

SAFETY PRACTICES OF SMALL TO MEDIUM-SIZED CONSTRUCTION FIRMS

By

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To my Grandfather “Whitey”

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TABLE OF CONTENTS

	<u>page</u>
ACKNOWLEDGMENTS	4
LIST OF TABLES	7
LIST OF FIGURES	8
LIST OF ABBREVIATIONS.....	9
ABSTRACT.....	10
CHAPTER	
1 INTRODUCTION	12
2 LITERATURE REVIEW	15
History of Construction Safety	15
Safety Statistics in Construction.....	17
Safety Practices for the Jobsite	18
Design Teams Role in Safety	18
Worker Training	19
Pre-work Meetings/ Toolbox Talks.....	20
Drug Testing.....	21
Safety Incentives	21
Safety Personnel/ Safety Inspections.....	23
Leading Indicators	24
Costs Associated with Injuries.....	25
Measurements of Safety	26
EMR	26
OSHA Recordable Injury Rate.....	27
3 RESEARCH METHODOLOGY	29
Introduction.....	29
Research Methods.....	30
Data Analysis.....	33
4 RESULTS	34
General Company Information	34
Safety Programs and Contents.....	38
Safety Record Keeping and Statistics.....	47
5 CONCLUSIONS	51

6	RECOMMENDATIONS.....	53
APPENDIX		
A	SURVEY	55
B	THESIS QUESTIONNAIRE INTRODUCTION	58
	LIST OF REFERENCES	60
	BIOGRAPHICAL SKETCH	61

LIST OF TABLES

<u>Table</u>	<u>page</u>
4-1 Projected volume of work for this year.....	34
4-2 Company history in the construction industry.....	35
4-3 Number of employees on payroll.....	36
4-4 Employees on payroll who perform field tasks.	36
4-5 Percentage of field work self performed.....	37
4-6 Average number of subcontractors on each job.....	38
4-7 Percentage of work completed for public owners.....	38
4-8 Common safety practices of small to medium-sized construction firms.....	50

LIST OF FIGURES

<u>Figure</u>	<u>page</u>
4-1 Classification of the type of construction firm.	35
4-2 Types of projects typically built.	36
4-3 Is this your average number of field employees?	37
4-4 Number of firms with a safety program.....	39
4-5 Companies that require the subcontractors to comply with the safety program.	39
4-6 New worker orientation required.	40
4-7 Toolbox meetings held weekly.	41
4-8 Worker incentive program.	41
4-9 Hard hats required at all times.	42
4-10 Safety glasses required at all times.	43
4-11 Drug testing program implemented.	43
4-12 When the drug tests are required.	44
4-13 Employ a full time safety employee.	45
4-14 Safety's effect on productivity.....	46
4-15 Reason for implementing the current safety program.....	47
4-16 Employee verification of completing safety program.	48
4-17 OSHA inspections in the past five years.....	49
4-18 Does your company compute its OSHA RIR?	50

LIST OF ABBREVIATIONS

OSHA	Occupational Health and Safety Administration. Formed in 1971 under the Department of Labor
NIOSH	National Institute for Occupational Safety and Health. Formed under the Center for Disease Control and Prevention.
EMR	Experience Modification Rate. A formula used by the insurance companies to rate the safety performance of construction companies.
OSHA RIR	OSHA Recordable Injury Rate. Another method used to rate safety performance of construction firms. This is the number of injuries per 200,000 work hours.
CDC	Center for Disease Control and Prevention.

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Since the early days of construction, injuries on construction jobsites have been viewed as occurrences that are a part of the construction process. In 1971, the Occupational Safety and Health Administration was formed to reduce the risks that employees were exposed to while working. While OSHA oversees all occupational hazards, they have directed much of their attention to the construction industry. This is because construction is one of the leaders in terms of the number of injuries sustained by workers in the United States of America. The effort that has been put forth by OSHA has made construction firms aware that jobsite safety is a concern of the government and should be made a priority on all jobsites, without regard to the size of the project.

Most of the safety studies involving construction firms have focused on the larger companies, in part because of the annual volume of work performed by these companies and because of the sizes of their jobs. This has been beneficial to the larger construction firms, but the smaller construction companies, accounting for the majority of the construction industry, cannot compare themselves with companies that have more resources to use for safety. One reason that past safety studies have been focused on the larger firms might be that the sizes of

their projects are usually larger, and therefore there is a greater reliability that can be placed on the safety performance measures, such as the OSHA recordable injury rate.

One might think that a smaller company would have a lower incident rate and less chance of injuries on a job, because there are fewer employees to oversee and the sizes of the projects are usually smaller. This may be true, but the smaller firms generally do not have a full-time safety representative to look over the jobs. The economy might be another factor that influences the safety practices implemented by construction firms. The rate of construction (especially in the residential sector) has slowed, and companies are looking for jobs to keep their firm running. Under such conditions, the firms will attempt to cut costs to complete their projects at the lowest price, so as to ensure the highest profit on the job. A successful construction project is one that is completed on time, within budget, and without human suffering. Obviously, if a project is completed on time and under budget, an attractive profit will probably be realized. If someone is seriously injured on a job though, the potential profits could be eroded or the project could even result in a loss.

This thesis will target small to medium sized construction firms, defined as companies who perform up to \$100 million dollars of contracted work per year. A survey on the most common safety practices that these companies implement was conducted. Reasons that particular practices were implemented were also examined.

The common safety practices found in small to medium-sized construction firms were new worker orientation, dug testing programs, requirements of hard hats, and toolbox talks.

CHAPTER 1 INTRODUCTION

Safety in construction is a topic that has changed the mindset for many of the construction firms in the U.S. The importance of safety in construction was overlooked for many years, and now companies are seeing the implications and/or consequences that come with injuries on the job. This has led to many companies changing their safety manuals, hiring a person on staff that handles the safety procedures on their projects, and some are even offering incentives to employees on projects during which there are no injuries recorded.

The current market for construction, especially in the residential sector is on a decline. This is making every project that much more important, so the cash flow situation with construction companies can stay positive. This means that either the construction companies are reducing the profit that they expect to make on a project, or they are cutting costs from different areas of the budget. Companies must carefully consider where they are reducing or eliminating costs from the budget. Some companies may be tempted to take money that was allocated for safety out of the budget. Although the idea of completing a project at a lower cost seems beneficial, the risks associated with cutting safety expenditures could prove to be detrimental.

The studies conducted on construction safety have dealt with the firms that are usually in the *Engineering News Record Top 400* construction firms. These studies have identified different safety methods and policies that have been implemented on different projects. Companies that have considered the implementation of different procedures in their safety programs have been able to look at these studies and develop different procedures and practices for their own safety programs.

The information gathered in the past has been very helpful, but just as every project in construction is different, so are the companies in construction. The small to medium-sized

construction firms do not have the financial resources enjoyed by the larger construction firms, and in turn, the amount of money allocated to safety is usually less. The challenge that small to medium-sized construction firms face is how to achieve the highest level of safety on the project while expending the least amount possible. This study will focus on small/medium-sized construction firms, which are defined as firms that complete less than \$100 million dollars of work each year.

This thesis will identify the safety procedures and practices being employed by small to medium-sized construction firms. The results should prove to be beneficial for small/medium-sized construction firms, in that they will be able to evaluate different safety techniques used by companies who are their peers. There will always be room for improvement for safety in construction, until every construction project is completed without any incidents. This idea should always have construction firms looking for ways to improve their safety practices and procedures.

The limitations of this study lie in the hands of the companies surveyed. The answers given by the personnel interviewed might be biased to make their firms sound as if their safety program is flawless.

Outline of this study: This introduction is the first of six chapters outlined in the study of safety in small to medium-sized construction firms. Chapter 2 is a literature review that presents information gathered through research about safety in construction. It will look at the history of construction safety, different methods implemented to ensure safe work performance in construction, the costs that are incurred when an employee is injured in a jobsite accident, and the different measurements of safety in construction. This will provide a base for the information that will be examined in the results and conclusion chapter.

Chapter 3 presents the methodology used in this study for obtaining the information analyzed. This will outline the questions used in the interviews and surveys, and it will describe the process used to gather the information. Chapter 4 presents the results, which show the data obtained as part of this research effort. This will lead to statements about safety in the construction industry and will provide answers to the questions about safety in small to medium-sized construction firms. Chapter 5 is the Conclusions chapter, which defines the most common safety procedures that are used in small to medium-sized construction firms, and the main reasons that these were selected for implementation by the firm.

CHAPTER 2 LITERATURE REVIEW

The safety performance record of the construction industry is far behind other industries in the U.S. This label, of being one of the most dangerous industries, is one that the construction industry as a whole would like to change. Different ideas have been expressed by construction companies on the types of safety procedures or practices that provide the safest environment for workers. This literature review will examine the history of safety in construction, some statistics focusing on construction safety, and the different practices that construction firms are implementing to strengthen their safety programs. Finally, the financial aspects of safety will be examined, by investigating the costs incurred when an injury occurs on the jobsite, and the different measures used to define the safety performance of a company.

History of Construction Safety

Injuries in construction have been viewed as part of the job since the early construction efforts. The U.S. government realized the need to protect workers in all industries. The government passed the Occupational Safety and Health Act (OSH Act) of 1970 to address the safety needs in the work environment. The OSH Act states the purpose of the act is, “to assure safe and healthful working conditions for working men and women; by authorizing enforcement of the standards developed under the Act; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions; by providing for research, information, education, and training in the field of occupational safety and health; and for other purposes (www.osha.gov).”

The passage of the OSH Act of 1970 brought forth two major contributors to the safety and well-being of employees in America. OSHA is the first agency that will be examined, and is generally the most recognizable in the construction industry. “The Occupational Safety and

Health Administration aims to ensure employees safety and health in the United States by working with employers and employees to create better working environments. Since its inception in 1971, OSHA has helped to cut workplace fatalities by more than 60 percent and occupational injury and illness rates by 40 percent” (www.osha.gov). The Department of Labor is the head of this Agency and the safety and health of America’s workers is the main focus of their mission (www.osha.gov).

The other agency formed by the Occupational Safety and Health Act of 1970 was NIOSH. This is the National Institute for Occupational Safety and Health. This agency is part of the Center for Disease Control and Prevention (CDC), which is in the Department of Health and Human Services, and its focus is safety in the workplace while providing healthful working conditions when people are on the job (www.cdc.gov/niosh/).

