Assessing the need for a nationwide licensing program for fire protection equipment.

Anita Holoubek Varone

The University of Montana

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ASSESSING THE NEED FOR A NATIONWIDE LICENSING PROGRAM
FOR FIRE PROTECTION EQUIPMENT

by
Anita Holoubek Varone
B.S. Eastern Montana College, 1974
presented in partial fulfillment of the requirements
for the degree of
Master of Public Administration
University of Montana
1995

Approved by:

[Signatures]

Chairperson
Dean, Graduate School

Date
9-25-95
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CHAPTER I
INTRODUCTION

Statement Of The Problem

No national program for fire protection equipment licensing currently exists. Each state has decided for itself whether to license fire protection equipment and what regulations to impose. Although state bureaus have been in existence since the turn of the century, regulation of fire protection equipment and the people that install and service the equipment is relatively new. For example, in 1911 the Montana legislature created an office of the state fire marshal but did not give it the authority to regulate fire protection equipment.\(^1\) The statute imposed a tax on fire insurance companies doing business in the state of one percent "on the fire portion of the direct premiums on such risks received during the calendar year next preceding after deducting cancellations and return premiums".\(^2\) The revenues were earmarked to maintain the State Fire Marshal Fund.

The duties and responsibilities of the bureau expanded considerably through the years. Original investigative responsibilities were increased to include inspection, code development and adoption, code interpretation, fire

\(^1\)En.Sec.1, Ch.148, l.1911, Montana Codes Annotated.
\(^2\)Sec. 50-3-109, 1993, Montana Codes Annotated.
investigation and inspection, fire prevention, and fire information collection programs. In 1967, the Fire Marshal Bureau was statutorily mandated to create, regulate, and manage a fire protection licensing program. The program initially served four regulatory functions:

1. It required businesses that sold fire extinguishers to purchase a sales permit.

2. It required all businesses involved in selling fire protection equipment, of any kind, to purchase a license. The application for the license reported kind(s) of fire protection the company was engaged in (i.e., service and/or installation of fire sprinkler systems, fire suppression systems, and fire alarm systems).

3. It required individuals to pass tests devised by the Fire Marshal Bureau staff. Tests were developed for many aspects of fire protection including installation and service. For example, if an individual installed and/or serviced hood suppression systems in restaurants, they were required to pass a specific test designed for that type of equipment. If an individual was in the business of installing and servicing fire sprinkler systems in schools, a test was designed for that type of equipment. Once the test was passed, the individual was issued a Certificate of Registration. No specific training or education was required. On-the-job training was not considered - an individual could actually walk off the street, with no training, pass the test and be licensed to install the product. Product knowledge played no part in the process.

4. It required facility inspection and made provision for suspension, revocation, or fines for those that failed to comply with the rules.

Businesses were required to renew their licenses and sales permits every two years. Continuing education was not

\[\text{En.82-1202.1 by Sec. 3, Ch.229, L. 1967, Montana Codes Annotated.}\]
required once a Certificate of Registration was issued although the Uniform Fire Codes, revised every three years, regulates installation and service of all fire protection equipment products sold in the United States. ¹

Initially, the program was seriously mismanaged. Businesses were not inspected to assure that appropriate equipment was installed or that the business was an authorized dealer of any product. Subsequent to the issuance of a license and sales permit, the business was allowed to maintain, purchase, sell, and operate as it saw fit. Complaints were frequent but rarely investigated. Although renewal was required every two years, no procedure or policy was established to monitor the renewal process. From 1972 to 1993 no business was contacted or reviewed to assure compliance⁵.

For more than twenty years individuals carrying a Certificate of Registration were given free reign to install and service equipment. Even though technology advanced through the years, no additional training or testing was required. In many cases fire protection equipment has advanced so significantly that formal education is necessary for an individual to correctly install or service the product.


⁵Department of Justice, Office of the Fire Prevention and Investigation Bureau, personal research conducted by the author of documents and logs, 1972-1993.
Furthermore, a Certificate of Registration was issued only once. Renewal consisted of submitting $5 along with perfunctory information (i.e., change in address, physical characteristic changes, or employer changes).  

Testing became a major factor in mismanagement. The original tests were never updated to include code revisions or address new technological developments. Consequently, by 1976 the tests being used were obsolete. Most individuals failed to pass the first time the tests were taken because they were based on outdated standards.

It is important to recognize the mind-set of the fire service during this period. The general rule was to "put the wet stuff on the red stuff" and to catch the individuals that set fires. Licensing, inspection, and prevention were not viewed as positive deterrents to fires. Deputy State Fire Marshals in Montana were encouraged to channel their energies toward investigation, arrest, arraignment, and conviction of arsonists. Other mandated responsibilities were largely ignored.

Although mandated in the statute, licensing and facility inspections were not given a high priority. Montana State

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6Certificate of Registration Renewal, 1992, Montana Fire Prevention and Investigation Bureau, Montana Department of Justice, Helena.


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Fire Marshals did not encourage staff to prepare or present prevention programs. Regulating the license program and monitoring the efficacy of suppression systems was simply not done. As a result, schools, prisons, state buildings, day care centers, homes for the developmentally disabled, and university buildings were rarely inspected for compliance. It was not unusual for a facility to go without inspection for more than twenty years. Many fire protection systems were installed that never functioned properly. Although the Department of Commerce Building Codes Bureau inspected new construction, existing buildings and new buildings not in the jurisdiction of the state or city/county law were not monitored.

Montana became a mecca for fire protection businesses due to the lack of governmental enforcement. In more than twenty years few licenses, certificates of registration, or sales permits were suspended or revoked. Businesses operated in Montana that were not licensed or certified. Other business persons travelled through Montana with no fear of enforcement. They were confident they could operate without interference from the government.

