

EXPLORATORY STUDY OF THE PRACTICE OF SUB-SUBCONTRACTING IN THE
CONSTRUCTION INDUSTRY

By

JOSHUA LEONARD MARKOWITZ

A THESIS PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE IN BUILDING CONSTRUCTION

UNIVERSITY OF FLORIDA

2007

©2007 Joshua Leonard Markowitz

To my Mom and Dad

ACKNOWLEDGMENTS

I would like to thank those people who have helped me to accomplish my goal of completing this thesis. I would like to thank my committee: Dr Jimmie Hinze, Dr. Leon Wetherington, and Dr. Kevin Grosskopf. Dr. Hinze gave me guidance and feedback throughout the thesis process. He was extremely helpful and knowledgeable regarding the issues discussed in this study.

I appreciate the support of my parents, Leonard and Connie Markowitz. They always encourage me to set goals and to never settle for mediocre results. I would also like to thank my fiancée Julia Giblin for reviewing my thesis and guiding me through its completion.

TABLE OF CONTENTS

	<u>page</u>
ACKNOWLEDGMENTS	4
LIST OF TABLES	7
LIST OF FIGURES	8
ABSTRACT	9
CHAPTER	
1 INTRODUCTION	10
2 LITERATURE REVIEW	12
Introduction.....	12
Reasons for Subcontracting	12
Jobsite Relations	13
Productivity.....	15
Summary.....	16
3 METHODOLOGY	18
Introduction.....	18
Survey Questions Designed.....	18
Sample Selection	20
Surveys Conducted	20
Initial Analysis Performed.....	21
4 RESULTS AND ANALYSIS.....	22
Survey Response Rate	22
Demographics	22
General Contractor Survey Results	23
Subcontractor Survey Results.....	27
5 CONCLUSIONS	42
6 RECOMMENDATIONS.....	45
Recommendations for the Construction Industry	45
Recommendations for Future Research.....	45
A GENERAL CONTRACTOR AND SUBCONTRACTOR SURVEYS.....	47
B INSTITUTIONAL REVIEW BOARD SURVEY COVER LETTER.....	51

LIST OF REFERENCES52
BIOGRAPHICAL SKETCH53

LIST OF TABLES

<u>Table</u>		<u>Page</u>
4-1	Annual revenue of respondent	31
4-2	Percent of construction work self performed.....	31
4-3	Number of subcontractors involved on a typical construction project	31
4-4	Number of sub-subcontractors on a typical construction project	31
4-5	Percentage of work self performed.....	31
4-6	Number of sub-subcontractors on a construction project	31

LIST OF FIGURES

<u>Figure</u>	<u>page</u>
4-1 Is sub-subcontracting more common on some projects than others	32
4-2 How sub-letting work is addressed in contract agreements	32
4-3 Specialties most commonly sub-subcontracted	33
4-4 Quality and productivity of sub-subcontractor	33
4-5 Services sub-subcontractors provide most often.....	34
4-6 More disputes arise on the job with sub-subcontractors	34
4-7 No significant problems with sub-subcontracted work	34
4-8 Impossible to determine if workers are employed by subs or sub-subs	35
4-9 Firm needs better job of controlling amount of work sub-subcontracted	35
4-10 Unique safety problems with work done by sub-subcontractor.....	35
4-11 Reasons subcontractors sub-subcontract work	36
4-12 Sub-subcontracting more common on some projects than others	36
4-13 Issue of sub-letting work in contract agreements	37
4-14 Specialties most commonly sub-subcontracted	37
4-15 Quality and productivity of sub-subcontractor	38
4-16 Services sub-subcontractors provide most often.....	38
4-17 More disputes on projects which utilize sub-subcontractors	39
4-18 Subs have no problems with work they have sub-subcontracted	39
4-19 Subcontractor needs to monitor working progress of sub-subcontractors	40
4-20 Unique safety problems	40
4-21 Reasons subcontractor sub-subcontract work.....	41

Abstract of Thesis Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Master of Science in Building Construction

EXPLORATORY STUDY OF THE PRACTICE OF SUB-SUBCONTRACTING IN THE
CONSTRUCTION INDUSTRY

By

Joshua Markowitz

May 2007

Chair: Jimmie Hinze

Cochair: Leon Wetherington

Major: Building Construction

Contractors rely heavily upon specialty contractor skills and expertise to cut costs and increase efficiency on construction projects. Subcontractors are specialty contractors that normally perform specific tasks that general contractors do not or cannot perform. When these tasks are reassigned by the subcontractor to another company, the lower tier agreements are called sub-subcontracts. Although, sub-subcontracting is widely practiced, the issues concerning it have rarely been addressed. In order to explain the many unanswered questions linked to this topic, a survey was developed and distributed to general contractors and subcontractors that provides additional information pertaining to contractual issues, safety concerns, common trades of sub-subcontractors, quality, productivity, and reasons for its existence. In conclusion, the data show an increase in the level of sub-subcontracting mainly due to a lack of specialized workers and an insufficient workforce available to complete the tasks at hand.

CHAPTER 1 INTRODUCTION

Subcontractors provide an extremely important service for the construction industry. On many building construction projects, it is common for 80% to 90% of the work to be performed by subcontractors (Hinze and Tracey 1994). Most general contractors sublet some or all of their work due to their inability to perform specialized tasks on a project, such as electric, plumbing and insulation. According to Arditi and Chotibhongs, “everyday economic facts have confirmed the subcontracting system to be efficient and economical in the use of available resources” (Arditi and Chotibhongs 2005).

The general contractor is not the sole proprietor of the subcontracting system. Subcontractors may also sublet a portion or all of their work to separate entities called sub-subcontractors. These sub-subcontractors or lower-tier subcontractors also play a necessary role in the construction process. The nature of the construction industry encourages the concept of economic feasibility; therefore allowing the use of subcontractors increases quality and decreases cost. In the end, general contractors and subcontractors are both contractually responsible for the parties to which they extend subcontract agreements.

The topic of sub-subcontracting has received little prior research attention as indicated by a limited number of articles on the subject. Sub-subcontracting may bring up concerns about safety, productivity and quality as critical areas of interest to managers. Experience shows that sub-subcontracting was not practiced as extensively in the past as it is today. Twenty-five years ago sub-subcontracting was virtually nonexistent. Today, complex projects, the shortage of skilled labor and increasing profit margins are all reasons sub-subcontracting is on the rise.

Larger more complex projects have created new specialty tasks that cannot be completed by the subcontractor; therefore specialized labor may need to be sub-subcontracted to ensure that

the tasks are properly completed. Another reason sub-subcontracting is on the rise is the desire for subcontractors to increase their profit. For example, a framing subcontractor may enter a subcontract for framing 3,000 square feet at eight dollars per square foot, but would like to increase and even guarantee the profit on the job. To accomplish this, the subcontractor will sub-subcontract 100% of their work to another subcontractor for a lower price per square foot. This strategy in turn will yield the subcontractor the difference between the original subcontract and the new sub-subcontract, hence guaranteeing a profit at a low risk.

Objective of study. The topic of sub-subcontracting has been investigated very little. The objective of this research is to explore the practice of sub-subcontracting. This study will provide general information about the practice of sub-subcontracting in construction. The research systematically explores the current consensus on the process of contracting out work from the perspective of both contractors and subcontractors. It attempts to shed new light on the topic, particularly relevant to the construction industry. The research addresses each of the following characteristics: *reasons for subcontracting*, *jobsite relations*, and *productivity*.

CHAPTER 2 LITERATURE REVIEW

Introduction

Sub-subcontracting is a common practice in the construction industry, however little has been written on the subject. Because of the lack of prior research about sub-subcontracting, this paper reviews three major issues involving subcontractors that have been explored in the literature. Although not directly written about the topic of sub-subcontracting, these sources provide a foundation on which to understand the dynamics of the topic. Each section addresses one of the following characteristics: *reasons for subcontracting*, *jobsite relations*, and *productivity*. A brief definition followed by past research findings on each characteristic is included in each section.

Reasons for Subcontracting

Subcontracting has been defined as the act of general contractors hiring specialty contractors to help them overcome problems on the jobsite. These problems include the need for special expertise, shortage in resources of the general contractor, and limitation in finances. General contractors may be able to complete specialty tasks on their own, but this may result in more risks and costlier fees. Subcontractors perform specialized duties, which enable them to cut costs and possess a higher level of efficiency (Elazouni and Metwally 2000).

Most construction work that is subcontracted is sublet for economic reasons. Contractors cannot afford to keep an assortment of full-time skilled craftsmen on their payroll, nor can they feasibly own, operate, and maintain the variety of specialized equipment needed on projects. Subcontractors can make the cost of a project more reasonable by maintaining contracts with material suppliers, manufacturers, distributors, and manufacturer's representatives.

Subcontractors can also save time and money by subcontracting some of their work, and they often have a series of sub-subcontractors (Arditi and Chotibhongs 2005).