The formation of OSHA and NIOSH helped to open the eyes of the different industries in that the workplace needed to ensure that employees could complete their tasks without having to worry about their well-being. Congress recognized the need to focus on safety in construction, and in 1990, Congress directed NIOSH to start research and train companies on ways to reduce the exposure to diseases and injuries for U.S. construction workers (www.cdc.gov/niosh/). This brought many studies, which were used to investigate construction and to analyze how the safety environments of jobsites could be improved for the wellness of the employees.

The construction industry responded to the initiative that the government was taking to make the workplace a safe place for employees and in 1989, The Construction Safety Council was formed. This non-profit organization was founded by large construction company owners who were seeking ways to inform the construction industry of the need for safety on jobsites (www.buildsafe.org). The Construction Safety Council provides safety training and education to

construction companies, for their employees as well as the owners. Prior to these training sessions, they evaluated the status of safety in the construction industry, so that the information that they passed on was the most up-to-date information that they could provide. The Construction Safety Council also has consultants that will come to a company, union, or association that needs their assistance in safety of the jobsite (www.buildsafe.org).

Safety Statistics in Construction

“The construction industry has been classified as one of the most hazardous industries in the United States for many years in terms of both fatal and nonfatal injuries” (Gillen 2004). This is a major concern, as the construction industry employs roughly 6% of the workforce in the U.S., but a disproportionate number of injuries and fatalities occur in construction. “Of approximately 600,000 construction companies, 90% employ fewer than 20 workers”, and of these small companies few have safety programs that are implemented (www.cdc.gov). This could help to explain why a company’s size is usually related to the company injury rate. From 1988 – 1993 the larger construction firms had a lower injury frequency, and as the firm size got smaller the injury rate increased (McVittie, Banklin, Brocklebank 1997).

It is not just the smaller firms though that was contributing to the injury statistics in construction. “In 1993 despite employing only 5% of the industrial workforce, construction accounted for 14% of all workplace deaths and 9% of disabling injuries” (Everett and Frank 1996). The only other industry that has a higher injury and illness rate than construction is agriculture (Jaselskis, Anderson, Russell 1996).

Although these statistics are very high, the effort that has been put forth by governmental agencies, academic research, and organizations within the construction industry have had a positive effect in reducing the number of injuries in construction each year (Broderick and Murphy 2001). The Construction Industry Institute was formed by owners in both the private

and public industry in construction to improve the overall effectiveness and quality of the construction industry (www.construction-institute.org). The Construction Industry Institute issued a report in 1993 that was aimed at providing construction companies with the most successful safety measures to eliminate injuries on the jobsite (Hinze and Gambatese 2003).

The measures that have been taken to reduce the construction worker injuries on the jobsite have been helpful in reducing the injury rate, but the fatality rate in construction remains flat (Broderick and Murphy 2001). The statistics in construction not only provide a bad image in the public eye, but the skilled workers are now noticing the hazards and it is becoming harder to attract these workers to construction (Everett and Frank 1996). This is the reason that safety programs are important to not only the employers, but also the employees. Not only do the workers feel safe, but they also notice that the company has their best interest in mind by trying to protect them from hazards on the jobsites.

Safety Practices for the Jobsite

Design Teams Role in Safety

Construction is a complex industry where no two jobsites are the same. There are hazards that change daily on the jobsite, and when combined with the potential for up to 35 different subcontractors working in the same areas, the chance for injuries is increased (www.cdc.gov/niosh/). There are many ideas on the best procedures to be used to prevent injuries on jobsites, and on ways to improve the safety of employees. One of the first steps that can be taken by a construction company to improve safety on a jobsite is to provide input to the designers. This has been referred to as a type of pre-job planning (Broderick and Murphy 2001). Designers generally have not focused on the safety of the means and methods used during construction, but if they are made aware of some of these instances where safety will be a concern, then they might be able to remedy the problem by altering the design. The Construction

Industry Institute has designed a computer-based program called “Design for Construction Safety Toolbox,” which helps the architect or designer notice areas that might have potential hazards during construction (Hinze, Gambatese, Hass 1997). This tool was developed to be used by designers to help eliminate unnecessary risks on jobsites and to provide useful information to designers to be used when making future design decisions.

Worker Training

Worker training has been proven to be a very effective means of ensuring that workers have the ability to complete their tasks in a safe manner. Training is not the same as experience. Experienced workers may feel that since a task has been completed successfully on multiple projects without injury that they are being safe. This is not necessarily true. Experienced workers may take certain procedures for granted, let their guard down, and subsequently be involved in an accident. “Data clearly shows that new workers to a company are at greater risk. Even long-term employees with the same company are at a higher risk when they move from one project to another” (Broderick and Murphy 2001). This shows that worker training is necessary for new and seasoned workers alike and the training reiterates the hazards found on jobsites. Worker training can be provided in-house, but there are also companies and organizations that provide excellent training services to construction companies. One of the most common types of training that companies provide for their employees is OSHA training. OSHA and their training centers distribute lists of their certified trainers, and when they will be providing classes for a 10-hour or 30-hour program. The trainers that are certified by OSHA to teach construction must have five years experience, and complete course 501 which involves the OSHA standards for the construction industry (www.osha.gov). This allows the employees for companies to learn the different regulations defined by OSHA, or if they are experienced workers it will act as a refresher course to items they have already learned.

Pre-work Meetings/ Toolbox Talks

Pre-work safety meetings, otherwise known as toolbox talks, are accepted in the industry as a formidable way to organize the workers on a jobsite, and to make everyone aware of the hazards that can occur during construction. On small construction projects, these meetings usually take place once a week, and are conducted by the safety engineer or the job superintendent. The attendees for the meetings consist of the general contractor's employees that are onsite, and all of the subcontractors' employees that are working that day. These meetings can be very effective, or they can be a waste of time. This is dependent upon the time and effort that the general contractor devotes to organizing the meeting. Many companies have a standard toolbox talk outline, and cover different hazards on the jobsite each week. As long as the subject covered relates to the work that will be taking place, it helps make the workers aware of the dangers that they could face that day. For instance, falls and ways to prevent them should not be discussed if on the primary work tasks involve sitework. All of the employees will be working at ground level, and this information would be useless on the job that week. If the general contractor designs the toolbox talks to discuss the scope of work that will be completed that week then the toolbox talk will prove to be effective (Broderick and Murphy 2001).

Language barriers can also limit the effectiveness of toolbox meetings. The Bureau of Labor Statistics has shown that during the years 1992 to 2002 the fatality rate for Hispanic construction workers tripled. Not all construction workers are bilingual, and if an English-speaking worker conducts the meeting and some of the attendees only speak Spanish, only some of the employees will receive beneficial information from the meeting. Some general contractors require the subcontractors provide a bilingual worker to be on their crew, and they must attend the toolbox talks. After the toolbox talk that is usually given in English, the bilingual worker will translate the information shared during the toolbox talk to the employees who only speak

Spanish. The Associated of General Contractors, otherwise known as AGC, provides training courses for general contractors to learn Spanish, which can help to eliminate the language barrier in construction (Parsons 2007).

Drug Testing

A drug-testing program is another effective way for construction companies to be proactive about safety on their jobsites. The success depends on the type of drug testing required by the company. Most companies that have a drug-testing program require a drug test to be taken prior to beginning their employment with the company. This is helpful in making sure that workers that are hired are drug-free on the first day of employment. To increase the effectiveness of these drug tests, follow up drug tests should be implemented. These tests can be administered upon suspicion, at random, or after an accident. This helps to identify employees who may have started to abuse drugs after being hired. Workers may also have stopped using drugs so as to pass the test, and then start back up after being hired.

Drug testing in large construction companies is quite common, but it is a relatively new practice in the small to medium-sized construction firms. Many of the smaller construction firms do not allocate sufficient money in their safety budgets to be able to require adequate drug testing, if at all. In a Nevada construction safety study conducted by Jimmie Hinze on drug testing in construction firms. It was discovered that the lack of drug testing was associated with higher injury rates as “the median injury rate for these contractors was 14.71, considerably higher than the injury rate reported by the firms with drug testing programs” (Hinze and Gambatese 2003).

Safety Incentives

One of the highly debated safety practices that construction firms are using is providing their employees with safety incentives. A construction company can provide safety awards for

their construction employees in multiple ways. One of the easiest and least expensive ways to provide a safety incentive for the employees is to recognize them in some way for undertaking their work tasks in a safe manner. This could also be done in a newsletter identifying the employees who completed work for the past year without an injury. While this may boost moral, many companies prefer to use monetary awards for their employees. Safety engineers and job superintendents can have safety incentives tied into a bonus that they will receive if they complete their jobs without an injury (Gillen, Kools, McCall, Sum, and Moulden 2004). A program such as this is only as good as the person who will be overseeing the project. If the safety engineer or the superintendent buy into the safety program and the incentive, they will put forth the effort to run the jobsite in a safe manner. Under such an incentive, only the supervisor has a stake in the incentive, and the other employees may not see any value. If everyone on the jobsite has an incentive tied into their performance, then the employees would be watching each other to make sure that the work is being completed in a safe manner (Hinze 1997).

While safety incentives are one of the most common practices that construction companies use for their safety program, it has controversy associated with it. There are construction companies that say their injury rate has declined after these incentives were put into place (Gillen et al. 2004). While this may be true, the fact is that because an employee did not get hurt does not mean that the project was completed in a safe manner. The award or recognition is ostensibly based on the assumption that no worker was injured, but it does not consider if they actually performed all their work tasks in a safe manner (Hinze and Gambatese 2003).

The chance of injuries being under-reported is another area where safety incentives could have a negative effect. Since incentives are tied directly to the injuries on a job, there may be workers who are injured, but do not report it. This way everyone will still be able to receive the

bonus or incentive award. While everyone on the jobsite may be happy, the real issue has been swept under the rug. If they had reported the injury, then the construction company would be made aware of different risks that they have on their jobsite. They could then expend the effort to find solutions to eliminate them in the future. The under-reporting gives the construction companies and their employees a false sense of security while on the jobsite (Hinze, unpublished report, 2005).