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8Sec. 50-60-201 through 50-60-302, 1993, Montana Code Annotated.

9Personal knowledge of the author based on documents and log research in the office of the Fire Prevention and Investigation Bureau.
The most common group of operators that travelled through the state were known as "rag and taggers". These people sold, installed, and serviced portable fire extinguishers. They would go into a business (or door to door) selling their wares. They placed extreme competitive pressure on long-established entities by under cutting all local fire protection dealers. They serviced fire extinguishers in their vans. The gold service included discharging the old chemical, checking for leaks, pressurizing, and recharging. The actual service included wiping off the outside of the extinguisher, changing and updating the tag to indicate service had been completed, and rehanging. No service took place.10

These operators spent approximately a week in one location and then moved on. By the time it was discovered that an extinguisher was inoperable, the service provider could not be located. Not only did property loss result but injury and death was also a consequence of this deceitful practice.

During the 1970's the consequences of fire and potential prevention programs became a national issue with the publication of a study ordered by Congress. America Burning (1973) addressed the fire problem in the United States. As a result of the study, the National Fire Information Council

(NFIC) was formed and directed to collect national data on all fires that occur in the country. Although not federally mandated, the program was widely endorsed. More than forty states currently participate in the program and submit data to the NFIC.

The data base grew through the years. Researchers at the United States Fire Administration began studying trends based on annual information. It became apparent that a need existed for more comprehensive and regulated inspection and more effective licensing programs. Over the last twenty years state fire marshals and the fire services began to realize that inspection and licensing needed to be addressed. However, their role as "hero" in the physical sense was widely revered and protected. They were not eager to become inspectors -- the prospect was demeaning to career firefighters and supervisors alike. They relished their national image of running through flames and emerging unscathed. Acknowledging and accepting responsibility for prevention was difficult for the fire service.

Recognizing that licensing was a necessary component to assure fire protection, the Montana Legislature enacted

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12Department of Justice, Office of the Fire Prevention and Investigation Bureau, personal research conducted by the author and experience.
statutes to provide development and administration for a licensing program in 1993. The Montana fire service was no different than most other states. They resented the notion that statistics proved the need for anything. They believed that fire was inevitable and that their sole purpose was to douse flames and pull bodies -- living and dead -- from the rubble. They did not support the idea of any kind of licensing program.¹³

The Montana Fire Marshal Bureau developed the licensing program because they were mandated to do so. They reasoned that once it was developed the responsibility ended there and would either magically go away or be lost in the shuffle of more important responsibilities. Fewer than one hundred fires were investigated each year by the Bureau and only one major conviction ever resulted from those investigations.¹⁴

The Bureau ignored its mandated responsibilities until 1988 when two people perished in a motel in Saltese, Montana due to a malfunctioning heater.¹⁵ Investigation by local officials and attorneys representing the family indicated that the motel (which was more than forty years old) had never been inspected and did not contain smoke detectors. A short time

¹³Nevada State Fire Marshal.


later, another individual staying in a motel in Butte nearly perished in an incident that mirrored the Saltese incident.\textsuperscript{16}

The Fire Marshal Bureau, which is under the direction of the Law Enforcement Services Division of the Montana Department of Justice, was ultimately held accountable. Then Attorney General, Marc Racicot, appointed a Fire Prevention and Investigation Advisory Council in 1992 and directed it to study the fire service in Montana. For more than a year the Council studied statutes that funded and provided direction for the Bureau. It found that insurance taxes collected to fund fire prevention, licensing, investigation, and inspection were consistently misdirected to non-fire agencies through the General Fund.\textsuperscript{17} Mismanagement of the licensing program and low staffing levels were the predominant problems cited by the Advisory Council. Based on the recommendations of the Advisory Council, legislation was passed in 1993 that updated the program and provided additional funding.\textsuperscript{18}

Administrative rules were developed based on information received from other states and the results of the Advisory Council deliberations. Analysis revealed that each state licensing program differed significantly. Some states


\textsuperscript{18}Section 50-39-101 through 50-39-107, 1993, \textit{Montana Codes Annotated}. 

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regulated "ad infinitum" whereas others regulated little or not at all. The most prominent finding from the information collected was that it appeared the collection of fees was more important than confirming the knowledge and skill of the licensee.

Montana decided to approach the licensing program by requiring the individual to provide verification that recent manufacturer, national, or other approved training took place. Moreover, Montana required each individual to provide documentation of annual continued education. Additionally, arrangements were made for bureau staff to inspect business facilities to assure that adequate equipment, supplies and code books were in each establishment. Each business was required to carry $500,000 - $1,000,000 general liability insurance (depending on the kind of product being sold, serviced and installed) and either Workers' Compensation or Independent Contractor Exemption.

Requiring the individual to provide training documentation to the Fire Prevention and Investigation Bureau, rather than preparing and administering tests, allowed staff time to actually visit and inspect the facility. As a result of this change, every applicant facility is inspected prior to being issued a license. Additionally, the onus of providing training documentation is the responsibility of the applicant; should fraudulent credentials be submitted and identified, a legal issue ensues with the individual rather than the Bureau.
bearing the responsibility of applicant knowledge. The purpose of this paper is to assess the need for national standards for fire protection equipment. The sections that follow discuss state licensing program characteristics and problems, language inconsistency between states that result in one term having several meanings, and the difficulty of understanding state regulations.

