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Executive Analysis of Fire Service Operations in Emergency Management

Dollar Loss Estimation Methods for Residential and Commercial Structure Fires

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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: s/s Allison Cabral

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Abstract

San Jose Fire Department (SJFD) had no consistent, accurate method to calculate residential and commercial fire loss estimates, resulting in questionable data to drive decisions about public safety resources. The research purpose was to identify fire loss estimation methods that improved accuracy and reliability of fire loss data with the implementation of SJFD's new records management system. Through descriptive research, questions concerning current estimating methods for pre/postincident property value or estimated dollar loss used by SJFD, other fire service agencies, and private industry were studied. The research approach was a review of pertinent literature, survey questionnaires, and interviews. Results identified various methods for fire loss dollar estimates. Recommendations were made for SJFD to acknowledge the problem, and offered possible methods for policy adoption.

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Introduction

The San Jose Fire Department (SJFD) is a career fire department protecting the City of San Jose's approximately 200 square miles located at the base of San Francisco Bay in northern California. SJFD embarked upon a long range planning effort to identify resource needs as part of a "Public Safety Augmentation Plan" in 1995 which included the completion of a strategic plan project in December of 2000 (Emergency Consulting & Research Center [ECRC], 2000, p. 1). This strategic plan identified that SJFD had failed in adding analytical and technological capabilities (record management systems) and that the absence of data and time-delayed data collection efforts impeded quantification of department activities and efforts to evaluate service delivery impacts or improvements (ECRC).

One area affected by lack of adequate analytical procedures was the estimation of fire losses in dollar values. The fire loss data recorded as part of performance measurement criteria in both fire suppression and fire cause investigation did not yield accurate information about the magnitude of San Jose's fire losses or the impact of field deployment improvements on service delivery. The problem is that SJFD has no consistent or accurate method to calculate residential and commercial fire loss estimates, resulting in the use of questionable data to drive decisions about public safety resources.

The research purpose is to identify fire loss estimation methods that improve the accuracy and reliability of fire loss data with the implementation of SJFD's new records management system. The descriptive research method was used to answer the following three research questions:

1. What are the current methods used by the San Jose Fire Department for preincident property value and postincident dollar loss estimates?

2. What methods for preincident property value and postincident dollar loss estimates are being used by other fire departments reporting data to the National Fire Incident Reporting system?

3. What methods are being used in private industry for preincident property value and postincident dollar loss estimates and cost for residential and commercial properties? The research approach was a review of pertinent literature, survey questionnaires, and interviews.

Background and Significance

The San Jose Fire Department, a metropolitan career fire department of 869 employees, protects the 10th largest city in the United States with a current population of over 973,600 (California Department of Finance, n.d.). SJFD's jurisdiction covers approximately 200 square miles of incorporated and unincorporated land including 44,000 acres of wild land interface (ECRC, 2000). SJFD operates 33 fire stations with a minimum daily line staffing of 194 persons and responds to approximately 68,500 emergencies annually (Ty Mayfield, SJFD analyst, personal communication, February 14, 2008).

The past impact of unreliable data used to drive policy and resource decisions was reviewed by consultants from Emergency Consulting & Research Center (ECRC) as part of the comprehensive strategic plan. ECRC consultants identified appropriate standards for emergency response and infrastructural aspects including administrative support and training, and reviewed staffing adequacy, functional efficiency, and the organizational

effectiveness of SJFD. Additionally, the ECRC reviewed existing standards and guidelines as a part of its analysis of department reporting methods and analytical capabilities. These data collection resources included the International City/County Management Association (ICMA) Comprehensive Performance Measures for 1997; the National Fire Incident Reporting System (NFIRS), and the National Fire Protection Association (NFPA) standards (ECRC, 2000).

A priority aspect discovered by ECRC as a result of this project was the lack of timely and reliable data in many areas. ECRC found discrepancies with respect to ICMA data, NFPA surveys, and NFIRS completion. Originally considered as one of the better tools for policymakers to make resource decisions and determine efficiency of government activities, the 1997 ICMA survey was determined to be only as good as the raw data used (ECRC, 2000). ECRC discovered that individuals tasked with these survey and report completions were not trained in performing the assessments, or in how to assure consistency in reporting. This resulted in multiple examples where the absence of standardization in assessment processes and tools which yielded information that was suspect, especially flame spread and fire loss data (ECRC, 2000).

ECRC concluded that the lack of analytical capacity prevented the department from adequate gap analysis and that in order to successfully report fiscal demands or match resources to community deployment requirements, SJFD needed to substantially increase analytical, technological, and staff capabilities through standardization of data gathering and review (ECRC, 2000).

Concurrent with these efforts, SJFD was required to align its mission with its city service area partners, the police department, and the police independent auditor, to

identify core services and performance measures using performance-based budgeting practices as part of a city-wide conversion effort called Investing in Results (IIR). This program was intended to convert program budgeting to performance-based budgeting in order to improve service delivery and government accountability for the community. Early performance measure development included several criteria that specified total estimated fire loss not only as part of the yearly fire department budget document but as the foundation for the calculation of various performance measures relating fire loss to fire suppression and fire cause determination (arson) as a percentage of the operating budget (ECRC, 2000). The impact of unreliable data continues to plague SJFD in the completion of benchmark surveys and NFIRS.

Future organizational impacts of this applied research project could result in finding solutions to ensure data accuracy and reliability. Incorporating these methods with the implementation of SJFD's new records management system would improve its ability to convey the magnitude of San Jose's fire problem, garner appropriate resources to deploy effective firefighting forces, and assist with mitigation efforts to reduce fire loss.

A National Fire Academy Executive Analysis of Fire Service Operations in Emergency Management (EAFSOEM) course goal is to "prepare senior fire officers in the administrative functions necessary to manage the operational component of a fire department effectively" (National Fire Academy, 2006, p. SM1-3). An appropriate topic of the same course is "to develop a damage inspection process, including identifying procedures and methods to train personnel" (Department of Homeland Security, 2006, p. SM1-5). Effective management of data used to make policy and resource decisions is

essential to acquisition of fiscal resources, training, and resource deployment. This ARP will help identify solutions to assist in that effort.

Identifying a standardized method for estimating fire losses by seeking fire service and private industry solutions could also be used as a nationwide fire service standard. These potential impacts support the following United States Fire Administration (USFA) operational objective: "to respond appropriately in a timely manner to emerging issues" (USFA, 2005, p.II-2). A desirable outcome would be public-private partnerships for determining accurate and reliable fire loss data.

Literature Review

A literature review was performed to explore the issue of estimating fire loss as a significant element in data collection relating to pre- and postincident property values. It included literature found at the Learning Resource Library at the National Fire Academy in Emmitsburg, Maryland, and the Martin Luther King, Jr./San Jose State Library, using search engines that included Google Scholar and Highbeam Research. According to America Burning—Recommissioned (2002), "Accurate and current data is critical to assessing the extent of fire loss in the U.S." (p. 20). Their 2002 report emphasized that data collection and analysis should drive fiscal and public policy decisions.

According to USFA's NFIRS 1999 handbook, the purpose behind fire loss measurement is to provide a universally understood meaningful scale to describe the magnitude of the fire problem. The fire loss statistics can also be used to demonstrate improvement or decline in the quality of fire protection systems and services. The resulting information can assist communities in determining degrees of urgency and prioritizing funding requirements for fire protection. The NFIRS handbook also notes that

if a better estimate of the dollar loss becomes available, a revision should be made especially in the case of large fires (USFA, 1999).

The NFIRS handbook requires that all NFIRS data is transmitted to the National Fire Data Center (NFDC). The USFA (1999) lists the following seven national organizations that are dependent on the NFIRS data to publish their reports and documents related to various aspects of the nation's fire problem. The seven organziations are the Consumer Product Safety Commission (CPSC), International Association of Fire Chiefs (IAFC), International Associaton of Firefighters (IAFF), National Association of State Fire Marshals (NASFM), National Fire Protection Association (NFPA), National Highway Traffic Safety Administration (NHTSA), and National Volunteer Fire Council (NVFC). Fire loss data is also used to facilitate management reviews related to performance-based budgeting, as well as to support congressional testimony and budget requests of the USFA (USFA, 1997).

NFPA notes that differences exist between NFIRS and NFPA data sets. The NFPA Fire in the United States 2004 report states that NFPA collects data from 3000 fire departments versus the average of 18,400 fire departments reporting to NFIRS. NFPA describes their data as an imperfect random sample of surveys with tallied totals versus the NFIRS data collected from individual incident reports (NFPA, 2004).

NFPA also reports differences between data sets, and that some fire departments underreport casualties or losses on survey forms. NFPA notes that techniques used to generate NFPA estimates unintentionally miscount residential structures or that NFIRS data is not a true random sample and may reflect a potential bias toward fewer residential losses (NFPA, 2004). Recognizing that differences exist between NFPA and NFIRS

underscores the possibility of under or over-stating the nation's fire problem. NFPA reports yearly estimated dollar losses (property losses in dollars) in multiple categories of assembly or building types. The assembly types include public assembly, educational, institutional, residential, stores/offices, industry/utility/defense/storage in structures (Karter, 2004).

The Consumer Product Safety Commission (2003) in their 1999 Residential Fire Loss Estimates report included national estimates of fires of unintentional origin relative to deaths, injuries, and property losses. The report summarizes fires by categorical causes such as heating, cooking, and other appliances, and expresses property loss in dollars based on NFPA's annual activity/loss survey of fire departments and USFA's NFIRS data. "The NFPA makes national estimates of aggregated fires, deaths, injuries, and property loss by weighting sample results according to the proportion of the total U.S. population accounted for by communities of each size" (Miller, Smith, & Greene, 2003, p. 8). These consumer product safety experts also summarize NFIRS reporting parameters and state that estimation procedures were "weighted by dividing NFPA estimated totals by NFIRS residential structure totals for fires, deaths, and property loss" (Miller et al., p. 9). These points illustrate the significance placed on estimation for national statistics, and this consumer product safety report also provides dollar losses for all categories.

Importance is placed on reporting dollar loss as an indicator of the severity of the fire problem. Postincident damage assessment is used by several agencies to prepare reports for government offices and the private sector. Dollar loss information is vital to the process of reimbursement for damages that may have occurred during certain types of

events. Public and private resources use a team approach to conduct postincident assessment. Professionals having the expertise to make up these teams include members of fire, building, public works, tax assessors; structural engineers, construction and demolition contractors; and claims agents or loss assessors for the insurance industry. EAFSOM's Unit six also mentions the importance of having procedures, forms, and training on damage assessment prior to emergencies in order to ensure correct implementation and collection of information when disaster strikes, facilitate recovery planning, and streamline reimbursement processes (DHS, 2006).

Appendix F provides an EAFSOM class example of a damage assessment method that utilizes percentage of damage in multiple categories when applied to large-scale emergencies. These categories are by geographical area, roads, residential, commercial, schools, target hazards, infrastructure damages, and areas of special concern (DHS, 2006). However, this damage assessment method does not require an estimated dollar loss amount to be recorded by the assessment team.

Research relative to estimating fire loss by Executive Fire Officer students included four studies found in the National Fire Academy Learning Resource Center. Authors included Jerry Harnish of Rural/Metro Fire and EMS (1995), Roger C. Sharp of Tulsa Fire Department (1999), Daniel W. Booker of Margate Fire Rescue (2004), and Andrew G. Smerz (2004). These studies validated the need for accurate, consistent estimating methods pertinent to their specific purpose and jurisdictions. Each research effort acknowledged that the lack of any type of national or local standard or method had an effect on the national database by under or overstating the magnitude of the fire problem. All applied research efforts confirmed that few consistent methods were

followed to estimate fire loss in the fire service. Three common methodologies in fire service loss estimation figures included: a prevalence of “guesswork,” factoring a dollars per square foot or cubic foot weighted by a multiplier for specific geographic locations, and using a formula incorporating local tax assessment data as the “truest” value. Harnish referenced building valuation data produced by Southern Building Code Congress International, Inc. (SBCCI) in his 1995 ARP to assist with using price per square foot as a recommended pathway to estimation (Harnish, 1995).

