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Failure Rates of New Fire Alarm Installations

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CERTIFICATION STATEMENT

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

Signed: _____

Abstract

Failure of fire alarm systems acceptance inspections has been identified as being the largest factor for the increase in the failure rate of fire alarm inspections in Peoria, Arizona. This is creating a negative customer service climate in the City of Peoria. The purpose of this applied research project is to identify the reason for the high failure rate of fire alarm inspections. The descriptive research method to identify the causes of the problem of failed fire alarm acceptance tests by answering the following questions: Is there a national standard regarding the qualifications of fire alarm installers? What are the qualifications of the fire alarm installation contractors installing the fire alarm systems in the City of Peoria? How does the Peoria Fire Department (PFD) conduct fire alarm acceptance inspections? How do departments of like size conduct fire alarm acceptance inspections? What were the reasons for the failures of the fire alarm system acceptance inspections performed by the PFD? Is the 70% failure rate unique to Peoria or do other departments of like size have similar results? The procedures used to evaluate the problem were a combination of literature reviews, interviews, personal observations, and surveys. The results identified inconsistent and inadequate qualifications in the fire alarm industry. The recommendation of the author was to establish and require a local certification exam for all fire protection contractors.

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Failure Rates of New Fire Alarm Installations

Since the days when Roman emperor Caesar Augustus created the first fire watches in 24 B.C., early fire detection and occupant notification have been an important component of public fire safety (Colburn, 1975, 1). With the advances in technology and scientific studies of fire and smoke behavior automatic fire detection systems can detect a fire, notify the building occupants, initiate fire suppression operations, and summon the fire department within seconds.

Fire detection systems have become very complex and specialized. However, the qualification requirements of the system designers and installers do not reflect a corresponding increase in knowledge and skill level. Electrical engineers with little or no specialized training in fire alarm or fire protection technology are allowed to design and seal fire alarm designs in the State of Arizona.

The State of Arizona Board of Technical Registration (Arizona State Board of Technical Registration [BTR], 2002, Figure 3) (BTR, 2002) requires that fire alarm designs be performed and sealed by a licensed professional engineer (PE). The BTR leaves the decision of an engineer's qualifications to design fire alarm systems to the individual engineer. If the individual engineer feels that they are qualified and that designing fire alarms systems is within their scope of knowledge, they are allowed to design these systems.

The requirements for installers are no better. To install a fire alarm system, the Arizona Registrar of Contractors (ARC) only requires an electrical contractor's license or a low voltage communications systems contractor's license of one person in the company. The person that holds the license is called the "qualifying party" (Arizona Registrar of Contractors [ARC], n.d.). This qualifying party is the only person in the company that is tested on their knowledge of electrical codes and standards. The people who do the installation do not have to pass any kind of

standardized test or demonstrate knowledge of the code. The training of the installers is left up to the qualifying party.

In July 2003, the Peoria Fire Department assumed responsibility of inspecting and testing fire protection systems during the construction process from the building department. Since that time the failure rate of new construction fire inspections has risen from 33% to 70% (City of Peoria [CP], 2004). Failure of fire alarm systems acceptance inspections has been identified as being the largest factor for the increase in the failure rate. (CP)

The problem is that this high failure rate of fire alarm inspections is creating a negative customer service climate between the fire alarm industry, general contractors, engineers, business owners, politicians, and the Peoria Fire Department.

The purpose of this applied research project (ARP) is to identify the reason for the high failure rate of fire alarm inspections. This ARP used the descriptive research method to identify the causes of the problem of failed fire alarm acceptance tests by answering the following questions:

1. Is there a national standard regarding the qualifications of fire alarm installers?
2. What are the qualifications of the fire alarm installation contractors installing the fire alarm systems in the City of Peoria?
3. How does the Peoria Fire Department conduct fire alarm acceptance inspections?
4. How do departments of like size conduct fire alarm acceptance inspections?
5. What were the reasons for the failures of the fire alarm system acceptance inspections performed by the Peoria Fire Department?
6. Is the Peoria Fire Department’s 70% failure rate unique or do other departments of like size have similar results?

The City of Peoria has experienced rapid growth in population and size. Since 1980, the City's population has grown from 12,351 to 126,410 in 2003. (City of Peoria [CP], 2004, 5) In this same time period City boundaries have expanded from 26.5 to 176.3 square miles (CP, 5). Population projections made by the Peoria Planning Department (CP, 16) estimate that this trend will continue and that the population will swell to 253,000 by the year 2030. Along with this population growth trend come commercial businesses and their associated buildings, which require the installation of new fire alarm systems.

If the current situation regarding fire alarm system installation failures is not corrected the negative climate will continue and the development process will be confrontational. This ultimately could result in businesses electing not to build in Peoria, a decline in sales tax revenue, and a decrease in the level of service that the City can afford to provide.

Background and Significance

In 1978 the Peoria Fire Department went from an all volunteer department in a sleepy little town with a population of less than 12,000 to a city of 130,000 and a full time paid fire department within the City government. This fledgling department had very limited resources and staff; however, it served the needs of the small farming town. By the year 2000 the population had grown to 114,000 and likewise the department had grown to more than 90 members. With only a Fire Marshal and 1 Fire Inspector, the Fire Prevention Division was not able to keep up with the growth and needs of the business community. Existing occupancy fire inspections were performed by fire crews with only cursory knowledge of the fire code and all new construction plans review and inspections were being performed by Building Safety Inspectors as an additional duty.

In October 2001, the Peoria Fire Department underwent a major leadership change. The Fire Chief of twenty-two years retired, the Deputy Chief of Support Services retired, and the Fire Marshal left the department to accept a position with another organization. These changes in leadership also brought about a change in philosophy toward the role of Fire Prevention.

In 2002 the new Fire Marshal identified concerns with how both existing occupancies and new construction occupancies were being inspected. The Fire Marshal had received many complaints from the development community about the Fire Inspectors and their application of the fire code during the construction process. These Fire Inspectors were actually Building Inspectors; however the fire department was the recipient of the complaints from the public and city leaders.

In 2003 an additional fire inspector was added to the staff. The annual fire inspections were triaged and assigned to the fire crews and inspectors based upon occupancy type and potential for hazardous materials. The more potentially hazardous occupancies were assigned to the inspectors and the others to the fire crews.

When the staff inspectors performed their inspections on the occupancies assigned to them they encountered hazards and processes that had been in existence for many years and in several cases since the building was issued a certificate of occupancy.

In 2003, Paul Zucker conducted a study of the City's development process (Zucker, Storcheim, & Tool, 2003, 69). This study confirmed the earlier concerns of the Fire Marshal regarding the inspections and review of fire department systems by Building Inspectors instead of Fire Inspectors. As a direct result of the Zucker Study, the Fire Department regained the responsibility of conducting both the plan review and inspections of all fire protection systems in new construction.

To address the concerns over the inconsistent and ineffective annual fire inspections of existing occupancies, the additional duty of fire inspections was removed from the fire crews and placed back on the Fire Prevention Division. As a result the City increased the staffing of the Fire Prevention Division from one Fire Marshal, one Inspector, one Public Education Specialist, and one Office Assistant to a staff of nine: one Fire Marshal, four Inspectors, one Plans Reviewer, one Public Education Specialist, one Fire Protection Engineer, and one Office Assistant.

Fire protection systems acceptance testing is one of the last inspections to be performed before a building is issued a Certificate of Occupancy. Since the Fire Prevention Division regained the function of new construction fire inspections, the failure rate of the fire protection system inspections has risen from 33% to 70%. This high failure rate has had a ripple effect on the entire development process.

Until the fire protection systems pass inspection, the building can not be occupied or prepared for opening. Construction schedules are so time compressed that the grand opening has been advertised for weeks in anticipation of all inspections passing the first time. If there are any delays because of a failed inspection and the opening is delayed, advertising dollars will have been wasted, financing for the project is jeopardized, the construction superintendent could lose his/her job, the business owner is upset, and a call to the mayor is sure to follow. Because fire is something that happens to *other people* the customer can not understand why the building can not be occupied while the corrections are being made. Despite the fact that there were numerous delays throughout the project which used up any time cushion that was built into the schedule, the fire department is viewed as holding up the project because of a remote possibility of a fire.