State Licensing Program Characteristics And Problems

This section reviews licensing requirements pertaining to fire protection equipment dealers in the United States to gain a picture of their characteristics and to identify problems that might indicate the need for implementing national standards. Data were gathered by surveying state fire program managers across the country. A state program manager is an individual who is a member of the National Fire Information Council (NFIC) and is responsible for managing their respective state fire incident data collection system and supplying data to the United States Fire Administration.\footnote{The NFIC is a congressionally mandated national fire data collection organization that is funded by the United States Fire Administration (an arm of the Federal Emergency Management Agency). State participation is voluntary and specialized fire data have been collected since 1972. Forty three states and 36 metropolitan areas (with populations of more than 500,000) participate by collecting and submitting fire data to the federal government. Nevada and North Carolina are currently planning to become members. Additionally, more than a dozen federal and private organizations are associate members. Associate members may attend conferences and participate on committee activities, but they cannot vote.}
The NFIC uses the National Fire Protection Agency coding system to code scenarios. Additionally, the incident report collects data about fire protection installations. The data base is of interest to this study because it will be used to compare fire incidence, injuries, and fatalities in states that provided fire protection equipment information.

Inconsistent Language Between States

Information was gathered from statutes or administrative rules provided by the state program managers of the NFIC. Requirements for each state, including terminology, differ significantly except in the area of portable fire extinguishers. Fire protection in one state does not necessarily mean the same thing in another state. Additionally, some kinds of systems are combined, partially or totally, and named something else.\(^{20}\)

\[^{20}\text{For example, the licensing systems in Idaho and Massachusetts are referred to as "Fire Protection Sprinkler Systems". The definitions, however, refer to different types of systems. The Idaho definition is "...an integrated system of underground and overhead piping designed in accordance with fire protection engineering standards. This installation includes a water supply, such as a gravity tank, fire pump, reservoir or pressure tank and/or connection by underground piping to a water supply. The portion of the sprinkler system above ground is a network of specially sized, or hydraulically designed, piping installed in a building, structure or area, generally overhead, and to which sprinklers are connected in a systematic pattern. The system includes a controlling valve and a device for actuating an alarm when the system is in operation. The system is usually activated by heat from a fire and discharges water over the fire area."}^\]
Considerable confusion exists regarding terminology within the industry and among the regulators and equipment manufacturers. As a result, the terminology used in regulations are state-specific. Although terms may be the same, the meaning varies among states.

The Difficulty of Understanding State Regulations

Although the states in this study regulate various kinds of fire protection systems, understanding the information is difficult. California and Texas characteristics appear simple. California licenses automatic fire extinguishing systems and portable fire extinguishers. Texas licenses fire extinguishers, fire detection and alarm devices, and fire protection sprinkler systems. The simplicity ends there.

The Massachusetts definition of the same name reads "...the installation of all fire protection and fire control systems, including both overhead and underground water mains, fire hydrants and hydrant mains, standpipes and hose connections to sprinkler systems, sprinkler tank heaters, back flow preventers, air lines and thermal systems, hot water fire protection systems and standpipes connected to sprinkler systems."


Both states' requirements are cumbersome and difficult to understand.\textsuperscript{23}

Conversely, while Utah's and Georgia's characteristics appear to indicate extensive regulation, Utah simplified the licensing process for both automatic fire suppression systems and portable fire extinguishers. License requirements and explanations are condensed in less than six pages each and specifically spells out the licensing process. Four kinds of licenses are offered for portable fire extinguishers and two for automatic fire suppression systems. The language is simple, concise, and appears to maintain safety standards.\textsuperscript{24}

\textsuperscript{23} California provides two books that explain the law and regulations, one 104 pages in length and the other 38. Five types of licenses are offered for portable fire extinguishers and three for automatic fire extinguishing systems. Each requires a specific and different application process, fee schedule, educational level, testing procedure, and the kinds and sizes of piping and equipment requirements.

Texas publishes three texts that appear to over-regulate and specify cumbersome and confusing regulations. The book on fire detection and alarm devices explains two kinds of licenses and two kinds of certificates with renewal fees ranging from 1 to 90 days and 91 days to two years. Additionally, it breaks down each renewal to certificates, branch office certificates, and technical and planning superintendent licenses.

The Texas book on fire extinguishers provides for eight separate licenses with definitive requirements. While the text on sprinkler systems provides for two kinds of licenses, it confuses the renewal process by escalating fees dependent on time frames: 1-90 days (certificate = $1350, license = $262.50), 91-365 days (certificate = $1800, license = $350), and 366 days to two years (certificate = $2700, license = $525). The lengthy narrative in these three publications is relatively simple to understand compared to California's requirements.

Georgia licenses portable fire extinguishers, engineered and pre-engineered fire suppression systems, and kitchen/restaurant systems. All other states require significant testing to receive a license. Most include some combination of written, oral and practical tests. Georgia has simplified the licensing process by requiring individuals to provide documentation that they have passed the National Institution for Certification in Engineering Technologies (NICET) (for engineered and pre-engineered fire suppression systems) and the National Association of Fire Equipment Distributors (NAFED) (for portable fire extinguishers). NICET is a nationally recognized organization whose purpose is to certify individuals that meet standards determined by a consensus of industry professionals. NAFED is a similar organization that encompasses portable fire extinguisher education, testing and application. Georgia has accomplished what few other states have through simplification. Georgia has transferred the responsibility to the individual to provide documentation they are qualified in the area in which they are applying for a license.

In 1993 the Montana legislature passed statutes similar to those enacted in Georgia. Montana, however, simplified the process even further by providing four licenses, one each for

fire alarm systems, special agent fire suppression systems, fire extinguishing systems, and portable fire extinguishers. Licenses are not broken down within the groups as they are in other states. NICET documentation is required for all applicants. It is simple to understand and places the responsibility on the applicant to provide not only NICET verification, but proof of liability and Workers' Compensation insurance.  

Are Regulations Enforced and Do They Assure Competence?