Insurance and construction industry estimating methods were reviewed in these four ARP studies which incorporated recommendations for specific solutions to the problem of fire loss estimation methods for the fire service. Smerz (2004) included alternatives to dollar loss estimation. These alternative methods included Physical Fire Damage Estimating which expressed loss as a percent of fire damage to the structure or percent of structure lost versus dollar value, Arrival/Departure Loss Estimating which measured structure loss from time on scene to extinguishment, and the use of a Property Coefficient which is calculated by dollar amount saved divided by total property value (Smerz). Both Sharp (2004) and Smerz utilized action research to produce estimation guides for their departments. Sharp utilized the framework from RS Means, a publisher of construction cost data, which uses specific construction cost estimates based on structure types and condition multiplied by a factor for geographic location. Harnish (1995) called for a national standard or process from USFA to create a method applicable for all fire service agencies.

The Fire Protection Research Foundation (FPRF), in a white paper in 2002, reported the recommendations of the Research Advisory Council on Post-fire Analysis.

One major need that was identified under the heading of “Deaths, injuries, property losses, and building costs” was to call for a “broadly accepted protocol with guidelines for analysis to ensure consistency of reported data” (FPRF, 2002, p.9). This supports the premise that, having standard protocols would ensure consistency and interrater reliability for postincident fire investigation and loss analysis, and is applicable to a standardization of estimated fire loss methods.

A San Jose Fire Department Library text L-T5-10a under the California Firefighter Joint Apprenticeship Committee—Training Reporting Systems identifies a specific area of study under the category “Fire and Arson Investigation” as category “C-Estimating Fire Loss Data.” No other data in the Training Reporting Systems refers to instructions for estimating fire loss data (California Firefighter Joint Apprenticeship Committee, 1989).

One policy in the San Jose Fire Department’s Routine Operations Policies and Procedures Manual (May, 2006) was found pertaining to estimating fire loss for fire incident reporting. Evidence from this resource will be reflected in the results portion of this applied research project. The priority in this policy reflected the critical, timely, and public nature of fire reporting, and the officers’ responsibilities associated with fire incident report procedures.

Three types of fire statistics relating to fire loss information were found in a *Fire Chief* magazine article titled “Scoring the Squad.” These were inputs (expenditures, number of personnel, etc.), outputs (population served, property protected), and outcomes (dollar loss, injury statistics, customer satisfaction) according to Lam (2001). A concept important to performance-based budgeting is the value of outcomes of which dollar loss

is one element. Lam also validates the purpose of collecting fire statistics in order to evaluate the effectiveness of fire service delivery and to identify directions for improvement. The value of fire service statistics being appropriately collected and evaluated are expressed in the following excerpt:

> To avoid making an erroneous conclusion about a fire agency and assigning an inappropriate action plan, care should be taken to ensure that interpretive fire statistics are reliable and valid through a quality check, such as establishing consistency in judgment between two or more data collectors. When collecting fire statistics, efforts also should be made to ensure that similar data are collected so that such statistics as assessed property values and injury rate mean the same thing for different fire agencies. Only when fire data are standardized can we meaningfully use them to generate fire department performance profiles in different regions and compare departments using these statistics. (Lam, 2001)

Colman (2001) discusses technology as critical to the success and evolution of the fire service. Colman conveys that organizational change starts with an idea, “The more knowledge that you have of how technology functions and the more you apply that knowledge to your department and your problems, the more likely the solution will be accepted within your organization” (Colman, p. 1).

Bernie Till (2005) in *Fire Protection Engineering* magazine, discussed the total financial impact of a large nuclear plant fire that took place in 1975. He stated that the actual fire loss, the facilities, equipment, or inventory directly impacted by the fire was only one aspect the total monetary impact of these types of large loss fires. He pointed out inconsistencies in reporting, one of which was that the original property damage was estimated at $10 million, only to discover later that the cost of replacement power was estimated at $10 million dollars per month. Another inconsistency that affected the loss estimate was the period of time in which they were established, inferring that values increase due to inflationary factors over time. Methods offered to convert yesterday’s loss

dollars into updated loss estimation included the use of the Consumer Price Index, the Gross Domestic Product Deflator, or the market value of the property. However, he remarked that no common agreement exists on which is the most accurate factor to estimate fire loss (Till).

A nationally known example of multihazard loss estimation methodology is Hazards United States (HAZUS). Literature search revealed multiple examples of loss estimation methods such as HAZUS were designed as risk analysis tools (also known as loss estimation) for earthquakes, floods, and wind events to predict catastrophic or disaster type loss (FEMA, 2003). In 2004, two corporations; ImageCat, Inc. and ABS Consulting together prepared data standardization guidelines for loss estimation related to the HAZUS program (version HAZUS99) for the California Governor's Office of Emergency Services. The objectives were to identify a standard for data structures and aspects compatible with this software program and evaluate building data for each county in California. Identified building types were codified by occupancy types with the focus of the document on loss estimation. A requested scenario is given with the data collection inputs of building stock throughout the state to estimate the magnitude and potential dollar loss that would be incurred given a sizeable earthquake. This software includes direct repair costs for buildings and lifelines in addition to specified indirect loss estimates (ICI/ABSC).

This risk analysis/loss estimation tool allows policymakers to make more informed decisions about how to prioritize short- and long-term mitigation efforts. These types of prediction tools do not specifically meet the focus of this study; however, this technology is mentioned to acknowledge other possible avenues to explore the topic of

loss estimates or damage assessment that may prove useful in the future relative to estimating fire loss from structure fires.

The Residential Substantial Damage Estimator (RSDE) is FEMA's software for extensive flood damage. This program uses the mutual aid services of nearby building inspectors in a task force to survey areas using the RSDE Damage Inspection Worksheet to manually record damage information. This information is downloaded into a database that provides defendable building values and damage estimates in a short amount of time. FEMA does not require homeowners to use the information from this software, but allows them to use alternative sources such as assessors, professional appraisors, etc. This software provides a preincident market value or it can estimate potential damage (risk assessment) (FEMA, 2007).

Cambridge Emergency Management Department (n.d.) published a document titled "After the Fire" outlining actions that fire victims can take after a fire in their home or business. Inside this document is a section called "valuing your property" that provides basic advice relative to defining the amount to claim as a casualty loss from the insurance company and for federal income tax reporting. It applies to personal valuation of items difficult to value (those with sentimental value) such as cost of home/business building when originally purchased, fair market value before the fire, and the salvage value or value after the fire, which affirm that estimating postincident fire loss as an important element toward recovery.

Santa Clara County provides the Tax Assessment Roll information on the Internet, and property searches can be accessed by address or parcel number for residential or businesses (Santa Clara County, 2008). This database could be considered

as a potential source for property values in San Jose as was reflected in the ARPs mentioned previously. However, according to Wealth and Want (2008), a non-profit organization that provides tax relief information, made the following statement:

> In California in 1978, the voters opted for Proposition 13, which (a) limited the sales tax to 1% of the assessed value of each property; and (b) limited annual increases in assessed values to the lesser of 2% or the increase in the cost of living for the year, with the exception that upon the sale of a property, the assessment would be updated to the transaction price. (p. 1)

In the researcher's review of four examples of similar properties located on the same street in San Jose, the assessed property values varied by over $400,000 on the Santa Clara County Tax Assessor's database (Santa Clara County, 2008).

Another source of property valuation data is the International Code Council (ICC), a non-profit membership association dedicated to building safety and fire prevention that develops codes applying to the construction of residential and commercial buildings, including homes and schools. The founders of the ICC are Building Officials and Code Administrators International, Inc. (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Congress International, Inc. (SBCCI) (ICC, 1994). The ICC provides a document titled Building Valuation Data in 6-month intervals for its members, by type and group of construction, condition, and square foot estimates. Harnish (1995) used an updated version of the building valuation data. The data represents average valuations for most buildings. These estimates do not include the price of land but include regional cost modifiers and are primarily used for permit fees (ICC, 2008). This database could assist with preincident values for structures only, without land values. However, it is uncertain whether this database would provide

an accurate replacement value to rebuild a property lost from fire, because it may not reflect the real loss.

The American Red Cross (ARC) in their training curriculum highlights the coordination and education of their volunteers in damage assessment and the formation of damage assessment teams during disasters. They categorize private, individual, and public (government) losses. The damage and loss figures are collected via telephone surveys by ARC volunteers trained in field assessments who have connections with local resources within a given community (i.e., government agencies and community based organizations). The ARC curriculum stresses that data collection for damage and loss estitmates during these phone surveys must be verified in order to provide accurate and effective relief services (ARC, 2006).

Private industry has developed resources to assist with loss estimation through data for valuation and replacement/repair costs used by appraisors, tax boards, insurance, and construction industries. Marshall, Swift, Beck, Inc. (MSBI), a corporation that produces literature, books, training, and computer software to provide new replacement costs of residential and commercial structures by region and zipcode. This corporation specializes in best practices to ensure effective valuation, repair and replacement costs, property insurance estimates, and claim management via databases founded on claims experience and annually recalculated by region in order to provide the most current data available (MSBI, 2008). MSBI also provides standards of cover analysis and states that "the most important factor in predicting a fire loss is how quickly firefighters respond to a risk . . drive distance is the major factor in firefighter response time" (MSBI, 2008,

p. 1). MSBI, as an industry leader, appears repeatedly in both public and private sectors for its valuation data services.

Competitors of MSB include Data Quick Information Systems (DQIS), a subsidiary of MacDonald, Dettwiler, and Associates, Ltd. (MDA) which provides Web-based real estate information. Each weekend, the San Jose Mercury News publishes median home prices and sales for Santa Clara, San Mateo, and Santa Cruz Counties by zip code, and includes market price per square foot based on information received from DQIS (DQIS, 2008).

Other companies providing software for value estimation include Xactware Solutions, Inc. (XSI), which offers software called Xactimate that is used by professionals involved in estimating all phases of building and repair (XSI, 2008). *Business Wire*, an online magazine, mentions Insurance Services Office which offers ISO HomeValue as another web-based residential property replacement cost estimator available for home insurers to assist with underwriting homeowner policies. One insurance company, Quincy Mutual selected this program to assist its agents with objective data to ensure accurate replacement cost estimates and underwriting (*Business Wire*, 2005).

A review was conducted of the Residential Square Foot Costs-Contractor's Price Guide for 2007 published by Reed Construction Data-R.S. Means (RCD-RSM) to understand the loss estimation method in Sharp's (2004) ARP in 1999. The data is consistent with the R.S. Means reference in Sharp's research and could be used in the development of a specific guide for San Jose Fire Department. This book contains drawings, and categorizes residences into building classes, types, exterior wall

construction, residential configurations, and garage types. This guide uses 10 elements related to components such as site work, foundation, framing, exterior, roofing, interior, specialties, mechanical, electrical, and overhead costs to break down square foot cost for each area. Each element is considered and entered on a worksheet to complete an estimate the constractor can use to submit bids or proposals. Other R.S. Means texts include remodeling, renovation, commercial costs, and best practices for builders and remodelers (RCD-RSM, 2006).

Literature contrary to the benefits or consequences of private industry efforts in cost estimation through claims and property insurance valuation reflect controversy over damage payouts. California, and the Southeastern states have been subjected to disasters of great proportion in the last several years. Hurricanes occurring over eight states and firestorms in 2003 and 2005 in California have created unprecedented loss estimates and casualty claims. Mowbray (2007) discusses class action lawsuits filed by the Louisiana State Attorney in November 2007 claiming collusion, price fixing, and antitrust violations. The six insurance companies named in the lawsuit were State Farm, Allstate, Farmers, Traveler's, USAA Casualty Insurance, and Lafayette Insurance Company. The suit also names MSBI and XSI as companies that make claims adjusting software used by these insurance companies. The suit also names a consulting firm known as McKinsey & Company that in 1995 created a document and claims adjusting program for Allstate Insurance Company to improve their loss ratios by adopting certain practices in computing claims (Mowbray).