Jobsite Relations

Subcontracting is used on nearly every construction project, but it is used more frequently on housing and building construction projects. On many projects, it is common for 80% to 90% of the work to be performed by subcontractors. The general contractor oversees the work performed by subcontractors on the project. The general contractor is perceived as providing guidance and coordination for the subcontractor (Hinze and Tracey 1994).

In 2005, Arditi and Chotibhongs conducted a survey study with general contractors and subcontractors to examine the prevailing issues in subcontracting. Two of the topics they examined were payment concerns and retainage withheld by the general contractor. These were identified as problem areas as both can adversely impact the relationship between the general contractor and the subcontractor.

The first problem they addressed was payment. The lack of timeliness of payments from the general contractor to the subcontractor could cause friction between the two parties. For instance, subcontractors may be required to abide by the “pay-when-paid” or “pay-if-paid” payment clauses. If neither clause is addressed in the contract, the subcontractors may incur the risk of late payment, unfair compensation, or even nonpayment. “The general contractor uses these strategies for insulating itself from any liability to subcontractors at any time in the event of nonpayment from the owner” (Arditi and Chotibhongs 2005).

The data from the survey questions involving payment issues showed contradictory responses from subcontractors and general contractors. “While late payments are perceived by many subcontractors to be a major issue, few general contractors acknowledge it as problem” (Arditi and Chotibhongs 2005).

The second parameter examined in Arditi and Chotibhongs' study involved retainage withheld by the general contractor. Retainage withheld by the general contractor is ostensibly used as a reserve fund to compensate for faulty or missing work performed by the subcontractor. The survey data revealed that retainage is almost always withheld by the general contractor. Forty-six percent of the subcontractors indicated that retainage could produce cash flow problems, whereas 12% of general contractors did not think so.

The conclusion of the study by Arditi and Chotibhongs, exposed jobsite relationship difficulties experienced by subcontractors, and recommended solutions to mitigate the current dilemmas. These solutions included requiring the general contractor to pay their subcontractor right after completion of the subcontracted work, and to eliminate the imposition of automatic retainage on funds earned by subcontractors.

A study by Proctor in 1996 attempted to provide a solution for mitigating relationship issues among general contractors and subcontractors. Proctor developed a system that applied the "golden rule" to the relationship between the general contractor and the subcontractor. The concept of the golden rule requires that each party treat the other, as he or she would want to be treated. This method utilizes the four Cs. The four Cs are as follows: consideration, communication, cooperation, and compensation. The four Cs represent Proctor's ideal jobsite relationship. Each factor could be utilized to solve a specific set of circumstances. Proctor concluded that consideration, communication, cooperation, and compensation are only effective if the general contractor assumes ultimate responsibility for the successful completion of the project. He also stated that disagreements and jobsite complications between general contractors and subcontractors would occur less frequently if the general contractor recognized project errors sooner (Proctor 1996).

“The Contractor-Subcontractor Relationship: The Subcontractor’s View” was written in 1994 by Hinze and Tracey. In relation to the previous reviews, Hinze and Tracey conducted an exploratory study to obtain general information about the working relationships between subcontractors and general contractors. The study took place in the Puget Sound area and included 28 of the following subcontractors: drywall-plaster, painting, mechanical, electrical, masonry, utility, flooring, and elevator. The study was conducted entirely through personal interviews from which the data were analyzed and recorded. The study concluded that subcontractors do not solely rely upon the general contractor for guidance and coordination. Subcontractors feel that the general contractors are not concerned about the best interests of the subcontractors. Hinze and Tracey also stated that many subcontracts are awarded without any formal discussion. This process can lead increased levels of poor communication and future conflicts. “The goal of this study was to improve the image of the industry and to lend a greater sense of pride to those involved in the construction process” (Hinze and Tracey 1994).

Productivity

Productivity is the amount of output produced relative to the amount of resources allocated for a project. In the construction industry, “subcontractors bear responsibility for much of the productivity levels on the construction site, particularly in areas such as labor relations, supervision, material delivery, prefabrication, standardization, worker training, quality control, and equipment maintenance” (Arditi and Chotibhongs 2005).

Much of the research on the study of subcontractor productivity is lacking due to subcontractor absence from productivity research studies (Arditi and Chotibhongs 2005). In 1998, Ting-Ya Hsieh conducted a research study on the impact of subcontracting productivity in Taiwan. The main purpose of his paper was to highlight the importance of subcontracting in construction and argue that subcontracting has been the missing element in construction

productivity studies. In order to complete his exploration, Hsieh send out 1,080 surveys to general contractors inquiring about the nature and extent of subcontracting in Taiwan. These surveys determined that subcontractor productivity is hindered by a series of barriers (1) market forces, (2) interfirm transaction linkages, and (3) the Intra-firm economic objectives. Market forces are guided by competition. For example, in a highly competitive atmosphere, general contractors will lower their mark-up in order to secure a bid. This procedure innately intensifies the risks of construction, which get passed down to the subcontractors. Inter-firm transaction linkage refers to the contractual and behavioral aspects of the contractor-subcontractor relationship. These aspects can cause great productivity loss. For instance, “due to various uncertainties in construction, the original contract agreements concerning pricing, quantity, quality standards, and delivery schedule may need to be adjusted, causing disputes to arise and worsen the team spirit of the project.” Under the last barrier of Intra-firm economic objectives, the general contractor can exert effort to maximize profit in two directions (A) control subcontract costs, and (B) decrease internal overhead. Both of these strategies will decrease worker productivity. For example, cutting overhead costs will result in a reduction of supervision, creating a lack of quality control leading to frustration (Hsieh 1998).

Hsieh’s study concluded that in order for productivity levels to remain constant the general contractor must implement both contractual and behavioral strategies. He also affirmed that subcontractor involvement in productivity research has filled the gaps between existing studies, and opened new possibilities for future research (Hsieh 1998).

Summary

Subcontractors are a necessary resource in the construction industry. This literature review addressed the most recent ideas investigated involving subcontracting. Many issues in

subcontracting have been studied except the topic of sub-subcontracting. This study will explore the process and involvement of sub-subcontractors in the construction industry.

CHAPTER 3 METHODOLOGY

Introduction

The objective of this research was to explore the practice of multi-tier subcontracting in the construction industry and to provide general information about the practice of sub-subcontracting in construction. The research systematically explored the practice of contracting out work from the perspective of both contractors and subcontractors. The study obtained information from general contractors and subcontractors as both are involved whenever sub-subcontracting occurs.

The first step in this research was to conduct a literature review. The literature search examined material related to previous studies conducted on subcontracting in the construction industry. The literature review provided sufficient information to develop a foundation for this research.

This research was to obtain information from general contractors and subcontractors. To obtain this information, it was decided that a mail-out survey approach was most appropriate. This would require the development of two surveys, namely one for general contractors and one for subcontractors. Both surveys were designed to measure the respondents' experiences with sub-subcontracting.

Survey Questions Designed

The *General Contractor Survey* was designed to determine each the general contractor's familiarity with sub-subcontracting. This survey entitled "General Contractor Experience with Sub-Subcontractors" is included as appendices in this thesis. The questionnaire included fill-in-the-blank questions about the firms' background, as well as multiple-choice questions concerning the general contractor's perception of sub-subcontractor productivity, quality and the frequency of use of sub-subcontractors. The survey also incorporated questions that pertained to

the general contractor's reaction to statements regarding the work ethic and supervision of sub-subcontractors.

The *Subcontractor Survey* was intended to capture information about sub-subcontracting work from a subcontractor's perspective. The survey was designed for subcontractors in the construction industry to gather information that could not be found in the literature review. This survey was entitled "Subcontractor Experience with Sub-Subcontractors" and can be found in the Appendix. The questionnaire for this survey was configured much like the *General Contractor Survey*, but it had a greater percentage of questions pertaining to the firm's background and specialty trade. The specific information on the firm's specialty trade was asked to identify the type of work most commonly sublet in the construction industry.

Both of the surveys contained thirteen questions. The first quarter of the survey dealt with questions pertaining to the company's background and the business volume of the firm. The second quarter of the survey administered questions pertaining to contractual obligations concerning sub-subcontracting. The third quarter pertained to the firm's reaction to statements made about sub-subcontractors. For example, respondents were asked to indicate the extent to which they agreed with specific statements. Some questions were to be answered by selecting from Likert-scale descriptions such as strongly agree, agree, slightly agree, neither agree nor disagree, slightly disagree, disagree or strongly disagree. The final part of the survey inquired about the firm's opinions on sub-subcontractor safety problems and the primary reasons why their firm or other firms would sub-subcontract all or part of their work on a project. In addition to the surveys, an introductory letter was prepared that described the purpose of the study and the rights of respondents. Approval for the survey was obtained from the University of Florida Institutional Review Board.

Sample Selection

The sample selection of construction companies used in this study consisted of two groups. The first group surveyed consisted of 50 of the office and field level management personnel of Engineering News Record's Top 200 Contracting Firms of 2006 and 50 of the top 301–400 Contracting Firms of 2006. This group represented predominately commercial and industrial general contracting construction companies from across the United States. The grouping of the top 301–400 was to provide a comparison of the smaller firms (\$121 million to \$176 million) to the larger top 200 firms (\$262 million to \$14.6 billion). The contractors were selected by choosing every fourth contractor on ENR's Top 200 and every other contractor on ENR's Top 301–400. A total of 100 questionnaires were sent to the randomly-selected general contractors.