Safety Personnel/ Safety Inspections

Safety employees are individuals who work for a construction company, and their responsibility is to oversee the company's safety program and track safety information for recordkeeping purposes. The safety employee may be involved with new worker orientation, pre-job planning, toolbox talks, and employee training. This is a broad scope of work for one employee and would be a full time position (Hinze 1997).

Construction companies can also hire an independent safety firm to assess the safety methods used by construction companies. This will eliminate any bias that may be apparent in the construction companies, and the construction companies will get an expert's advice on how to achieve the highest security for their employees' safety on the jobsite. JMJ is an independent consulting firm that has been used by many construction firms, and their approach is to add a new layer of commitment to the existing safety program. "It requires shifting safety from a priority to a "value," a deep-seated belief that it will not be compromised and it will actually drive company's actions." Independent safety consulting firms have proven to be a positive method used to improve a construction firm's safety program (Powers and Rubin 2005).

The employment of safety personnel or an independent safety consultation agency is a common practice with large construction firms, but with small to medium-sized construction firms, the safety budget may not allow this type of program. This is where the project managers

who focus mainly on the scheduling and paperwork aspects of construction provide assistance in the field by enforcing safety. Jobsite safety inspections are a method used to achieve this goal. The project manager meets with the job superintendent on the site and walks through the jobsite to look at the safety aspects of construction. These inspections usually are performed weekly, and range from one to two hours in length. A checklist is commonly used to conduct the inspection. The jobsite safety inspections should not be scheduled, in order to keep the workers unaware of when the inspection will be. If the time is random, then the workers will need to make sure that they are working safely at all times (Hinze 1997). A study by Jimmie Hinze showed that although these safety inspections allow project managers to become familiar with the jobsite and the safety procedures being used, there have been no indications that these safety inspections reduce accidents (Hinze and Gambatese 2003).

Leading Indicators

Many of the strategies used for coming up with the safety procedures for a company's safety program are developed by using lagging indicators. This method defines hazardous construction areas by looking where the past injuries on construction jobsites occurred. After the construction firms analyze this information, they can implement new safety techniques or procedures to put into their safety program. Although this gives an accurate account for areas of improvement, it only looks at the past. If a company is involved in a new and unfamiliar type of construction project, the safety program may not be as successful. The new trend for a company's safety procedures to be considered successful includes initiating preventative measures, which look for leading indicators on the jobsite. This is defining the problem before there is an actual injury and coming up with a plan to prevent it (Mohamed 2002). Leading indicators show that the company takes the employees safety as a high concern, because there is more research required for leading indicators compared to lagging indicators.

Costs Associated with Injuries

Costs that construction companies have incurred due to injuries on jobsite have added to the importance of safety that owners are stressing to their employees. A study conducted by the Business Roundtable in 1979 found that injuries in construction accounted for 6.5% of the total cost for construction, including the industrial, utility, and commercial divisions combined. The Business Roundtable also found that for the average construction company the amount of money allocated to the safety program is roughly 2.5% (Everett and Frank 1996).

There are two types of costs that a construction company incurs when an employee is injured on the jobsite. These costs are defined as either direct costs or indirect costs. The direct cost is one that the company can track after the injury has occurred. An example of a direct cost would be any medical costs for the employee that are paid by workers' compensation, disability benefits, or ambulance services that were required (Hinze 1997).

While direct costs help to provide an accounting method to quantify the financial damage done by an injury on a jobsite, the construction company needs to also look at indirect costs. Indirect costs are not easily tracked or measured. Some examples of these costs are loss of productivity in the crews, training of replacement employees, schedule delays, and the time allocated by administration to research the injury. Since the indirect costs associated with injuries cannot be clearly measured, a cost multiplier is used. This multiplier is a ratio of the indirect costs to the direct costs, and varies from company to company. Usually these multipliers range from two to 20, and are assigned by the construction company. An example would be if a construction company thought that the indirect costs after an injury were not that severe they would probably use a multiplier of two. Whereas if a different construction company felt that the indirect costs were far greater than the direct costs then they would assign a higher multiplier value up to 20 (Everett and Frank 1996).

Once the direct costs are accounted for by the construction company, they will add the indirect costs to the direct costs associated with the injury to find an estimate of the total costs associated with the particular injury. This can only be an estimate, since the indirect costs include an assumption of the ratio of the direct costs to the indirect costs (Everett and Frank 1996).

Measurements of Safety

In construction there are multiple measurements used to evaluate a construction company's safety performance. While all of these measurements look at a firm's safety statistics, they all (one-way or another) can be biased. The types of measurements will be defined below, and their advantages and disadvantages will be explained.

EMR

The Experience Modification Rate otherwise known as the EMR is a way that the insurance companies measure a construction company's safety on the jobsite. "The EMR, which is employer-specific, is a complex formulation that takes into account both the frequency and the severity of the injury" (Hinze 1997). The formula for the Experience Modification Rate is as follows.

$$\text{Experienced Modification} = \frac{A_p + WA_e + (1 - W) E_e + B}{E + B}$$

The formula takes into account the following:

- A_p = the actual primary losses
- W = weight (provided in state experience rating plan manuals)
- A_e = the actual excess losses
- E_e = the expected excess loss
- E = the expected loss
- B = the ballast

The EMR takes into account the costs of the injuries along with the severity of injuries sustained by employees of a construction company. A severe injury is not as crucial as if a company has multiple minor injuries that add up to the same cost of a severe injury. For instance, if a construction company of a particular size (number of employees) paying a particular wage has one injury that costs \$50,000 the EMR is around .8, but if that same company were to have five \$10,000 injuries totaling \$50,000 the EMR would be around 1.09. This shows that the EMR weighs the frequency of injuries higher than the severity of injuries (Hinze, Bren, Piepho 1995).

The amount of workers' compensation insurance that a company has to pay is dependent upon the EMR of the company multiplied by the manual rate that is established each of the trades employed by the company in a particular state. This shows that the insurance companies regard the EMR as an acceptable way to measure a company's safety performance (Hinze 1997).

The size of the construction firm plays a factor on the EMR rating when the valuations of the injuries vary. This is attributed to the annual expenditures on labor. If two construction firms have the same frequency of injuries, and the injuries cost the same (say \$3,000), then the larger construction firm that spends more on labor annually will have the lower EMR. If the frequencies stay the same, but the value of the injuries increase significantly, the smaller construction company will have the more favorable EMR (Hinze et al. 1995). This is why it is important to look at the factors that are being measured when evaluating a firm's safety performance.

OSHA Recordable Injury Rate

The OSHA recordable injury rate is another measurement used to evaluate a construction company's safety performance. This measurement takes into account the number of recordable injuries that are sustained by employees of a company per 200,000 worker hours of exposure. An

example of how to calculate the OSHA RIR is as follows. A company that has 3 OSHA recordable injuries with 100,000 hours of work performed would have an OSHA RIR of 6. This is found by using the following formula.

$(\text{Number of OSHA recordable injuries} / \text{number of hours}) * 200,000$

Using the formula the calculation would be $(3/100,000)*200,000$, which equals 6.

The accuracy for determining the OSHA RIR lies in the hands of supervision and the employees to account for any injury considered recordable. The following is a list of requirements for injuries to be considered as recordable.

- Death
- Loss of consciousness
- Days away from work
- Restricted work activity or job transfer
- Medical treatment beyond first aid

OSHA defines these classifications, and the forms for recording these injuries that can be found on the OSHA website (www.osha.gov).

CHAPTER 3 RESEARCH METHODOLOGY

Introduction

For a construction company to be successful there have to be three factors present on every project. The project must be completed on time, within budget, and with no serious worker injuries. If any one of these three factors is missing, the construction company performing the work could lose money or its reputation, which in turn could compromise business opportunities. Most construction companies put forth a strong effort in the estimating and scheduling of projects. The safety concerns on project do not seem to get the same time and effort as the other two factors. This could be the reason that the construction industry is one of the leaders in jobsite injuries and fatalities for all industries in the U.S.

The safety research in the construction industry conducted in the past has focused on the larger construction firms, and the smaller construction firms have been overlooked. The small to medium-sized construction firms make up the majority of the construction industry and research of these companies is warranted. This study focused on small to medium-sized construction firms, with the objective of identifying the most common safety procedures and practices being used by these companies.

Although construction firms may complete the same tasks, the general operations can vary from firm to firm. If a comparison was to be conducted on a firm that completed \$15 million dollars worth of work each year with a company that completed \$212 million dollars of work each year there would be a tremendous difference in how the companies operated. This would include the nature and implementation of the safety programs of these companies. A small to medium-sized construction firm does not have the financial assets that a larger construction firm would have to allocate strictly to safety on a jobsite.

This situation places a greater burden on the small to medium-sized construction firms to find ways that they can have a successful and cost effective safety program implemented. This has become even more difficult with the decline of construction in the industry. Many companies are trying to maximize profits while offering the lowest bid for work. This is where companies need to balance the priority of getting a job with the safety and well-being of their employees.

The literature review showed that the government has put an emphasis on construction safety and the well-being of company employees. Many organizations and associations have been formed to help construction companies with safety concerns, and to improve their current program. Some of the methods are very costly to construction firms. In order for a construction company to have a successful safety program it will require a concerted effort from all parties in the company.

Research Methods

This research was completed to identify safety policies and practices being employed in small to medium sized construction firms. The definition of a small to medium-sized construction firm was any construction company that completed less than \$100 million worth of work each year. This definition excluded all construction companies that are included in the *Engineering News Record's* list of Top 400 Firms for completed construction.

A survey was developed to ask construction companies about the various aspects of their financial and safety information. An introduction was included with the questionnaire introducing this researcher to the construction company, and letting them know that this research was to identify common safety practices in small to medium-sized construction firms. The construction companies were informed that their identities would not be included in the final analysis, and that if they would like a copy of the results, one would be provided to them at no

charge, in return for participating in the survey. The survey consisted of 26 questions, some with multiple parts. This survey could be completed in around ten minutes and the questions ranged from company history, to views of safety in construction.

The construction companies to be included in this research were selected at random from firms doing business within the state of Florida. Companies were originally selected from a list of firms that had participated in the University of Florida Building Construction Career Fair. Additional companies were identified in the *Blue Book of Construction* website from which companies were randomly selected. A link on the website allows the user to examine each construction company's annual volume of work. This feature was helpful in selecting companies to ensure that they satisfied the size criteria for the study.