The suit alleges that, by using the MSBI and XSI claims software, by MSB and Xactware, the insurance industry has been standardizing tactics for low-balling claims to

its customers. The suit alleges that suppressing claims settlement figures in this way underestimates what people need to repair their homes. XSI, a wholly owned subsidiary of Insurances Services Office (ISO), is allowing companies to collude in data sharing to suppress claim payouts, contractor, and restoration company pricing. After the Katrina disaster, policyholder claims were routinely paid at only 50 cents on the dollar versus historical payouts of 70 cents on the dollar. This change in business practices resulted in record profits for these insurance companies at a time when the number of claims for disaster losses was at an all time high. Senator Trent Lott was also reported to have lost his home in the hurricane disaster and had to sue to get the insurance company to pay replacement value as described in his insurance policy. Senator Lott's case settled for an undisclosed amount (Mowbray, 2007).

Journalists Dietz and Preston (2007) investigated California firestorm victims of 2003 and 2005 who also experienced similar shortfalls in insurance claim payouts. One such victim was Julie Tunnell of southern California. State Farm Mutual Insurance Company, the largest home insurer in the U.S., was only going to pay $220,000 of the $306,000 to rebuild her home. This is just one of many examples of people who lost their homes to fire and were offered claim payouts well below replacement costs. Insurance companies routinely refuse to pay market prices for homes and replacement contents; they use computer programs to cut payouts, change policy coverage with no clear explanation, they ignore or alter engineering reports, and they sometimes ask their adjusters to lie to customers. These allegations are based on evidence from state regulators from court records, and interviews with former employees (Dietz & Preston).

An alternate method to dollar loss estimation is the dollars saved or loss averted measurement as designed by the U.S. Navy. An article by Schaenman in the March 2008 edition of *Fire Chief* magazine discusses efforts made by naval fire officers to convey that dollars saved is the true measure of firefighting effectiveness. The Navy's method incorpates the concept that, had the loss not been stopped, the likelihood of fire extension could be measured in four categories: highly probable, probable, possible, unlikely/low possiblity of spread. The Navy attached percentages to these categories: 90% for highly probable, 60% for probable, 25% for possible, and 10% for unlikely/low possibility of spread. The Navy used their own book on property values and estimated content values. They would use the percentages of likehood for fire spread as a multiplier with the preincident property value to arrive at a dollars saved estimate. Thus, the value of the property saved becomes the value of the structure and contents that would probably have been damaged, which may not necessarily be the total value of the structure and contents. The concept of loss averted is not new, but the Navy has made a significant step toward creating a workable method to communicate effective fire service performance and value to government agencies and the community at large (Schaenman).

The literature review included searches for data, articles, or books specific to other organizations or fire departments related to estimating dollar loss and its impact on their organizations. Solutions discovered will aid in training SJFD personnel to pursue a standardized method on how property values and loss estimates are determined.

Procedures

This ARP is a descriptive research endeavor exploring methodologies for estimating preincident property value and postincident dollar loss. The research included

a literature review, interviews and questionnaires with private sector, public sector and fire service personnel. The literature review was commenced at the Learning Resource Center (LRC) at the National Fire Academy in May 2007. ARPs regarding the general topic of fire loss, loss and damage assessment were reviewed. Literature searches were performed at the LRC using key words such as fire loss, damage assessment, fire loss estimation methods, insurance industry claim estimation; appraisal methods.

Internet sources were explored using search engines with key words during November 2007 through March 2008. Applicable material was reviewed at the Martin Luther King, Jr. Library which is in partnership with San Jose State University in San Jose, California. A literature search was also conducted within San Jose Fire Department station libraries for material related to this research effort.

For the purposes of this inquiry it is important to establish an understanding of several terms that have varying meanings to different agencies. These terms include loss, fire loss, estimated dollar loss, property value, preincident value, property conservation, and damage assessment.

Loss is defined according to the Merriam-Webster online dictionary as destruction or ruin. As it applies to postincident loss, the website states that “loss is the amount of an insured’s financial detriment by death or damage that the insurer is liable for” (Merriam-Webster Online Dictionary, 2008).

Fire loss as used by National Fire Protection Association to publish national statistics encompasses all losses that fire causes directly and indirectly (Hall, 2006). This includes loss of life, injury and property loss or property damage as it relates to quantities

of fires, deaths, dollar loss or monetary estimates of replacement or repair costs for lost property.

Estimated dollar loss is defined in the United States Fire Administration's National Fire Incident Reporting System (NFIRS) 5.0 Reference Guide. This information is a required data field in the completion of fire reports. The implied intent of NFIRS is to provide rough estimates of the total loss to the structure and contents, in terms of the cost of replacement in kind and quantity. Estimated dollar loss is also referred to as fire loss, the rough estimate of which includes contents damaged by fire, smoke, water, and overhaul. However, this estimate does not include indirect loss. Examples of indirect loss include but are not limited to monies lost from stoppage or interruption of the business owner's opportunity to conduct business (USFA, 1999).

Preincident value, as defined by NFIRS, is the the replacement cost of the structure and contents (USFA, 1999). Preincident value is a data requirement for NFIRS completion and helps by providing a basis of comparison with postincident value, and like estimated loss, preincident value assists in describing the extent of a region's fire problem (USFA, 1999). NFIRS is the largest known national, annual database of fire incident information (USFA, 2008).

Property value as defined by the Internal Revenue Service includes estimated value based on comparable sales; capitalization of income; and replacement cost new or reproduction cost minus observed depreciation (Internal Revenue Service, 2007).

Property conservation means the stopping of additional loss, ensuring complete extinguishment, determining cause and origin, and returning occupancy where possible (California Fire Service Training and Education System CFSTES, 1985).

Propery damage according to the California State Fire Marshal Fire Command 2A curriculum is divided into primary and secondary damage. Primary damage results from fire and products of combustion such as flame, heat, and smoke (CFSTES, 1985). Secondary damage is caused by what fire personnel do to the building and its contents to provide rescue and fire control functions. The community's expectation for the fire service is to deliver services that continually reduce loss during fire control operations (CFSTES).

Damage assessment is another essential component that establishes definable loss as presented in Unit Six of the Executive Analyis of Fire Service Operations in Emergency Management (EAFSOM) student manual. This concept is defined as a gathering of information related to the impact of an event, or series of events, on life and property within a given area. The two types of damage assessment are immediate and postincident. Immediate damage assessment is a rapid estimate of damage at a specific incident site or within an incident area. Postincident damage assessment is a detailed examination and analysis of the total damage at a specific incident site or within an incident area. The postincident damage assessment is conducted after the active phase of the incident has been concluded (DHS, 2006).

The literature reviewed related to the following three research questions:

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2. What methods for preincident property value and postincident dollar loss estimates are being used by other fire departments reporting data to the National Fire Incident Reporting system?

3. What methods are being used in private industry for pre-incident property value and postincident dollar loss estimates and cost for residential and commercial properties?

Interviews were conducted to refine and understand the scope of this research effort as well as provide information to answer the identified research questions. Geoff Cady, Administrative Officer, SJFD Bureau of Support Services was interviewed because of his expertise in strategic planning, deployment modeling, and research development. Mr. Cady was interviewed January 2 and 10, 2008 for approximately 60 minutes each time. Trent Engler, Fire Captain, SJFD Bureau of Field Operations was interviewed January 15, 2008 because of his expertise in computer data systems and NFIRS. Captain Engler was interviewed February 8, 2008 for approximately 30 minutes to assist with answering research question number one on the methods for determining preincident property value and postincident dollar loss (fire loss) used by SJFD. Phone interviews (approximately 15 minutes each) in January 2008 were conducted with SJFD Arson Fire Captain Bob Mueller and Arson Investigator James Hirano, on fire investigation and answering Research Question 1. They were selected because of their expertise in fire investigation methods and contact with insurance and loss assessment companies during routine and arson fire investigations. City of San Jose Chief Building Official, Ed Tolentino was interviewed by phone for approximately 20 minutes on January 22, 2008 to inquire as whether the City of San Jose Building, Planning and Code Enforcement Department had any criteria for preincident and postincident values as they related to answering the previously mentioned research question. The Santa Clara County Tax Assessors Office was also contacted January 22, 2008 to inquire about property valuations and estimation methods used by the County Tax Assessor.

Deputy Fire Marshal for Fremont, California Fire Department, Amiel Thurston was interviewed for 60 minutes regarding Research Question 2 on methods for preincident property value and postincident dollar loss estimates used by other fire departments reporting to NFIRS. Deputy Fire Marshal Thurston was selected for his background in fire prevention and loss assessment. Michael Mayers, Acting Director of Urban Search and Rescue Program and the South Carolina Emergency Response Task Force was interviewed for approximately 30 minutes in March 2007 at the National Fire Academy and also contacted with follow-up emails regarding Research Question 2. He was selected because of his background in managing large-scale incidents and knowledge of damage assessment.

Three individuals from private industry were consulted in 30-minute phone interviews to answer Research Question 3 on methods used in private industry for preincident property value and postincident dollar loss of residential and commercial properties. The first contact was Michelle Croghan, Claims Manager for Farmers Insurance. Ms. Croghan, a 25-year veteran of Farmer's in the claims adjustment area provided depth of knowledge and experience that assisted with understanding how the insurance industry views damage assessment and loss. A follow-up 30 minute in-person interview was also conducted. Ms. Croghan assisted with information to address Research Question 3 and provided feedback and validation of questions identified for the private industry questionnaire. The two other industry professionals interviewed were Dale Terry of Jansen International and Bill Gertz of California Casualty Insurance Company. Jansen International, is one of the largest loss consulting firms in the United States that services commercial businesses and homeowners throughout the United States

and abroad. California Casualty Insurance Company is solely a residential casualty insurance company that insures customers throughout the United States. Initial questions were those itemized on the private industry survey (Appendix C) followed by open-ended discussion to gain understanding and background about the estimation aspect of the insurance industry. Dale Terry was interviewed via phone for approximately 30 minutes on February 26, 2008. Gertz was interviewed via phone for approximately 30 minutes on March 5, 2008.

Three questionnaires were developed by the author to help answer the three research questions. The questionnaires were developed by first determining the purpose and depth of the information desired from the responses. General questions were written first, and then the breadth of the questions funneled down to specifics issues desired to be explored. Questions were amended and some discarded. Questions were in part, based on information gained from the literature review and feedback by SJFD Senior analyst Ty Mayfield.

The first questionnaire was developed specifically for San Jose Fire Department Officers to answer Research Question 1 and to understand their background and source of training in loss estimation. All 204 SJFD officers surveyed were in the ranks of Company Officers, Battalion Chiefs, Deputy Chiefs, Assistant Chief and Fire Chief.

The second questionnaire was developed for fire service agencies within the United States fire service using NFIRS. The sample size was determined by the fire department members across the United States that the author could contact via email directly or via a National Society for Executive Fire Officers website posting. The total number of emails sent was 454.

The third questionnaire was developed and sent via Internet to 30 contacts in private industry. Three types of industry professionals were contacted at 10 insurance companies, 10 loss consulting firms, and 10 restoration/construction companies.

All three surveys were conducted during the period February 26, 2008 through March 10, 2008. The questionnaires were sent via the Internet through the professional survey company, Survey Monkey (2008). The SJFD officer survey contacted 204 officers with 62 completed (30%). Other fire departments throughout the United States were also sent 454 invites; 46 (10%) completed questionnaires returned. The private industry survey was sent to 30 invitees via email. Two results were received online and two contacts were made by phone to complete the survey for a total of four of 30 private industry surveys (13%).

The company Survey Monkey automatically tabulates the results in an easy to read format. Samples of each questionnaire are found in Appendixes A, B, and C. The respondents for the SJFD survey encompassed all officers in the San Jose Fire Department who have had experience with loss estimates for NFIRS reporting. They were selected because they represented a broad spectrum of the U.S. fire service and could be contacted via the Internet to participate in the questionnaire. A target sample of private industry professionals was selected by type of business that was related to loss assessment, casualty estimating, and postincident restoration.