The Second group surveyed consisted of the subcontractors listed on Engineering News Record's Top 600 Specialty Contractors of 2006. A random sample was taken from this specialty contractor list. Examples of the participants included the following specialty trades: HVAC, sheet metal, electrical, painting, concrete, woodwork, excavation, steel erection, drywall, masonry, plumbing, utility, and asphalt and grading. A total of 100 surveys were sent to this group.

Surveys Conducted

The first step used to collect the data included developing a list of general contracting and subcontracting firms. This list included a physical address and a contact name. The address and contact name for each company was located in the issues of Engineering News Record's Top 400 and 600 contractors. The second step performed was to create mailing labels and to package the envelopes with the proper questionnaire and IRB disclaimer. The third step performed was to

contact the companies by mail with the surveys. The final procedure was to review and analyze the data that was obtained for the study of sub-subcontracting in the construction industry.

Initial Analysis Performed

After the survey responses were received, both the *General Contractor Survey* and the *Subcontractor Survey* were analyzed in a similar manner. The results of the *General Contractor Survey* and the *Subcontractor Survey* were analyzed by calculating the mean, median, and frequency of responses. Microsoft Excel 2003 was the software used to calculate the results.

CHAPTER 4 RESULTS AND ANALYSIS

Survey Response Rate

A total of 200 surveys were distributed to the selected contractors and specialty contractors on November 11, 2006. These surveys consisted of two separate questionnaires. The *General Contractor Survey* was created for general contractors and the *Subcontractor Survey* for subcontractors. Each survey group was sent 100 questionnaires. Companies solicited for this survey were selected at random, producing a diverse sample of the construction industry. A total of 38 responses were received within a month of distribution. The rate of return was 23% for the *General Contractor Survey* and 15% for the *Subcontractor Survey*.

Demographics

Respondents to the *General Contractor Survey* represented companies with annual construction volumes ranging from \$140 million to \$1.8 billion (Table 4-1). The median annual construction volume of those companies was \$300 million. The titles/positions of respondents to the surveys included President, Senior Vice President, Project Manager, Project Engineer, and Chief Operating Officer. Companies represented by this survey included commercial general construction companies and industrial construction companies. Commercial and industrial companies were not specifically chosen, but are the types of firms listed on Engineering News Record's Top 400 Contractors that were selected as survey recipients.

Respondents to the *Subcontractor Survey* represented companies with annual construction volumes ranging from \$14 million to \$250 million (Table 4-1). The median annual construction volume of those companies was \$16.8 million. The titles/positions of the respondents of the surveys included President, Senior Vice President, Project Manager, Project Engineer, and Chief Operating Officer. Examples of the participants involved in the *Subcontractor Survey* represent

the following specialty trades: HVAC, sheet metal, electrical, painting, concrete, woodwork, excavation, steel erection, drywall, masonry, plumbing, utility, and asphalt and grading.

General Contractor Survey Results

In order to understand the need for sub-subcontractors in the construction industry, respondents completing the survey were asked to answer a series of questions pertaining to their experience with sub-subcontracting. To determine background information, respondents completing the survey were asked what percentage of their construction work was self-performed. The median response was 12.5% with a maximum 90% and minimum of 0% (Table 4-2). To compare the number of subcontractors and sub-subcontractors on construction projects the respondents were asked how many subcontractors were involved on a typical project. The median response was 25 subcontractors with a minimum of 5 and a maximum of 60 (Table 4-3). The succeeding question asked how many sub-subcontractors were involved on a typical project. The median response was 10 with a minimum of zero and a maximum of 60 (Table 4-4).

When asked if sub-subcontracting was more common on some types of projects than others 70% of the respondents said “No”, while 30% of the respondents said “Yes” (Figure 4-1). These respondents were asked to explain their reason for replying “Yes”. The responses included complex projects, larger projects, and multi-family buildings.

The next question asked how the issue of sub-subcontracting was addressed in their subcontract agreements. The categories consisted of four multiple-choice responses including: the issue of sub-subcontracting is not addressed, the subcontractors can sub-subcontract the work if approved by the general contractor, the subcontractors are forbidden to sub-subcontract any of the work, and other. Fourteen percent of the respondents stated that the issue of sub-subcontracting was not addressed contractually, 81% of the respondents stated that subcontractors can sub-subcontract the work if approved by the general contractor, and 5% of the

respondents stated that subcontractors are forbidden to sub-subcontract any of the work (Figure 4-2).

An attempt was made to determine the specialty trades that are most commonly sub-subcontracted on a typical construction project. The trades represented by the sub-subcontracted work were as follows: insulation, excavation, caulking and sealants, fire-safing, drywall, framing, masonry, roofing, traffic control, low-voltage specialty systems, landscaping, and other. Figure 4-3 shows the distribution of the various trades selected; respondents were asked to check all that applied. Based on 96 responses, the most common sub-subcontracted trade, with 15 responses (16%), was low-voltage specialty systems. Low-voltage specialty systems include but are not limited to communication wiring, fire alarm systems, security systems and A/C controls. Because of the highly specialized nature of the work, low-voltage specialty systems are associated with the most sub-subcontracted work.

The next set of questions asked respondents to rate the quality and productivity of sub-subcontractors. Each question asked the respondents how they would generally rate the quality and productivity of sub-subcontracted work. The answer choices for both questions were as follows: better than subcontractors, about the same as subcontractors, and lower quality done by the sub-subcontractors. The response rates for both questions were correlated. Every respondent who chose an answer describing the quality of sub-subcontractors also chose the same answer to describe their productivity (Figure 4-4). The responses most chosen for both questions show that the general contractors feel that quality and productivity of the sub-subcontractors is the same as that of the subcontractors.

Contractors were asked about the services sub-subcontractors provide most often. The choices listed were: design input, prefabrication of components, material supply, and

construction installation. Based on 29 responses, the results show that 19 of the respondents (66%) stated that most sub-subcontractors provide construction installation services the most. Six of the ten responses were in the category “material supply”, and the remaining 4 were divided among “design input” and “prefabrication of components” (Figure 4-5).

Information was sought about the general contractors’ attitudes toward sub-subcontractors in a series of four statements portraying their firm. The respondents were asked to circle one response that most accurately represented their opinions. The possible answers were: strongly agree, agree, slightly agree, neither agree nor disagree, slightly disagree, disagree, or strongly disagree. The first statement declared that more project disputes arose with sub-subcontractors. Figure 4-6 shows that most of the respondents had varied opinions about this statement. There is an even distribution of agreement and disagreement with a majority of the respondents neither agreeing nor disagreeing.

The second statement declared that the firm had not had any significant problems with work that was sub-subcontracted. Based on 23 responses, Figure 4-7 shows that most general contractors have mixed opinions about having any significant problems concerning sub-subcontractors.

The third comment stated, “it is often impossible for the firm to determine if workers on the jobsite are employed by subcontractors or sub-subcontractors.” Based on the responses, Figure 4-8 shows that there are varied opinions about this issue, but a significant number of the respondents agreed that it is often impossible to determine if workers on the jobsite are employed by subcontractors or sub-subcontractors.

The fourth statement declared that the firm (general contractor) needed to do a better job of controlling the amount of work that was sub-subcontracted. Based on the responses, Figure 4-9

shows that a most of the respondents surveyed felt that their firm did not need to do a better job of controlling the amount of work that was sub-subcontracted. Nonetheless, there were some general contractor respondents that stated that greater control over sub-subcontracting was needed.

The survey asked respondents to identify any unique safety problems encountered with work that was done by sub-subcontractors. Based on 23 responses, 61% of the respondents stated that they had never encountered any safety issues with sub-subcontractors (Figure 4-10). On the other hand, 39% of the respondents revealed that they have had safety problems with sub-subcontractors. Respondents who answered, “Yes” were asked to explain their specific circumstances related to this response. Safety issues included the following: no safety program, lack of safety knowledge, workers not trained in safety, missed safety orientation sessions, language and communication difficulties and not complying with the general contractor’s safety policies.

In order to determine why subcontractors sub-subcontract some or all of their work, general contractors were asked to indicate why they felt sub-subcontracting was done. They were given the following four choices: inability to provide a sufficient work force to complete the work, work is sub-subcontracted at a fixed price, some work is too specialized for the firm, and other (see Figure 4-11). Based on 37 responses, 17 of the respondents (46%) felt that subcontractors sub-subcontract their work due to their inability to provide a sufficient work force. A total of 11 respondents (30%) believed that some work is too specialized for the subcontractor. Seven respondents (19%) felt that work is sub-subcontracted at a fixed price, which guarantees a profit to the subcontractor. Two of the respondents (5%) chose the choice “other”, but did not elaborate on the reason for their answer.