The danger that exists when so many different kinds of licenses are available for a given product is that businesses and individuals are more likely to apply for the cheapest and easiest license available and then use the license to perform a variety of installation and inspection services. The public is generally not knowledgeable of the kinds of licenses required for particular phases or kinds of product facilitation. When an individual displays a license to a prospective client, it is often accepted as certification. Most people do not closely inspect a license and may not understand exactly what service the license holder is authorized to perform. Closer inspection may reveal the licensee is qualified to conduct inspections when the

individual may actually be hired to install a complete system. Additionally, it may not be understood that the license is limited. What Montana and Georgia have done is require individuals to be trained in all phases prior to licensing. Montana set up an apprentice program to accommodate individuals who are in training and working on NICET certification.

Some states provide up to eleven different kinds of licenses for fire protection equipment -- licenses within licenses. This type of system is often complicated and confusing. The public cannot be assured a licensee actually working on a facility is adequately trained to perform the work. Additionally, the industry is confused regarding the kind(s) of license(s) that may be required and many unknowingly operate illegally.

When a project is bid, licensing is usually a requirement of the process. Unless the contractor is knowledgeable of the requirements, merely providing a photocopy of a legal-looking document will often suffice. States that issue several licenses within the context of fire protection equipment cannot expect a contractor to understand the intricacies of each license. License holders often do not understand exactly what service they are licensed to perform.

The diversity of the kinds and varieties of fire protection equipment that are regulated and the accompanying licenses, sub-licenses, fees, renewal schedules and other
various requirements indicate consistency only in the fact that confusion is the norm rather than the exception. A spectrum of qualifications and restrictions exist among states. While similarity exists in some instances, no two states provide or require the same information or skills and obtaining a license does not guarantee competence.

Methodology

The purpose of this research is to assess the need for national standards for fire protection equipment. Federal regulations, similar to occupational safety (i.e. OSHA) regulations, would provide greater consistency in enforcement, but would they in fact increase fire protection? To answer this question, the research measures high, medium and low regulation states to determine if high regulation states that heavily regulate fire codes have better outcomes than states with weak regulation.

The criteria used to determine high and low regulation states were separated into four categories: fire alarm systems, special agent fire suppression systems, fire extinguishing systems, and fire extinguishers. The data are based on information provided by state program managers and it is assumed the data is complete. Definitions of the four groups are:
**Fire Alarm System:** A combination of approved compatible devices with the necessary electrical interconnection and energy to produce an alarm signaling the event of fire or system activation but does not include single station smoke or heat detectors.

**Special Agent Fire Suppression System:** An approved system and components which require individual engineering in accordance with manufacturer specifications and includes dry chemical, carbon dioxide, halogenated, gaseous agent, foam and wet chemical systems; includes pre-engineered system but does not include a fire extinguishing system.

**Fire Extinguishing System:** A fire sprinkler system designed in accordance with nationally recognized standards that consists of an assembly of piping or conduits that conveys water, foam or air with or without other agents to dispersal openings or devices to extinguish, control or contain fire and to provide protection from exposure to fire or the products of combustion. Included are underground and overhead piping, ponds, tanks, pumps, extra or special hazard applications and other related components or devices necessary for water supplies.
Fire Extinguisher: A portable device containing an extinguishing agent that can be expelled under pressure for the purpose of suppressing or extinguishing a fire.²⁷

The independent variable in this study is the degree to which each state regulates fire protection systems. States were identified as high, medium, and low regulation states as follows. Two points were awarded for each of the four types of fire protection systems (8 points possible). Two points each were awarded for annual licensing, annual examination, proof of NICET/NAFED certification, continuing education requirement, facility inspection by licensing entity, and commercial liability insurance requirement (40 points possible). A total of 48 points is possible. Table 1 identifies states as high, medium, and low regulation states according to their total point scores. Only 14 states are represented because only 43 belong to NFIC and less than half of these responded to a survey by the author.

Nevada, Florida, Georgia, and Texas are high regulatory states; North Carolina, Nebraska, Wyoming and Oklahoma appear to be minimally regulated. Interestingly, while many states regulated most of the four categories, annual requirements

²⁷Section 23.7.113 through 23.7.136, 1993, Administrative Rules of Montana.
were by and large deferred, required every two to five years, or not enforced.

**TABLE 1**
STATE REGULATION STATUS

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>ONE</th>
<th>TWO</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High-Regulated</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nevada</td>
<td>8</td>
<td>24</td>
<td>32</td>
</tr>
<tr>
<td>Florida</td>
<td>6</td>
<td>24</td>
<td>30</td>
</tr>
<tr>
<td>Georgia</td>
<td>6</td>
<td>24</td>
<td>30</td>
</tr>
<tr>
<td>Texas</td>
<td>8</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td><strong>Medium-Regulated</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arkansas</td>
<td>6</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td>Utah</td>
<td>6</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>Montana</td>
<td>*8</td>
<td>*8</td>
<td>*16</td>
</tr>
<tr>
<td>Alaska</td>
<td>8</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>California</td>
<td>6</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Idaho</td>
<td>2</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Mass.</td>
<td>8</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td><strong>Low-Regulated</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. Carolina</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Nebraska</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Wyoming</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

*Note: Comparison figures are for 1992. In 1994 Montana adopted a new licensing system whose points total 46.*

To predict whether a national licensing program would have beneficial impacts, the research sought to
determine whether fire protection is highest in the most highly regulated states. This would constitute evidence that regulation is beneficial and national regulation would be highly desirable.

The following hypothesis were tested:

\( H_1 \) The average fail rate of smoke detectors is lower for high regulation states than for medium and low regulated states.