Initially, the research was conducted via a telephone survey with the selected construction companies. This approach was selected so the person being interviewed could expand on answers and give their beliefs on safety in construction. The telephone survey approach was not as successful as anticipated. In the construction industry, time is money, and when a random phone call was made to conduct the survey, it had to be at a time that was convenient to the interviewee. This led to playing "phone tag" with many of the selected construction firms.

Seven telephone surveys were successfully completed. These seven respondents appeared to be more inclined to answer the opened ended questions since they could explain their answers in a conversation. Since the telephone survey was not as successful as originally anticipated, the subsequent surveys were distributed to the construction firms in another manner. Email was initially considered as a means of distributing the surveys, but this method would require the interviewees to save a copy of the survey to the drive on their computers, fill out the survey, save

it again to their computer, and then send via email as an attachment. The survey was not meant to be tedious to the interviewees so this method was abandoned.

A survey through the mail seemed to be the best option. The introduction, along with the questionnaire, was sent to the construction firms that were found in the *Blue Book of Construction*. A self-addressed stamped envelope was included with each survey, so that it would not cost the construction firms to participate in the study. It was felt that this helped to get a higher response rate. With the surveys being distributed by mail the construction companies could complete the questionnaire when they had the available time and all they had to do was place it in the self-addressed stamped envelope and drop it in the mail.

The telephone survey initially started in May of 2006. After seeing the low response rate of the participants, and difficulty in scheduling callbacks during the workday, the written surveys were sent out in December of 2007. Initially 100 surveys were mailed out on December 10, 2007. The responses to the surveys began to be received as soon as three days after initially mailing them. The returned surveys seemed to stop two to three weeks after they were initially sent to the construction companies. The first mail survey provided 12 respondents, which brought the total number of responses to 19. It was decided that the sample size was too small and that additional responses should be sought.

On February 11, 2008, 100 more surveys were distributed in the mail with self-addressed stamped envelopes. This round of surveys resulted in responses from 22 construction firms, the highest response rate experienced in this research. When reviewing the survey replies, it was noted that five surveys were not completed, and some included statements that due to the construction slump they would not be performing any work this year. This resulted in 36 usable surveys for the final analysis.

Data Analysis

Upon receipt of the completed surveys, the responses from the construction companies were compiled in a Microsoft Excel spreadsheet. Each company was given a row on the spreadsheet, and their responses were inserted in each column. Many of the questions could be answered by checking a box, so in this case, a number was given to each possible response, and the number that was placed in the response column coincided with a selected answer. This procedure was also followed when questions could be answered with a yes or no response. Number one was used if the company responded “yes”, and number 2 was used if the company responded “no”. The questions that sought opened-ended responses were also entered in the cells, and if a company did not respond, a dash was placed in the cell. There were instances where the company put a question mark in the answer blank and for these a question mark was used.

These questions were then compiled into charts to show the percentages of the answers that were shared by the construction firms. These showed the prevalence of the use of specific safety practices for small to medium-sized construction firms.

CHAPTER 4 RESULTS

The survey consisted primarily of multiple-choice questions and opened-ended questions. The results for these questions are shown using different methods, depending upon the type of question that was asked. The responses to the multiple-choice questions are shown in a bar chart to illustrate the distribution of responses to the questions. The opened-ended questions resulted in two types of responses. Some of the questions were answered with a numeric response and other were answered with a comment or opinion. The questions that had a numeric response are shown in charts, and the others are summarized in the paragraph descriptions.

General Company Information

Size was the determining factor for selecting companies. There were 36 companies that returned surveys, and all of the companies had annual volumes of business of less than \$100 million. Table 4-1 shows information on the volume of work performed by the responding firms, with the average being \$18.44 million. The volume of work ranged from \$250,000 to \$100 million, and the most common annual volume of work was \$1 million dollars.

Table 4-1. Projected volume of work for this year.

Number of companies	Average	Median	Mode	Range
36	\$18.44 ± \$4.8	\$5	\$1	\$250,000 - \$100 Million

Note: Projected volume shown in millions.

Experience can play a positive role in construction safety. The longer that a construction company is in business, the better prepared will be the company principals to address various types of issues that might arise. It would be suspected that this experience would be associated with better safety performance. Table 4-2 shows the experience history of the responding companies. The average amount of time that the companies had been in business is 22.22 years ± 3.1, with one company having 88 years of experience in the industry. The most common response for a company's length in the industry was 10 years.

Table 4-2. Company history in the construction industry.

Average	Median	Mode	Range
22.22 ± 3.1	19.5	10	2.5 - 88

Note: Company history is shown in years.

The survey did not discriminate on basis of the type of construction undertaken or performed by the companies. The surveys were returned from general contractors and subcontractors. Even subcontractors may subcontract a portion of their work. An example would be for an electrical subcontractor that subcontracts the fire alarm installation to another company. Figure 4-1 shows that the majority of surveys that were returned were completed by general contractors, with two companies stating that they fell into both categories.

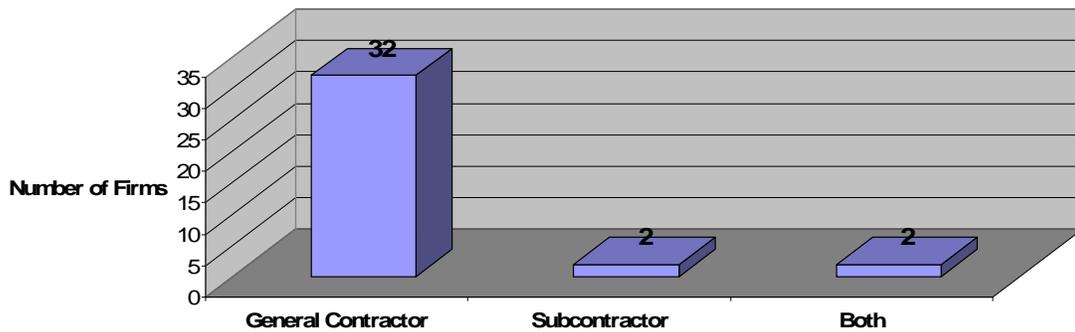


Figure 4-1. Classification of the type of construction firm.

The survey asked about the type of construction work that was performed by each responding firm. This was divided into the residential sector and the commercial sector, with some of the companies stating that they fell into both of the categories. Some firms may have gained experience by working in both sectors of the construction industry, while others may have been residential builders who undertook commercial projects when business opportunities in the residential market began to decline. Working in both sectors could prove to be hazardous though, because the employees may be subjected to unfamiliar types of construction work. Figure 4-2 illustrates firms and the projects they complete.

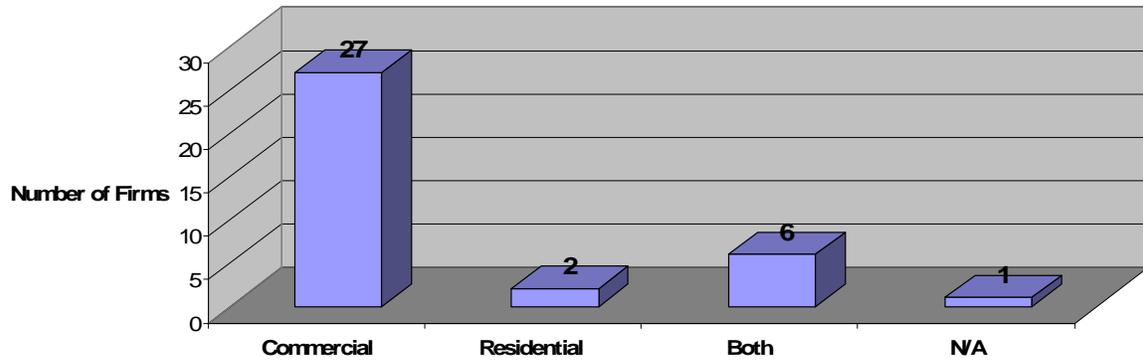


Figure 4-2. Types of projects typically built.

Another way of describing companies by size is by the number of workers that the company employs. Table 4-3 shows the average number of workers employed (37.5 ± 3.33 employees) by the construction company respondents. The number of employees in the responding firms ranged from 1 – 600, but the average is clearly being influenced by the responding firm with 600 employees.

Table 4-3. Number of employees on payroll.

Average	Median	Mode	Range
37.5 ± 3.3	11	5	1 - 600

It is apparent that not all of the employees shown in Table 4-3 work in the field. The question was posed to see how many of the employees on payroll actually worked in the field, where they could be subjected to more serious safety issues on the jobsite. The responses showed that less than half of the employees on payroll worked in the field.

Table 4-4. Employees on payroll who perform field tasks.

Average	Median	Mode	Range
18.6 ± 10.9	5	1	0 - 400

With the construction industry slowing down, many companies have had to lay off some of their workers. The companies were then asked if the number of field personnel shown in Table

4-4 reflected the normal size of their field labor. Figure 4-3 shows that for 77.8% of the companies this reflected the average size of their field labor force.

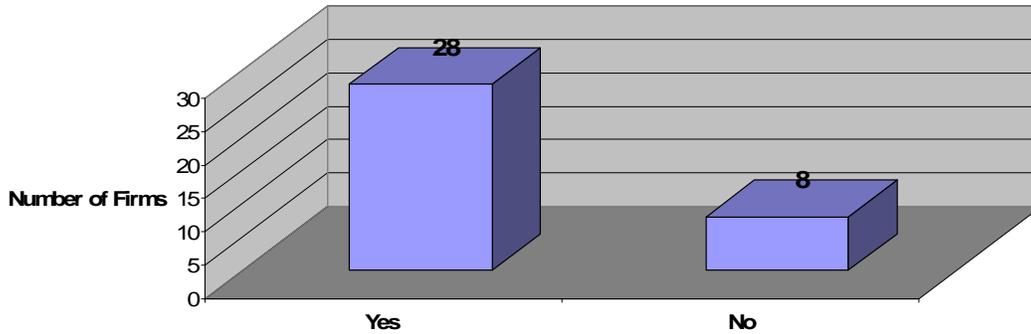


Figure 4-3. Is this your average number of field employees?