Limitations of these results included low percentage of respondents in all three surveys. However, the SJFD officer survey identified training and protocol needs for property values and loss estimations. The fire service industry survey, despite a limited response, provided an overview of the U.S. fire service and methods used for value and

loss estimation. The private industry survey target sample of companies was insufficient to establish statistical findings, but provided an understanding of industry claims adjustment methods and valuation processes. The literature review resulted in limited data sources and found only four direct research efforts that targeted fire loss estimation and property valuation methods for the fire service. Another limitation was that some respondents elected to skip or not answer various questions in the surveys.

Results

The literature review, interviews, and three questionnaires disclosed several inconsistent methods in use to estimate dollar loss for fires in residential and commercial buildings within the San Jose Fire Department, as well as other fire service organizations throughout the United States. Private industry was found to view loss in terms of extent of damage or repair versus replacement, that results in dollars paid through claims adjustors, the goal being restoration to preincident condition or value. Literature validated the need for reporting loss statistics to ensure credible data is presented for improved fiscal and logistical decision making in San Jose as well as the fire service.

To answer Research Question 1 on current methods for determining preincident property value and postincident dollar loss (fire loss) used in the San Jose Fire Department, a 13-item questionnaire was emailed to all 204 SJFD officers (Appendix A). In answer to Item 1 of this questionnaire, 62 SJFD officers responded of which 11% (7) held the rank of Battalion Chief or above, and the remaining 88% (55) were Fire Captains. All fire captions are responsible for first alarm fires, while Battalion Chiefs are responsible for multiple alarm fires.

In answer to Item 2 of the SJFD officer questionnaire on their years of experience in their current positions, 42% (26/62) had more than 10 years of experience in the officer rank, 31% (19/62) had fewer than 5 years as officers, and 27% (17/62) had between 5 and 19 years as officers. In answer to Item 3 of the SJFD officer questionnaire on their type of training in NFIRS reporting (which included the components of estimating fire loss -- preincident property and content values, postincident property and content loss), 67% (41/61) of the respondents taught themselves how to complete NFIRS reports and estimate fire loss; 18% (11/61) received classroom training for NFIRS; 15% (9/61) learned NFIRS reporting procedures through peer training; aside from the 1 respondent who skipped the question about type of NFIRS training received. In answer to Item 4 of the questionnaire on how much training the officer respondents had, 71.2% (42/59) stated they received two hours or less of training for NFIRS completion; 22.0% (13/59) received between two and four hours of NFIRS training; 1.7% (1/59) received between six to eight hours of NFIRS training; 3.4% (2/59) received more than eight hours of NFIRS training; 1.7% (1/59) reported more than 100 hours of on-the-job training in NFIRS reporting. Three SJFD respondents stated they received no training.

Despite the SJFD officers' years of experience, results demonstrated that inconsistent methods were used to establish preincident property value and postincident dollar loss in residential structures. In answer to Item 5 of the questionnaire on the method(s) SJFD officers used to estimate dollar loss for residential structure fires, the most common methods used were price per square foot, followed by percentage of structure size. Many officers stated they used a range of methods or a combination of factors that they felt were applicable to the case reported. The other choices of factors

included guesses at value, fair market value, quality of construction, replacement cost, experience in building construction, types of construction, real estate experience, homeowner's opinion, opinions of others or bystanders on the scene, or the opinions of people with some background in fire loss estimation. Four officers did not answer the question. The responses received produced results that were unclear because of the lack of firm guidelines and numerous choices.

In answer to Item 6 of the questionnaire on what method(s) SJFD officers used to estimate dollar loss for commercial structure fires, responses were virtually the same as for residential structure loss estimates, and the numerous choices of methods were similar. One SJFD officer offered the following comment:

> Commercial property is harder. They don't change ownership very often, so it is hard to determine value. You have to keep track of the values and areas through sales approach usually from the local newspaper. You need to take into consideration types of construction, number of stories, finish work, landscaping, age of building, and any deferred maintenance.

Item 7 of the questionnaire asked SJFD officers that, if they used the price per square foot method to estimate dollar loss, what amount(s) they used for completing NFIRS to estimate dollar loss for residential and commercial structures. SJFD officer responded as follows:: 74% (46/62) offered a range of costs; 26% (16/62) declined to answer or did not use square footage costs as their method of choice. Residential cost per square foot estimates ranged from $40-$600. Commercial cost per square foot estimates ranged from $70-$800. Several of the SJFD respondents used the same figure for both residential and commercial structures, which ranged from $60-$300 per square foot.

In answer to Item 8 of the questionnaire on what method SJFD officers used for content loss estimation, 44% (27/62) of SJFD respondents indicated replacement value;

16% (10/62) used salvage value; 15% (9/62) guessed at the amount of content loss; 11% (7/62) used purchase value; 9% (6/62) used a percentage of the structure loss; 3% (2/62) offered comments on their range of methods; 2% (1/62) used $100 per square foot of area damaged. Others used estimates based on interviews of property owners, other department member opinions, and consideration for the quality of furniture (low quality versus high quality).

In answer to Item 9 of the questionnaire on how SJFD officers determined preincident values for residential property with four options that included property owner/tenant, neighbors, insurance company, and other (commentary): 29% (18/62) referred to the property owner/tenant for content loss values, 5% (3/62) used information obtained from neighbors, 3% (2/62) used insurance company values for content loss. Sixty three percent (39/62) selected commentary and stated that they used one or more of the following methods: local market value, web-based real estate market estimates, multiple listing services, experience in real estate, guessed at the content loss amount, or used replacement cost.

In answer to Item 10 of the questionnaire on how SJFD officers determined preincident values in commercial property: 42% (24/62) referred to the property owners or tenants for the value data; 26% (16/62) used comparable business values; 26% (16/62) offered comments which included guessing at commercial preincident values, using market value, using value of the commercial building in the year of purchase, and some stating they did not know how to determine commercial preincident value. Six percent (6/62) SJFD officers did not answer the question.

In answer to Item 11 of the questionnaire on how SJFD officers determined preincident content values for commercial properties, 40% (25/62) used replacement value, 24% (15/62) used fair market value, 11% (7/62) used the value of contents when purchased, and 20% (12/62) offered commentary which included guessing at the contents loss estimates, checking with the property owner for value data, and considering the type and quality of furnishings and the condition of the property.. Five percent (3/62) did not answer the question.

In answer to Item 12 of the questionnaire on whether SJFD officers used any books, software, or other estimating tools estimating: 68% (42/62) stated they used no books, tools, or Internet mediums in estimating, 24% of (15/62) added comments about tools they used in estimating which included Internet real estate websites, newspapers, multiple listing services, and Kelly Blue Book for estimating values for vehicle fires. One officer used a calculator and a formula for price per square foot by the percent of damage, with a heavy or light damage qualifier for the entire structure. Eight percent (5/62) did not answer the question.

In answer to Item 13 of the questionnaire requesting SJFD officers' comments. One officer stated the following:

> Experience in doing this (loss estimates) plus—as a general contractor and landlord for over 30 years. Most people who do this estimating are very far off when they do the cost for the loss. The rebuild is usu8ally way higher than is put for our "Fire Loss". Usually people doing the reports have no idea about the reconstruction after a fire. Sometimes it takes a structural engineer to determine the integrity of a commercial concrete building. It might have damage to the concrete walls to the point of taking it down to the foundation. There are many variables to this. Is the plumbing salvageable, etc.

Other officers felt that NFIRS was not a user-friendly program, or that they had received little or no training. They stated that NFIRS had multiple ways of being interpreted and

that its accuracy was not very good. They expressed that the program is always difficult especially when adding a casualty report and requested that the program be changed. One officer stated the following, “Why do we even get involved in property dollar loss values? That’s strictly the business of the insurance companies and they don’t care what we put in there anyways.” Another officer recommended using the best practices from insurance adjustors, who are licensed. Sixteen of the 37 SJFD officers who left a comment, stated that a consistent method and training was definitely needed to help with this NFIRS program and all aspects of estimating for residential and commercial properties. These results clearly indicated the need for a formalized training curriculum for SJFD officers in NFIRS reporting and loss estimation.

A 15-item questionnaire was sent via email to officers of 454 fire officers of various ranks and tenure of various departments within the United States via email to answer the following research question: What current methods for determining preincident property value and postincident dollar loss (fire loss) are used by other fire departments that report data to the National Fire Incident Reporting System?,(See Appendix B). Approximately 10.1% (46/454) those fire service officers contacted nationally via email responded to the 15-item questionnaire via SurveyMonkey. Twelve of the questions asked were the same as those items asked in the SJFD officers questionnaire.

In answer to Item 1 of the questionnaire on which type of fire organization employed each fire service officer (i.e. career, volunteer, combination), 69.6% (32/46) fire service industry officers were from career departments; 26.1% (12) of the fire service

industry officers were from combination departments made up of both career and volunteer personnel; 4.3% (2/46) fire service officers were from volunteer departments.

In answer to Item 2 of the questionnaire on what rank of fire service industry officer responded to the survey, 31.1% (14/45) were fire chiefs; 17.8% (8/45) were assistant chiefs; 17.8% (8/45) were battalion chiefs; 11.1% (5/45) were deputy chiefs; 8.9% (4/45) were fire captains; (13.3%) 6/45 comprised ranks such as district chief, deputy commissioner, safety officer, fire marshal, research specialist and division chief The geographic range of respondents were from 17 states within the United States (see Appendix C). One person skipped the question.

Item 3 of the questionnaire, which asked fire service industry officers about the number of years they held their current rank, 97% (45/46) respondents stated the range of experience in rank was reported to be between 1 and 20 years. One person skipped the question.

In answer to Item 4 of the questionnaire, asking if their departments participated in NFIRS reporting, 93.5% (43/46) of respondents participated in the National Fire Incident Reporting System. Three respondents 6.5% (3/46) stated no to this question.

In answer to Item 5 of the questionnaire which asked what type of training fire service industry officers had received for NFIRS reporting. Results indicated that respondents chose multiple answers for this item. It is not know how many officers selected more than one answer. Item 5 answer selections included classroom setting; on-line module; peer training; self-taught; or other. The two options most frequently chosen as methods for receiving NFIRS training were in the class room setting and peer training [70.5% (31/44) and 61.4% (27/44)]. Fire service officers who elected to teach

themselves about NFIRS reporting comprised a group of 10 out of the 44 officers who responded to this item. Those fire service officers who elected to provide comments offered the following: one respondent stated he gained experience from reviewing thousands of submitted NFIRS and another fire service respondent had taken a class on NFIRS at the National Fire Academy. Two fire service officers skipped the question.

In answer to Item 6 of the questionnaire, many fire service officers received between two and four hours of training on NFIRS (32%). Approximately 23% received more than eight hours of training. The remaining percentages of fire service officers received between zero and eight hours of NFIRS training. Two fire service officers skipped the question.

In answer to Item 7 of the questionnaire, fire service officers were asked which methods they used to estimate dollar loss for residential structure fires. Answer choices for Item 7 included square feet, linear feet, percent of structure size, or other. Fire service officers stated they use percent of structure size 56.8% (25/44) of the time for residential fires and 34.1% (15/44) selected square feet.

Approximately, 31.8% (14/44) of fire service respondents offered commentary about the methods they used in residential dollar loss estimations. Methods included guessing, market values or identified a dollar figure of $300 per square foot to estimate damage. Other commentaries included using the International Code Council (ICC) building valuation data by square foot, type and class of assembly, appraised tax values; tax values combined with replacement costs; construction cost estimates from firefighter contractors and fire prevention guidelines. Insurance companies were also consulted to estimate dollar loss. Two fire service officers skipped the question.

In answer to Item 8 of the questionnaire, fire service officers were asked which methods they used to estimate dollar loss for commercial structure fires. Selections for Item 8 were the same as in Item 7. Results for methods of estimating commercial dollar loss followed similar trends as those for residential structure fires with approximately 53.3% (24/44) using percent of structure size and 37.8% (17/45) using square foot in commercial estimations. Commentaries for the commercial category 37.8% (17/45) matched residential parameters. One fire service officer skipped the question.