Regardless of the reasons for the delays, the perception of the customer is that the fire department is not customer friendly.

Using the procedures taught in the Executive Fire Officer Program Executive Development (EFOP-ED) course and through research I will identify the problem and recommend changes to correct this perception and to provide the level of service that the customer demands.

This ARP used the descriptive research method to identify the causes of the problem of failed fire alarm acceptance tests by answering the following questions:

1. Is there a national standard regarding the qualifications of fire alarm installers?
2. What are the qualifications of the fire alarm installation contractors installing the fire alarm systems in the City of Peoria?
3. How does the Peoria Fire Department conduct fire alarm acceptance inspections?
4. How do departments of like size conduct fire alarm acceptance inspections?
5. What were the reasons for the failures of the fire alarm system acceptance inspections performed by the Peoria Fire Department?
6. Is the Peoria Fire Department's 70% failure rate unique or do other departments of like size have similar results?

This applied research project (ARP) directly relates to the EFOP-ED goal of transforming fire service organizations from being reactive to becoming proactive by evaluating a known deficiency in the development process to determine the best course of action to correct the problem and the United States Fire Administration (USFA) goal of reducing life and economic losses due to fire and related emergencies.

This APR was performed to investigate the current practices, procedures, and qualifications of fire departments and fire protection contractors to identify the reason for the high failure rate

of fire alarm inspections in an effort to find solutions to correct the deficiencies in the development process.

Literature Review

To determine if the City of Peoria was experiencing a unique or common problem, several different sources were reviewed. The author found many concerns that have been documented throughout the entire fire alarm installation process, design, installation and maintenance. The National Fire Protection Association (NFPA), a recognized leader in fire and life safety standards, addresses the qualifications of designers, installers, and service personnel (Richardson & Moore, 2002, Section 4.3).

Fire alarm designers must be able to demonstrate their experience and have one or more of the following qualifications: Factory trained and certified, National Institute of Certification in Engineering Technology (NICET) certified in fire alarms at a minimum of a level III, or licensed or certified by state or local authority (Richardson & Moore, 2002, section 4.3.2). Installers must be supervised by a qualified individual that is factory trained and certified, NICET level II in fire alarms, or licensed by state or local authority (Richardson & Moore, 2002, 4.3.3).

There are issues with each of these qualifications. A factory trained and certified person generally can only work on specific systems (Bunker, 2004, 48).

The second acceptable qualification is NICET certification for installers. In addition to specific exam elements that must be passed for each level, a NICET II requires a minimum of two years experience in fire alarm systems and a NICET III requires five years experience (National Institute for Certification in Engineering Technologies [NICET] 3).

The third qualification standard of being certified by state or local authority is vague and open to interpretation by both the Authority Having Jurisdiction (AHJ) and the fire alarm

contractors. If the state does not have a certification process then the local jurisdictions would need to create their own certification program. The practice of local jurisdictions requiring fire alarm installers demonstrate competency is required in many areas of the country (Gagnon & Kirby, 2003, 144). But what is acceptable to one jurisdiction may not be adequate for another. In a large metropolitan area like Phoenix, a fire alarm contractor would be required to have a certification for each jurisdiction. This would result in a bureaucratic nightmare for the contractors and increased costs of doing business.

The State of Arizona does not certify or license contractors specifically in fire alarm installations. A commercial electrical contractor with an L-11 license is authorized to install, alter, or repair any electrical material and equipment utilizing electricity less than 600 volts (State of Arizona [SA], 2003). Additionally a residential or commercial low voltage communications systems contractor with a C-12 or L67 license is authorized to install and repair low voltage alarm systems (State of Arizona [SA], 2003).

The L-11 electrical exam is an open book exam consisting of 80 questions. The minimum passing score is 70%. Out of the 80 questions, only four (5%) are related to low voltage systems and zero directly covering fire protection systems (SA, 2003).

The C-12/L-67 exam is a 60 question open book exam with a minimum passing score of 70%. Out of the 60 questions, seven (13%) questions are on fire detection and alarms (SA, 2003). It is conceivable that a contractor could miss all fire detection and alarm questions and still receive a license. The person that holds the license is called the “qualifying party” (Arizona Registrar of Contractors [ARC], n.d.). The qualifying party is the only person in the company that is tested on their knowledge of electrical codes and standards.

The people who do the actual installation are not required to demonstrate competence or knowledge of the applicable codes nor are they required to have any experience. The training of the installers is left up to the company and the qualifying party. The author is aware of the practice of contractors using day laborers that were picked up in front of the local big box home improvement store to run wire and other critical tasks. The issue of qualified contractors and workers is not limited to the fire alarm industry. The Arizona Registrar of Contractors has measured a 32% increase in license revocations and a 71.6% increase in license suspensions from FY01/02 to FY03/04 (Arizona Registrar of Contractors [ARC], 2004).

The industry practice in Arizona is that an electrical contractor installs all of the fire alarm wiring, conduit, boxes, devices, etc. and a fire alarm contractor only makes the final connections to the fire alarm panel. This practice has been allowed because of a lack of understanding of the technical differences involved with the installation fire alarm systems versus other electrical appliances by regulators. A basic but common occurrence that demonstrates this point is exemplified by the fact that splices in electrical wiring are commonplace and are considered acceptable however; fire alarm wire cannot have any splices commonly know as t-taps (National Fire Protection Association [NFPA], 2002, 9.7.1.6.4)

These issues are not a new phenomenon. Similar issues have been documented in Wyoming (McHenry, 2000, 7) and Idaho (Silva, 1997, 7-8).

Procedures

The procedures used to evaluate the problem of the high failure rate of fire alarm inspections, creating a negative customer service climate between the fire alarm industry, general contractors, engineers, business owners, politicians, and the Peoria Fire Department, were a combination of literature reviews, interviews, personal observations, and surveys. The purpose of

the ARP was to identify the reason for the high failure rate of fire alarm inspections in order to make recommendations to correct any identified deficiencies.

The first phase in the process was to review available literature on the topic of fire alarm system design, review, installation, inspection, and testing. While attending the National Fire Academy in August 2004, the author reviewed the vast collection of reference material for items relating to the problem statement. Upon returning to the City of Peoria, an extensive internet search and review of materials locally available was conducted to identify materials related to the problem statement. Each reference resource was evaluated to determine how pertinent or relevant the material was to the overall objective.

Meetings were conducted with the following organizations: Arizona Automatic Fire Alarm Association (AZAFAA), Arizona Fire Marshal's Association (AFMA), Valley Fire Marshal's Association, the Arizona chapter of the American Fire Sprinkler Association (AFSA), National Electrical Contractors Association (NECA), and the Independent Electrical Contractors of Arizona (IECA) to discuss the problem and receive their input and perspective.

The second phase of the research was a review of the inspection data from the new construction inspection database known as Permits Plus. The Permits Plus system is used to track all required inspections associated with a building permit. This review was conducted to quantify what actually were the causes of the failed inspections and testing of new fire alarm systems. To assure a ninety-five percent confidence level in the results of the data, the author reviewed 360 permits out of 580 permits queried from the Permits Plus database for the time period of January 1, 2003 through October 19, 2004.

Discrepancies were grouped into one of five categories: incorrect installation, incomplete installation, wiring issues, device location, and other.

The third phase of the research involved an internet based survey of fire departments similar in size to the Peoria Fire Department. Each department was asked eleven questions regarding their inspection process and qualification requirements of both inspectors and contractors. The author contacted 48 departments via letter requesting their input on the survey. Out of the 48 departments 24 responded. While the information provided by these departments is valuable, this number was not an adequate response rate to assure a 95 percent confidence level in the results.

The fourth phase of the project was a review of the City of Peoria Fire Department's qualification requirements of fire protection contractors. These requirements were compared to the requirements of the other departments in the internet based survey.