To find out about the extent of work that is subcontracted to other firms, the firms were asked about the amount of work that is self-performed. The average response showed that 21% \pm 4.6% of the field work is self-performed, but the most common response was that 10% was self-performed. The average for the work that is self-performed could have been affected by the responses from subcontractors who self-perform a large portion of their work. Subcontractors will perform most of their own work, and they tend to subcontract only a small portion of their work on each project.

Table 4-5. Percentage of field work self performed.

Average	Median	Mode	Range
21% \pm 4.6%	10%	10%	0 - 100%

The percentage of fieldwork self-performed by each company shows the amount of work performed by the general contractors or the subcontractors, i.e., there are many employees on a jobsite at one time. This worker crowding can result in hazardous situations, and the employees always have to watch what they are doing, because if they are not careful they cannot only hurt themselves, but they can injure other workers. The average number of subcontractors that are

used by the construction firms on each project is 12.8 ± 1.4 . Seven of the companies did not respond to this question.

Table 4-6. Average number of subcontractors on each job.

Average	Median	Mode	Range	N/A
12.8 ± 1.4	10	10	0 - 30	7

Public owners usually invest more time in the safety of the project, and require background checks for construction companies who are bidding their projects. The companies were asked how much of their work completed is for public owners. The responses to this question ranged from 0% to 100%. The average for the firms was $29.8\% \pm 6.2\%$, but the most common response from the companies was 0%.

Table 4-7. Percentage of work completed for public owners.

Average	Median	Mode	Range
$29.8\% \pm 6.2\%$	10%	0%	0 - 100%

Safety Programs and Contents

The responses to the preceding questions provided a broad overview of the types of construction firms that responded in this study and the type of construction work that they perform. The second half of the survey focused on the safety programs of the responding firms, including the different measures that the companies implemented to keep their employees safe while on the jobsite and how these safety procedures are carried out. The recordkeeping of their past safety performance was also examined in this area of the survey along with their views on safety and the overall effect that it can have on the performance of their workers while on the jobsite. The adherence to a safety program confirms the importance that a company places on safety for their employees. Of the 36 responding companies, 32 firms stated that they have a safety program that their employees must adhere to. All of the companies responded yes or no to this question in the survey.

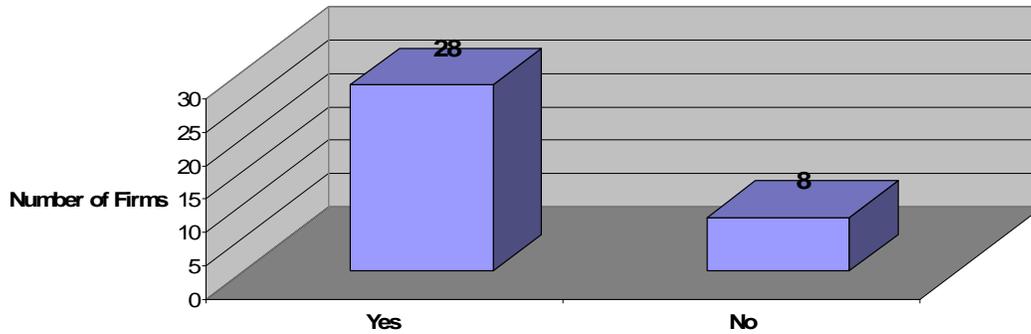


Figure 4-4. Number of firms with a safety program.

Table 4-6 showed that the average number of subcontractors on a project was 12.75 ± 1.4 . Every construction company has a different view on safety, and the importance of it. Many of the subcontractors in construction only take jobsite safety as serious as the general contractor that contracted with them. If the general contractor does not emphasize the importance of safety, the subcontractors often follow suit. Figure 4-5 shows that 26 of the contractors stated they require subcontractors on their jobs to comply with the components of their safety programs. This demonstrates to the subcontractors that the general contractors believe that safety is of the utmost importance. This guidance can help the subcontractors to perform work in a safe manner.

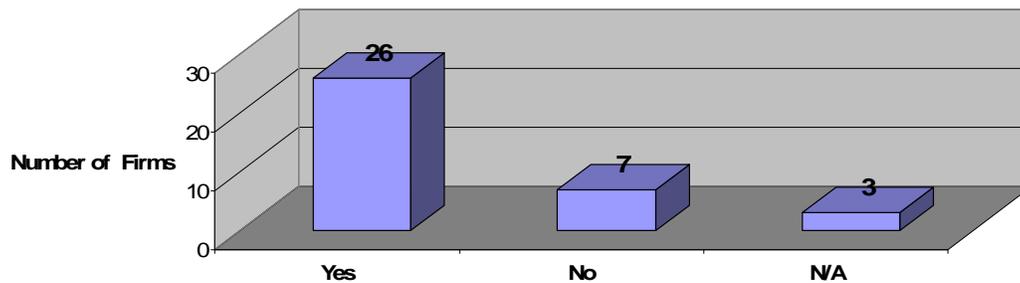


Figure 4-5. Companies that require the subcontractors to comply with the safety program.

The Literature Review explained that one of the measures that can be taken by a construction company early in the construction process is to provide employees with worker

orientation sessions. This usually gives a broad overview of the company's procedures while working in the field, and what the employee will need to do if an accident were to occur. Figure 4.6 shows that 29 of the 36 responding companies included new worker orientation in their safety program, and one company did not. The new worker orientation varies in length, with two hours being the highest response for the length.

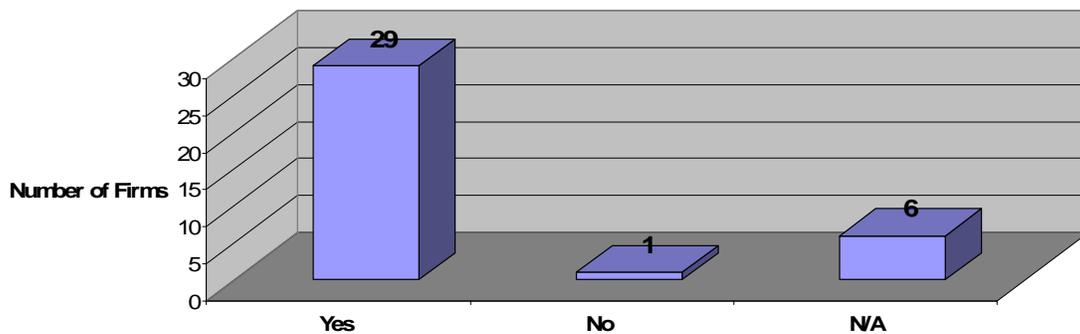


Figure 4-6. New worker orientation required.

Toolbox meetings take a proactive approach on the jobsite where the superintendent (or the individual conducting the toolbox meeting) goes over the different areas of construction that will be taking place during the week, and informs the workers of the hazards that they may face while on the job. Since these meetings are held weekly, the information is always fresh in the minds of the employees and subcontractors. These meetings also open up discussions if any of the subcontractors or employees has safety concerns they would like to have addressed. This lets the subcontractors or employees know that safety is a team effort and that in order for a construction jobsite to be safe it takes everyone's input to locate different areas on the jobsite where injuries could occur. Figure 4-7 shows that 74% of the respondents stated that they hold toolbox talks weekly on their jobsite to address safety, while eight (26%) of the respondents do not. Six of the companies did not answer the question if a toolbox talk was held weekly on their construction jobsites.

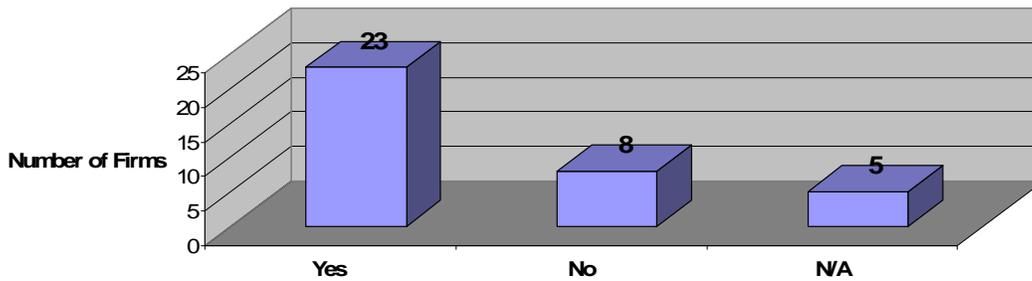


Figure 4-7. Toolbox meetings held weekly.

Worker Incentive programs as explained in the Literature Review are aimed at rewarding the employees for performing work without accidents. The concept is good, but just because someone is not injured on the job does not mean that the job was completed in a safe manner. The objective of incentives is for workers to take stock of safety of the project, and instead of a few eyes looking out for worker safety, everyone on the job will be making sure the job is as safe as possible. Figure 4-8 shows that 13 companies include safety incentive programs for their employees, while 18 of the companies do not.

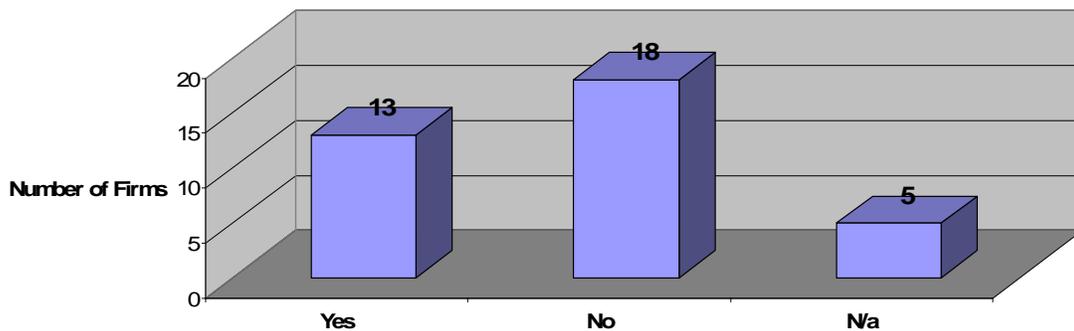


Figure 4-8. Worker incentive program.

OSHA requires that hard hats must be worn on the jobsite when there is the potential for injury from objects falling from above. If there is no hazard of objects falling from above, then the hard hat is optional for anyone on the jobsite, according to OSHA. Companies requiring hard

hats to be worn at all times while on the jobsite have strengthened this requirement. This eliminates any confusion or misinterpretation of the OSHA guidelines, and ensures that if there is an OSHA inspection, hardhats will not be an issue during the walkthrough. Of the 36 responding companies, 23 require hard hats to be worn at all times while on the jobsite. The response “only when required by OSHA” was given by one company.