Subcontractor Survey Results

To understand the need for sub-subcontractors in the construction industry, the subcontractor respondents were asked to answer a series of questions pertaining to their experience with sub-subcontracting. To obtain background information, respondents were asked about the amount of their contracted construction work that was self-performed. The median response was 93% with a minimum 30% and maximum of 100% (Table 4-5). To determine the prevalence of sub-subcontracting on construction projects, respondents were to estimate the number of sub-subcontractors involved on a typical project. The median response was 1.5 with a minimum of zero and a maximum of 25 (Table 4-6).

When asked if sub-subcontracting is more common on some types of projects than others 53% of respondents said “No”, while 47% respondents said “Yes” (Figure 4-12). The respondents replying “yes” were asked to explain their answers. The types of projects involving more sub-subcontracting included hospitals and schools, surface prep jobs, projects involving fuel/oil, projects requiring a fire alarm, projects with roofing shingles, and projects with automatic opening doors.

Subcontractor respondents were asked how the issue sub-subcontracting was addressed in their subcontract agreements with the general contractor. The categories consisted of four multiple-choice responses including: the issue of sub-subcontracting is not addressed, the subcontractors can sub-subcontract the work if approved by the general contractor, the subcontractors are forbidden to sub-subcontract any of the work, and other. Based on 15 responses, 13% of the respondents said that the issue of sub-subcontracting was not addressed, while 87% (13 of 15 respondents) of the respondents said that subcontractors can sub-subcontract the work if approved by the general contractor (Figure 4-13).

An attempt was made to determine the specialty trades that are most commonly sub-subcontracted on a typical construction project. As previously noted in the *General Contractor Survey* results, the trades deemed to be the best candidates were developed through research obtained in the review of the literature. The trades listed included the following: insulation, excavation, caulking & Sealants, fire-safing, drywall, framing, masonry, roofing, traffic control, low-voltage specialty systems, landscaping, and other. Figure 4-14 shows the distribution of the various trades selected; respondents were asked to check all that applied. Based on 28 responses, the most common answer with ten responses was “other”. The response “other” was listed with a blank space provided for explanation. The explanations provided are as follows: sheet metal, ductwork, and test/balance. The second highest response rate was insulation with seven responses.

The next set of questions on the survey related to an assessment of the quality and productivity of sub-subcontractors. Each question asked the respondents how they would generally rate the quality and productivity of sub-subcontractors. The choices for both questions were as follows: good, improvement desired, not observed, and unsatisfactory. The responses for both of these questions were interrelated. Every respondent who chose an answer describing the quality of sub-subcontractors also chose the same answer describing their productivity (see Figure 4-15). The response most often chosen on both questions indicated that the subcontractors felt that sub-subcontractor performance is “good” when rating quality and productivity.

Subcontractors were asked which services sub-subcontractors provide the most. The choices listed were: design input, prefabrication of components, material supply, and construction installation. Based on 20 responses, the results show that 13 of the respondents (65%) believed that sub-subcontractors generally provide construction installation services. Four

of the seven remaining responses were related to the category “material supply”, and four were divided among “design input” and “prefabrication of components” (Figure 4-16).

Information was sought about subcontractor attitudes toward sub-subcontractors. In response to specific comments, the respondents were asked to circle one response appropriately labeled strongly agree, agree, slightly agree, neither agree nor disagree, slightly disagree, disagree, or strongly disagree. The first statement stated that more disputes arose on projects in which they used sub-subcontractors than on those that did not. Figure 4-17 shows that a majority of the respondents were unsure of the statement. The distribution of responses illustrates that many respondents disagree or cannot make a decision based on their firm’s history.

The second statement asked respondents to indicate the level of agreement with the statement that no significant problems exist with work that their firm sub-subcontracted. Based on the responses, Figure 4-18 shows that more subcontractors have not faced any significant problems concerning sub-subcontractors in the past, but some respondents did disagree with the statement.

The third statement declared that the firm needed to continuously monitor the working progress of sub-subcontractors to prevent poor craftsmanship and mistakes. Based on the responses, Figure 4-19 reveals that a majority of the respondents felt that their firm did indeed need to do a better job of monitoring the working progress of sub-subcontractors.

The survey asked respondents to identify any unique safety problems encountered with work that was done by sub-subcontractors (Figure 4-20). Based on 15 responses, 57% of the respondents stated that they had never encountered any safety issues with sub-subcontractors. However, 43% of the respondents revealed that they had safety problems with sub-subcontractors. Respondents who answered, “Yes” were asked to explain their specific

circumstance. Several safety issues were noted, including no safety program, OSHA is not effective, workers were not trained in safety, language barrier, no scaffold training, and ignoring subcontractor safety requirements.

In order to determine why subcontractors sub-subcontract some or all of their work, subcontractors were asked to choose the primary reasons from the following four choices: inability to provide a sufficient work force to complete the work, work is sub-subcontracted at a fixed price, some work is too specialized for the firm, and other (Figure 4-21). Based on 23 responses, six of the respondents (26%) felt that subcontractors sub-subcontract their work due to their inability to provide a sufficient work force. A total of 14 respondents (61%) believed that some work was too specialized for the subcontractor. Three respondents (13%) felt that work was sub-subcontracted at a fixed price, which guaranteed a profit to the subcontractor. None of the respondents chose the choice “other.”

Table 4-1. Annual revenue of respondent

Type of Firm	N	Mean	Median	Minimum	Maximum
General Contractor	23	\$497 million	\$300 million	\$140 million	\$1.8 billion
Subcontractor	15	\$69.4 million	\$16.8 million	\$14 million	\$250 million

Table 4-2. Percent of construction work self performed

Type of Firm	N	Mean	Median	Minimum	Maximum
General Contractor	23	21%	12.5%	0%	90%

Table 4-3. Number of subcontractors involved on a typical construction project

Type of Firm	N	Mean	Median	Minimum	Maximum
General Contractor	23	25	25	5	60

Table 4-4. Number of sub-subcontractors on a typical construction project

Type of Firm	N	Mean	Median	Minimum	Maximum
General Contractor	23	14-2	10	0	60

Table 4-5. Percentage of work self performed

Type of Firm	N	Mean	Median	Minimum	Maximum
Subcontractor	15	84%	93%	30%	100%

Table 4-6. Number of sub-subcontractors on a construction project

Type of Firm	N	Mean	Median	Minimum	Maximum
Subcontractor	15	3.5	1.5	0	25

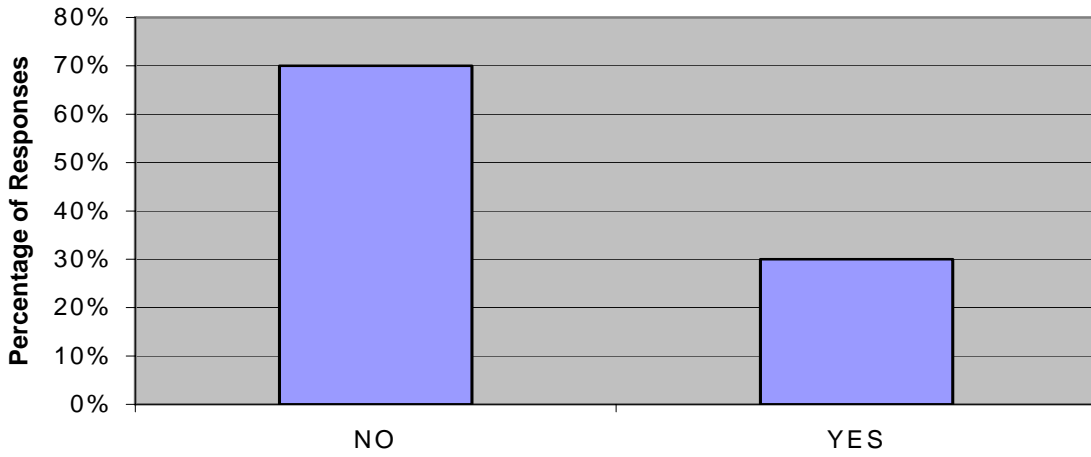


Figure 4-1. Is sub-subcontracting more common on some projects than others (N = 23)

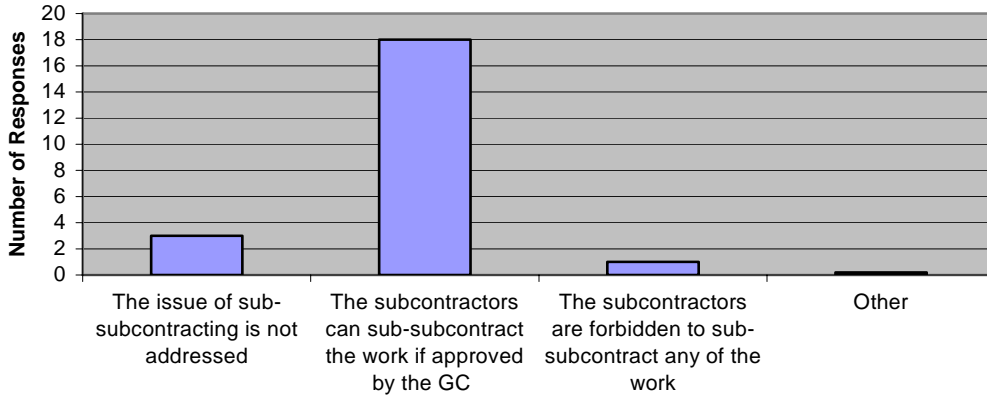


Figure 4-2. How sub-letting work is addressed in contract agreements (N = 22)