The fifth and final phase of the research was a survey of the fire protection contractors that currently have or have had a permit with the City of Peoria Fire Department. Each contractor was asked seven questions regarding their installation process and qualifications of their employees. Out of 112 contractors surveyed only 24 responded. This number of respondents was not enough to assure a 95 percent confidence level in the data.

Because of the low response rate to the surveys, assumptions had to be made based upon the available data. These assumptions may not necessarily reflect a true and accurate depiction of the situation in other cities.

Results

Research Question 1: Is there a national standard regarding the qualifications of fire alarm installers?

The literature review that was performed revealed that determining the qualifications for fire alarm designers and installers has been controversial for more than 20 years. In the 1980's

professional organizations like the Society of Fire Protection Engineers (SFPE), the National Council of Examiners for Engineering and Surveying (NCEES), the National Institute of Certifying Engineering Technologies (NICET), and the National Society of Professional Engineers (NSPE) worked together to define the various roles and assign responsibilities to those people that are involved from design to installation of a fire alarm system (Society of Fire Protection Engineers [SFPE], 1998, 2-3).

The position of the SFPE is that a Fire Protection Engineer, hereafter referred to as engineer, is responsible for the design of the overall fire protection system. A technician certified to the level of NICET III or IV performs basic system layout and prepares shop drawings based upon the engineer's design (SFPE, 1998, 3).

The requirements for installers are less clear. The National Fire Protection Association (NFPA) Standard 72 sets requirements, which are vague at best, for the supervision of installation personnel. Installation personnel are required to be supervised by a person that is qualified and experienced in the installation of fire alarm systems. NFPA 72 proceeds to list three examples of how a person could become qualified but then opens these requirements up to interpretation by stating that the requirements are not limited to the three examples (Richardson & Moore, 2002, 53). Service personnel are required to be qualified and experienced in the testing, maintenance, and inspection of fire alarm systems. Again NFPA 72 lists examples of what is considered qualified. (Richardson & Moore, 430).

The intent of these qualifications is to ensure that the people installing, testing, inspecting, and maintaining fire alarm systems have the appropriate level of knowledge and training. Because the acceptable qualifications are not limited to the cited examples in NFPA 72 each AHJ must establish the qualifications that are acceptable in their jurisdiction (Richardson &

Moore, 2002, 430). The issue of qualifications of the individuals that design, install and maintain fire alarms was the topic of several code change proposals to NFPA 72, 1999 edition. However, the changes were not approved by the membership (Roux, 2002, 44).

Some states have addressed this issue by developing specific qualification standards. The California Fire Alarm Association (CAFFA) in conjunction with the California Fire Chiefs Association, the International Conference of Building officials, the Society of Fire Protection Engineers and other professional organizations collaborated on developing the Western Burglar and Fire Alarm Association (WBFAA) apprenticeship program that complied with Assembly Bill 931 that was signed into law in October 1999 by then Governor Gray Davis (Western Burglar and Fire Alarm Association [WBFAA], 1999). This bill required that any person making electrical connections of 100 volt amperes or more be certified by passing the State exam or be enrolled in a State approved apprentice program. (WBFAA, Section A, Page 1).

The WBFAA apprenticeship program requires 6,000 hours of on the job training, under the direct supervision of a journeyman (a 1:1 ratio), and 525 hours of formal classroom instruction two nights per week for three hours per night (WBFAA, 1999, Section A, Page 5) throughout the California college system and administered by the Unilateral Apprenticeship and Training Committee (UTAC). The classroom training covers an array of electrical topics including 40 hours specifically on fire alarms. Although not as stringent or as specific, Texas, Ohio, and Louisiana also have state licensing requirements.

A survey was sent out to 49 fire departments of similar size to the Peoria Fire Department and cities of similar population size. Of the 49 departments surveyed 24 responded which is not sufficient to assure a 95 percent confidence level. (Appendix A)

The cities that responded to the survey were: Chandler, AZ, Glendale, AZ, Imperial, CA, Laredo, TX, Arvada, CO, Waco, TX, Madera, CA, Kissimmee, FL, Boulder, CO, Tempe, AZ, Lucas, TX, San Bernardino, CA, Idaho Falls, ID, Savannah, GA, Merced, CA, Ontario, CA Hayward, CA, Garland, TX, Daly City, CA, Pocatello, ID, Downey, CA, Garden Grove, CA, Carrollton, TX, Henderson, NV, Corona, CA.

For the convenience of the respondents the survey was internet based and the data was collected in an Access database. The following questions were asked of each department and summarized below. The percentage shown was calculated by dividing the number of responses by 24 (the number of respondents).

1. What department in your jurisdiction performs the inspections of fire alarm systems during the construction process?

- Building Department 11.5%
- Fire Department 84.6%
- None 3.8
- Other (special inspectors or 3rd party)

2. If the answer to question 1 is “none”, who performs these inspections? Building Department

If the answer to question 1 was “yes” please answer the following

3. What stage or stages of installation do your inspectors conduct their fire alarm inspections?

Rough wiring (conduit and boxes are set, and wiring is pulled, but prior to dry wall). 50%

Final Fire inspection (after all devices have been installed and the building is ready for occupancy). 100%

4. If other than above please describe: In one jurisdiction the Electrical Inspector performs the rough inspection and the fire inspector performs the final inspection.

5. Does your jurisdiction require a Fire Alarm Record of Completion to be submitted from the Fire Alarm Installer in accordance with NFPA 72 (2002 edition) Paragraph 4.5.2.1?

Yes 84.6%

No 15.3%

6. In your jurisdiction, what is the percentage of fire alarm systems that fail the inspection process?

The average was 26%.

7. How many inspectors do you have on your staff?

Average of 4.8

8. How many of your inspectors inspect fire alarm installations?

Average of 4.1

9. What qualifications/certifications do your inspectors possess? Please provide the total number that possesses the following certifications (If "zero" please list "zero"):

NFPA Certified Fire Protection Specialist (CFPS) Overall % = 0%

- None of the respondents have staff with this certification

NFPA Certified Fire Inspector I (CFI) Overall % = 10.6%

Department	# certified/#inspector	Department percentage
Chandler, AZ	0/24	0%
Imperial, CA	0/1	0%

o Laredo, TX	0/6	0%
o Arvada, CO	0/3	0%
o Waco, TX	0/4	0%
o Madera, CA	0/2	0%
o Kissimmee, FL	7/7	100%
o Boulder, CO	0/3	0%
o Tempe, AZ	0/7	0%
o Lucas, TX	0/7	0%
o San Bernardino, CA	0/1	0%
o Idaho Falls, ID	0/3	0%
o Savannah, GA	1/2	50%
o Merced, CA	1/1	100%
o Ontario, CA	4/6	66%
o Hayward, CA	0/4	0%
o Garland, TX	0/6	0%
o Daly City, CA	0/5	0%
o Pocatello, ID	0/2	0%
o Downey, CA	0/3	0%
o Garden Grove, CA	0/3	0%
o Carrollton, TX	0/4	0%
o Henderson, NV	0/12	0%
o Corona, CA	0/6	0%
o Peoria, AZ	1/6	16%

NFPA Certified Fire Inspector II (CFI-II) Overall % = 4.0%

Department	# certified/#inspectors	Department Percentage
o Chandler, AZ	1/24	4.1%

o Imperial, CA	0/1	0%
o Laredo, TX	--	--
o Arvada, CO	0/3	0%
o Waco, TX	0/4	0%
o Madera, CA	0/2	0%
o Kissimmee, FL	5/7	71.4%
o Boulder, CO	0/3	0%
o Tempe, AZ	0/7	0%
o Lucas, TX	0/7	0%
o San Bernardino, CA	0/1	0%
o Idaho Falls, ID	0/3	0%
o Savannah, GA	0/2	0%
o Merced, CA	0/1	0%
o Ontario, CA	0/6	0%
o Hayward, CA	0/4	0%
o Garland, TX	0/6	0%
o Daly City, CA	0/5	0%
o Pocatello, ID	0/2	0%
o Downey, CA	0/3	0%
o Garden Grove, CA	0/3	0%
o Carrollton, TX	0/4	0%
o Henderson, NV	0/12	0%
o Corona, CA	0/6	0%
o Peoria, AZ	0/6	0%