In answer to Item 9 of the questionnaire, fire service respondents who used square foot in their estimation method, were asked to provide a dollar figure for both residential and commercial estimates. The range of square foot estimates for residential was $45-$300 dollars and the range of square foot estimates for commercial buildings was $85-$500 dollars expressing the differing values throughout the country.

In answer to Item 10 of the questionnaire, fire service officers when asked what method they used for estimating content loss, responded as follows: 53.5% (23/43) stated content loss estimation was based on replacement value; 27.9% (12/43) offered commentary, using insurance values, values identified by county appraisers, replacement cost plus demolition costs, 50% of structure loss or building value, twenty dollars ($20) per square foot, or simply educated guesses. Three fire service officers skipped the question.

In answer to Item 11 of the questionnaire, fire service officers when asked how they determined preincident property values for residential properties: 59% (24/41) provided commentary that included guessing, tax records, fair market value, internet

research, percentage of loss factored by 10% of property value. Thirty four percent (14/41) used property owner/tenant information, and 7% (7/41) used values obtained from insurance companies, and information from neighbors. Five fire officers skipped the question.

In answer to Item 12 - determining preincident property values for commercial property, fire officer responses were: 38% (16/42) used property owner/tenant information, 10% (4/42) used comparable business information, 21% (9/42) used insurance company information, and the remaining 31% (13/42) used either guessing, county tax records, neighborhood comparisons, property appraisers, and ICC estimates. Four fire officers skipped the question.

In answer to Item 13 of the questionnaire regarding preincident values for residential and commercial content, fire officer responses were: 43% (18/42) used replacement value, 21% (9/42) used fair market value, 5% (2/42) used value when purchased, and the remaining 31% (13/42) provided commentary, including educated guesses, information from fire prevention bureau, and 50% of structure value. Four fire officers skipped the question.

In answer to Item 14 of the questionnaire on whether fire service officers used any books, software or other estimating tools to assist in estimations: 35 of 46 answered the question. The majority used no additional resources, others used contractors' information, ACC permit valuation tables, formulas from the internet, and county tax appraiser's website. Eleven skipped the question.

In answer to Item 15 of the questionnaire on fire service officers' opinions or helpful information, six officers responded. Fire Chief Joe Davis from Cypress, TX

stated that ninety-five percent (95%) of their estimates are referred to the county fire marshal. Captain Christopher Switala of Pittsburgh, PA states that his department follows up with the insurance carrier on fires with greater than $5,000 damage and then they amend their reports to reflect actual loss data. Deputy Chief Tom Ebsen of Oakpark, IL also reports that his department follows up with insurance companies to determine actual payout to confirm loss estimates. Battalion Chief Mike Senchyna of Vancouver, WA reports that his department provides their officers with a one-page quick reference guide for estimating loss, content and restoration values. Assistant Chief Clay Fenwick of Sugar Land, TX reports that their program puts estimates in preliminarily, followed up by their fire marshal's office to update the report. Division Chief Christopher Wier of Port Orange, FL reports using construction cost estimates from ICC for refurbishing fire, weather or vehicle impact related damage. They also factor these values into their permit costs and use in plan review costs. They use fire impact fees for new developments when a residential community is in the design phase. The use a formula of $0.20 (cents) times the square footage of the building and $250 per residential home. Chief Wier gave the example of a 100 home community would have a one time fire impact fee of $25,000.

A 17-item questionnaire was sent via email to 30 private companies to answer the following research question: What current methods for determining preincident property value and replacement cost are used in private industry? (See Appendix D). Private industry included three aspects: insurance companies, loss adjustment companies, and restoration companies. Four of thirty (4/30) or 13% of companies responded via the survey or by phone. Two responses were received via Survey Monkey (2008) to the private industry questionnaire and two responded by phone and an interview was

conducted to complete the survey. The two responses were from a loss adjustment claim management company and a restoration company.

The loss adjustment company owner that responded was Tom (declined to state last name) from Insurance Claim Service, Incorporated (ICS). He reported that his loss adjustment company does not use NFIRS data for property values or content loss estimates. The owner obtained his estimates from local contractors bidding for the restoration work. As far as loss estimates in all categories, Tom stated the estimates were based on the size of the loss being handled. The owner of ICS used Marshall and Swift appraisal books as benchmark data (no computer software) to assist with estimates and also applied a depreciation factor when making loss estimates. The owner used square foot averages for residential structures and cubic foot averages for commercial structures, but provided no dollar figures.

The one restoration company that responded was PuroClean East Bay. Brian Agnew, the owner, stated the he did not estimate dollar loss, only dollars to restore. He does not refer to NFIRS dollar loss figures as any type of basis or factor in his property restoration estimations. He did state that he used Xactimate Software (a MSBI company) to assist with his bid estimates.

Dale Terry of Jansen International contacted the author by phone to discuss and answer the survey questions. The phone interview occurred February 28, 2008. Terry, a loss adjustor for 18 years and an emergency services commissioner in the State of Texas, offered information relative to this research effort. He believed NFIRS dollar loss estimates are incredibly inaccurate. Property loss estimates are undervalued in most cases and he believes the news media reports losses that are overvalued. Terry reported that

Marshall, Swift and Boeckh are a national benchmark for appraisal and property values and that his company also uses Xactimate as a resource for claims management. His company uses square footage for estimation but did not provide dollar figures, stating that each case is based on restoration or replacement cost, not loss.

Terry also stated that their claims adjustors work to estimate all the associated costs of restoration. Some of these costs included tear out/debris removal, preparation of the area to be restored, and re-installation with code upgrades. Terry mentioned that restoration costs an average of 50% more than the cost of building anew. However, he also mentioned much controversy exists in the industry currently regarding the use of Xactimate and other software that estimate claim losses and restoration costs. Terry reported the existence of class action law suits filed after the Katrina Hurricane and California firestorm disasters against several large insurance companies as well as Marshall, Swift, & Boeckh, Inc. (MSBI) for alleged price manipulation, undervaluation of property, and loss payouts by insurance companies based on MSBI software estimates. He stated that many payouts after these disasters were offered at 50 cents on the dollar versus industry practice of an average of 79 cents on the dollar just ten years earlier, and many individuals had to sue insurance companies to recover enough money to rebuild their homes. Terry also stated that Insurance Services Office community ratings have an impact on property values.

Bill Gertz of California Casualty Insurance Company, a residential insurance company primarily for California, Oregon, Arizona, and Nevada, also responded to the survey request by phone. Gertz reported that his company does not use NFIRS loss estimates as a factor in their estimation practices. Gertz as a 30 year veteran of the

insurance industry reported that more credibility was placed on fire reports in years past, however they are not relied upon in today's claim adjustment industry. He reported that his adjustors use the MSB software, Xactimate to assist with repair or replacement estimates and to define scope of damages. No average per square foot is used for residential structure fires due to the emphasis on cost to repair or replace. He reported that the cause of the fire is most important in order to facilitate cost recovery in the event the fire is related to arson versus accidental causes. Content loss estimates are made on a case by case basis, and no average dollar amount is used by this company. No commercial information was provided due to California Casualty's sole focus on residential customers.

The results of this research revealed themes common to SJFD officer responses that pointed to the need for a consistent method and training in order to provide credible loss estimates for residential and commercial structure fires occurring in San Jose. Other fire service organization responses provided multiple options currently used in other parts of the U.S. that could be adopted to provide more credible property and content loss estimates for residential and commercial structure fires. Limited responses were received from private industry sources. However, each response provided an industry snapshot and background on estimation practices for property and content values.

Discussion

This study affirmed the importance of credible statistical fire loss data and its use in the fire service. The study illustrated examples of fire loss estimation data used locally and nationally in the fire service to communicate the magnitude of community fire problems. ECRC had concluded that the lack of analytical capacity prevented SJFD from

adequate gap analysis and that the department needed to substantially increase analytical, technological, and staff capabilities through standardization of data gathering and review (ECRC, 2000, p. 39). NFIRS reports the purpose behind fire loss measurement was to provide a meaningful scale that everyone understands to describe the severity or magnitude of the fire problem (USFA, 1999). Adpting methods for improving fire loss estimation provides SJFD with an opportunity to bring greater credibility to budget documents and proposals to garner future resources and for post-disaster reimbursement tracking.

FEMA's Residential Substantial Damage Estimator uses mutual aid from alternative resources that include assessors and professional appraisers to manually record community/structural damage that is downloaded into a FEMA software program to summarize damage assessment estimates (FEMA, 2007). This method is one way to obtain loss estimates; however, the logistical challenges of gathering a team of this magnitude is not fiscally prudent for routine fires. Further research of this software is required to explore its applicability to fire losses.

The damage estimate worksheet from the EAFSOM class provided a framework for broad based damage assessment (Appendix F). This worksheet supports the idea of incorporating percentage of structure damage as a factor to estimate residential and commercial amount of damaged but does not specifically identify any dollar loss estimation procedure. This worksheet could only be used if the percentage of the structure would be converted to square footage measurements and multiplied by a dollar figure. It could not be used as a stand-alone method to arrive at the desired outcome for estimation efforts.

Methods available that provide promise to finding workable solutions for San Jose included using the ICC Building Valuation data. This information is now available on the ICC website which is updated twice a year and provides a regional multiplier for local property values (ICC, 2008). The positive implications if San Jose used this method include having square foot dollar figures for construction by assembly group type that is a nationally recognized standard and is updated semiannually by the ICC which also provides regional cost modifiers by state to accommodate for differences in property values. However, there is no certainty that the ICC modifier used for California would accurately depict San Jose niche property values.

Results of the survey of SJFD officers validated the lack of a consistently applied standard or method. Few SJFD officers used the outdated policy in place, most officers relied on their construction background or the expertise of colleagues, and many officers used market value or simply guessed. Survey results for other fire service agencies validated the use of dollar per square foot as a common measurement.

While some fire service agencies used a variety of sources to estimate residential and commercial dollar loss estimates, others used a combination of ICC and MSBI-based data to create basic guides for fire officers to use for completing NFIRS loss estimates. Battalion Chief Mike Senchyna provided the Vancouver Fire Department's one-page quick reference guide for estimating loss, content, and restoration values that was based on data from their local insurance industry (which likely used data from MSBI) and ICC. This format offers another possible solution for San Jose to emulate as the organization moves forward with implementing a fire loss estimation solution. This guide provides pricing for square foot for residential property estimates, and provides loss estimates

examples for living room, kitchen, and bathrooms. However, it does not provide estimates for commercial structures and defers these estimates to city or county fire investigators.

The benchmark that appeared to be most common in all environments, (SJFD, other fire departments, government agencies, and private industry) was the use of appraisal and analysis data from MSBI (2008), which produces appraisal books and software for property values, and construction costs to repair or replace residential or commercial real estate. Research found that MSBI data underscores valuations in multiple environments that included county tax assessors, insurance and restoration companies, independent claims management companies, and fire departments.

Other estimation programs in existence such as R.S. Means estimation guides and Xactware Solutions are competitors in the appraisal and restoration markets. Nevertheless, the company that was cited most often as the basis for property valuation and replacement costs in the environments surveyed or interviewed for this research project was MSBI despite the negative media reports of class action law suits surrounding MSBI's valuation practices within the insurance industry.

SJFD would benefit by using national benchmarks such as the ICC and MSBI data to update current policies for fire and content loss estimation practices and augment the impending records management system. Valid dollar loss estimates also correlate to predicting resource deployment locations. The most important aspect in predicting fire loss is how quickly firefighters arrive to mitigate the problem (MSBI, 2008). Knowing where the greatest fire problem occurs in the City of San Jose using dollar loss estimates would augment deployment model considerations. Another benefit to adopting a method

disclosed in this research allows SJFD to align with valid replacement cost estimates used nationally with consideration for regional impacts.

An alternative technique of communicating department value was found to be the Navy's method for expressing firefighting effectiveness in terms of loss averted. Schaenman (2008) reports the Navy's view of true firefighting effectiveness as loss averted or dollars saved. This method demonstrated that the Navy was able to show greater savings than the budgetary costs needed to deliver fire protection by a two to one margin (Schaenman). Adapting this method could be beneficial relative to budget justification and would communicate the value of tax dollars spent for fire protection in San Jose.