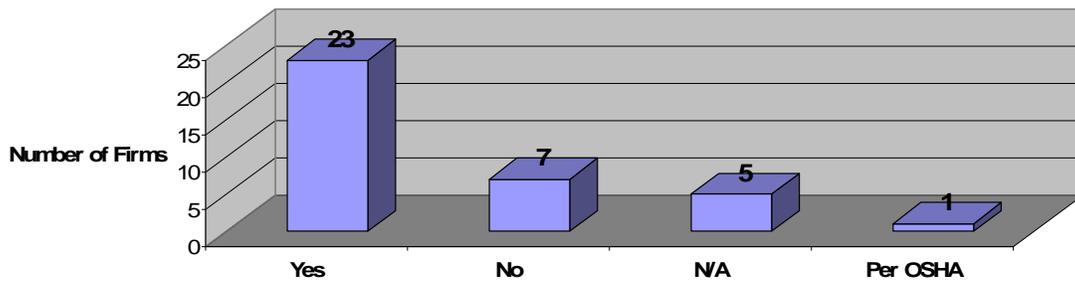


Figure 4-9. Hard hats required at all times.

Like hardhats, OSHA only requires safety glasses to be worn when workers are using equipment or tools that have the potential to cause harm to the eyes or the face. This means that the employees are not required to wear safety glasses at all times while on the job, unless their work that they are completing at that time falls into the description provided by OSHA. This requires the onsite supervisory personnel to remind the employees if they are performing certain tasks that they must have their safety glasses on. The question was posed to the participants if they required their employees to wear safety glasses on the job at all times and not just when OSHA requires them to. Of the participants, 10 responded yes, 17 responded no, six did not answer the question, and three clarified that they are worn only per OSHA’s requirements. The tasks in construction that require safety glasses to be worn on the job per OSHA are minimal compared to the number of different tasks that can be performed on the jobsite throughout a project.

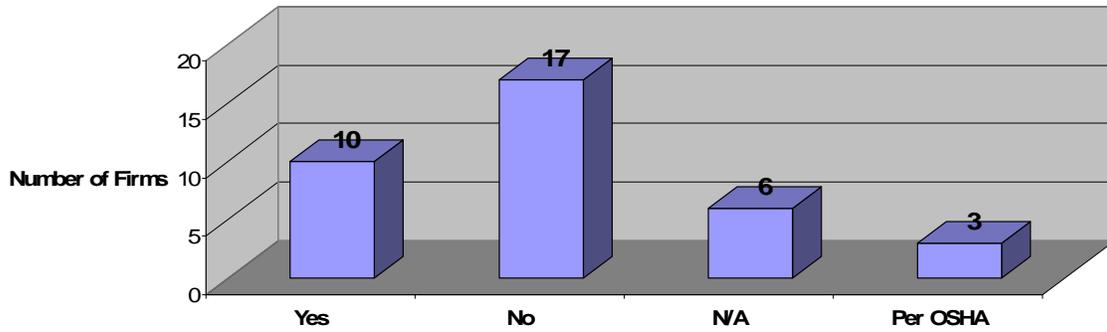


Figure 4-10. Safety glasses required at all times.

The Literature Review described drug-testing policies that can be used in the construction industry, and explained that this is a new practice among many small to medium-sized construction firms. Drug testing programs are a type of preventative measure, and an investigative post accident drug test can be enforced by construction companies. If the employees are screened prior to working with the company, then the construction firm is taking measures to make sure they are not hiring someone who has an addiction to drugs. Many of the companies require testing after an accident, to make sure that the employee was under sound mind while they were working, and the drugs or alcohol did not hinder their ability to work. This would be considered a post-accident indicator. Of the companies participating in the study, 26 said that they have a drug testing policy in their safety program. Nine of the participating companies stated that they did not have such a policy in their safety program.

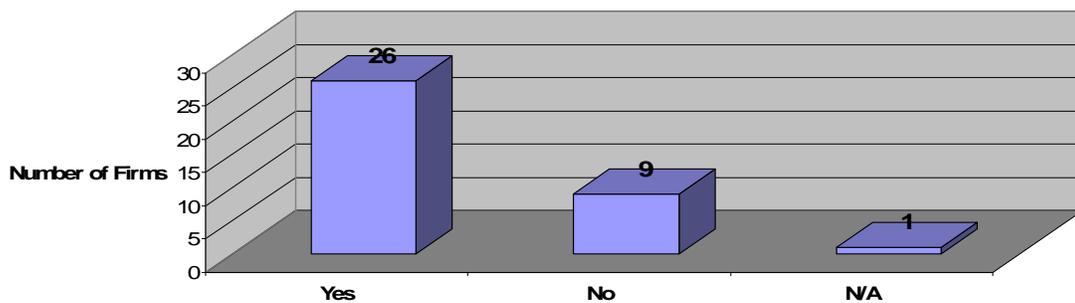


Figure 4-11. Drug testing program implemented.

If the companies indicated that they had implemented a drug testing program, they were asked to define when these tests were administered. Seventeen of the 26 responding companies indicated that they have a drug-testing program and required the tests prior to hiring the workers. The next highest response for when drug tests would be administered was for post accident evaluations and to satisfy workers' compensation requirements. Post accident drug tests are administered in 16 of the 26 companies that have a drug-testing program. Figure 4-12 illustrates when the participating companies require the drug tests.

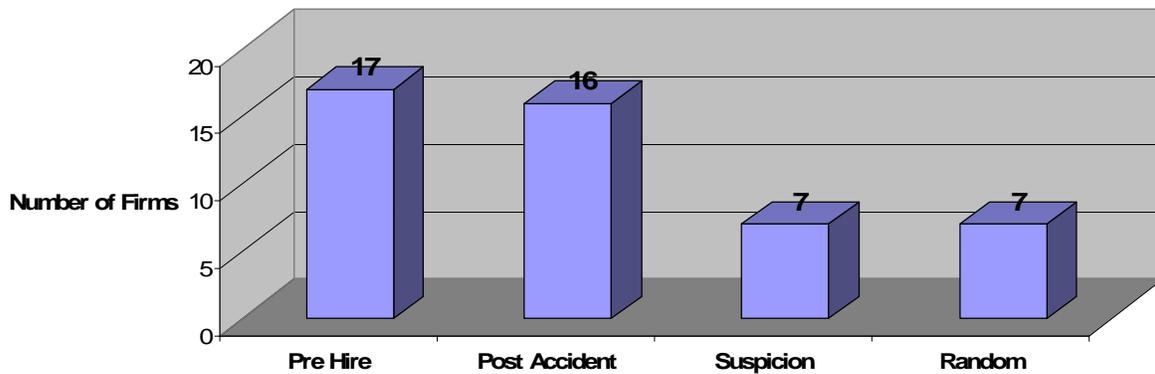


Figure 4-12. When the drug tests are required.

Large construction companies usually have a full time employee who oversees the safety aspects of the company, and tries to eliminate the chance of injuries on the jobsites. As explained in the Literature Review, the small to medium-sized companies do not have the financial resources that are available to the larger companies. Therefore, the small to medium-sized construction firms have to run their organization in a different manner. A fourth (25%) of the participants in this study employ a full time person to oversee the safety aspects of the company. Most (69.4%) of the companies stated that they did not have a full time safety employee, and one of the 36 companies stated they have a part time safety employee. This would lead to the project managers taking on the responsibility to oversee the project safety.

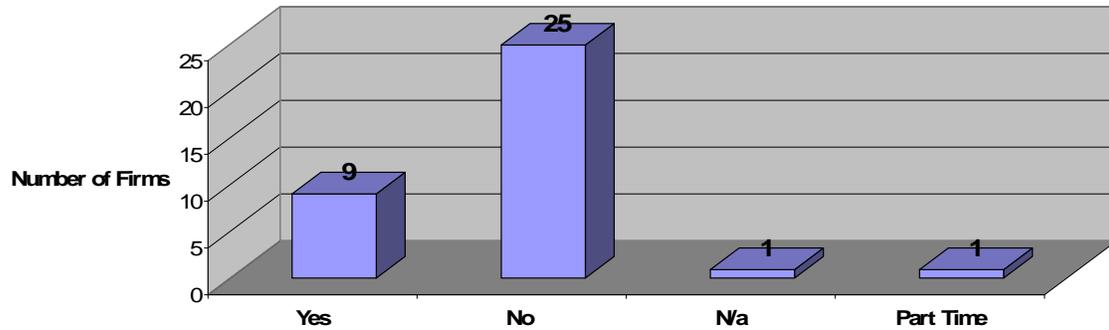


Figure 4-13. Employ a full time safety employee.

Safety and its effect on productivity of employees is a concern that many construction companies have in the industry. Some industry professionals consider safety and productivity to be mutually achievable goals while others consider them to be mutually exclusive. If a company believes that productivity compromises the rate at which a person can complete tasks, they might reduce the level of safety enforcement to avoid losses and to stay on schedule. When a construction company cuts back on the safety budget for a project to reduce costs, it will increase the chance of an injury on the job and could actually end up costing the company more money than they would have saved by keeping to the budget or schedule. If someone on the jobsite is injured it can slow the construction process considerably. Not only will the injured employee have to be treated, the co-workers on the jobsite might be affected mentally by the injury, and this would contribute to slowing down the rate of productivity. Of the 36 participants, 22 stated they felt that safety actually increases productivity, while three believed that it compromises it. Nine of the companies felt safety has no effect on the productivity of the employees, and two of the companies did not answer the question. Most respondents felt that the achievement of efficient work did not have to compromise safety while on the construction jobsite. This is an important view on safety that the construction company should let their employees know that performing tasks in an unsafe manner can actually slow the construction process down.