NFPA Certified Fire Plan Examiner I (CFPE) Overall % = 7.3%

Department	#certified/#inspectors	Department Percentage
Chandler, AZ	0/24	0%
Imperial, CA	0/1	0%
Laredo, TX	5/6	83.3%
Arvada, CO	0/3	0%
Waco, TX	0/4	0%
Madera, CA	0/2	0%
Kissimmee, FL	1/7	14.2%
Boulder, CO	0/3	0%
Tempe, AZ	0/7	0%
Lucas, TX	0/7	0%
San Bernardino, CA	0/1	0%
Idaho Falls, ID	0/3	0%
Savannah, GA	0/2	50%
Merced, CA	1/1	100%
Ontario, CA	1/6	16.6%
Hayward, CA	0/4	0%
Garland, TX	0/6	0%
Daly City, CA	0/5	0%
Pocatello, ID	0/2	0%
Downey, CA	0/3	0%
Garden Grove, CA	1/3	33.3%
Carrollton, TX	0/4	0%
Henderson, NV.	0/12	0%
Corona, CA	0/6	0%
Peoria, AZ	1/6	16.6%

NFPA Certified Electrical Inspector - Master (CEI-M) Overall % = 0%

Department	# certified/#inspectors	Department Percentage
o Chandler, AZ	0/24	0%
o Imperial, CA	0/1	0%
o Laredo, TX	0/6	0%
o Arvada, CO	0/3	0%
o Waco, TX	0/4	0%
o Madera, CA	0/2	0%
o Kissimmee, FL	0/7	0%
o Boulder, CO	0/3	0%
o Tempe, AZ	0/7	0%
o Lucas, TX	0/7	0%
o San Bernardino, CA	0/1	0%
o Idaho Falls, ID	0/3	0%
o Savannah, GA	0/2	0%
o Merced, CA	0/1	0%
o Ontario, CA	0/6	0%
o Hayward, CA	0/4	0%
o Garland, TX	0/6	0%
o Daly City, CA	0/5	0%
o Pocatello, ID	0/2	0%
o Downey, CA	0/3	0%
o Garden Grove, CA	0/3	0%
o Carrollton, TX	0/4	0%
o Henderson, NV.	0/12	0%
o Corona, CA	0/6	0%

o Peoria, AZ	0/6	0%

NFPA Certified Electrical Inspector - Residential (CEI-R) Overall % = 0.8%

Department	# certified/#inspectors	Department Percentage
o Chandler, AZ	0/24	0%
o Imperial, CA	0/1	0%
o Laredo, TX	0/6	0%
o Arvada, CO	0/3	0%
o Waco, TX	0/4	0%
o Madera, CA	0/2	0%
o Kissimmee, FL	0/7	0%
o Boulder, CO	0/3	0%
o Tempe, AZ	0/7	0%
o Lucas, TX	0/7	0%
o San Bernardino, CA	0/1	0%
o Idaho Falls, ID	0/3	0%
o Savannah, GA	0/2	0%
o Merced, CA	1/1	100%
o Ontario, CA	0/6	0%
o Hayward, CA	0/4	0%
o Garland, TX	0/6	0%
o Daly City, CA	0/5	0%
o Pocatello, ID	0/2	0%
o Downey, CA	0/3	0%
o Garden Grove, CA	0/3	0%
o Carrollton, TX	0/4	0%
o Henderson, NV.	0/12	0%

o Corona, CA	0/6	0%
o Peoria, AZ	0/6	0%

NICET Certification in Fire Alarms Overall % = 2.4%

Department	# certified/#inspectors	Department Percentage
o Chandler, AZ	0/24	0%
o Imperial, CA	0/1	0%
o Laredo, TX	0/6	0%
o Arvada, CO	0/3	0%
o Waco, TX	0/4	0%
o Madera, CA	1/2	50%
o Kissimmee, FL	0/7	0%
o Boulder, CO	0/3	0%
o Tempe, AZ	0/7	0%
o Lucas, TX	0/7	0%
o San Bernardino, CA	0/1	0%
o Idaho Falls, ID	0/3	0%
o Savannah, GA	0/2	0%
o Merced, CA	0/1	0%
o Ontario, CA	0/6	0%
o Hayward, CA	0/4	0%
o Garland, TX	0/6	0%
o Daly City, CA	0/5	0%
o Pocatello, ID	0/2	0%
o Downey, CA	0/3	0%
o Garden Grove, CA	2/3	66.6%
o Carrollton, TX	0/4	0%

o Henderson, NV.	0/12	0%
o Corona, CA	0/6	0%
o Peoria, AZ	0/6	0%

ICC Fire Inspector I — Overall % = 27.8%

Department	# certified/#inspector	Department Percentage
o Chandler, AZ	22/24	91.6%
o Imperial, CA	1/1	100%
o Laredo, TX	0/6	0%
o Arvada, CO	0/3	0%
o Waco, TX	0/4	0%
o Madera, CA	0/2	0%
o Kissimmee, FL	0/7	0%
o Boulder, CO	2/3	66.6%
o Tempe, AZ	0/7	0%
o Lucas, TX	0/7	0%
o San Bernardino, CA	0/1	0%
o Idaho Falls, ID	1/3	33.3%
o Savannah, GA	0/2	0%
o Merced, CA	1/1	100%
o Ontario, CA	0/6	0%
o Hayward, CA	0/4	0%
o Garland, TX	6/6	100%
o Daly City, CA	0/5	0%
o Pocatello, ID	0/2	0%
o Downey, CA	0/3	0%
o Garden Grove, CA	1/3	33.3%

o Carrollton, TX	0/4	0%
o Henderson, NV.	0/12	0%
o Corona, CA	0/6	0%
o Peoria, AZ	2/6	33.3%

ICC Fire Inspector II — Overall % = 21.3%

Department	# certified/#inspectors	Department Percentage
o Chandler, AZ	2/24	8.3%
o Imperial, CA	0/1	0%
o Laredo, TX	0/6	0%
o Arvada, CO	3/3	100%
o Waco, TX	0/4	0%
o Madera, CA	0/2	0%
o Kissimmee, FL	0/7	0%
o Boulder, CO	1/3	33.3%
o Tempe, AZ	6/7	85.7%
o Lucas, TX	0/7	0%
o San Bernardino, CA	0/1	0%
o Idaho Falls, ID	1/3	33.3%
o Savannah, GA	0/2	0%
o Merced, CA	0/1	0%
o Ontario, CA	0/6	0%
o Hayward, CA	0/4	0%
o Garland, TX	0/6	0%
o Daly City, CA	0/5	0%
o Pocatello, ID	0/2	0%
o Downey, CA	0/3	0%

o Garden Grove, CA	1/3	33.3%
o Carrollton, TX	0/4	0%
o Henderson, NV.	12/12	100%
o Corona, CA	0/6	0%
o Peoria, AZ	0/6	0%

ICC Building Inspector — Overall % = 17.4%

Department	#certified/#inspectors	Department percentage
o Chandler, AZ	20/24	83.3%
o Imperial, CA	0/1	0%
o Laredo, TX	0/6	0%
o Arvada, CO	3/3	100%
o Waco, TX	0/4	0%
o Madera, CA	0/2	0%
o Kissimmee, FL	0/7	0%
o Boulder, CO	1/3	33.3%
o Tempe, AZ	6/7	85.7%
o Lucas, TX	0/7	0%
o San Bernardino, CA	0/1	0%
o Idaho Falls, ID	1/3	33.3%
o Savannah, GA	0/2	0%
o Merced, CA	0/1	0%
o Ontario, CA	0/6	0%
o Hayward, CA	0/4	0%
o Garland, TX	0/6	0%
o Daly City, CA	0/5	0%
o Pocatello, ID	0/2	0%

o Downey, CA	0/3	0%
o Garden Grove, CA	1/3	33.3%
o Carrollton, TX	0/4	0%
o Henderson, NV.	12/12	100%
o Corona, CA	0/6	0%
o Peoria, AZ	2/6	33.3%