Based on the results of this research, SJFD should acknowledge that problems associated with inaccurate dollar loss reporting can have implications on local fiscal and logistical resource availability and contribute to inaccurate statistics for the nation's tenth largest city. The lack of a consistent or formalized estimation policy leads to freelancing among SJFD fire officers when completing NFIRS dollar loss estimates.

Recommendations

Changes recommended for SJFD include several options for consideration. SJFD would benefit by the development and delivery of a mandatory training program in NFIRS completion for SJFD officers to include loss estimation methods. New SJFD officers would be required to participate in a class dedicated to NFIRS completion and loss estimation methods as part of an officer academy. A semiannual refresher class is recommended to provide current information on building valuation data and quality assurance for NFIRS completion.

Another recommendation is to create a reference guide for fire loss estimation for residential and commercial structure fires using building valuation data from the International Code Council and a nationally recognized appraisal data service such as MSBI that is specific to San Jose building values. This guide could be reviewed to coincide with the ICC semiannual building valuation update to ensure the most current data available. This proposed reference guide should be developed and alpha tested by SJFD officers for clarity and ease of use for reporting loss estimates. The guide would serve as an interim to future technological estimation solutions.

Fire officers are motivated by economy of motion when it comes to accomplishing the many tasks required of daily fire house responsibilities, of which NFIRS reporting comprises only one aspect. Current computer technology can automate the dollar loss estimation process. An additional recommendation is to consider adopting appraisal software solutions from a nationally recognized appraisal data service with the intention of blending this software into the impending SJFD records management system.

Additional private industry feedback is needed to augment and validate industry standards expressed in this report. Further research is recommended for SJFD to study the Navy's method for reporting firefighting effectiveness in terms of loss averted versus dollars lost. Adapting this method for SJFD could be beneficial relative to budget justification and would communicate the value of tax dollars spent for fire protection to the residents of San Jose.

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Appendix A

Fire loss estimate methods – SJFD officer questionnaire

SJFD Officers-Dollar Loss Estimate Methods Survey Exit this survey >>

1. SURVEY QUESTIONS

1. What is your current rank?

2. How many years have you been in your current rank?

3. What type of training have you had on the completion of the National Fire Incident Reporting System fire incident report?

- a) Classroom setting
- b) On-line training module
- c) Peer training
- d) you taught yourself
- e) Other, please explain

Other (please specify)

4. How much training have you had on NFIRS?

- a) 0-2 hours
- b) 2-4 hours
- c) 4-6 hours
- d) 6-8 hours
- e) more than 8 hours

Other (please specify)

5. What method(s) do you use to estimate property (dollar)loss for residential structure fires?

Appendix A- continued

Fire loss estimate methods – SJFD officer questionnaire

- [ ] a) square feet
- [ ] b) linear feet
- [ ] c) % of structure size
- [ ] d) other

Other (please specify)

6. What method(s) do you use to estimate property (dollar) loss for commercial structure fires?

- [ ] a) square feet
- [ ] b) linear feet
- [ ] c) % of structure size
- [ ] d) other

Other (please specify)

7. If you use a "dollars" per square foot loss measurement, how much do you estimate per square foot

_____ $ per square foot for residential

_____ $ per square foot for commercial

8. What method do you use to estimate contents loss?

- [ ] a) value when purchased
- [ ] b) replacement value
- [ ] c) current value (salvage value)
- [ ] d) % of structure value
- [ ] e) other

Appendix A- continued

Fire loss estimate methods – SJFD officer questionnaire

Other (please specify)

9. How do you determine Pre-Incident Values for Residential Property?

- a) property owner/tenant
- b) neighbors
- c) insurance company
- d) other

Other (please specify)

10. How do you determine Pre-Incident Values for Commercial property?

- a) property owners/tenant
- b) comparable business values
- c) insurance company
- d) other

Other (please specify)

11. How do you determine Pre-Incident Values for Contents?

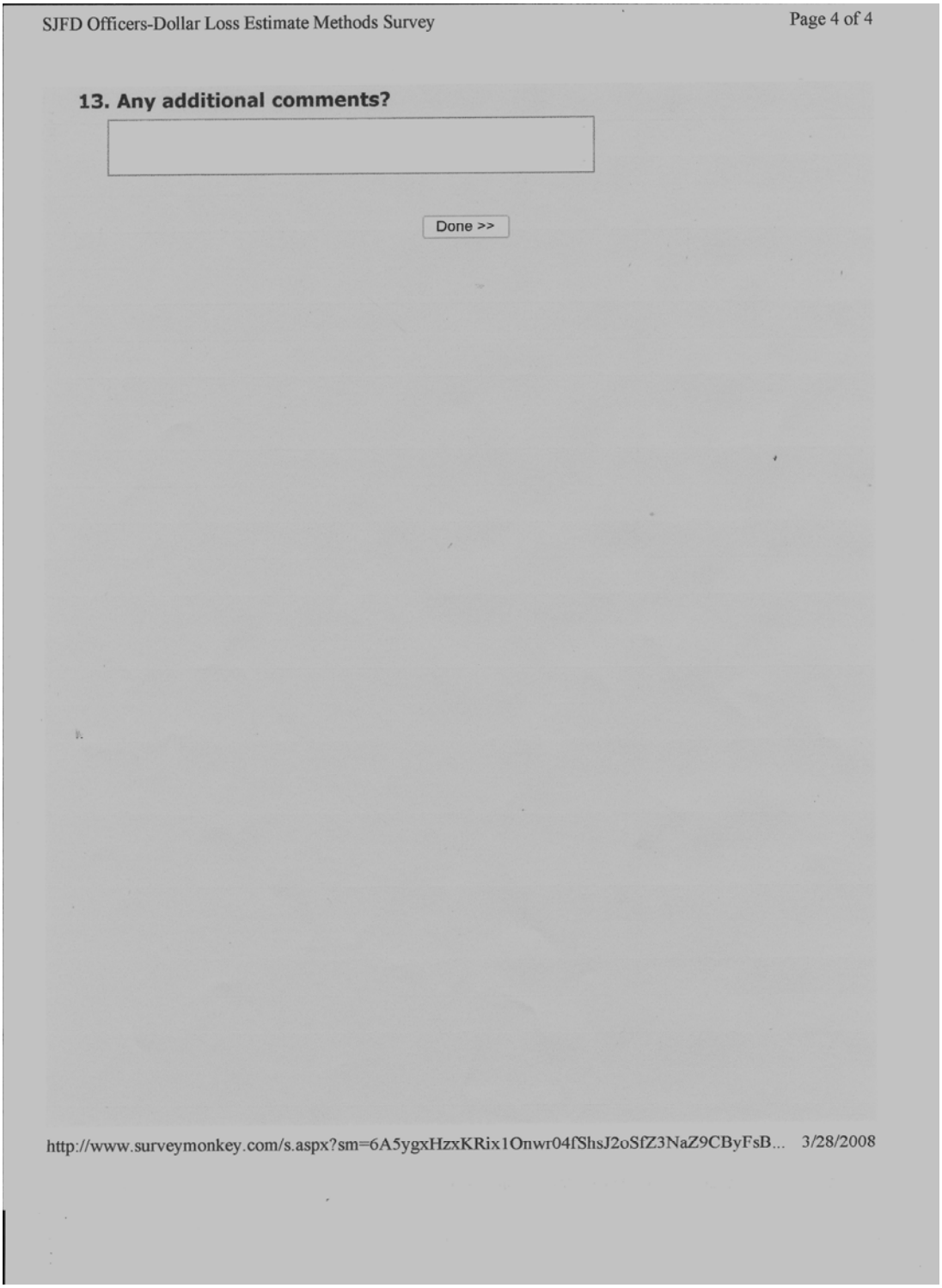
- a) value when purchased
- b) replacement value
- c) current value (fair market value)
- d) other

Other (please specify)

12. Do you use any books, software or other estimating tools to assist you?

Appendix A- continued

Fire loss estimate methods – SJFD officer questionnaire



SJFD Officers-Dollar Loss Estimate Methods Survey Page 4 of 4

13. Any additional comments?

Done >>

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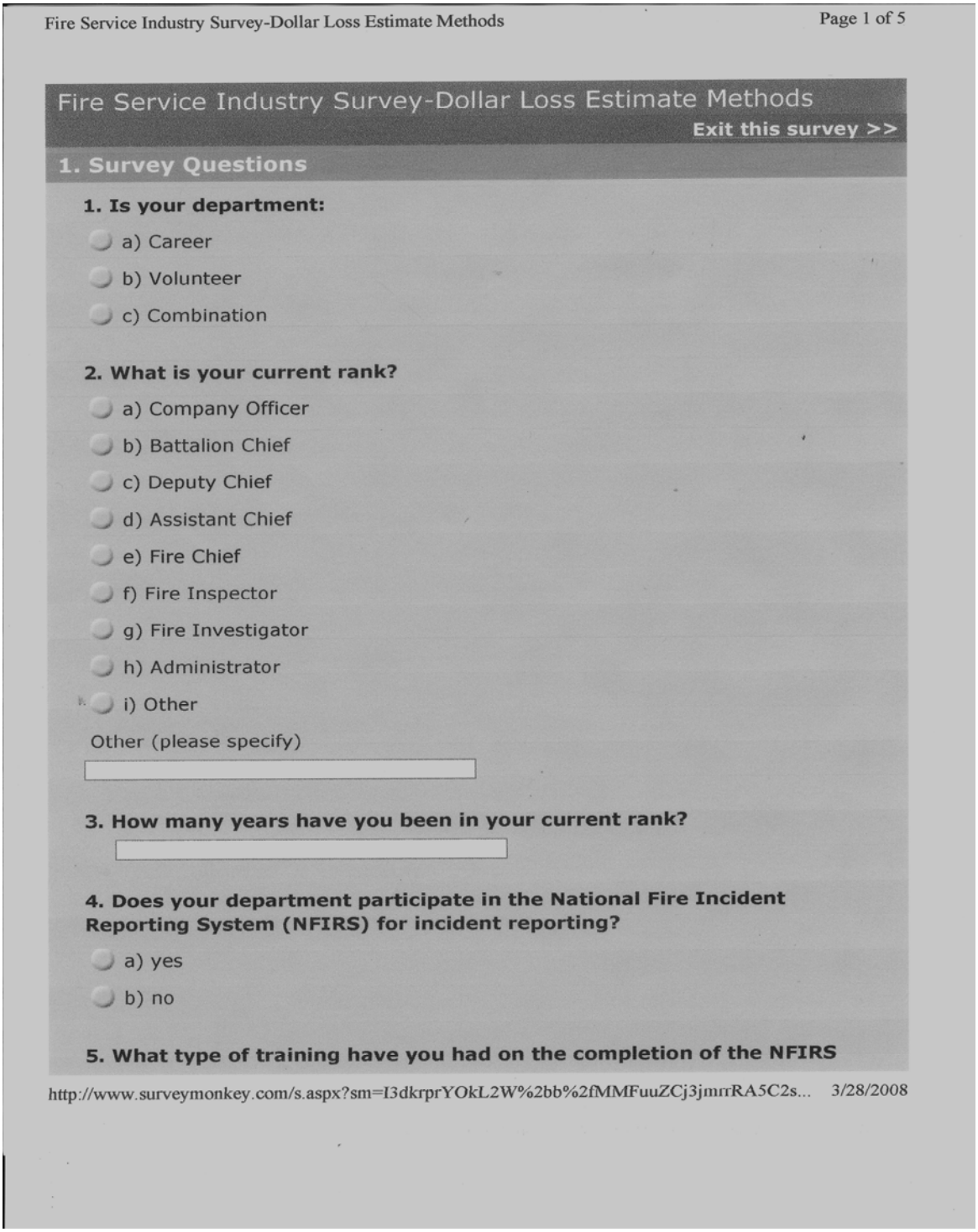
Appendix B

