penalties for repeated false or nuisance alarms (see Table 13). The number of alarms permitted before penalties were assessed ranged from none to more than 10, with the most common allowance being 3 in a 12-month period. Thirteen of 30 respondents (43.3 percent) allow 3 alarms before the imposition of penalties (see Table 14).

The literature review had indicated that most of those departments, which had adopted false alarm fees, utilized some type of a sliding scale that increased as the number of false or nuisance alarms increased. Dennis (1993), Barnes (1995), and Hoover (1997) all advocated this approach to the problem. Hoover wrote:

> Having an ascending fee scale will encourage owners of defective systems to have their systems serviced after the first fee is collected. Then they will understand that the department really does perceive nuisance alarms as a serious problem. No longer are we willing to place citizens and firefighters at risk because an owner is unwilling to maintain an adequate alarm system. (Hoover, 1997, p. 21)

Hoover's (1997) research also found that 70 percent of departments that serve populations less than 50,000, and, perceive that they have a false alarm problem, issue penalties. However, only one third of departments with populations between 50,000 and 250,000 do likewise. He offers the explanation that:

> ... the high percentage of smaller departments that charge for nuisance alarms is that these departments depend on volunteers to respond to these non-events. Volunteers may be less tolerant of nuisance alarms when it requires them to take personal time, or time away from their primary job. (Hoover, 1997, p. 18)

The issue of an increasing number of false or nuisance alarms stretching the resources of the city's volunteer fire companies, and, the development of solutions to address the problem, is one of the primary catalysts for this research. Another area of concern is that even when career companies respond to an activated fire alarm, depending on staffing, one alarm can require the response of the entire on duty force. The imposition of a fine or penalty for these "frequent flyers" appears to be an effective part of that strategy. While the survey did not gather specific data, from the responding fire departments, on the effectiveness of issuing penalties, the research did uncover strong evidence that these programs are successful.

Kenny Heitzman, Fire Marshal for the Midwest City, Oklahoma Fire Department reported that their false alarms decreased dramatically when they began an aggressive program to fine chronic offenders. Hoover (1997) also weighed in when he reported that one respondent to his research stated, "We had a problem with alarm systems until we implemented a strong system of citations for false alarms due to faulty equipment or other chronic problems" (Hoover, 1997, p. 18). These examples are only a few of the various success stories that were uncovered during this research.

It is important to remember, however, that the primary goal of any false alarm ordinance should be limited to gaining compliance and cooperation from those whom we serve. Barnes (1995) recommends that any ordinance adopted stress that its intention is not punitive, and, that

it includes a provision encouraging citizens to continue to install alarm systems (Barnes, 1995, p. 20). According to Oakland, California Fire Chief Lamont Ewell, "We don't want to create revenue, but we do want to coerce cooperation" (Hershfield, 1995, p. 47). In the same article, Palm Beach County, Florida Fire Marshal Jim Sweat cautions, "Keeping a balance is important. If we make the fines too heavy, people will disable their systems, but [the fine] has to be enough to be a reminder" (Hershfield, 1995, p. 47).

Some departments have adopted creative ways of gaining compliance through the threat of fines or penalties. Palm Beach County forgives fines in return for documented repairs on faulty alarm systems. In other words if a system owner who has accumulated $2,000 worth of fines, documents an equal amount of repairs or upgrades to the system, the fine is forgiven (Hershfield, 1995, p. 47). Dennis (1993) reports a similar approach in Lake Havasu City, with only a $25 administrative fee being assessed after documentation of repairs is presented (Dennis, 1993, p. 22).

Not all attempts to assess fines or penalties have been successful though. New Orleans did away with their false alarm ordinance after about a year (Hershfield, 1995, p. 46). According to New Orleans Superintendent of Fire Warren McDaniels, "It was unenforceable. People blamed passing buses and lightening. Politicians being the reactive people they are, repealed [the ordinance]" (Hershfield, 1995, p. 46).