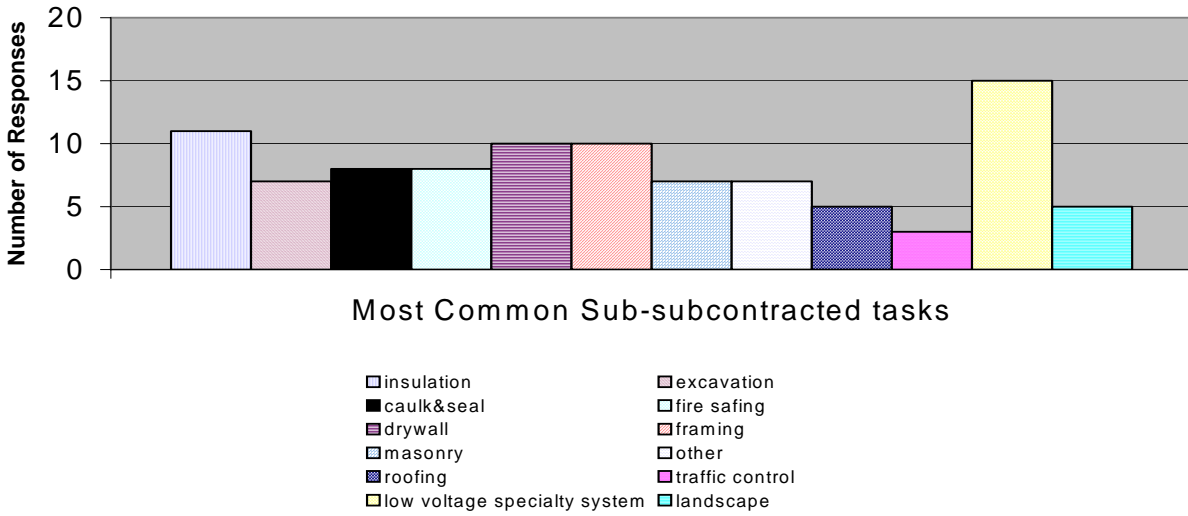


Figure 4-3. Specialties most commonly sub-subcontracted (N = 96)

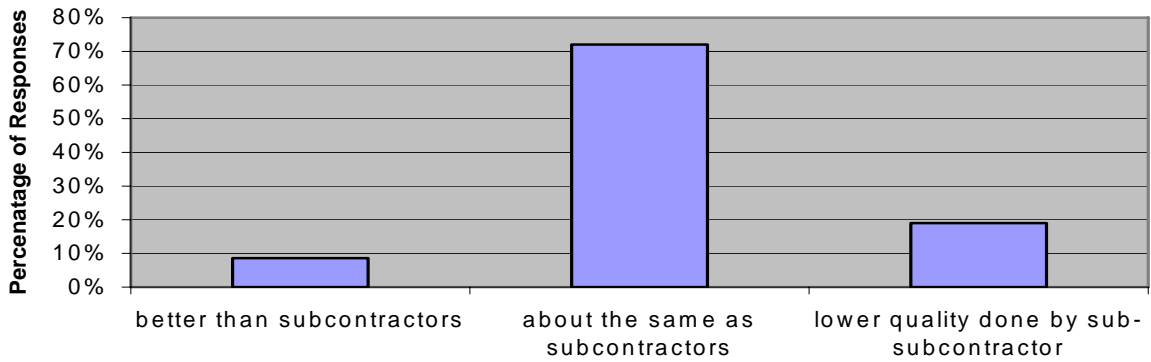


Figure 4-4. Quality and productivity of sub-subcontractor (N = 23)

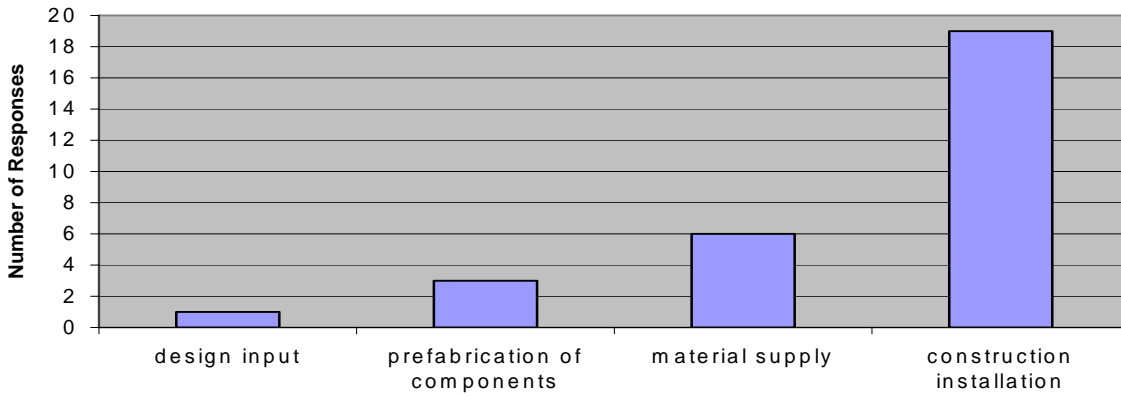


Figure 4-5. Services sub-subcontractors provide most often (N = 29)

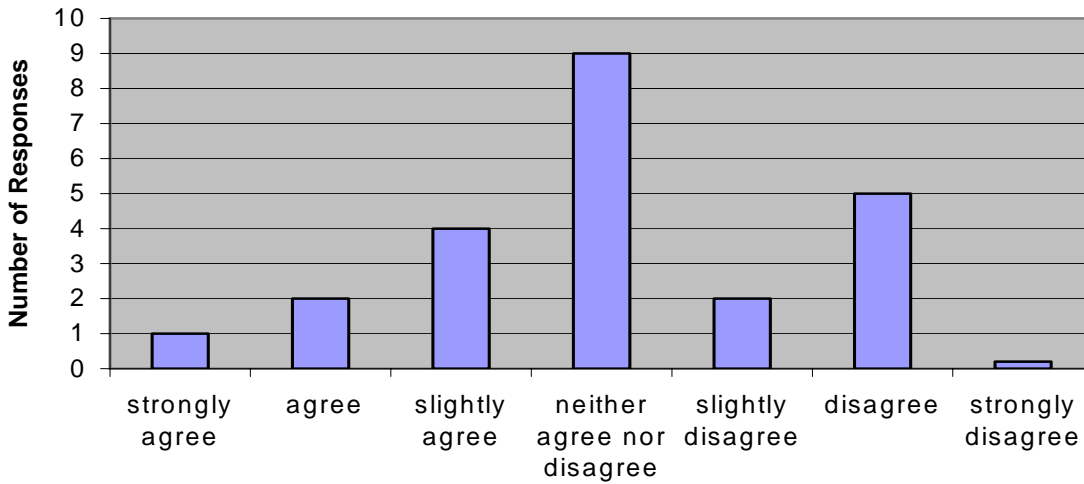


Figure 4-6. More disputes arise on the job with sub-subcontractors (N = 23)

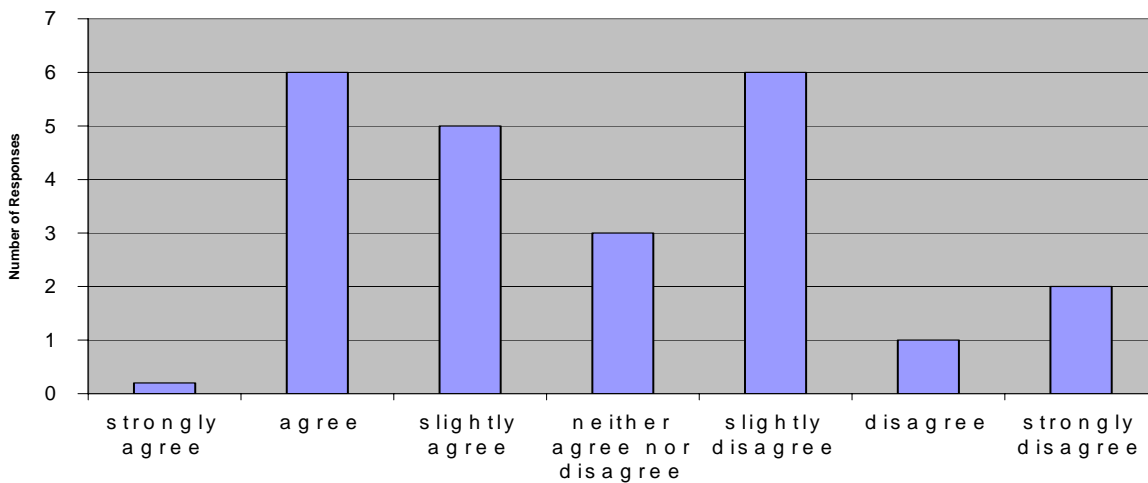


Figure 4-7. No significant problems with sub-subcontracted work (N = 23)