Fire loss estimate methods – fire service questionnaire



Fire Service Industry Survey-Dollar Loss Estimate Methods Page 1 of 5

Fire Service Industry Survey-Dollar Loss Estimate Methods

Exit this survey >>

1. Survey Questions

1. Is your department:

- a) Career
- b) Volunteer
- c) Combination

2. What is your current rank?

- a) Company Officer
- b) Battalion Chief
- c) Deputy Chief
- d) Assistant Chief
- e) Fire Chief
- f) Fire Inspector
- g) Fire Investigator
- h) Administrator
- i) Other

Other (please specify)

3. How many years have you been in your current rank?

4. Does your department participate in the National Fire Incident Reporting System (NFIRS) for incident reporting?

- a) yes
- b) no

5. What type of training have you had on the completion of the NFIRS

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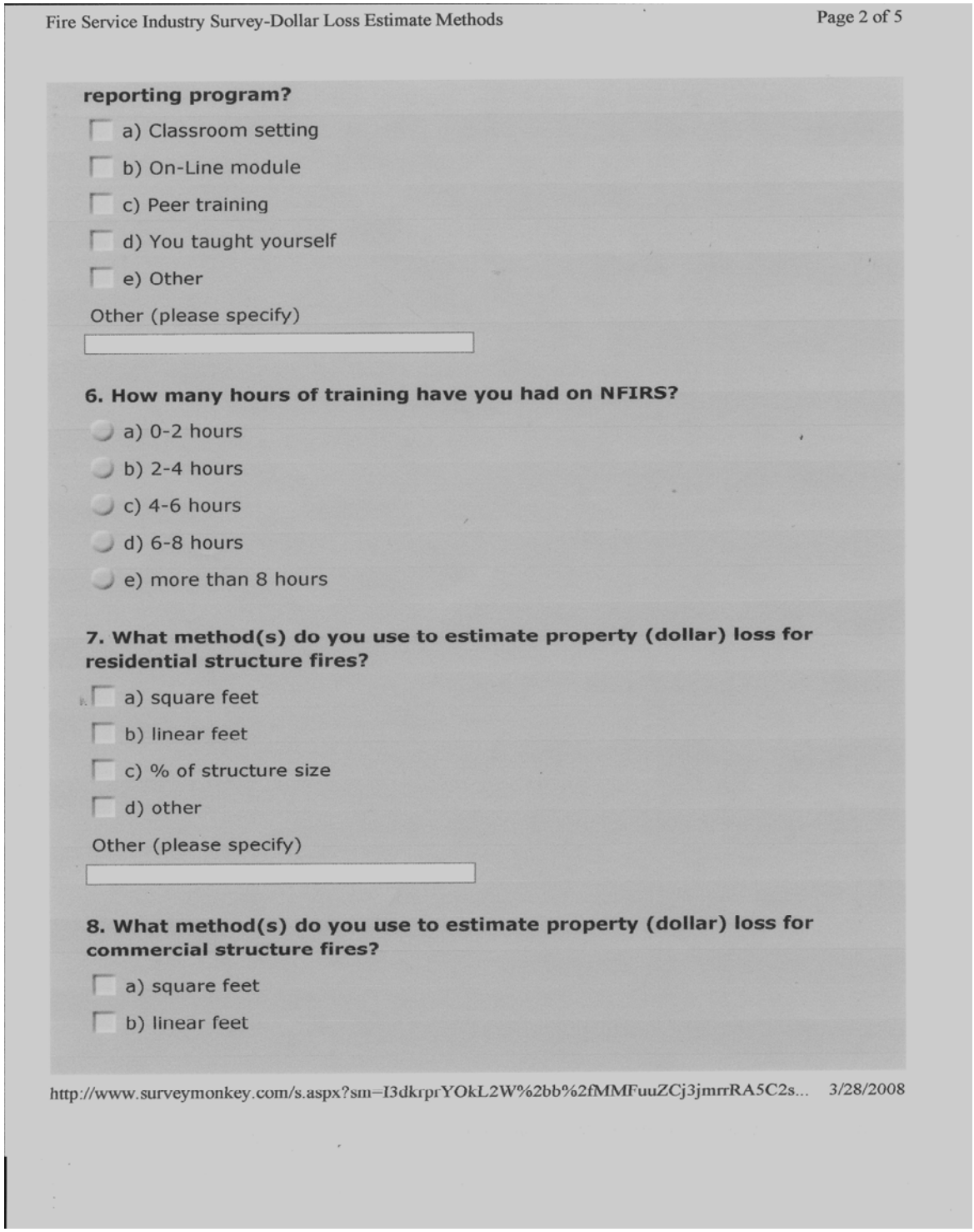
Appendix B -continued

Fire loss estimate methods – fire service questionnaire



Fire Service Industry Survey-Dollar Loss Estimate Methods Page 2 of 5

reporting program?

- [ ] a) Classroom setting
- [ ] b) On-Line module
- [ ] c) Peer training
- [ ] d) You taught yourself
- [ ] e) Other

Other (please specify)

6. How many hours of training have you had on NFIRS?

- ○ a) 0-2 hours
- ○ b) 2-4 hours
- ○ c) 4-6 hours
- ○ d) 6-8 hours
- ○ e) more than 8 hours

7. What method(s) do you use to estimate property (dollar) loss for residential structure fires?

- [ ] a) square feet
- [ ] b) linear feet
- [ ] c) % of structure size
- [ ] d) other

Other (please specify)

8. What method(s) do you use to estimate property (dollar) loss for commercial structure fires?

- [ ] a) square feet
- [ ] b) linear feet

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Appendix B -continued

Fire loss estimate methods – fire service questionnaire

- [ ] c) % of structure size
- [ ] d) other

Other (please specify)

9. If you use a "dollars" per square foot loss measurement, how much do you estimate per square foot?

_____$ per square foot for residential

_____$ per square foot for commercial

10. What method do you use to estimate contents loss?

- [ ] a) value when purchased
- [ ] b) replacement value
- [ ] c) current value (salvage value)
- [ ] d) other

Other (please specify)

11. How do you determine Pre-Incident Values for Residential property?

- [ ] a) propoerty owner/tenant
- [ ] b) neighbors
- [ ] c) insurance company
- [ ] d) other

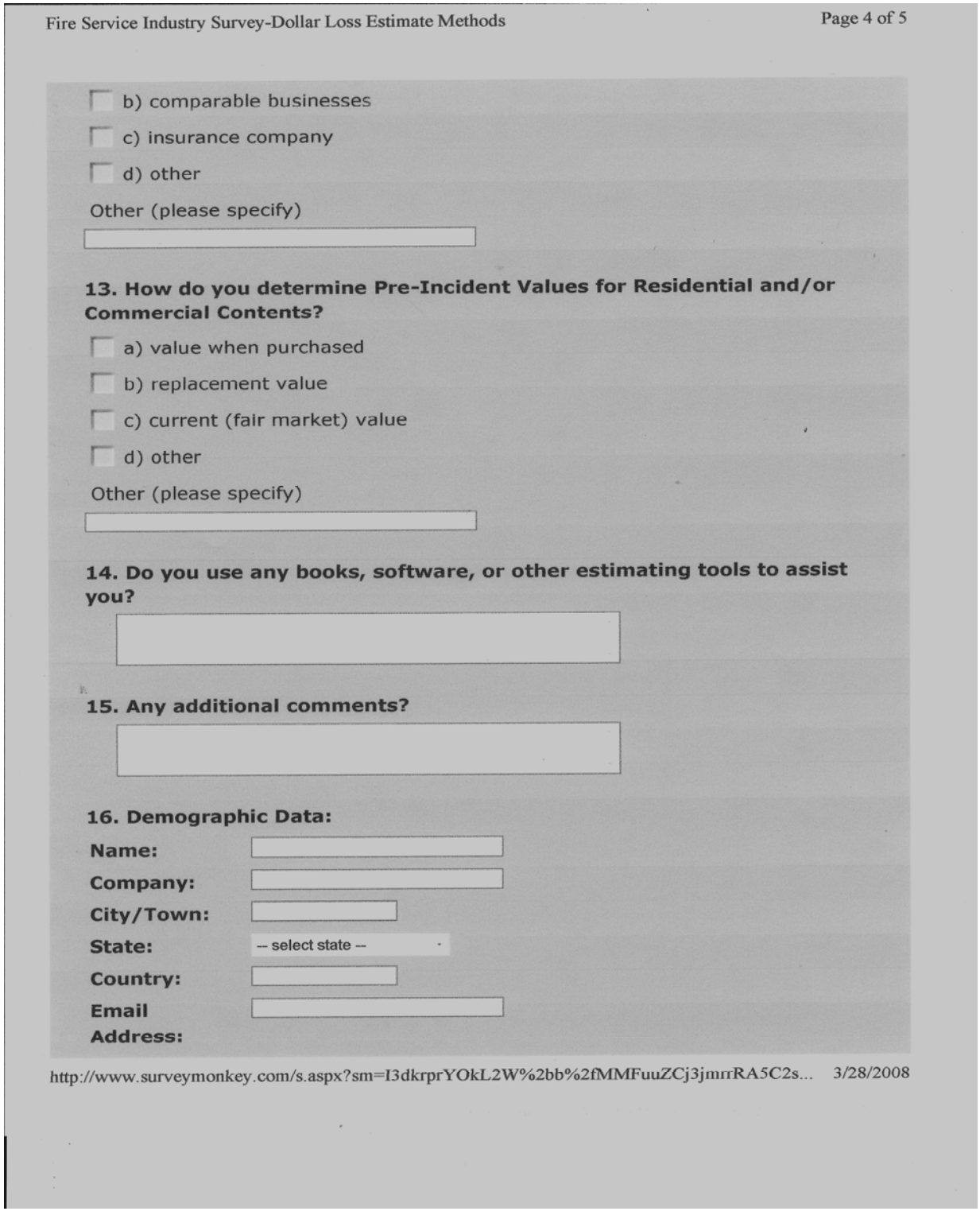
Other (please specify)

12. How do you determine Pre-Incident Values for Commercial property?

- [ ] a) property owner/tenant

Appendix B -continued

Fire loss estimate methods – fire service questionnaire



Fire Service Industry Survey-Dollar Loss Estimate Methods Page 4 of 5

- [ ] b) comparable businesses
- [ ] c) insurance company
- [ ] d) other

Other (please specify)

13. How do you determine Pre-Incident Values for Residential and/or Commercial Contents?

- [ ] a) value when purchased
- [ ] b) replacement value
- [ ] c) current (fair market) value
- [ ] d) other

Other (please specify)

14. Do you use any books, software, or other estimating tools to assist you?

15. Any additional comments?

16. Demographic Data:

Name:
Company:
City/Town:
State: -- select state --
Country:
Email Address:

http://www.surveymonkey.com/s.aspx?sm=I3dkrprYOkL2W%2bb%2fMMFuuZCj3jmrrRA5C2s... 3/28/2008

Appendix C

Distribution of states for fire service respondents

STATES	**# OF RESPONDANTS**
Arizona	2
California	10
Colorado	2
Florida	5
Illinois	2
Indiana	1
Kansas	2
Minnesota	2
New Hampshire	1
Ohio	1
Pennsylvania	2
Tennessee	1
Texas	9
Virginia	1
Wisconsin	1
Wyoming	1

Appendix D

Estimation methods - Private Industry Survey

Private Industry Survey-RE: Fire Loss Estimate Methods Exit this survey >>

1. Survey Questions

1. Type of Company or Service provided:

- a) Insurance Company
- b) Loss Adjustment/Claim Company
- c) Restoration Company

2. Do you use fire incident reported estimated dollar loss and pre-incident property values as part of your claim processing?

- a) yes
- b) no

3. If you answered no to the previous question, why or why not?

4. If you answered Yes to question 2, How accurate are reported dollar loss estimates vs. actual loss payments?

- Highly Accurate
- Somewhat Accurate
- Less than Accurate
- Not at all Accurate

5. What is the average contents loss payment for residential fires?

6. What is the average contents loss payment for commercial fires?

Appendix D – continued.