As with each of the other components of the comprehensive solution to the false alarm problem, the imposition of fines or penalties has a definite purpose, and will probably provide an effective remedy for the hardcore producers of false or nuisance alarms. The fine or penalty should be assessed objectively, and, consistently. However, it also needs to have some built in flexibility and discretion so that the old lady who is a terrible cook, or, frequently forgets she has food on the stove, or, in the oven is not fined repeatedly. In these cases each time the system activates it may be averting a potential disaster. Any fine or penalty will be most effective if it serves primarily as a deterrent, or, a motivational tool for homeowners to keep their systems in proper working order.

The final issue to consider is what is the proper amount of apparatus to dispatch on a residential fire alarm system, and, how should that apparatus respond. The "Residential Fire Alarm Verification and Response Survey" found that of the 67 departments surveyed, 28 (41.8 percent) dispatch 2 engines, 1 ladder and 1 chief to residential alarm activations (see Table 9). An additional 26.9 percent of the respondents (13 departments) dispatch only a single engine company, which is the written procedure in Vineland, although it is frequently disregarded. The remaining 31.3 percent dispatch some other combination of apparatus. Not a single department surveyed dispatched only an officer, or, the police department to investigate.

Nearly two thirds of the departments surveyed (64.6 percent) have all units respond at emergency speed (see Table 10). The majority of the rest of the departments (27.7 percent) have the first due unit respond at emergency speed, and, the remaining units respond at reduced speed. If information is received subsequent to dispatch that an alarm was activated accidentally, or, is false, 49 out of 56 departments that answered (87.5 percent) reported that they modified their response, while seven departments (12.5 percent) did not adjust their response (see Table 11).

Of 53 departments who provided information, 28 (52.8 percent) returned all units except the first due engine (see Table 11). An additional 11 departments (20.8 percent) have all units proceed in, however, they have all units except the first due engine proceed in at reduced speed. Surprisingly, six departments (11.3 percent) return all units, and, conduct no further investigation.

Casey (1995) wrote that his unnamed department enacted, "... a tiered response to monitored fire alarms, with only the first due responding as an emergency while others continued to respond, but driving normally" (Casey, 1995, p. 18). This change was followed by a number of additional response modifications designed to, "...reduce the risk due to lights and sirens response..." (Casey, 1995, p. 45). He indicates that there has been little difference in response times between emergency and reduced speed responses. Hilton and Smith (1987) also offered insight on "Managing the Red Light Syndrome" with a seven-point plan that included most units responding to incidents in a non-emergency mode.

Wilbur (1995) advocates a common sense approach to emergency vehicle responses. Like the others, he argues for more reduced speed type responses as a way to "reduce emergency vehicle exposure, prevent accidents and save firefighters lives" (Wilbur, 1995, p. 96).

O'Neal (1998) performed research on the subject of emergency response. He found that many departments, while still dispatching multiple units to emergencies, now require units that are not first due to respond at a reduced rate of speed. He cites statistics from his department that showed 82 percent of reported structure fires, and, 99 percent of automatic fire alarm responses were handled by the first engine and ladder (O'Neal 1998, p. 18). O'Neal also stresses the importance of properly training emergency vehicle operators, and, the need for an emergency response and driving policy.

The insurance industry, and specifically ISO, have some input into the decision making process here also. While ISO is silent on the issue of verification of residential fire alarms, once the decision is made to respond, they require two engines and one ladder or service truck be dispatched (K. Cimeno, personal communication, October 24, 2001). Failure to follow this standard can result in heavy point losses during an evaluation (K. Cimeno, personal communication, October 24, 2001). However, according to Wilbur (1996), "... ISO doesn't care whether the entire response is emergency or non-emergency" (Wilbur, 1996, p. 16).

Every time a piece of fire apparatus responds, especially in the emergency response mode, it places firefighters and civilians alike at risk. We do however, have a duty to respond when summoned, and, must respond with sufficient apparatus and personnel to function effectively. This risk can be magnified in volunteer or combination fire departments by a significant number of personnel responding to the station, or, the emergency scene in personal vehicles with blue lights, or, some other type of warning device in use. However, as was stressed by a number of the authorities cited, a good training program, and, a well thought out response policy or procedure can go a long way toward promoting prompt, effective mitigation of emergency incidents while minimizing potential problems associated with response to them.