10. What license/certification does your jurisdiction require of fire alarm installers? (Please check all that apply)

- Electrical Contractor License 57.6 %
- General Contractor License 15.3%
- NICET I (Fire Alarms) 19.2%
- NICET II(Fire Alarms) 19.2%
- NICET III(Fire Alarms) 11.5%
- NICET IV(Fire Alarms) 7.6%
- No License/Certification 7.6%
- Other (Please Specify) 26.9% State Certification
  3.8% Low Voltage License
  3.8% City exam

11. What competency level does your jurisdiction accept for fire alarm design? (Please check all that apply.)

- Fire Protection Engineer 76.9%
- PE (electrical) 42.3%
- PE (mechanical) 11.5%

- NICET II 30.7%
- NICET III 23.0%
- NICET IV 15.3%

Research Question 2: What are the qualifications of the fire alarm installation contractors who install fire alarm systems in the City of Peoria?

The State of Arizona Registrar of Contractors does not have license requirements specifically for Fire Alarm Installers. Any company holding an L-11 electrical license is allowed to install or repair any wiring or related equipment designed to carry 600 volts or less (SA, 2003, 1). Companies holding an L-67 low voltage communications systems license is allowed to install or repair low voltage systems and devices including alarm systems (SA, 2003, 1).

The exam for the L-11 license is an 80 question open book exam. The minimum passing score is 70 percent. Of the 80 questions only four questions (5%) are specific to low voltage systems. There is not a specific exam category on fire alarm installation (SA, 2003, 1).

The exam for the L-67 license is a sixty question open book exam. A score of seventy percent is required to pass. Of the 60 questions only eight questions (13%) are specific to fire alarms (SA, 2003, 1). It is possible that a person could pass either of these licensing exams and not have any knowledge of fire alarm systems or NFPA 72 which specifies how fire alarms systems are to be installed. However, these license examinations are only required of one person in the company referred to as the *qualifying party. (ARC, n.d., 1).* The qualifying party is responsible to assure that all employees working under their license have the appropriate skills and knowledge.

The City of Peoria requires that all persons engaged in the design, sale, maintenance, testing, and servicing of fire protection systems have a permit issued by the Peoria Fire

Department. Current practice is to issue a permit to the Fire Protection Contractor, otherwise known as the responsible party. The responsible party must provide the following items: a copy of their L-11 or L-67 license, a certificate of insurance listing the City of Peoria as additional insured, a City of Peoria business license, and copies of their certifications relating to fire protection systems. Like the ROC requirements, only one person in the company is required to show proof of competency.

A survey was sent out to the 112 fire protection contractors that currently have a valid permit or have had a valid permit with the City of Peoria Fire Department. To foster conditions so that the contractors could be open and honest, the responses to the survey were anonymous. Each contractor was asked seven questions regarding their installation process and qualifications of their employees (Appendix B).

Out of 112 contractors surveyed, only 24 responded. This number of respondents was not enough to assure a 95 percent confidence level in the data. Because of the low response rate to the survey assumptions had to be made based upon the available data. These assumptions may not necessarily reflect a true and accurate depiction of all contractors currently or previously permitted by the City of Peoria.

The survey questions are listed below with the results

1. How many fire alarm installers does your company employ? 5.1 average

2. Out of that total number of employees, please provide the total number of employees in each category that possesses the following licenses/certifications (If “zero” please list “zero”): The results of this question are listed as the percentage of the companies that had one or more employees in each category.

	Installers	Supervisors	Office Staff
State of Arizona L11 License	0%	0%	0%
State of Arizona L16 License	0%	0%	0%
State of Arizona C12 License	0%	0%	0%
State of Arizona L67 License	25%	41.6%	37.5%
State of Arizona C16 License	0%	4.1%	4.1%
NICET I in Fire Alarms	50%	16%	4.1%
NICET II in Fire alarms	37.5%	37.5%	12.5%
NICET III in Fire Alarms	25%	16.6%	33.3%
NICET IV in Fire Alarms	4.1%	8.3%	20.8%
No Licenses/certifications	50%	8.3%	4.1%

Other: Please Specify It depends is the paraphrased answer that the two respondents gave.

3. How many installation supervisors do you employ? 1.5 average

4. What is the ratio of installers per supervisor for each job site? (Please circle the most appropriate ratio)

1:1 = 29.1% 2:1 = 29.1% 3:1 = 4.1% 4:1 = 8.3% More then 4:1 = 29.1%

5. Does an Installation Supervisor remain on site throughout the entire installation process? Yes 33.3% No 66.6%

6. When installing a fire alarm system in a commercial occupancy, do your employees install all control panels, wiring, conduit, boxes, devices, and other related equipment associated with the fire alarm system? Yes 58.3% No 41.6%

7. If the answer to question 7 was “no”, who installs these items associated with the fire alarms you install?

50% General Contractor

41.6% Electrician

8.3% Other

Question 3: How does the Peoria Fire Department conduct new fire alarm inspections?

The Peoria Fire Department has established a checklist of the items to be inspected at both the rough stage and at the final inspection. This checklist is provided to all contractors when they pick up their permit from the building safety division.

When a fire alarm system is being installed, the first inspection of the fire alarm system is at the rough stage. The rough stage is when the building itself has been framed up but the walls and ceiling have not been covered. The purpose of this inspection is to identify any issues with wiring and device locations because it is easier and cheaper to correct errors at this stage of construction. To ensure consistency a checklist followed by each Peoria Fire Department inspector (Appendix B). Both the rough and final inspection checklists were developed using NFPA 72 as a guide (Richardson & Moore, 2002, 436-461).

The next inspection of the fire alarm system is the final inspection performed before a building can be issued a certificate of occupancy by the building official. If the Fire Protection Contractor corrected any deficiencies noted during the rough inspection, the final inspection should go smoothly.

Question 4: How do departments of like size conduct fire alarm acceptance inspections?

The survey of the fire department of like size revealed that 100 percent of the departments perform a final inspection while only 50 percent perform a rough inspection. No details of what is inspected during each inspection were provided.

Question 5: What were the reasons for the failures of the fire alarm system acceptance inspections performed by the Peoria Fire Department?

To determine the reasons for failures of the new fire alarm system inspections a review of the inspection data from the new construction inspection database known as Permits Plus (CP, 2004) was performed. The Permits Plus system is used to track all required inspections associated with a building permit.

This review was conducted to quantify the causes of the failed inspections and testing of new fire alarm systems. To assure a 95 percent confidence level in the results of the data, the author reviewed 360 permits out of a 580 permits queried from the Permits Plus database for the time period of January 1, 2003 through October 19, 2004 (Appendix C).

Discrepancies were grouped into one of five categories: incomplete installation, incorrect installation, wiring issues, device location, and other.

Incomplete installation was defined as any inspection that was not complete and ready for inspection at the scheduled appointment. Incorrect installation was defined as the installation of any device or associated equipment that was not installed according to NFPA 72. Wiring issues were separated from incorrect installation because of the frequency that they occur. Wiring issues are defined as any discrepancy associated directly with the wiring (i.e. Class A loop, wire separation, etc.). Device location was defined as any detection or notification device that was not located properly according to NFPA 72. The final category, other, was defined as any condition that did not fit into one of the previous four categories.

The results of the review of the Permits Plus database revealed the following frequency of each type of discrepancy during the time period of January 1, 2003 through October 19, 2004:

1. Incomplete installation occurred 64 times in 360 inspections accounting for 18% of the discrepancies.
2. Incorrect installation occurred 47 times in 360 inspections accounting for 13% of the discrepancies.
3. Wiring issues occurred 40 times in 360 inspections accounting for 11% of the discrepancies.
4. Device locations discrepancies occurred 5 times in 360 inspections accounting for 1.3% of the discrepancies.
5. Other discrepancies occurred 3 times in 360 inspections accounting for 0.8% of the discrepancies.