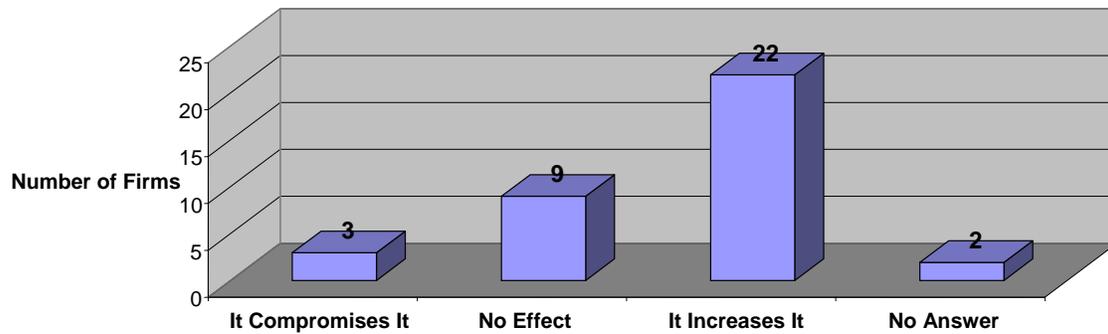


Figure 4-14. Safety’s effect on productivity.

Part of the focus for this study was to define the reasons that the companies had implemented the current safety program. This question was left open ended so that the participants could express their views on the subject matter, and they would not be limited to multiple-choice answers. Although this was an open ended question, the responses could be grouped into five different categories. The categories are as follows: internal, external, legal, save money, and isolated incident. Six of the participants did not respond to this question. The companies were not limited to one category; dependent on how they felt, they could have a response that fell into more than one category.

The answers were grouped into internal responses, which varied from company beliefs that it was the right thing to do and that the company was concerned for the employees. Many of the external responses cited requirements by the government, the owner, and OSHA. The companies that responded legal to the question may have been referring to liability and potential lawsuits. There were companies who stated that they wanted to lower their worker’s compensation rate, and these participants were grouped in to the “Save Money” category. One company answered the question with “isolated incident”. Figure 4-15 shows the categories and the responses from the participants. Internal factors received the highest response rate for this question with 15 of the companies citing that this was the reason the current safety program was implemented.

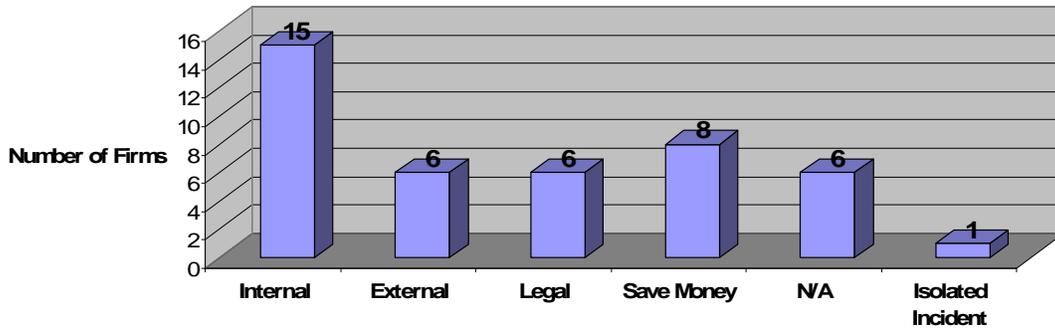


Figure 4-15. Reason for implementing the current safety program.

Safety Record Keeping and Statistics

Keeping well maintained records of a company's safety performance shows that the company is concerned with their safety, by taking the time required to keep the records up-to-date. This way the company can track their safety performance over time and easily determine if it has improved or declined over the years. Keeping records also shows that the company has studied the rating systems for safety in construction. To achieve the highest ratings, they would have to know how different measures are calculated.

One way that construction companies can protect themselves is to require their employees to sign a form stating that they have completed safety training, and are aware of the current safety program and its contents. This way the employee knows if they have received all of the components of the safety program, and they are assuring the company that they have the knowledge to perform the field tasks in a safe manner as set forth by the company. Of the respondents, 63.8% confirmed that they require their employees to provide documentation that they have completed the safety program, while 30.5% of the companies do not. Two companies did not respond to this question. This type of verification provides the construction company with a written record stating their employees have received the training to perform their tasks in a safe manner and allows the companies to follow up with continuing education.

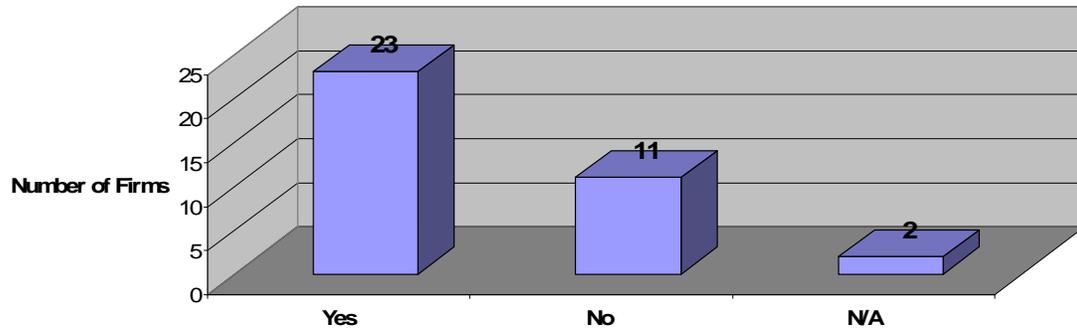


Figure 4-16. Employee verification of completing safety program.

OSHA is a well-known and recognized agency that performs random safety checks on construction jobsites in the U.S. The OSHA compliance officer must provide documentation of their credentials to the general contractor on the site, and then they typically walk the site with the superintendent. The length of the inspections can vary, and a report is written at the end of the inspection to make the general contractor aware of any violations or corrections that are needed. Based on the compliance officer's notes, the OSHA Area Director will decide if it is appropriate to issue fines/citations for not complying with the OSHA standards. Figure 4-17 shows the number of participants who have had an OSHA inspection in the past five years. Some have argued that once OSHA performs an inspection and they find a violation, then that company is targeted by OSHA in the future. This is a false statement. The OSHA inspections are random, and are usually initiated by a compliance officer who happens to see a jobsite while driving. The response to the question if the companies have had an OSHA inspection in the past five years was almost split. There were 20 companies that stated they have had an OSHA inspection while 16 of the 36 companies responded they did not. All of the respondents answered this question. While some companies may feel that it is a bad thing if OSHA visits the jobsite, it can actually prove to be very beneficial. The OSHA inspector might bring up areas of concern that were originally overlooked in the jobsite planning.

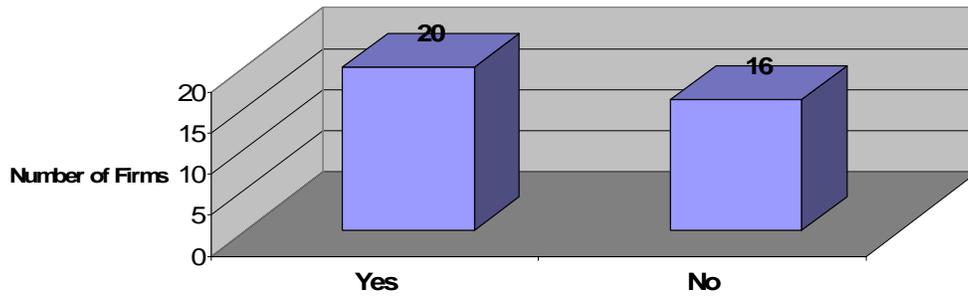


Figure 4-17. OSHA inspections in the past five years.

The results from the participants who had OSHA inspections varied from no citations, to minimal infractions. None of the companies participating in the study claimed that they had major violations or infractions brought upon them by OSHA after the inspection.

As described in the Literature Review a company can compute their OSHA Recordable Injury Rate by taking the number of recordable injuries as defined by OSHA and divide this number by the total number of worker-hours worked by the company. Then take this quotient and multiply it by 200,000 worker-hours.

In order for the OSHA RIR to be accurate, the company must keep accurate recordable injury records. In the survey there were two related questions. The first posed the question of the number of accidents in the past year where a worker was treated by a doctor. The next question consisted of two parts, and inquired if the company computes its own OSHA RIR and, if so, what it was. If the companies participating knew of their injuries in the past year, and they had the records for the hours worked, then the OSHA RIR would be found using the equation provided in the Literature Review.

The results from the responding companies are as follows: 22 of the companies stated that they did not have any injuries that were treated by a doctor in the past year. Seven of the companies had one, four of the companies had two injuries, one company had three injuries, one

company had 7 injuries, and the most injuries reported by a participant was 43 injuries in the past year. Figure 4-18 shows the number of companies who compute their OSHA RIR.

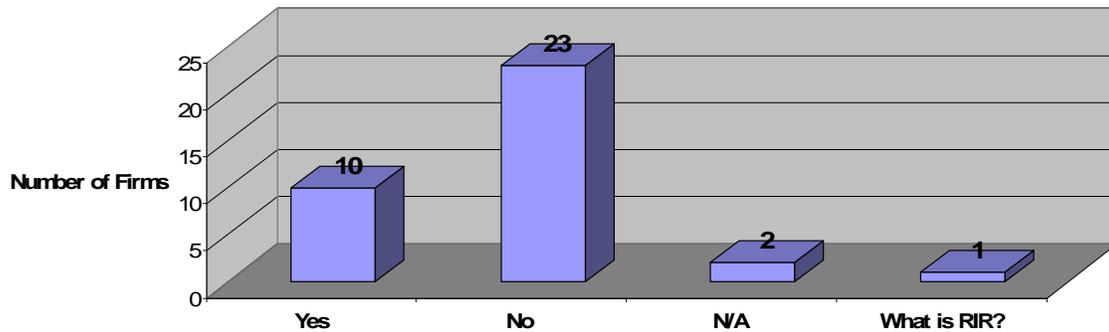


Figure 4-18. Does your company compute its OSHA RIR?

Three of the ten companies that answered yes to the question in Figure 4-18 were able to provide the company’s OSHA RIR. This failure to be able to give details about the company RIR may indicate that the individual did not have access to the safety performance measures. The last question that was asked of the participants was if they knew the company’s Experience Modification Rating (EMR). The EMR as defined in the Literature Review shows how a company’s safety performance compares to other companies in the industry. The EMR is a factor in the Workers’ Compensation Insurance rate that construction companies pay. Nine companies answered the question, one company left the response blank, and 26 of the companies asked what EMR stood for.