In the context of responses to automatic fire alarm systems, and, particularly residential systems, only the first due unit should respond at emergency speed. Even if the department has minimized its problem alarms, chances are good that the alarm system incident will be unnecessary, or, minor in nature. All other units should respond at reduced speed. If subsequent information that is received indicates or confirms a fire, it is easy to have additional units upgrade their response to emergency speed. Conversely, if a call is received reporting the alarm was tripped accidentally, or, is false, all companies except the first due company can be returned to service, and, thus be available to handle another incident. The first due unit should go to a reduced speed response. While they are not emergency response vehicles, any policy that dictates a reduced speed response under specified circumstances, should include volunteer personnel responding in their personal vehicles.

It is also important to note, that even though responses may be at reduced speed, firefighters should avoid complacency, and, expect the unexpected. Department procedure should specify that even on reduced speed responses all personnel should don full protective equipment including SCBA. All appropriate tools, lights, and, equipment should be carried, even when operating in the investigative mode.

In conclusion, false, or, unnecessary alarms from residential fire alarm systems are undeniably a problem. However, the way to deal with the problem is to address the various issues as part of a comprehensive department strategy, not to disregard or ignore it and hope that it will go away. This approach does nothing to solve the underlying causes of the problem, and, can in fact be counterproductive, if homeowners start to disable their systems because of reliability problems. Paulfranz (1995) summarizes the situation well when he writes:

> Fire service leaders, decision makers, and fire officers have a responsibility to develop more effective strategies to reduce and minimize the impact of false alarms on declining fire/emergency response resources (Paulfranz, 1995, p. 1). False alarms are identifiable, manageable, and their impact can be minimized; it's the choice of a strong leader. (Paulfranz, 1995, p. 14)

With an aggressive multi-pronged approach, the Vineland Fire Department will be able to significantly reduce its responses to false and nuisance alarms originating from one and two family dwellings. By addressing the problem at its source, the core issue of whether or not to allow verification of these alarms, because of an excessive number of responses, should become a non-issue, as most of these responses will be eliminated through other means. These actions in conjunction with a smart approach to responses should minimize the risks associated with making these responses, and, be palatable to the citizens to whose homes we will be responding.

RECOMMENDATIONS

The Vineland Fire Department should initiate a multi-faceted program designed to reduce the number of false, or, nuisance alarms originating from one and two family dwellings. The program will require the support of the Mayor, City Council, and city administration, and, will require increased cooperation between the Fire Department and the Department of Licenses and

Inspections. In order for the program to be successful, the Fire Department, and, city administration must look beyond the singular issue of verification of residential fire alarms, and, address the problem at its core. Only with a comprehensive program will the public safety interests of the citizens be served, while at the same time the concerns of the Fire Department are addressed.

The Fire Department should immediately commence an aggressive public relations campaign to educate residents on the importance of having their home fire alarm systems serviced and properly maintained. This campaign should utilize whatever media outlets are available including local newspapers, radio, public access television, city Web site, etc. Part of this campaign could include courtesy inspections by fire department personnel to check for proper locations of detectors. This campaign should raise public awareness of the issue, and, hopefully, will encourage homeowners to have their systems cleaned, tested and inspected.

The City should ensure, that if it is not already required, plans for all new residential fire alarm systems be thoroughly reviewed prior to installation of the system. Once a system is installed, a comprehensive acceptance inspection and test should be conducted prior to the issuance of a Certificate of Approval, which will allow the system to be placed on line. The focus of this initiative should be to ensure that new systems are being installed utilizing properly specified, quality components, and, that they meet the requirements of NFPA, and, the Uniform Construction Code.

As part of an ordinance to address this issue in an overall manner, the City should require the registration of all fire alarm systems, including those located in one and two family dwellings. Part of the registration process should include a stipulation that the provisions found in NFPA 72 are adhered to, specifically the requirements for maintenance by a qualified service technician every three years, and, replacement of all detectors more than ten years old. Registration renewal should occur every three years, and, be contingent upon the homeowner providing adequate documentation on servicing and detector replacement. While the full benefits of the installation, and, maintenance requirements might not be realized for several years, the long term benefits of this program should be a substantial reduction in the number of alarm malfunctions, and, nuisance alarms being generated from residential occupancies.