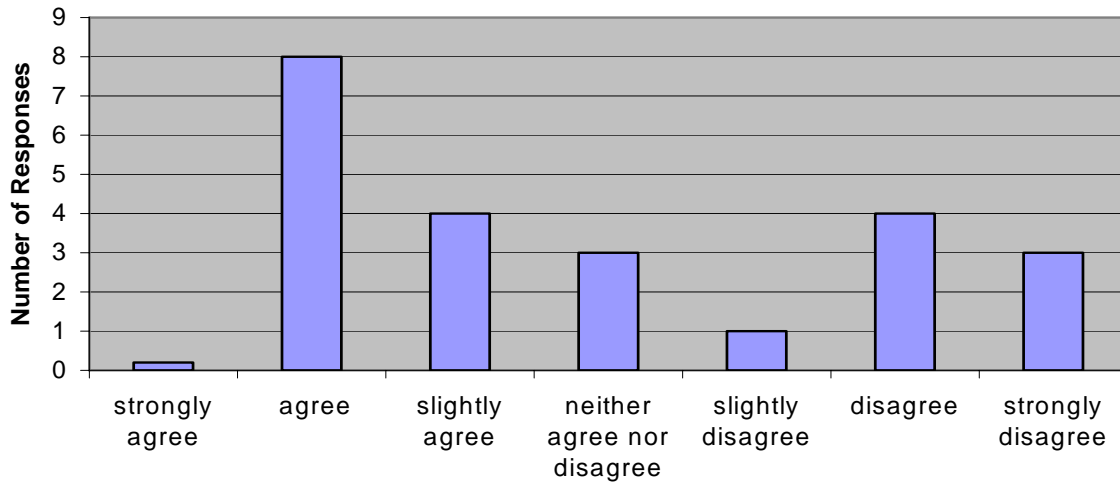


Figure 4-8. Impossible to determine if workers are employed by subs or sub-subs (N = 23)

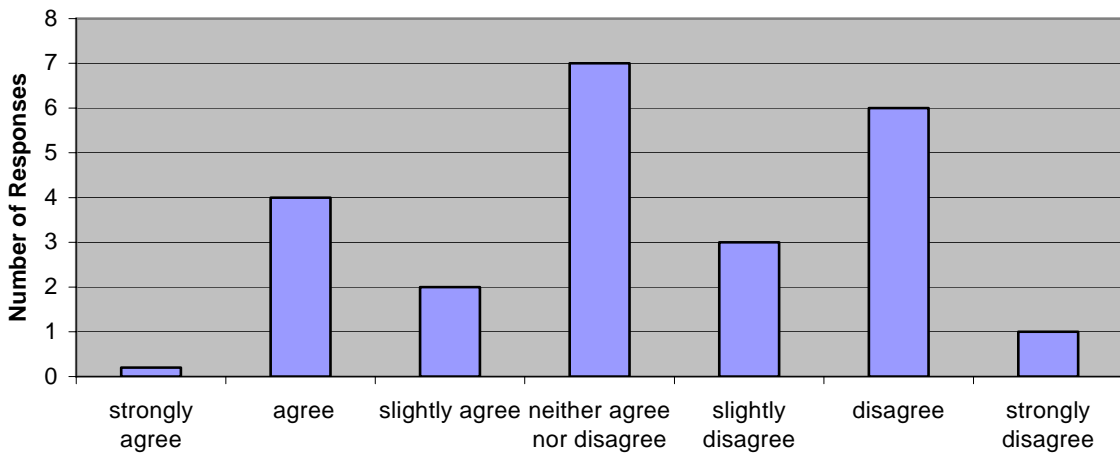


Figure 4-9. Firm needs better job of controlling amount of work sub-subcontracted (N = 23)

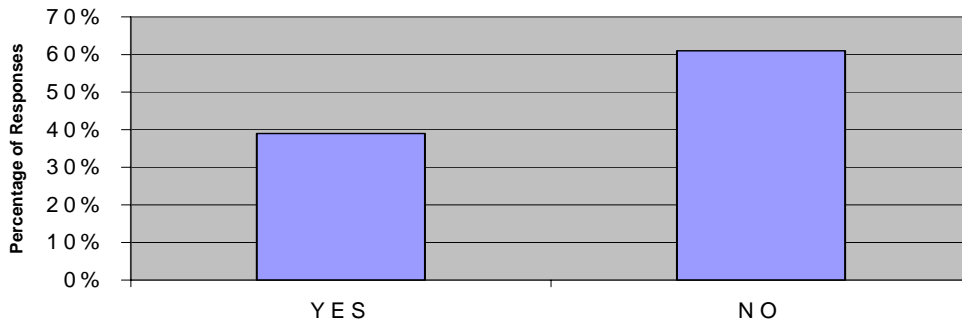


Figure 4-10. Unique safety problems with work done by sub-subcontractor (N = 23)

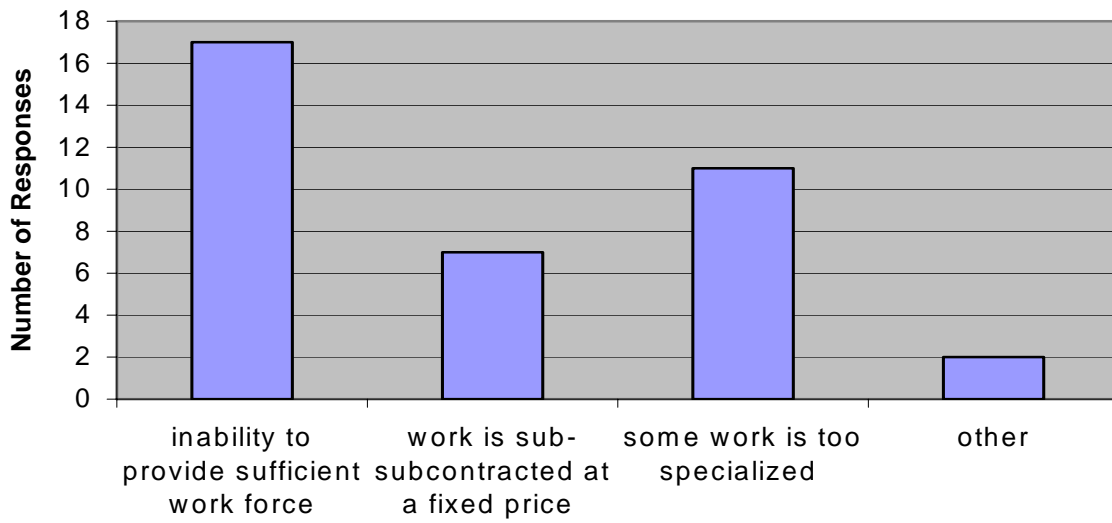


Figure 4-11. Reasons subcontractors sub-subcontract work (N = 37)

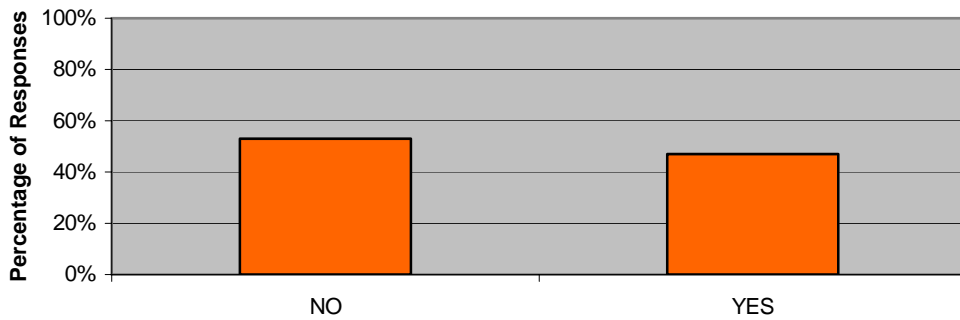


Figure 4-12. Sub-subcontracting more common on some projects than others (N = 15)

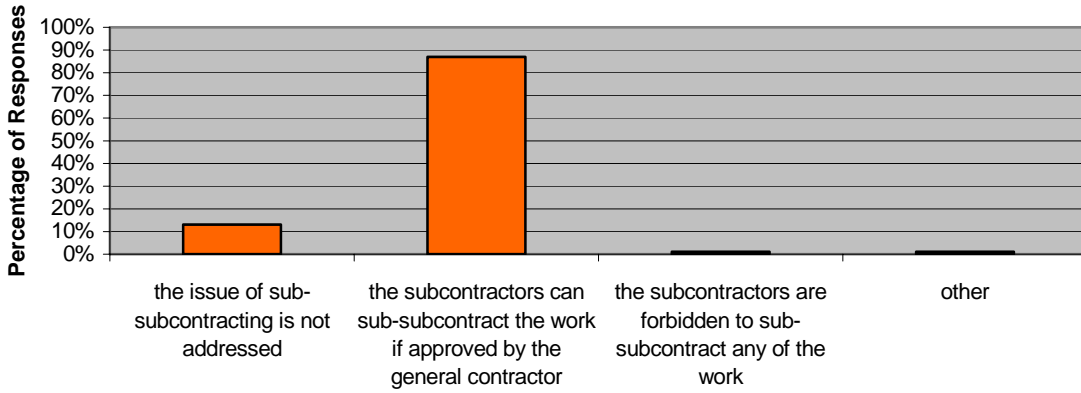


Figure 4-13. Issue of sub-letting work in contract agreements (N = 15)