\( H_2 \) The average fail rate for sprinkler systems is lower for high regulation states than for medium and low regulated states.

\( H_3 \) Fatalities per 1000 fires are lower for high regulation states than for the nation as a whole, as well as for low and medium regulated states.

\( H_4 \) Injury rates per capita are lower for high regulation states than for the nation as a whole, as well as medium and low regulated states.\(^28\)

\(^{28}\) The original intent of this study was to examine all major regions of the country. Although fewer than fifty percent of the NFIC states responded to the survey, western states were over-represented. The states included are: Alaska, Arkansas, California, Colorado, Florida, Georgia, Idaho, Massachusetts, Montana, Nebraska, Nevada, North Carolina, Oklahoma, Texas, Utah, Washington, and Wyoming.


Fatalities and injuries were also compared to assist in determining subsequent correlation between fire protection equipment performance and resulting injury/death. The data
A questionnaire was sent to forty three NFIC state project managers requesting information about their licensing requirements and procedures. Seventeen states responded to the survey. Data provided by three states was not usable because either partial information was received or the data were representative of specific cities rather than the state. National data were also obtained from the United States Fire Administration regarding types of fires and equipment performance.

provided by the United States Fire Administration was not sufficient to confirm an association among factors. However, it is reasonable to assume that fewer lives would be lost and injuries result if the equipment operated more than seventy to eighty percent of the time.
CHAPTER II
DATA ASSESSMENT

The purpose of this chapter is to determine whether there is a need for a nationwide licensing program for fire protection equipment by testing five specific hypotheses. States are separated based on degree of regulations, high-, medium-, and low-regulation. Detector performance, sprinkler performance, and the number of fire-related injuries and fatalities, are examined to determine whether high degrees of regulation are associated with better detector and sprinkler performance. Additionally, fire-related injuries and fatalities are examined.

Equipment Failure Rates

Tables 2.1 and 2.2 provide 1992 smoke detector and sprinkler performance data and address $H_1$ and $H_2$. \(^{29}\)

Although $H_1$ and $H_2$ appear to have been disconfirmed, the small number of cases raises doubts about the validity of these results. High regulated states experience a 29% failure rate whereas low regulated states experience a 28% failure rate. Medium regulated states are lower by 8% and 7%.

\(^{29}\)Ibid.
### TABLE 2.1
DETECTOR PERFORMANCE

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>TOTAL FIRES</th>
<th>DETECTOR OPERATED</th>
<th>DETECTOR FAILED</th>
<th>FAILURE RATE</th>
<th>NUMBER OF CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-Regulated</td>
<td>6,380</td>
<td>4,519</td>
<td>1,861</td>
<td>29%</td>
<td>3</td>
</tr>
<tr>
<td>Medium-Regulated</td>
<td>5,372</td>
<td>4,261</td>
<td>1,111</td>
<td>21%</td>
<td>6</td>
</tr>
<tr>
<td>Low-Regulated</td>
<td>432</td>
<td>311</td>
<td>121</td>
<td>28%</td>
<td>2</td>
</tr>
</tbody>
</table>

* Total fires includes only those fires where detectors were present.

**NOTE:** Data are for 1992

### TABLE 2.2
SPRINKLER PERFORMANCE

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>TOTAL FIRES</th>
<th>SPRINKLER OPERATED</th>
<th>SPRINKLER FAILED</th>
<th>FAILURE RATE</th>
<th>NUMBER OF CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-Regulated</td>
<td>582</td>
<td>480</td>
<td>104</td>
<td>18%</td>
<td>3</td>
</tr>
<tr>
<td>Medium-Regulated</td>
<td>457</td>
<td>426</td>
<td>41</td>
<td>7%</td>
<td>6</td>
</tr>
<tr>
<td>Low-Regulated</td>
<td>36</td>
<td>31</td>
<td>5</td>
<td>14%</td>
<td>2</td>
</tr>
</tbody>
</table>

* Total fires includes only those fires where sprinklers were present.

**NOTE:** Data are for 1992
Fatality and Injury Rates

Table 2.3 provides the average fire death rate (per thousand fires) for 1989 through 1992 (Hypothesis 3).

<table>
<thead>
<tr>
<th>Table 2.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>FATALITIES</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AVERAGE</th>
<th>1989-1992</th>
<th>NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATIONAL ......</td>
<td>6.8</td>
<td></td>
</tr>
<tr>
<td>HIGH-REGULATION</td>
<td>5.7</td>
<td>3</td>
</tr>
<tr>
<td>MEDIUM-REGULATION</td>
<td>7.9</td>
<td>7</td>
</tr>
<tr>
<td>LOW-REGULATION</td>
<td>5.5</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 2.3 provides partial support for H₃. Fatalities are lower for highly regulated states than for the nation as a whole and medium regulated states. Low regulated states were slightly lower.

The fire injury rate (per thousand fires) (Hypothesis 4) for these states provides additional information regarding fire detector and fire sprinkler use and performance.

<table>
<thead>
<tr>
<th>Table 2.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>INJURY RATE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AVERAGE</th>
<th>1989-1992</th>
<th>NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATIONAL ....</td>
<td>82.8</td>
<td></td>
</tr>
<tr>
<td>HIGH-REGULATION</td>
<td>72.4</td>
<td>3</td>
</tr>
<tr>
<td>MEDIUM-REGULATION</td>
<td>75.1</td>
<td>7</td>
</tr>
<tr>
<td>LOW-REGULATION</td>
<td>74.4</td>
<td>2</td>
</tr>
</tbody>
</table>

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Table 2.4 provides support for $H_4$. Injuries are lower for highly regulated states than for other states and the nation as a whole.