The ordinance should include provisions to issue fines or penalties for repeated alarm malfunctions, or nuisance alarms. The fines or penalties should increase incrementally as the number of responses increases. The City might want to consider, for first time offenders, a provision that would abate most of the fine or penalty, if they provided documentation that repairs have been made to the problem system. This option should not be available to repeat offenders. The City should also include a provision for a fine or penalty for failing to register an alarm system. The purpose of the fines or penalties should be to encourage compliance, not make money. Also, as was done in Oneonta, so as the ordinance does not appear to be strictly punitive in nature, it should include a provision encouraging residents to continue to install early detection and alarm systems, in the interest of public safety.

If the components of the program recommended above are implemented, are enforced, and, are successful, virtually all nuisance, and, most alarm malfunctions should be eliminated over time. This will render the issue of verification a much less controversial issue, because the

Department will be responding to far fewer residential fire alarms. The assumption could be made that those responses still being made will have a much higher probability of requiring some type of fire department service; whether it be attempting to determine the cause of the alarm activation, removing smoke from the dwelling, etc.

The verification of residential fire alarms, prior to notification of the fire department, is permitted by NFPA, and, this fact alone makes it a viable alternative, one that would probably withstand judicial muster. However, as the research results indicate, far more fire departments prohibit verification than permit it. It is recommended that the Vineland Fire Department continue to prohibit verification of residential fire alarms until after it is determined whether the other components of the program have achieved their anticipated results.

Although the Department's current SOP specifies a response of one engine to residential fire alarm activations, this provision is frequently disregarded, and, is not consistent with the research findings. Five of six stations in the city have two engines. If the Fire Department adopted a response policy of two engines and one ladder to residential fire alarm activations, this policy would satisfy the ISO requirements, would be more consistent with the practices in other fire departments serving similar sized communities, and, would not place any additional burden on the volunteer companies, since in many cases they already respond with multiple units. Once again, if most nuisance alarms, and, system malfunctions have been eliminated, the credibility associated with these responses should increase. As a result, modifying the response should not strain the fire department's resources.

The first due engine should respond at emergency speed. The second due engine and the ladder should respond at reduced speed. However, unless smoke or fire is visible, the first due unit should switch to a reduced speed mode several blocks from the residence. Utilization of this procedure will show deference to the homeowners who would not object to a fire department response, if it consists of one engine with no lights or sirens. If information is received subsequent to dispatch indicating that the alarm is accidental, unnecessary, or, false, the second due engine and the ladder should be returned or held at station. The first due unit should continue in to investigate at reduced speed. The Fire Department's SOP should be modified to reflect and implement these response changes.

Finally, the Fire Department should track and analyze response data carefully to determine the effectiveness of the various components of the program and make adjustments accordingly. Only by continuing to make the issue a priority, will it remain as one, and, ultimately be successful. Complacency, or only addressing one aspect of the problem, will not result in a meaningful solution to an important public safety issue.

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Appendix A

Residential Fire Alarm Verification and Response Survey

1) Please provide the following background information regarding your fire department:

A) In what state is your department located: _____

B) Current population served by your department: _____

C) Type of Department:
Fully Paid: _____
Combination _____
Fully Volunteer _____

D) Total area (square miles) served by your department: _____

E) Response area characteristics:
Urban _____
Suburban _____
Rural _____

F) Total annual fire related responses (excluding EMS): _____

2) What percentage of the responses listed in Question #1(F) are for automatic fire alarm system activations? _____.

For the purposes of this survey, "residential fire alarm activation" means an automatic fire alarm originating from a one or two family dwelling, and, being transmitted to a central monitoring station or emergency services dispatch center. It does not include alarm activations originating from multi-family residential occupancies consisting of 3 or more dwelling units, or, from occupancies such as hotels and motels.

3) What percentage of the responses listed in Question #2, above, are for residential fire alarm system activations _____ .

4) What percentage of residential fire alarm activations were the result of:

_____ Actual fire
_____ Smoke from cooking/burnt food
_____ Steam from a shower
_____ Smoke from fireplace, candles, etc.
_____ Other accidental activation, not otherwise specified
_____ Malfunction of system

>>OVER>>

5) What percentage of residential fire alarm activations result in some type of service by your department? _____ .