Estimation methods - Private Industry Survey

7. Do you use computer software programs to assist with loss estimates?

- a) Yes
- b) No

8. If you use a software program, which program do you use?

9. What method do you use to estimate replacement costs for residential structure fires?

10. What method do you use to estimate replacement cost for commercial structure fires?

11. If you responding from a Restoration Company, How do you estimate your charges for clean-up services?

12. If you use an average cost per square foot, what cost do you use for:

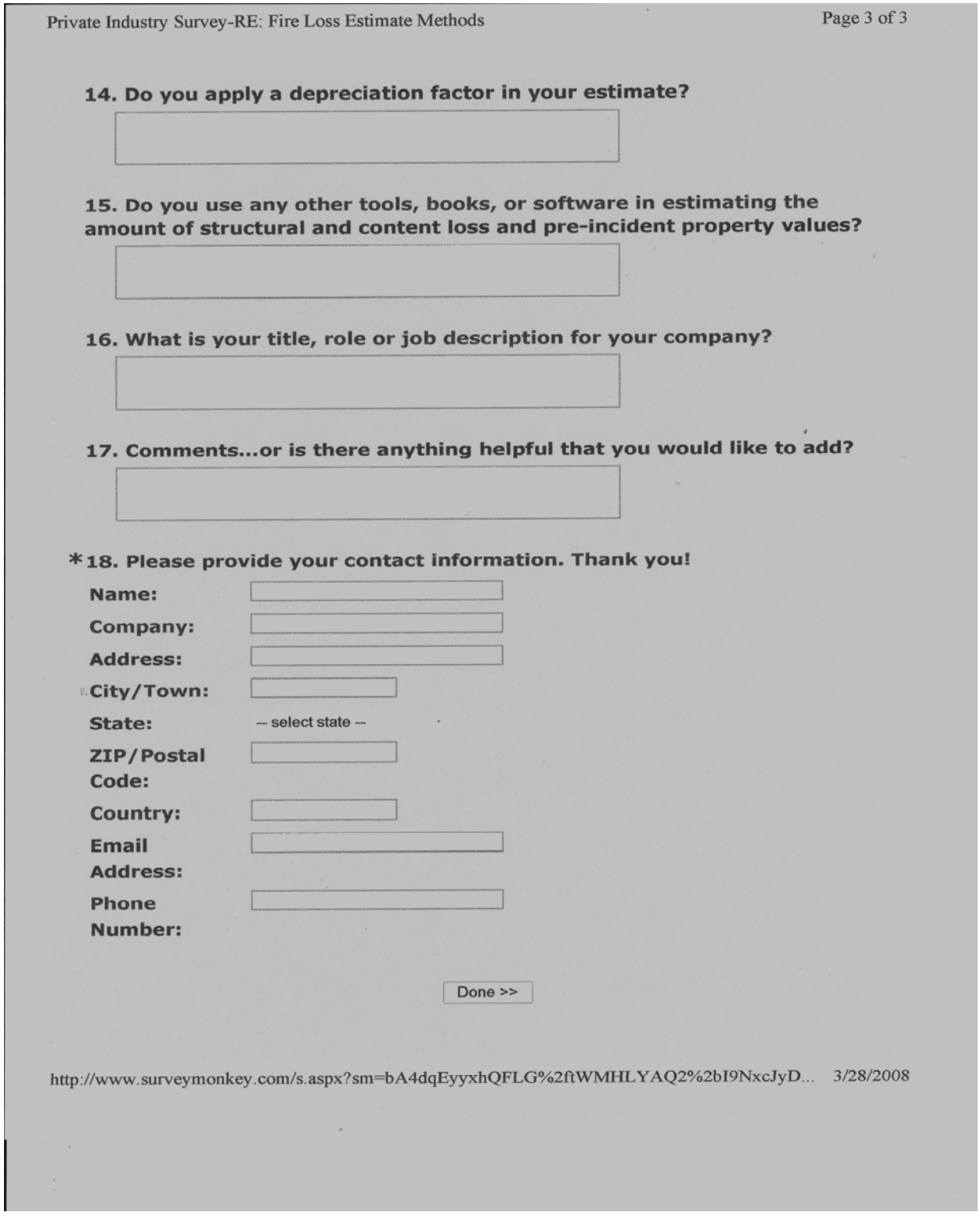
_____$ per square foot for residential

_____$ per square foot for commercial

13. How do you determine pre-incident property values?

Appendix D – continued.

Estimation methods - Private Industry Survey



Private Industry Survey-RE: Fire Loss Estimate Methods Page 3 of 3

14. Do you apply a depreciation factor in your estimate?

15. Do you use any other tools, books, or software in estimating the amount of structural and content loss and pre-incident property values?

16. What is your title, role or job description for your company?

17. Comments...or is there anything helpful that you would like to add?

***18. Please provide your contact information. Thank you!**

Name:
Company:
Address:
City/Town:
State: -- select state --
ZIP/Postal Code:
Country:
Email Address:
Phone Number:

Done >>

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Appendix E

Cover letter for survey request

SAMPLE

February 27, 2008

ATTN: Paul Thompson
CIG Insurance

Dear Paul;

Thank you for helping me as a possible resource to aid me in the research paper I am presently writing on dollar loss estimation methods for residential and commercial structure fires.
.
I am a Fire Captain with the San Jose, California Fire Department.

I am also a student at the National Fire Academy (NFA) in Emmitsburg, Maryland. The NFA is part of the United States Fire Administration, which is under the Department of Homeland Security.

I am enrolled in the Executive Fire Officer Program, which is a four year program. This program requires its participants to attend four specific courses over four years at the NFA. After the completion of each course participants are required to write an applied research project (ARP) for submission to the NFA. The ARP is similar to a Master's thesis.

I am presently writing this ARP for my recently completed third year course, Executive Analysis of Fire Service Operations in Emergency Management.
.
If possible, would you please complete a web-based survey regarding dollar loss estimation methods for structures fires and how your company estimates property value and replacement costs. This will assist me answering one of my research questions for this project: What methods for pre-incident value and replacement cost of residential and commercial properties are used in private industry? I am aware that some of your company's proprietary information in this area may not be appropriate to be discussed.

Any information you can offer will be of great help to my department and for the fire service. To access the survey, please click on the following link to Survey Monkey:

http://www.surveymonkey.com/s.aspx?sm=WLKb6efG8RYM1c_2fT2iYOcA_3d_3d

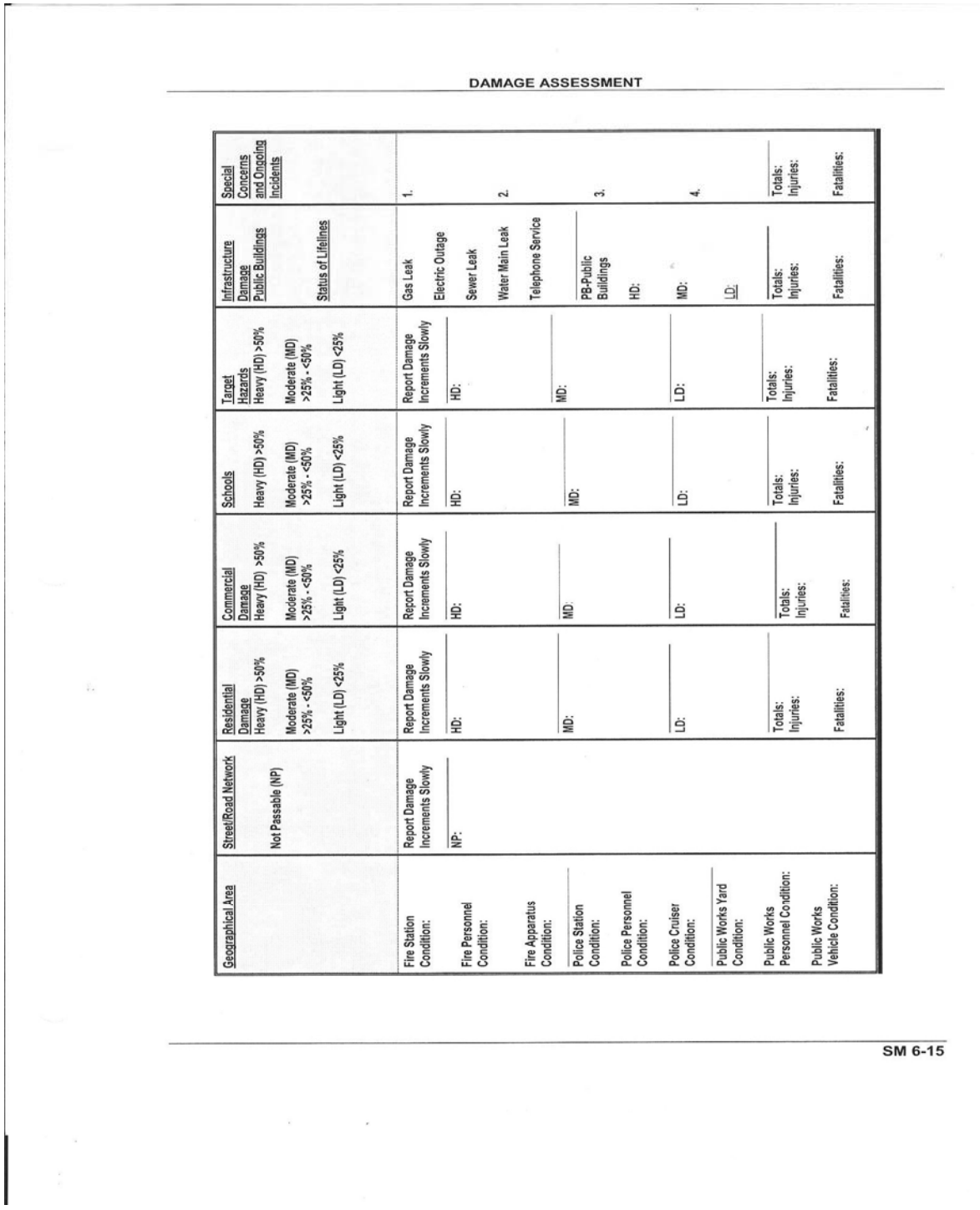
I can be reached at 510-366-5630 or at allisoncabral@yahoo.com. Thank you for your time and consideration.

Sincerely,

Allison J. Cabral, M.S., EMT-P
Fire Captain
San Jose Fire Department
170 W. San Carlos Street
San Jose, CA 95110

Appendix F

Damage Assessment Form Sample



DAMAGE ASSESSMENT

Geographical Area	Street/Road Network	Residential Damage	Commercial Damage	Schools	Target Hazards	Infrastructure Damage	Special Concerns and Ongoing Incidents
	Not Passable (NP)	Heavy (HD) >50% Moderate (MD) >25% - <50% Light (LD) <25%	Heavy (HD) >50% Moderate (MD) >25% - <50% Light (LD) <25%	Heavy (HD) >50% Moderate (MD) >25% - <50% Light (LD) <25%	Heavy (HD) >50% Moderate (MD) >25% - <50% Light (LD) <25%	Public Buildings Status of Lifelines	
Fire Station Condition: Fire Personnel Condition: Fire Apparatus Condition:	Report Damage Increments Slowly NP:	Report Damage Increments Slowly HD: MD: LD: Totals: Injuries: Fatalities:	Report Damage Increments Slowly HD: MD: LD: Totals: Injuries: Fatalities:	Report Damage Increments Slowly HD: MD: LD: Totals: Injuries: Fatalities:	Report Damage Increments Slowly HD: MD: LD: Totals: Injuries: Fatalities:	Gas Leak Electric Outage Sewer Leak Water Main Leak Telephone Service PB-Public Buildings HD: MD: LD: Totals: Injuries: Fatalities:	1. 2. 3. 4. Totals: Injuries: Fatalities:
Police Station Condition: Police Personnel Condition: Police Cruiser Condition:							
Public Works Yard Condition: Public Works Personnel Condition: Public Works Vehicle Condition:							

SM 6-15