Hypotheses 3 and 4 appear to have been confirmed. The small number of cases, however, raises doubts about the validity of these results. In all but one instance, high regulated states experienced a lower death and fatality rate than other regulated states and the nation as a whole.
**TABLE 2.5**

**SUMMARY OF FINDINGS**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Description</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₁</td>
<td>Average fail rate of smoke detectors is lower for high regulation states than for medium and low regulated states.</td>
<td>Disconfirmed. Failure rate was 29% in high regulated states, 28% in low regulated states, and 21% in medium regulated states.</td>
</tr>
<tr>
<td>H₂</td>
<td>Average fail rate for sprinkler systems is lower for high regulation states than for medium and low regulated states.</td>
<td>Disconfirmed. Failure rate was 18% in high regulated states, 14% in low regulated states, and 7% in medium regulated states.</td>
</tr>
<tr>
<td>H₃</td>
<td>Fatalities per 1000 fires are lower for high regulation states than for the nation as a whole, as well as for low and medium regulated states.</td>
<td>Confirmed. Fatality rate in high regulated states was 5.7, the nation was 6.8, and medium regulated was 7.9. Low regulated states was slightly lower at 5.5.</td>
</tr>
<tr>
<td>H₄</td>
<td>Injury rates per capita are lower for high regulation states than for the nation as a whole, as well as medium and low regulated states.</td>
<td>Confirmed. Injury rate in high regulated states was 72.4, the nation was 82.8, and low regulated was 74.4.</td>
</tr>
</tbody>
</table>
CHAPTER III
SUMMARY, RECOMMENDATIONS, AND CONCLUSION

SUMMARY

The purpose of this study was to assess the need for a nationwide licensing program for fire protection equipment. No data has been collected prior to this study to determine the effectiveness or efficiency of state licensing. Consequently, a limited amount of data is currently available.

Most current state licensing and endorsement programs in this study are fragmented and provide minimal safety assurance to the consumer. Some states provide minimal fire, or no safety regulations. Injuries and fatalities that result from fires are a national embarrassment. Billions of dollars are spent each year rebuilding homes and reforesting wildlands as a result of carelessness, lack of education, poor enforcement, and failure to develop appropriate regulations that provide realistic safety measures. The United States reports the highest fatality and dollar loss rate in the world. Establishing regulations and enforcement procedures that are simple to understand and that assure reasonable competence are paramount to saving lives and property. The data suggest that individual state fire protection regulations currently provide protection to the public between 74 and 87 percent of the
time. That means up to 26 percent of the time, the equipment functions improperly.

Regulation does not seem to affect the performance of fire protection systems (hypothesis one and two). The reason may be that regulations do not provide assurance of competency due to lack of enforcement. No standards exist that cross state lines and contribute to the overall well being of the public. Fire protection equipment that has been installed provides a sense of false security. Some equipment simply does not work. The obvious reason lies in improper installation, service, lack of enforcement or all three. Additionally, improper training and education of enforcement staff combined with passive attention to the job plays a significant role. An alternative explanation for the failure to confirm hypotheses one and two is that the number of cases is too small to provide statistically valid results.

Fire protection equipment is marketed nationwide and requirements for company and individual licensing may not be remotely similar from one state to another. Some states do not regulate at all. Additionally, terminology differs among states and federal fire agencies. For example, the definition of "service" and "maintenance" of a portable fire extinguisher may be different. The definition provided by the National Fire Protection Agency may not be adopted by a state. The state may prepare its own definition. Consistency is not
apparent among federal or state agencies. The programs are
difficult to understand because no uniform program exists.

Current programs do not assure reasonable individual
competence. Fire protection equipment is approved by
Underwriters Laboratories (UL) and registered prior to
manufacture. That means the equipment works if it is
installed properly. The equipment fails to operate up to
twenty-six percent of the time. It is reasonable to suspect
that the equipment is installed improperly, even in those
states that license. Individual competency is not reflected
in the bearer of the license, certification, or endorsement.
Although many states require an individual to read mountains
of regulations and pay confusing fees that can total thousands
of dollars, the affect on competency and knowledge are
questionable.

RECOMMENDATIONS

Because the data collected indicate abysmal functionality
of fire protection equipment, it is reasonable to assume that
basic requirements should be developed that assure competency.
Requiring individuals, through business licensure, to provide
verification of competency appears to be the most logical
confirmation. Additionally, annual training requirements
would assure continuous education to maintain technological
changes.
State administration would be the logical vehicle for consistent data collection with a national database that maintains information. All fire protection individuals should study and pass specific criteria prior to being licensed, similar to an individual who studies to become an accountant, architect or any other professional.

The issue is prevention, prevention through protection. Up to twenty-six percent of installed fire protection equipment does not operate as a result of improper installation and inspection. Loss of life, injury and damage to property can be and should be decreased or eliminated. Currently, regulations do not exist that assure installed protection equipment is reliable. The false sense of security is deadly and needs to be remedied.

Additionally, individuals licensed to install or service fire protection equipment should be held accountable. Federal, state, and local governments provide laws that discipline drunk drivers, penalties correspond with the degree of severity. Should a drunk driver be convicted of vehicular homicide, incarceration most assuredly results. Multiple deaths occur frequently as a result of fire protection equipment failure. Dealer accountability, if the equipment is improperly installed, should be mandatory.

Educational facilities are available - either through NICET, NAFED, or the manufacturer. A prospective applicant should be required to provide verification of training.
Annual continuing education should also be required to assure that as technology advances, the knowledge of the individual is maintained.

CONCLUSION

Clearly, the states studied in this paper are failing to successfully address what may be a national problem. Lives are lost through carelessness, slipshod workmanship, and lack of enforcement. Billions of dollars of property are destroyed. Thousands of people are injured; some live with their injuries as a continual reminder.