For the purpose of this question "service" by the fire department would include, but not be limited to, fire suppression, checking for fire extension, smoke removal, assisting with restoring alarm system to working order, loaning/installing smoke detectors if system is placed out of service, etc.

6) Do you permit verification of residential fire alarm systems, prior to fire department response, as permitted in section 2-4.9.2 of NFPA 72, National Fire Alarm Code, 1996 edition?

Yes: _____ No: _____

7) If you permit verification of residential fire alarms (answered yes to Question #6), have you ever experienced any of the following as a result of an incident that was initially verified as "no problem," or, "no need for fire department to respond?"

	YES	NO
Fire that caused significant property damage	_____	_____
Serious civilian injury	_____	_____
Civilian fatality	_____	_____
Serious firefighter injury	_____	_____
Firefighter fatality	_____	_____

If you answered yes to any part of this question, can you please provide additional information and/or details?

8) If you do not permit verification of residential fire alarms, how do you enforce this prohibition?

_____ Fire Department policy
_____ Statute or ordinance
_____ Locally enforced fire code
_____ Other (Please Describe)

9) Do you feel that the exception in section 2-4.9.2 of NFPA 72, which allows verification of residential fire alarms:

	YES	NO
Prevents unnecessary responses	_____	_____
May compromise firefighter and public safety by potentially	_____	_____
delaying response by the fire department to actual fires:	_____	_____
Should be deleted from the standard:	_____	_____

>>PLEASE CONTINUE ON NEXT PAGE>>

10) Which situation do you feel presents a greater liability to your department:

Responding to every alarm activation, including those that have been reported as false, since you have apparatus and personnel on the street in a response mode: _____

Allowing untrained civilians to decide if they have a problem when their alarm system activates _____

11) Do you feel that once an alarm system activates and notifies the occupants of a residence of a potential problem, as long as they are able to escape, that it has performed its job, and, reducing or eliminating property damage through a prompt response by the fire department is not a consideration because "the insurance company will pay without a question"?

YES: _____ NO: _____

12) What is your normal response to residential fire alarm activations?

_____ 1 Engine
_____ 1 Engine, 1 Ladder
_____ 1 Engine, 1 Ladder, 1 Chief
_____ 2 Engines, 1 Ladder
_____ 2 Engines, 1 Ladder, 1 Chief
_____ Chief or other officer only
_____ Police Department response only
_____ Other (Please Describe)

13) How does your department respond to residential fire alarm activations?

_____ All units at emergency speed (Lights and sirens)
_____ First due engine at emergency speed, all other units at reduced speed (No lights and sirens)
_____ All units at reduced speed
_____ Other (Please Describe)

>>OVER>>

14) If during response, units are advised that the alarm was activated accidentally or is "false," do you modify your response?

YES: _____ NO: _____

If yes, how do you modify your response?

_____ First due engine continues at emergency speed, all other units reduce speed
_____ All units proceed in at reduced speed
_____ Return all units except first due engine
_____ Return all apparatus, Chief proceeds into investigate
_____ Return all units, no further response or investigation
_____ Other (Please Describe)

15) Do you define any of the following situations as a "false" alarm?

	YES	NO
Smoke from cooking/burnt food	_____	_____
Steam from shower	_____	_____
Smoke from fireplace, candles, etc	_____	_____

16) How do you handle repeat false alarm offenders?

_____ Educate resident(s) regarding detector placement, system maintenance, etc.
_____ Issue citation/violation notice under fire local fire code or ordinance
_____ Issue penalties/fines
_____ Reduce response to that location
_____ Discontinue response to that location

For the purpose of this question, false alarm should include alarm activations caused by a system malfunction, or, an activation for no apparent reason.

17) If you issue fines or penalties for repeat false alarm offenders, how many false alarms do you permit in a year (12-month period) prior to the imposition of penalties?

_____ None
_____ One
_____ Two
_____ Three
_____ Four
_____ Five
_____ Six
_____ Seven
_____ Eight
_____ Nine
_____ Ten
_____ More than Ten

>>PLEASE CONTINUE ON NEXT PAGE>>

Please note that your department will not be identified by name in the research. However, in order to prevent duplicate responses from the same department, I request that you include your department name on the survey form.