Question 6: Is the Peoria Fire Department's 70% failure rate unique or do other departments of like size have similar results?

The detail listed below show the failure rates of each department surveyed:

- Chandler, AZ 0%
- Imperial, CA 0%
- Laredo, TX 3%
- Arvada, CO 0%
- Waco, TX 0%
- Madera, CA 75%
- Kissimmee, FL 50%
- Boulder, CO 25%
- Tempe, AZ 99%

- Lucas, TX 35%
- San Bernardino, CA 0%
- Idaho Falls, ID 5%
- Corona, CA 25%
- Savannah, GA 0%
- Merced, CA 33%
- Ontario, CA 0%
- Hayward, CA 10%
- Garland, TX 50%
- Daly City, CA 25%
- Pocatello, ID 25%
- Downey, CA 10%
- Garden Grove, CA 5%
- Carrollton, TX 25%
- Henderson, NV. 50%
- Peoria, AZ 70%

Discussion

The results of the author's research confirmed that the experiences in Peoria in 2004 are not unique to Peoria but in fact are happening in other locations throughout the country (McHenry, 2000, 7) (Silva, 1997, 7). These issues are not even unique to the fire alarm industry. Similar problems are occurring in all areas of the construction industry made evident by the number of contractor licenses that are being revoked or suspended in Arizona (ARC, 2004).

Different opinions exist regarding who is at fault for fire alarm system acceptance testing failures (McHenry, 7). While the author does not deny that the designer and the AHJ have responsibilities and weaknesses in this process, this ARP was focused on the role that the fire protection contractor plays in fire alarm installations. While the literature review confirmed that

fire alarm installation problems have been a topic of concern (Silva, 1997), none of the articles that the author found presented any solutions.

The data and information collected was evaluated and used to answer each of the research questions.

Research Question 1: Is there a national standard regarding the qualifications of Fire Alarm Installers?

The author was unable to find a definitive consistent standard regarding the qualifications of Fire Alarm Installers. NFPA 72 states that the installation of fire alarm systems must be supervised by individuals that are experienced and qualified in the installation of fire alarms. However the standard does not define what constitutes experienced ad qualified. NFPA 72 lists examples of what should be considered as qualifications but leaves the final determination to the AHJ (NFPA, 2002, 24).

The Fire Alarm Installer requirements of the 24 departments that replied to the author's survey were not consistent either. An Electrical Contractor license was required 57.6 % of the time, a General Contractor license15.3%, NICET I (Fire Alarms) 19.2%, NICET II (Fire Alarms) 19.2%, NICET III (Fire Alarms) 11.5%, NICET IV (Fire Alarms) 7.6%, No License/Certification 7.6%, State Certification 26.9% , Low Voltage License 3.8%, and a City exam 3.8% of the time.

Research Question 2: What are the qualifications of the Fire Alarm Installation Contractors installing the fire alarm systems in the City of Peoria?

To determine the answer to this question an internet based survey was sent out to 112 Fire Protection Contractors that currently have a permit or have had a permit with the City of Peoria. This survey did not receive an adequate response rate to ensure a 95% accuracy rate. The

information that was collected did shed light on the issue at hand. Because of the low response rate the author made assumptions on the data.

The survey results reported that on the average each company employs 5.1 installers and 1.5 supervisors. Of the 24 companies, seven reported the ratio of supervisors to installers for each job site was 1:1. Another seven companies reported their ratio as 2:1. One company reported their ratio as 3:1, and two companies reported a 4:1 ratio. A supervisor to installer ratio of more then 4:1 was reported by the final seven companies.

Of the 24 contractors that responded to the survey, 50% reported that their installers have no license or certifications. They further acknowledged that only 41.6% of the supervisors, 37.5% of the office staff, and 25% of the installers have an L-67 license to install Low Voltage Communications Systems (CP, 2004) which according to the State of Arizona is allowed to install alarm systems (SA, 2003). Assuming that this data was reflective of all Fire Protection Contractors, then more than half of the time, it is possible that a project could have a non-qualified employee and/or supervisor installing the fire alarm system.

If each employee that does not have a license of certification were to have a supervisor that met the requirements of NFPA 72, only eight out of the 24 companies (33.3%) state that the supervisor remains on site throughout the entire installation process.

To compound the situation even further, only 59% of Fire Protection Contractors install all of the control panels, wiring, conduit, boxes, devices, and other equipment directly related to the fire alarm system. The remaining 41% are installed by the General Contractor or an Electrician. A licensed electrician in Arizona is only tested on the contents of NFPA 70, the National Electric Code and not on NFPA 72 the National Fire Alarm Code (SA, 2003).

The results of the survey conducted by the author indicate a significant inconsistency in the licensure and qualifications of the Fire Protection Contractors and their employees doing business in the Phoenix metropolitan area.

Research Question 4: How does the Peoria Fire Department conduct fire alarm acceptance inspections?

The procedures followed by the Peoria Fire Department when performing a rough inspection and a final acceptance test of fire alarm systems were reviewed. The procedures were consistent and congruent with the requirements of NFPA 72. To ensure consistency, a checklist is used by the inspectors. This same checklist is provided to the construction superintendent early in the project so all parties are aware of what will be inspected and tested.

Research Question 5: What were the reasons for the failures of the fire alarm system acceptance inspections performed by the Peoria Fire Department?

The author reviewed inspection data from the new construction inspection database known as Permits Plus (CP, 2004). The Permits Plus system is used to track all required inspections associated with a building permit. This review was conducted to quantify the causes of the failed inspections and testing of new fire alarm systems. To assure a 95 percent confidence level in the results of the data, the author reviewed 360 permits out of 580 permits queried from the Permits Plus database for the time period of January 1, 2003 through October 19, 2004.

Discrepancies were grouped into one of five categories: incomplete installation, incorrect installation, wiring issues, device location, and other.

The number one reason (41%) for fire alarm test failures were incomplete installation. Basically the Fire Protection Contractor was not completely finished with the installation of the fire alarm system before calling for an inspection. This condition is a result of the compressed

construction time schedules. The General Contractor schedules the inspections before the installation is complete and then pressures the Fire Protection Contractor to get the installation completed.

The number two reason, 28.8% of failures was due to incorrect installation. This category is directly related to installer qualifications. The third reason for failure was wiring issues. Wiring issues accounted for 24.5% of all fire alarm inspection failures. Number four was incorrect device location which accounted for 3% of the failures and at number five occurring 1.8% of the time were other reasons not specified.

Wiring issues and device location are actually subsections of incorrect installation. When you add these three categories together they account for 58.1% of all fire alarm inspection failures. These three issues can be attributed to the qualifications, or lack thereof, of the Fire Protection Contractors.

Research Question 6: Is the Peoria Fire Department's 70% failure rate unique or do other departments of like size have similar results?

A survey was sent out to 49 fire departments of similar size to the Peoria Fire Department and cities of similar population size. Of the 49 departments surveyed, only 24 responded which is not sufficient to assure a 95 percent confidence level. Assuming that the data collected was representative of the industry, the following observations have been made.

The average failure rate of the 24 cities that responded to the survey was 22.9%, the median failure rate was 18%, and the mode was 0%. Failure rates of 0-5% occurred seven times, 6-10% occurred twice, 11-20% occurred zero, 21-40 occurred seven times, 41-75% occurred four times, and greater than 75% occurred once. Only two departments surveyed, Madera, Ca and Tempe, AZ, had failure rates equal to or above Peoria.

In an effort to determine if there was a specific reason for the difference in the failure rates a review of the inspection process, the number of inspectors, and the inspector qualifications were considered.

A review of the inspection procedures of these departments did not provide many details nor did it reveal any significant difference in the way each department performs their inspections. The average number of inspectors of each department was 4.1, Peoria has 4.