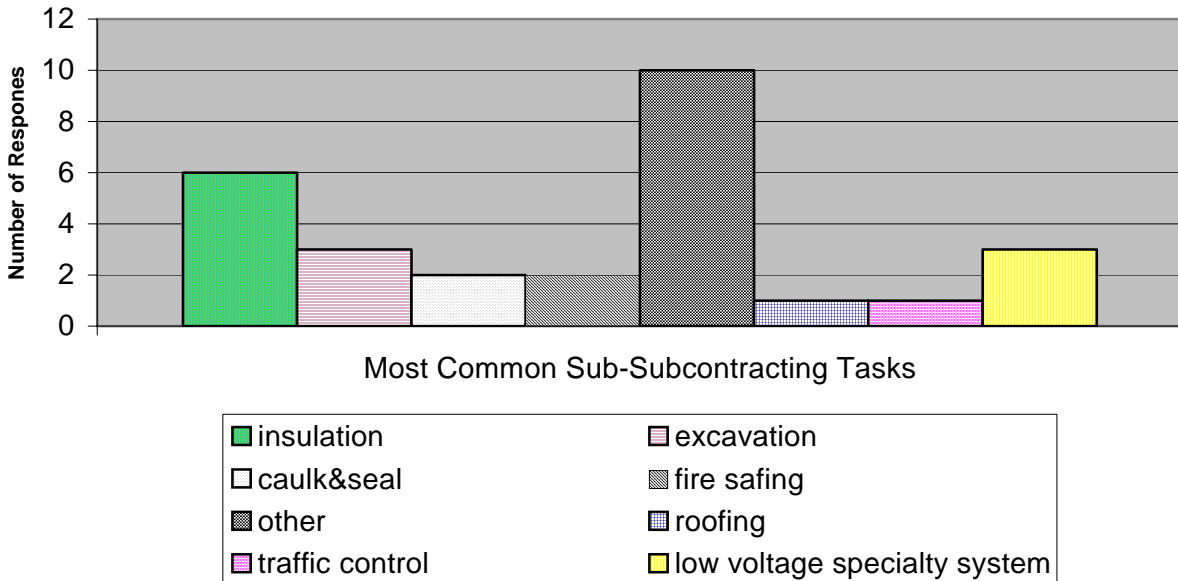


Figure 4-14. Specialties most commonly sub-subcontracted (N = 28)

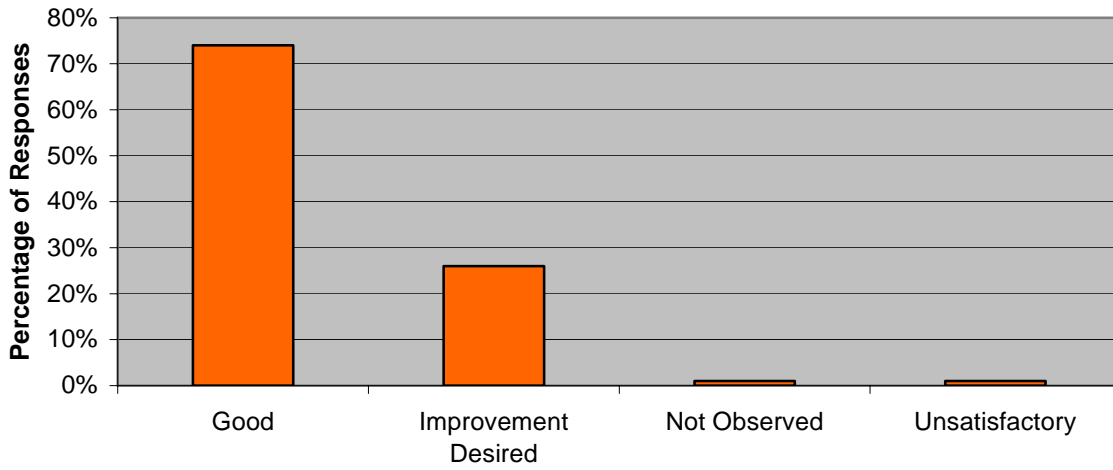


Figure 4-15. Quality and productivity of sub-subcontractor (N = 15)

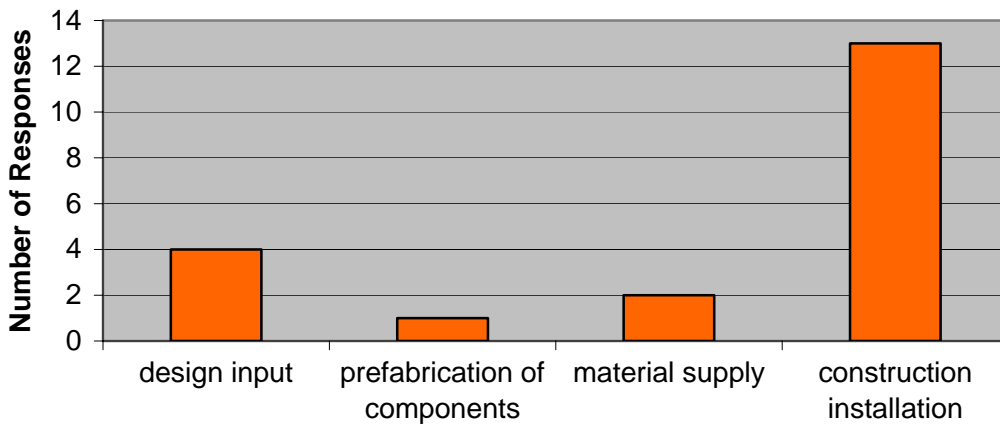


Figure 4-16. Services sub-subcontractors provide most often (N = 20)

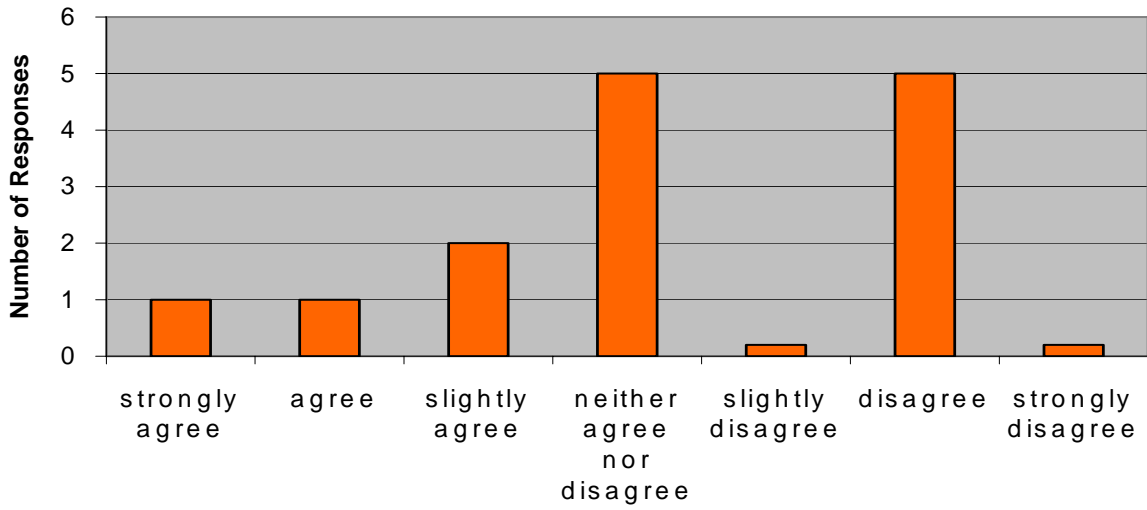


Figure 4-17. More disputes on projects which utilize sub-subcontractors (N = 15)

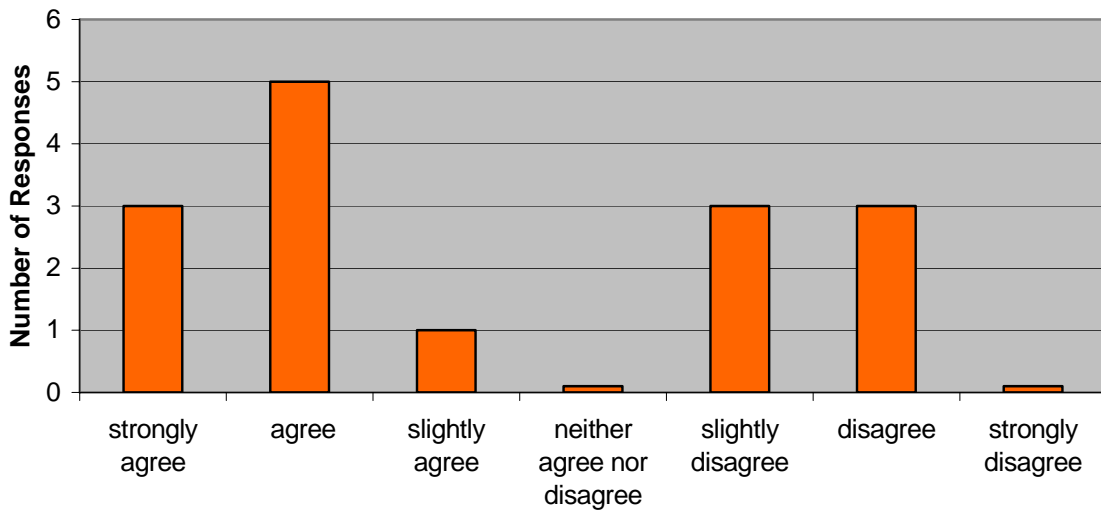


Figure 4-18. Subs have no problems with work they have sub-subcontracted (N = 15)