Department: _____

Contact Person: _____

Telephone or e-mail: _____

Appendix A (cont'd)

September 10, 2001

Dear Chief,

Over the past five to ten years, the Vineland Fire Department, like many other departments, has experienced a significant increase in the number of responses to automatic fire alarm systems, especially residential systems. The department is currently evaluating whether to rescind a local amendment to the New Jersey Uniform Fire Code, which prohibits verification of residential fire alarm systems, prior to notification of the fire department. This verification is permitted in NFPA 72. As part of our comprehensive review of this issue, we are also examining response to these alarms, and, whether to adopt some type of penalty for frequent false alarms. I have been assigned this project, and, am completing it in conjunction with an applied research project for the National Fire Academy course, Executive Analysis of Fire Service Operations in Emergency Management. Enclosed, please find, a survey titled, *"Residential Fire Alarm Verification and Response"*.

I would respectfully request that you, or someone that you designate, take a few minutes to complete this survey and return it to me as soon as possible. I have enclosed a self-stamped addressed envelope for your convenience. If you prefer, you may fax your response to me at (856) 794-5073 or e-mail it to me at PEADARFIRE @ aol.com. The information that we obtain through this survey will assist us with determining whether to allow verification of residential fire alarms, whether we should modify our response to these systems, and, if the assessment of penalties or fines may be appropriate in some instances. Your responses will be kept confidential and your department will not be identified by name or specific location.

Thank you in advance for your time and assistance. If you make a notation on the survey form, and, include your name and mailing or e-mail address, I will be happy to provide you with a copy of the survey results once they are compiled.

Sincerely,

Peter J. Finley, Jr.
Deputy Fire Chief

Enclosure

Appendix B

Demographic/Background Information About Fire Departments Responding to the Survey

Number of surveys sent out	216
Number of surveys received	72
Return average	33.33%

Geographic Location of Departments Surveyed	
Northeast	6
Southeast	9
North Central	26
South Central	10
Northwest	6
Southwest	10

Populations of Departments Surveyed	
Minimum population	49,000
Average population	57,018
Maximum population	67,000

Types of Departments Surveyed	
Fully paid departments	55
Combination departments	12
Fully volunteer departments	0

Average Area Served by Departments Surveyed (in square miles)	
Minimum area covered	0
Average area covered	127.85
Maximum area covered	6118

Response Area Characteristics of Departments Surveyed	
Urban area	35
Suburban area	50
Rural area	18

Total Annual Fire Related Responses of Departments Surveyed (excluding EMS responses)	
Minimum annual responses	0
Average annual responses	2517
Maximum annual responses	15571

Percentage of Annual Fire Related Responses of Departments That Were For Automatic Fire Alarm Activations	
Minimum percentage of automatic activations	0%
Average percentage of automatic activations	18.70%
Maximum percentage of automatic activations	68%

Percentage of Automatic Fire Alarm Activations That Were Residential Fire Alarm System Activations	
Minimum percentage of residential activations	0%
Average percentage of residential activations	8.82%
Maximum percentage of residential activations	60%

Percentage of Residential Fire Alarm Activations That Resulted in Some Type of Service by Departments Surveyed	
Minimum percentage of service rendered	0%
Average percentage of service rendered	47.43%
Maximum percentage of service rendered	100%

Appendix C

Residential Fire Alarm--Homeowner Input Survey

1) How many activations of your home's fire alarm system have you experienced in the past year that resulted in a response(s) by the Vineland Fire Department? _____

2) What was/were the cause(s) of the fire alarm activation(s)?

Please check all that apply and indicate a number, if there was more than one response for a particular choice.

_____ Actual fire
_____ Smoke from cooking or burnt food
_____ Steam from the shower
_____ Alarm system malfunction
_____ Performing system maintenance/cleaning
_____ Other (Please Describe)

3) Do you consider any of these causes of fire alarm activation to be a false alarm?

	YES	NO
Smoke from cooking or burnt food	_____	_____
Steam from the shower	_____	_____
Alarm system malfunction	_____	_____
Performing system maintenance/cleaning	_____	_____

4) Did you try to notify your alarm company that any of the alarms were "false" and stop the response of the fire department?