Consumers are assured manufactures provide products that are operational and function according to recommended usage. Fire protection equipment is tested and approved through the Underwriters Laboratories prior to marketing. Seldom does a product reach the consumer that functions improperly. The fault lies in regulations, installation, service, maintenance, and enforcement. That means the individual is responsible for making sure the equipment not only is installed properly, but will operate in the future should it be needed.

Local, state, and federal fire protection agencies fall woefully short of protecting the consumer. The author recommends additional study of other states to determine if this analysis is confirmed. While the data are reliable for the states studied, it should not be assumed that the results
are conclusive for the nation. Should the results be supported, the author recommends national regulation to assure that loss of life, property, and injuries are kept to a minimum.
May 1, 1994

National Fire Information Council
Program Manager

I recently addressed the full membership of the National Fire Information Council regarding research I am conducting to complete the requirements for the degree of Master of Public Administration. This letter is a follow-up to that presentation as a reminder and request to send me your state statutes and administrative rules pertaining to licensing, endorsement, certification, etc. of fire protection equipment dealers and installers.

Please send the information to: Anita L. Varone, 646 Tamarack, Helena, Montana 59620. If you have any questions, please call me at (406)442-2072 or (406)444-2050.

Additionally, if your state does not regulate fire protection equipment, please mark the space below and return this letter in the enclosed, self-addressed and stamped envelope.

I appreciate any assistance you can provide for my research.

THE STATE OF _______________________________ DOES NOT REGULATE FIRE PROTECTION EQUIPMENT.

Very truly yours,

Anita L. Varone
# APPENDIX 2

## DETECTOR PERFORMANCE IN STRUCTURE FIRES - 1992

<table>
<thead>
<tr>
<th></th>
<th>TOTAL FIRES</th>
<th>DETECTOR PRESENT</th>
<th>IN ROOM OPERATED</th>
<th>IN ROOM NOT OPERATED</th>
<th>SUCCESS RATE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. NEVADA*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. FLORIDA</td>
<td>12,859</td>
<td>2,078</td>
<td>1,545</td>
<td>533</td>
<td>74%</td>
</tr>
<tr>
<td>3. GEORGIA</td>
<td>3,202</td>
<td>486</td>
<td>362</td>
<td>124</td>
<td>74%</td>
</tr>
<tr>
<td>4. TEXAS</td>
<td>25,412</td>
<td>3,816</td>
<td>2,612</td>
<td>1,204</td>
<td>68%</td>
</tr>
<tr>
<td>5. ARKANSAS</td>
<td>4,020</td>
<td>357</td>
<td>271</td>
<td>86</td>
<td>76%</td>
</tr>
<tr>
<td>6. UTAH</td>
<td>2,167</td>
<td>254</td>
<td>183</td>
<td>71</td>
<td>72%</td>
</tr>
<tr>
<td>7. MONTANA</td>
<td>1,404</td>
<td>174</td>
<td>118</td>
<td>56</td>
<td>68%</td>
</tr>
<tr>
<td>8. ALASKA</td>
<td>1,090</td>
<td>215</td>
<td>147</td>
<td>68</td>
<td>68%</td>
</tr>
<tr>
<td>9. CALIFORNIA**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. IDAHO</td>
<td>1,856</td>
<td>198</td>
<td>148</td>
<td>50</td>
<td>75%</td>
</tr>
<tr>
<td>11. MASSACHUSETTS</td>
<td>11,982</td>
<td>4,194</td>
<td>3,394</td>
<td>780</td>
<td>81%</td>
</tr>
<tr>
<td>12. NORTH CAROLINA*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. NEBRASKA</td>
<td>2,254</td>
<td>354</td>
<td>259</td>
<td>95</td>
<td>73%</td>
</tr>
<tr>
<td>14. WYOMING</td>
<td>673</td>
<td>78</td>
<td>52</td>
<td>26</td>
<td>67%</td>
</tr>
</tbody>
</table>

** Does not report detector performance.
### SPRINKLER PERFORMANCE IN STRUCTURE FIRES - 1992

<table>
<thead>
<tr>
<th>State</th>
<th>Total Fires</th>
<th>Sprinkler Present</th>
<th>In Room Operated</th>
<th>In Room Not Operated</th>
<th>Success Rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEVADA*</td>
<td>12,859</td>
<td>208</td>
<td>180</td>
<td>28</td>
<td>87%</td>
</tr>
<tr>
<td>FLORIDA</td>
<td>3,202</td>
<td>63</td>
<td>57</td>
<td>6</td>
<td>90%</td>
</tr>
<tr>
<td>GEORGIA</td>
<td>25,412</td>
<td>311</td>
<td>241</td>
<td>70</td>
<td>77%</td>
</tr>
<tr>
<td>ARKANSAS</td>
<td>4,020</td>
<td>54</td>
<td>52</td>
<td>2</td>
<td>96%</td>
</tr>
<tr>
<td>UTAH</td>
<td>2,167</td>
<td>40</td>
<td>36</td>
<td>4</td>
<td>90%</td>
</tr>
<tr>
<td>MONTANA</td>
<td>1,404</td>
<td>15</td>
<td>12</td>
<td>3</td>
<td>80%</td>
</tr>
<tr>
<td>ALASKA</td>
<td>1,090</td>
<td>13</td>
<td>12</td>
<td>1</td>
<td>92%</td>
</tr>
<tr>
<td>CALIFORNIA**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDAHO</td>
<td>1,856</td>
<td>16</td>
<td>14</td>
<td>2</td>
<td>88%</td>
</tr>
<tr>
<td>MASSACHUSETTS</td>
<td>11,982</td>
<td>319</td>
<td>290</td>
<td>29</td>
<td>91%</td>
</tr>
<tr>
<td>NORTH CAROLINA*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEBRASKA</td>
<td>2,254</td>
<td>30</td>
<td>26</td>
<td>4</td>
<td>87%</td>
</tr>
<tr>
<td>WYOMING</td>
<td>673</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>83%</td>
</tr>
</tbody>
</table>