Table 4-8 has compiled the information gathered from the questions in the survey dealing with the different safety practices in small to medium-sized construction firms. The table shows the common safety practices found in small to medium-sized construction firms.

Table 4-8. Common safety practices of small to medium-sized construction firms.

New worker orientation	Drug testing program	Hard hats required at all times	Toolbox talks	Worker incentive program	Safety glasses required at all times	Full time safety employee
80.56%	72.22%	63.89%	63.89%	36.11%	27.78%	25.00%

CHAPTER 5 CONCLUSIONS

The objective of the study was to provide information on which types of safety procedures are used in small to medium-sized construction firms. To be considered as being small or medium-sized, a firm must have an annual volume of business of less than \$100 million. Previous studies dealing with safety in construction has focused on the larger construction firms.

The number one safety procedure used by the participants in the study is requiring a new worker orientation for the employees. This can vary in costs dependent upon the duration of the orientation session, and if the orientation consists of meetings or just reading a manual provided by the company.

The Literature Review described drug testing in the industry, and how smaller construction firms were not implementing this as a safety procedure, primarily due to the high costs. The results negated this comment, and showed that drug testing was the second most common procedure used by small to medium-sized construction companies. This may reflect the concern that the construction companies have for their employees, and the declining costs for administering a drug test. The construction companies may also receive a lower insurance rate for being a drug free workplace.

Toolbox talks and hard hats being required at all times was tied for third on the most common safety practices. These requirements have a minimal impact on the project budget, and if conducted properly can prove to be beneficial in increasing the safety on a jobsite. The rest of the practices were implemented by less than half of the participants in the study, and will not be examined any further.

The response that stood out in Figure 4-15 is “saving money.” Eight companies responded that the safety program was implemented to reduce the workers’ compensation insurance rate.

Although they expressed a concern about the workers' compensation rates, but they were asked later about the EMR, many of the respondents questioned what the EMR was. With this playing a factor in the workers' compensation insurance rate, and the high response that the companies wanted to reduce this cost it was anticipated that they would all know this value.

CHAPTER 6 RECOMMENDATIONS

This study focused on the most common safety procedures that are used in small to medium-sized construction firms. This study can serve as a base to further research of small to medium-sized construction firms.

A recommendation of studying the EMR and the OSHA RIR for each company, along with the components of their safety program, one could analyze which components have the largest affect on the safety ratings. This would prove beneficial for the small to medium-sized construction firms to reevaluate the current components of their safety program.

Originally, the method used to collect data for this study was via the telephone. This method would be acceptable for future study, as long as the interviewer had the ability to place calls during the normal business hours in a day. Because of other daytime obligations of this researcher, the telephone interviews proved to be a major obstacle in this research.

The use of surveys sent in the mail with self-addressed envelopes proved to be successful in collecting data. The turnaround time for the surveys was around two to three weeks. If a company did not respond by then, usually they did not respond at all. Calling or emailing the potential participants could cut down on the number of surveys that are not returned. An email could be sent out asking the companies to decline or accept the offer to be part of the study. Only the companies accepting the offer would receive the surveys, and this would save time and money on the interviewer's part. It would also make sure that the company is still in business.

The Blue Book of Construction was used for selecting companies in this study, and although the latest edition online was used, there still were companies that had gone out of business. This may be due, in part, to the construction industry becoming more competitive and the amount of construction slowing down.

The participants should also be grouped into the same category in future studies, as far as the type of construction. Residential contractors usually do not have extensive safety programs that may be more common for commercial contractors.

This study has many branches that can be investigated through future studies to improve jobsite safety for small to medium-sized construction firms, and with the majority of the industry falling into this size category, it is essential for worker safety.

APPENDIX A
SURVEY

Questionnaire for Safety in Small to Medium Sized Construction Firms

1. How long has your company been in business? _____ Years
2. What is the approximate projected volume of work for the upcoming year?
\$ _____ Million
3. What was the average volume of work completed by the company 5 years ago?
\$ _____ Million
4. Does your firm work as a general contractor or as a specialty/subcontractor?
 General contractor Subcontractor
5. a. How many employees do you currently have on your payroll? _____ Employees
b. Of these employees how many perform field tasks? _____ Employees
Is this typically the size of your field labor force? yes no
6. What percent of the contracted construction work does your company self perform?
_____ %
If less than 100%, how many subcontracts do you have on most projects? _____ Subs
7. What type of work do the field employees perform (ex. Masonry, concrete, etc.)?
_____.
8. for GC: What kind of projects does your firm typically build? _____
for subs: What kind of work does your firm do? _____
9. What percent of the projects are done for public owners? _____ %
10. Does your firm have a safety policy or safety program? yes no
If yes, do you require your subcontractors to comply with the requirements that are stated in it? yes no
11. What does your safety program consist of?
 new worker orientation, if yes who receives the orientation? all new hires
If yes, how long is the orientation, typically? _____ Hours
 are toolbox meetings held each week on the project? yes no
 does the company have a worker safety incentive program? yes no
 new workers must submit to a drug test before being hired? yes no
 hard hats are required to be worn at all times on the job? yes no
 safety glasses are required to be worn at all times on the job? yes no

12. Does your company have a drug-testing program? ____.
If yes when are the drug tests required? _____.
13. Has your firm ever prepared a site specific safety program for a particular project?
 yes no
14. What percent of your employees wear safety glasses when on the job? _____%
15. How do you enforce safety compliance with subcontractors?

16. When was safety designated a major part of your company?_____
17. How has the safety program changed in the past 5 years?

18. What was the reason for implementing the current safety program that you use? (internal, external, legal, etc.)

19. How do you enforce safety compliance with your employees?

20. In general, how do you feel safety relates to productivity?
 Safety compromises Productivity
 Safety has no effect on Productivity
 Safety Increases Productivity
20. Do you employ a full-time safety person in the company? yes no
If so how many jobs will that person oversee at a time? _____
How much time does the safety person spend on the jobs? _____
What is their background? (safety, production, trades)_____
21. What aspects of your program do you feel has been the most successful in providing a safe workplace for your employees?

22. Is there any documentation that you require employees to sign verifying that they have completed your safety training? yes no
23. Have you had any OSHA inspections in the past 5 years? yes no
If yes, how did it turn out? _____

24. About how many injuries have your company workers had in the past year where they were treated by a doctor? _____ Injuries

25. Does your company compute its OSHA recordable injury rate? yes no
If yes, do you know what the RIR is? RIR=_____

26. What is your company EMR? _____

APPENDIX B
THESIS QUESTIONNAIRE INTRODUCTION

Hello, my name is Shane Bizzell, and I am a graduate student in the M.E. Rinker, Sr. School of Building Construction at the University of Florida. I am conducting a study on safety programs in Small to Medium-Sized construction firms. I am gathering information on various aspects of safety programs. The benefit of this study will provide the most common safety procedures used in Small to Medium-Sized Construction Firms, and the reasons for implementing them.

I have enclosed a survey with various questions about your safety program. If you decide to participate in this study, then please fill out the questionnaire, place it in the self-addressed envelope, and return it as soon as possible. Many of the questions can be answered by simply answering yes or no. There are no risks associated with participating in this study, and it should take about ten minutes to complete. Naturally, you are asked to answer only those questions that you feel comfortable in answering. There are no direct benefits to you for participating in the study.

The results of this study will be compiled and a summary report will be prepared. As a token of our appreciation for participating in the study, I would be happy to provide a copy of the summary report to you at no charge. If you would like a copy of the summary please send an email to sbizzell@ufl.edu stating that you participated in the study and would like a copy of the summary. This will ensure that your identity will be kept separate from your survey. Upon completion I will send a copy of the survey to your office. Following this procedure will ensure that I have no knowledge of who completed the surveys.

Your consent to participate will be implied by the completion of the survey. You may withdraw your consent to participate at any time without penalty. For questions about your rights as a research participant, contact the IRB office at 352-392-0433.

The responses you provide will be kept strictly anonymous to the extent provided by law. Research data will be summarized so that the identity of individual participants will be concealed. To keep your survey anonymous, please do not include your return address when returning the survey. The report will include surveys from a maximum of 100 participants, not just your company. You have my sincere thanks for participating in the valuable study.

The results to the research will be provided to your company upon request. This research will identify the common safety practices that are used in Small to Medium-Sized construction firms and the reasons they were implemented. You may withdraw your participation at any time without penalty.

If you have any questions I will be happy to answer them, and I can also direct you to the personnel at the University of Florida.

My name is Shane Bizzell
Phone: (941) 312-4972 Email: sbizzell@ufl.edu

Others that can be contacted:

Jimmie Hinze

Holland Professor, Director of Center for Construction Safety Loss and Control

Phone: (352) 273-1167 Fax: (352) 392-4537 Email: hinze@ufl.edu

University of Florida Institutional Review Board at (352) 392-0433

Email: IRB2@ufl.edu

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BIOGRAPHICAL SKETCH

Shane was born in Pensacola, Florida, and that is where he spent most of his life growing up. Shane moved to Montgomery, Alabama for two years, and Birmingham, Alabama for one year. This was during the first through third grade. Shane completed the rest of his education all of the way through high school when he moved back to Pensacola, Florida in 1987.

Upon graduation from Escambia High School in 1996, Shane was accepted to The University of Florida. This is where Shane completed his undergraduate degree in finance at the Warrington College of Business in the fall of 2000. After graduation, Shane took a couple of years off and tried to decide what he was going to do with the rest of his life. One of Shane's roommates while in undergraduate school was a student in the Rinker School of Building Construction. Shane was always intrigued with the type of work that his roommate was completing for his classes.

In the fall of 2003, Shane moved to Gainesville, Florida with his future wife to enroll in the Rinker School of Building Construction. Originally, Shane planned to receive a post baccalaureate degree, but after talking to Dottie Beaupied at the school of Building Construction, he decided to pursue a master's degree.

Shane completed his coursework for the degree in the summer of 2006, but due to the lack of success with telephone interviews, he did not receive adequate responses for his survey. Shane moved to Sarasota, Florida and began working for a construction firm that falls into the category defined earlier as a small to medium-sized firm. Shane has been working for this company since September of 2006 and has been very pleased with the selection to work in construction. Shane is now currently married, promoted to Project Manager, and is planning to purchase his first house sometime around August.