YES: _____ NO: _____

5) If you answered question # 4 above, yes, why did you not want the fire department to respond? *Please check all that apply.*

_____ Did not want to inconvenience Firefighters
_____ Did not want to tie up fire department units on a minor incident
_____ Embarrassment of having fire trucks in front of your home
_____ Fear of being fined or penalized
_____ Belief that you are entitled to decide if fire department response is necessary

>>OVER>>

6) Did the fire department perform any of the following services when they responded to your home?

_____ Extinguish fire or check for fire spread
_____ Assist with removing smoke from your home
_____ Assist you with determining the cause of the alarm activation
_____ Assist you with restoring your alarm system to working order
_____ Educate you and provide information on proper placement of smoke detectors to minimize unintentional activations
_____ Offer to provide you with loaner smoke detector(s) if your alarm system was placed out of service
_____ Fire Department provided no service

7) If you knew that the fire department could provide the above services to you, would you:

_____ Want the fire department to respond when your alarm activates to make sure that everything is OK
_____ Want to still be able to decide if response by the fire department is necessary

8) If the fire department responded to your home with only one fire truck, with no lights or sirens, to make sure that everything is OK, would you want them to respond?

YES: _____ NO: _____

9) Were the firefighters who responded to your home:

	YES	NO:
Courteous and professional	_____	_____
Wearing gear and appeared to be ready for a fire	_____	_____

10) If you have children who are home alone at any time, would you want them to be able to stop a response by the fire department if they activated your alarm.

YES: _____ NO: _____

11) If you have any other comments or suggestions that you feel might help us decide how to address this issue, please feel free to note them below.

Appendix C (cont'd)

September 25, 2001

Dear Neighbor,

Over the past five to ten years, the Vineland Fire Department, like many other fire departments, has experienced a significant increase in the number of responses to automatic fire alarm systems, especially residential systems such as yours. We are currently reevaluating how we respond to these alarm systems, and need your assistance. Enclosed, please find, the, *"Residential Fire Alarm – Homeowner Input Survey"*.

I would respectfully request that you take a few minutes to complete this survey and return it to me no later than October 15th. I have enclosed a self-stamped addressed envelope for your convenience. If you prefer, you may fax your response to me at (856) 794-5073 or e-mail it to me at pjfinley@vinelandcity.org. Your input is very important to us. The information that we obtain through this survey will assist us with determining whether to allow verification of residential fire alarms, and, whether we should modify our response to these systems. Your responses will be kept confidential.

Thank you in advance for your time and assistance. If you have any questions, or, if I, or any of the staff of the Vineland Fire Department can assist you in any way, please do not hesitate to contact me at the above number.

Sincerely,

Peter J. Finley, Jr.
Deputy Fire Chief

Enclosure

Appendix D

Background Information from Homeowner Survey

Number of surveys sent out	97
Number of surveys returned	53
Return percentage	54.64%

Number of Fire Alarm Activations Experienced by Homeowners Surveyed in the Past Year	
Minimum number of activations experienced	0
Average number of activations experienced	1.92
Maximum number of activations experienced	5

How Homeowners Surveyed Define False Alarms	
Homeowners surveyed that consider smoke from cooking or burnt food to be a false alarm	27
Homeowners surveyed that do not consider smoke from cooking or burnt food to be a false alarm	15
Homeowners surveyed that consider steam from the shower to be a false alarm	26
Homeowners surveyed that do not consider steam from a shower to be a false alarm	3
Homeowners surveyed that consider an alarm system malfunction to be a false alarm	20
Homeowners surveyed that do not consider an alarm system malfunction to be a false alarm	9
Homeowners surveyed that consider performing alarm system maintenance/cleaning to be a false alarm	19
Homeowners surveyed that do not consider performing alarm system maintenance/cleaning to be a false alarm	5

Homeowners surveyed that feel the firefighters who responded to their home were courteous and professional	49
Homeowners surveyed that do not feel the firefighters who responded to their home were courteous and professional	1
Homeowners surveyed that feel that the fighters who responded to their home were wearing gear and appeared to be ready for a fire	47
Homeowners surveyed that do not feel that the firefighters who responded to their home were wearing gear and appeared to be ready for a fire	1