A review of the qualifications and certifications of inspectors from each department was compared to Peoria and revealed the following: NFPA Certified Fire Protection Specialist (CFPS) Overall % = 0% Peoria =0%, NFPA Certified Fire Inspector I (CFI) Overall % = 10.6%; Peoria 16.6%; NFPA Certified Fire Inspector II (CFI-II) Overall % = 4.0%, Peoria 0%; NFPA Certified Fire Plan Examiner I (CFPE) Overall % = 7.3%, Peoria 16.6%; NFPA Certified Electrical Inspector - Master (CEI-M) Overall % = 0%, Peoria 0%; NFPA Certified Electrical Inspector - Residential (CEI-R) Overall % = 0.8%, Peoria 0%; NICET Certification in Fire Alarms Overall % = 2.4%, Peoria 0%; ICC Fire Inspector I Overall % = 27.8%, Peoria 33.3%; ICC Fire Inspector II Overall % = 21.3%, Peoria 0%; ICC Building Inspector Overall % = 17.4%, Peoria 0%. There were not any anomalies noted.

Recommendations

Based upon the results of this ARP, I will be recommending the following changes and further studies into the issue of fire alarm system inspection failures.

Because there is not a standard or consistent set of required qualifications for Fire Alarm Contractors in Phoenix, in Arizona, or the country, I recommend that the Peoria Fire Department take steps to create and implement a fire protection contractor certification process. The Peoria

Fire Department will need to evaluate the requirements of the states that were identified in this ARP as having certification procedures.

The certification process that Peoria develops needs to be coordinated with the other jurisdictions in the Phoenix metropolitan area in an attempt to create a program that would be acceptable to most, if not all, AHJs. Ideally, certification from one city would be honored in the others. This process should also be presented to the Arizona Fire Marshal's Association for possible adoption on a State level.

After a specified period of time a review of the Permits Plus database should be made to document any changes in the failure rate of fire alarm inspections. I would expect that the number of failed inspections would decrease as the level of qualifications increases.

The level of certification of the fire inspectors assigned to the Peoria Fire Department also needs to be enhanced. It is the author's recommendation that all inspectors have a Fire Inspector I certification from NFPA or the International Code Council (ICC). In addition, each inspector and plans reviewer should be required to pass the same certification exam as the contractors. This will give credibility to the certification process and enhance the reputation and professionalism of the Peoria Fire Department. As the qualification of the Fire Protection Contractors increases without a corresponding increase in qualification of the inspectors the process could be construed as placing an undue burden on the contractors.

In conclusion, future researchers of fire alarm issues should consider evaluating Fire Protection System Designer qualifications and conduct an in-depth review of plans that are submitted for review that are approved or denied correlated with qualifications of the designer. Throughout this ARP, the issue of designer qualifications has been the topic of discussion.

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Appendix A

Comparable Cites Survey

Dear

My name is Howard Munding. I am the Fire Marshal for the City of Peoria, AZ. I am currently involved in a research project both for the National Fire Academy Executive Fire Office Program and the Arizona Fire Marshal's Association.

The Peoria Fire Department assumed responsibility of new construction fire inspections in July 2003. Since that time the failure rate of new construction fire inspections has risen from 39% to 50%. Failure of new fire alarm system inspections has been identified as being the largest factor for the increase in the failure rate. The problem is that the high failure rate of new fire alarm inspections is creating a negative customer service reputation.

To objectively evaluate our problem I need your input. I have put together 2 short surveys that are internet based. Your response to these two short surveys is critical to the success of this project. I will be happy to share the research report with each of you for use in your areas.

To access the surveys please use the following go to the listed web address and follow the instructions:

Jurisdiction Fire Alarm Survey

https://www.peoriaaz.com/firealarm/

Username: firealarm

Password: rycg40 (that's zero not an O)

Jurisdiction Fire Sprinkler Survey

https://www.peoriaaz.com/firesprinkler/

Username: firesprinkler

Password: yacru9u9

If you have any questions please feel free to call or email me at 623-773-7279 or

hmunding@peoriaaz.com

Sincerely,

Howard M. Munding

Fire Marshal

Comparable Cities Fire Alarm Survey

1. What department in your jurisdiction performs the inspections of fire alarm systems during the construction process?

- Building Department ___
- Fire Department ___
- None ___
- Other (special inspectors or 3rd party) _____

2. If the answer to question 1 is "none", who performs these inspections? _____

If the answer to question 1 was "yes" please answer the following

3. What stage or stages of installation do your inspectors conduct their fire alarm inspections?

___ Rough wiring (conduit and boxes are set, and wiring is pulled, but prior to dry wall).

___ Final Fire inspection (after all devices have been installed and the building is ready for occupancy).

4. If other than above please describe:

_____

_____

5. Does your jurisdiction require a Fire Alarm Record of Completion to be submitted from the fire alarm installer in accordance with NFPA 72 (2002 edition) Paragraph 4.5.2.1?

Yes ____

No ____

6. In your jurisdiction, what is the percentage of fire alarm systems that fail the inspection process? ____

7. How many inspectors do you have on your staff? ____

8. How many of your inspectors inspect fire alarm installations? ____

9. What qualifications/certifications do your inspectors possess? Please provide the total number that possesses the following certifications (If “zero” please list “zero”):

- NFPA Certified Fire Protection Specialist (CFPS) Q9A
- NFPA Certified Fire Inspector I (CFI) Q9B
- NFPA Certified Fire Inspector II (CFI-II) Q9C
- NFPA Certified Fire Plan Examiner I (CFPE) Q9D
- NFPA Certified Electrical Inspector - Master (CEI-M) Q9E
- NFPA Certified Electrical Inspector - Residential (CEI-R) Q9F
- NICET Certification in Fire Alarms Q9G
- ICC Fire Inspector I Q9H
- ICC Fire Inspector II Q9I
- ICC Building Inspector Q9J

10. What license/certification does your jurisdiction require fire alarm installers? (Please check all that apply)

- Electrical Contractor License Q10A
- General Contractor License Q10B
- NICET I (Fire Alarms) Q10C
- NICET II(Fire Alarms) Q10D
- NICET III(Fire Alarms) Q10E
- NICET IV(Fire Alarms) Q10F

- No License/Certification Q10G
- Other (Please Specify) Q10H

11. What competency level does your jurisdiction accept for fire alarm design? (Please check all that apply.)

- Fire Protection Engineer Q11A
- PE (electrical) Q11B
- PE (mechanical) Q11C
- NICET II Q11D
- NICET III Q11E
- NICET IV Q11F

Appendix B

Fire Alarm Installer Letter

Dear

My name is Howard Munding. I am the Fire Marshal for the City of Peoria, AZ. I am currently involved in a research project both for the National Fire Academy Executive Fire Office Program and the Arizona Fire Marshal's Association.

The Peoria Fire Department assumed responsibility of new construction fire inspections in July 2003. Since that time the failure rate of new construction fire inspections has risen from 39% to 70%. Failure of new fire alarm system inspections has been identified as being the largest factor for the increase in the failure rate. The problem is that the high failure rate of new fire alarm inspections is creating a negative customer service reputation.

To objectively evaluate our problem I need your input. I have put together a short (8 question) survey that is internet based. Your response to this short survey is critical to the success of this project. I will be happy to share the research report with each of you for use in your areas.

To access the surveys please use the following go to the listed web address and follow the instructions:

Fire Alarm Installer Survey

https://www.peoriaaz.com/fireinstaller/

Username: fireinstaller

Password: wasu75

If you have any questions please feel free to call or email me at 623-773-7279 or

hmunding@peoriaaz.com

Sincerely,

Howard M. Munding
Fire Marshal

Fire Alarm Installer Survey

Definitions:

Fire Alarm Installer: a fire alarm installer is anyone that is physically involved on a project site with the installation, inspection or testing of fire alarm systems, control panel, wiring, conduit, boxes, devices, and other related equipment.

Fire Alarm Installation Supervisor: a fire alarm installation supervisor is the person responsible for the supervision of the fire alarm installer.