** Does not report detector performance
### APPENDIX 4

**FATALITY RATE PER THOUSAND FIRES**

**BY STATE**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NEVADA</td>
<td>7.5</td>
<td>7.1</td>
<td>5.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>FLORIDA</td>
<td>7.2</td>
<td>7.3</td>
<td>7.5</td>
<td>10.6</td>
<td>7.5</td>
</tr>
<tr>
<td>GEORGIA</td>
<td>5.0</td>
<td>3.1</td>
<td>2.1</td>
<td>2.1</td>
<td>-</td>
</tr>
<tr>
<td>TEXAS</td>
<td>2.6</td>
<td>7.7</td>
<td>9.1</td>
<td>8.9</td>
<td>-</td>
</tr>
<tr>
<td>ARKANSAS</td>
<td>7.1</td>
<td>8.0</td>
<td>8.4</td>
<td>5.1</td>
<td>7.4</td>
</tr>
<tr>
<td>UTAH</td>
<td>5.0</td>
<td>10.2</td>
<td>6.9</td>
<td>8.7</td>
<td>8.1</td>
</tr>
<tr>
<td>MONTANA</td>
<td>7.7</td>
<td>7.8</td>
<td>10.2</td>
<td>8.6</td>
<td>5.8</td>
</tr>
<tr>
<td>ALASKA</td>
<td>11.8</td>
<td>18.3</td>
<td>14.6</td>
<td>16.8</td>
<td>11.8</td>
</tr>
<tr>
<td>CALIFORNIA</td>
<td>1.8</td>
<td>5.1</td>
<td>5.0</td>
<td>5.0</td>
<td>5.4</td>
</tr>
<tr>
<td>IDAHO</td>
<td>8.6</td>
<td>5.4</td>
<td>6.0</td>
<td>5.6</td>
<td>2.6</td>
</tr>
<tr>
<td>MASSACHUSETTS</td>
<td>4.6</td>
<td>6.1</td>
<td>4.8</td>
<td>8.7</td>
<td>7.4</td>
</tr>
<tr>
<td>NORTH CAROLINA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>NEBRASKA</td>
<td>4.9</td>
<td>5.3</td>
<td>7.6</td>
<td>5.4</td>
<td>5.4</td>
</tr>
<tr>
<td>WYOMING</td>
<td>3.6</td>
<td>0.8</td>
<td>6.5</td>
<td>5.8</td>
<td>8.3</td>
</tr>
</tbody>
</table>

**TOTAL STATE AVERAGE** 6.6 6.4 7.3 7.6 7.1

**NATIONAL AVERAGE** 6.5 7.2 6.4 6.7 6.7

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APPENDIX 5

INJURY RATE PER THOUSAND FIRES

BY STATE

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NEVADA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>FLORIDA</td>
<td>100.1</td>
<td>97.8</td>
<td>7.5</td>
<td>101.8</td>
<td>104.5</td>
</tr>
<tr>
<td>GEORGIA</td>
<td>46.3</td>
<td>95.9</td>
<td>95.9</td>
<td>22.9</td>
<td>2.8</td>
</tr>
<tr>
<td>TEXAS</td>
<td>-</td>
<td>89.0</td>
<td>79.0</td>
<td>86.2</td>
<td>84.9</td>
</tr>
<tr>
<td>ARKANSAS</td>
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<td>43.0</td>
<td>42.5</td>
<td>29.2</td>
<td>37.8</td>
</tr>
<tr>
<td>UTAH</td>
<td>91.3</td>
<td>115.8</td>
<td>105.2</td>
<td>102.9</td>
<td>106.8</td>
</tr>
<tr>
<td>MONTANA</td>
<td>48.9</td>
<td>46.3</td>
<td>49.7</td>
<td>54.8</td>
<td>50.1</td>
</tr>
<tr>
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<td>53.5</td>
<td>58.7</td>
<td>62.6</td>
<td>59.0</td>
<td>31.3</td>
</tr>
<tr>
<td>CALIFORNIA</td>
<td>-</td>
<td>63.1</td>
<td>61.5</td>
<td>53.1</td>
<td>51.2</td>
</tr>
<tr>
<td>IDAHO</td>
<td>43.8</td>
<td>48.0</td>
<td>6.0</td>
<td>62.5</td>
<td>44.1</td>
</tr>
<tr>
<td>MASSACHUSETTS</td>
<td>162.4</td>
<td>165.5</td>
<td>178.4</td>
<td>178.8</td>
<td>194.2</td>
</tr>
<tr>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>NEBRASKA</td>
<td>90.3</td>
<td>77.2</td>
<td>87.3</td>
<td>87.9</td>
<td>81.4</td>
</tr>
<tr>
<td>WYOMING</td>
<td>44.1</td>
<td>89.2</td>
<td>46.7</td>
<td>68.4</td>
<td>56.6</td>
</tr>
<tr>
<td>TOTAL STATE AVERAGE</td>
<td>71.4</td>
<td>82.5</td>
<td>68.5</td>
<td>75.6</td>
<td>70.5</td>
</tr>
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<td>83.0</td>
<td>84.1</td>
<td>84.0</td>
<td>82.5</td>
<td>80.7</td>
</tr>
</tbody>
</table>
BIBLIOGRAPHY

BOOKS


**ARTICLES**


**PERSONAL RESEARCH**