1. How many fire alarm installers does your company employ? _____

2. Out of that total number of employees, please provide the total number of employees in each category that possesses the following licenses/certifications (If "zero" please list "zero"):

	Installers	Supervisors	Office Staff
State of Arizona L11 License	Q2A1	Q2A2	Q2A3
State of Arizona L16 License	Q2B1	Q2B2	Q2B3
State of Arizona C12 License	Q2C1	Q2C2	Q2C3
State of Arizona L67 License	Q2D1	Q2C2	Q2C3
State of Arizona C16 License	Q2E1	Q2E2	Q2E3
NICET I in Fire Alarms	Q2F1	Q2F2	Q2F3
NICET II in Fire alarms	Q2G1	Q2G2	Q2G3
NICET III in Fire Alarms	Q2H1	Q2H2	Q2H3
NICET IV in Fire Alarms	Q2I1	Q2I2	Q2I3
No Licenses/certifications	Q2J1	Q2J2	Q2J3

Other: Please Specify _____

3. How many installation supervisors do you employ? ____

4. What is the ratio of installers per supervisor for each job site? (Please circle the most appropriate ratio)

1:1 2:1 3:1 4:1 More then 4:1

5. Does an Installation Supervisor remain on site throughout the entire installation process?

Yes ___ No ___

6. When installing a fire alarm system in a commercial occupancy, do your employees install all control panels, wiring, conduit, boxes, devices, and other related equipment associated with the fire alarm system?

Yes ____ No ____

7. If the answer to question 7 was “no”, then who installs these items associated with the fire alarms you install?

____ General Contractor

____ Electrician

____ Other (Please specify)

_____

Appendix C

Fire Alarm Inspection Discrepancies Raw Data

Service Date	Description		Installation Incomplete
10/10/2003	Device Location	1/13/2004	installation
10/10/2003	Device Location		Incomplete
10/15/2003	Device Location	3/4/2004	installation
9/17/2004	Device location		Incomplete
3/25/2004	Device location	1/13/2004	Installation
	Incomplete		Incomplete
10/10/2003	Installation	3/24/2004	Installation
	Incomplete		Incomplete
10/15/2003	Installation	9/3/2003	Installation
	Incomplete		Incomplete
10/15/2003	Installation	9/3/2003	installation
	Incomplete		Incomplete
11/20/2003	Installation	10/15/2003	installation
	Incomplete		Incomplete
5/23/2004	installation	4/14/2004	installation
	Incomplete		Incomplete
5/23/2003	installation	5/14/2004	installation
	Incomplete		Incomplete
5/27/2003	Installation	5/14/2004	Installation
	Incomplete		Incomplete
5/28/2003	Installation	5/14/2004	installation
	Incomplete		Incomplete
3/31/2003	Installation	5/15/2004	Installation
	Incomplete		Incomplete
3/31/2003	installation	4/14/2004	Installation
	Incomplete		Incomplete
3/21/2003	installation	10/31/2003	installation
	Incomplete		Incomplete
12/22/2003	Installation	10/31/2003	installation
	Incomplete		Incomplete
12/18/2003	Installation	12/17/2003	Installation
	Incomplete		Incomplete
4/21/2003	Installation	2/24/2004	Installation
	Incomplete		Incomplete
4/21/2003	Installation	3/30/2004	Installation
	Incomplete		Incomplete
1/30/2004	Installation	3/30/2004	installation
	Incomplete		Incomplete
9/9/2003	Installation	12/10/2003	installation
1/13/2004	Incomplete	4/6/2004	Incomplete

	installation		
	Incomplete		Incomplete
3/17/2004	installation	3/16/2004	installation
	Incomplete		Incomplete
9/24/2003	installation	3/16/2004	installation
	Incomplete		Incomplete
9/18/2003	installation	2/11/2004	Installation
	Incomplete		Incomplete
9/16/2004	installation	2/11/2004	installation
	Incomplete		Incomplete
9/16/2004	installation	2/11/2004	installation
	incomplete		Incomplete
4/22/2004	installation	1/5/2004	installation
	Incomplete		Incorrect
4/5/2004	installation	10/15/2003	Installation
	Incomplete		Incorrect
10/14/2003	Installation	11/20/2004	Installation
	Incomplete		Incorrect
1/13/2004	Installation	9/25/2003	Installation
	Incomplete		Incorrect
2/25/2004	installation	3/10/2004	Installation
	Incomplete		Incorrect
8/9/2004	Installation	5/23/2004	Installation
	Incomplete		Incorrect
10/30/2004	Installation	5/23/2004	Installation
	Incomplete		Incorrect
1/30/2004	Installation	5/28/2004	Installation
	Incomplete		Incorrect
9/3/2003	Installation	10/22/2004	Installation
	Incomplete		Incorrect
1/7/2004	Installation	10/22/2004	Installation
	Incomplete		Incorrect
10/29/2003	Installation	3/7/2003	Installation
	Incomplete		Incorrect
10/6/2003	Installation	12/18/2003	Installation
	Incomplete		Incorrect
10/6/2003	Installation	4/7/2003	Installation
	Incomplete		Incorrect
5/17/2004	Installation	4/7/2003	Installation
	Incomplete		Incorrect
3/16/2004	installation	3/11/2003	Installation
	incomplete		Incorrect
3/16/2004	installation	9/2/2003	Installation
	Incomplete		Incorrect
9/17/2004	installation	9/2/2003	Installation
2/26/2004	Incomplete	9/2/2003	Incorrect

	Installation Incorrect		Incorrect
1/13/2004	Installation Incorrect	11/3/2003	Installation Incorrect
1/20/2004	Installation Incorrect	9/23/2004	installation Incorrect
1/30/2004	Installation Incorrect	4/14/2004	installation Incorrect
9/9/2003	Installation Incorrect	6/18/2004	installation Incorrect
9/9/2003	Installation Incorrect	2/11/2004	installation Incorrect
8/26/2004	Installation Incorrect	3/3/2004	installation Incorrect
1/13/2004	Installation Incorrect	3/3/2004	installation Other
7/7/2003	Installation Incorrect	6/24/2004	Other Other
12/17/2003	Installation Incorrect	3/30/2004	Other Wiring
3/30/2004	Installation Incorrect	10/10/2003	Wiring Wiring
3/30/2004	Installation Incorrect	10/15/2003	Wiring Wiring
12/12/2003	Installation Incorrect	10/15/2003	Wiring Wiring
12/12/2003	Installation Incorrect	10/15/2003	Wiring Wiring
9/18/2003	Installation Incorrect	10/1/2003	Wiring Wiring
9/18/2003	Installation Incorrect	10/1/2003	Wiring Wiring
9/18/2003	Installation Incorrect	5/28/2003	Wiring Wiring
2/25/2004	Installation Incorrect	12/22/2004	Wiring Wiring
1/23/2004	Installation Incorrect	12/18/2003	Wiring Wiring
10/6/2003	Installation Incorrect	4/7/2003	Wiring wiring
10/6/2003	Installation	9/9/2003	Wiring wiring
11/1/2003	Incorrect	1/13/2004	Wiring wiring
		1/13/2004	Wiring wiring
		9/3/2003	Wiring wiring
		9/3/2003	Wiring wiring
		5/14/2004	Wiring wiring
		2/24/2004	Wiring wiring
		3/30/2004	Wiring wiring
		12/12/2003	Wiring wiring
		6/24/2004	Wiring wiring
		3/17/2004	Wiring wiring
		9/18/2003	Wiring wiring
		9/16/2003	Wiring wiring
		9/16/2003	wiring wiring
		1/7/2004	wiring wiring
		2/25/2004	wiring wiring
		1/23/2004	wiring wiring
		9/30/2003	wiring

5/27/2004	wiring
9/23/2004	wiring
3/16/2004	wiring
3/25/2004	Wiring
3/25/2004	wiring
3/25/2004	wiring
11/5/2004	wiring
3/16/2004	wiring
3/3/2004	wiring
1/5/2004	wiring
7/26/2004	wiring
7/26/2004	wiring