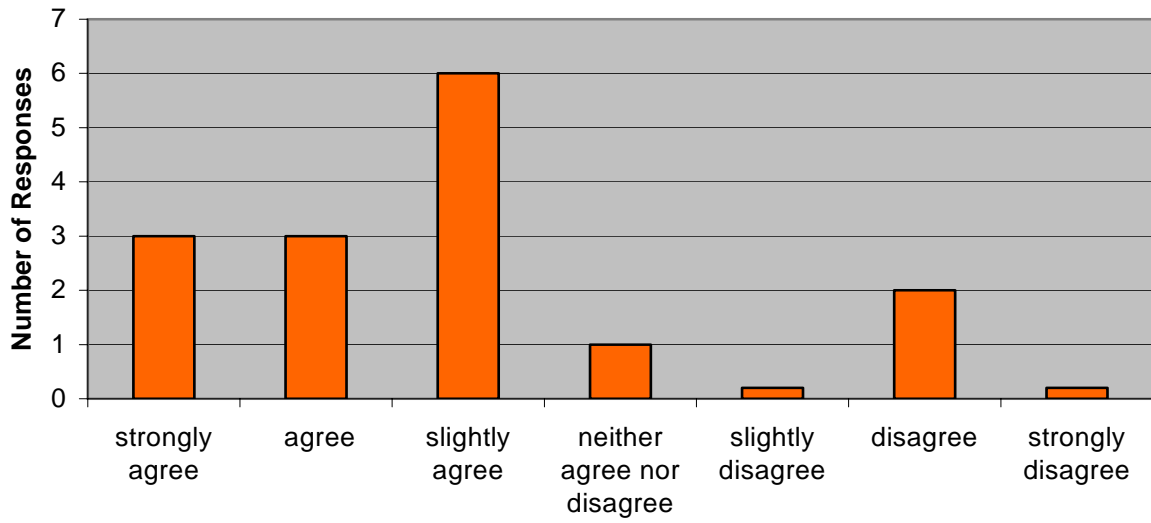


Figure 4-19. Subcontractor needs to monitor working progress of sub-subcontractors (N =15)

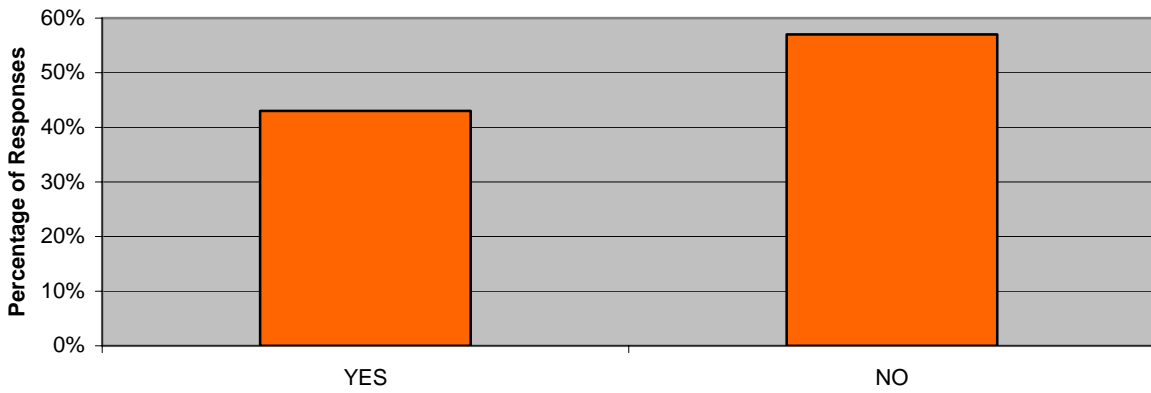


Figure 4-20. Unique safety problems (N = 15)

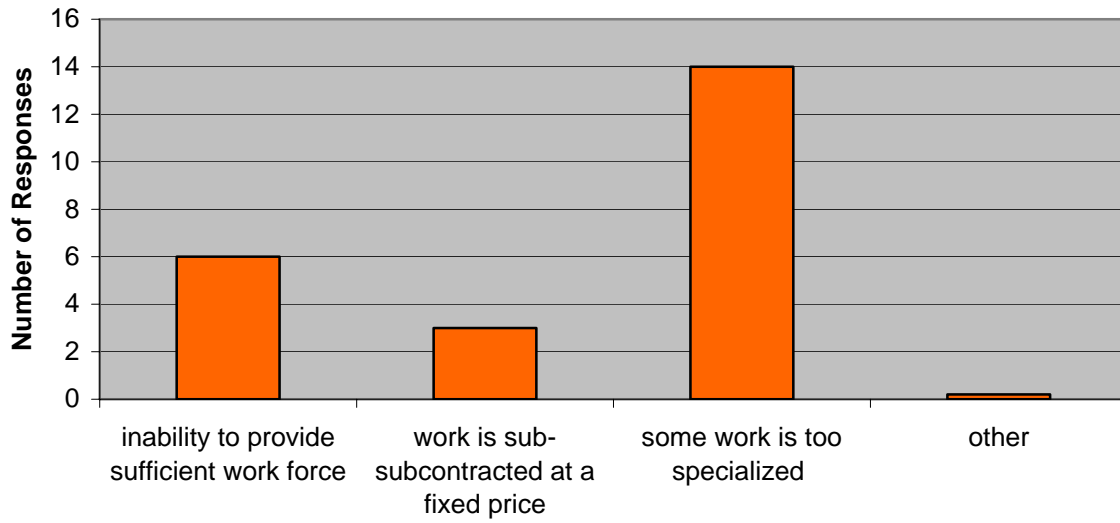


Figure 4-21. Reasons subcontractor sub-subcontract work (N = 23)

CHAPTER 5 CONCLUSIONS

Survival in the construction industry is based on the concept of economic feasibility. Subcontracting has allowed general contractors to sublet a portion or all of their work to decrease costs and increase quality. Due to the time constraints placed on construction projects, subcontractors have adapted to subletting their work for a variety of reasons.

In the past, general contractors self-performed a large portion of their work on construction projects; today, it is not unusual for general contractors to subcontract 100% of their work on commercial or residential projects. Subcontractors have recently adopted the process of subletting some or all of the work in the scope of the subcontract. General contractors have frequently noticed an equal number of subcontractors and sub-subcontractors on their construction projects. This shows that a large percentage of the subcontracted work is being sublet. The data show that the reasons for this increase are due to the lack of specialized labor and an insufficient workforce to complete the tasks at hand. General contractors and subcontractors feel that these two areas are the most common motivations for sub-subcontracting.

Sub-subcontracting occurs on a variety of projects and at differing scales, but the research concludes that it takes place more frequently on complex and larger projects. General contractors and subcontractors feel that complex projects such as hospitals and multifamily structures involve more labor and specialty tasks. The results of this research suggest, if needed, both the general contractor and the subcontractor can predict the necessity for extra services. This means a shortage of labor may deem certain projects out of the question because subcontractors might have difficulty in locating the specialty trades to issue sub-subcontract agreements.

Subcontract agreements with the general contractor can limit the amount of work the subcontractor sublets. The stipulations located in these agreements that pertain to sub-subcontracting overwhelmingly favor the general contractor. In most cases the subcontractor is only allowed to subcontract their work with the permission of the general contractor. The reason for this is because the general contractor retains sole responsibility for the actions of the subcontractor. Subcontractors have a contractual obligation to the general contractor to complete their assigned portions of the work. Permission is required to sub-subcontract any work because the general contractor must take on increased risk if they choose to allow the use of a sub-subcontractor.

Quality and productivity levels of sub-subcontractors are key indicators to their success in the construction industry. The results for these traits were surprisingly positive. Representation of general contractors and subcontractors strongly believed that the quality and productivity levels of sub-subcontractors are about the same or better than that of subcontractors. The data pertaining to quality and productivity support the inference about increased levels of sub-subcontracting. This shows that general contractors and subcontractors recognize the need for sub-subcontracting and most likely encourage the use of sub-subcontracting if it can increase productivity and quality of performance. The only disadvantage to this is that subcontractors feel that they need to continuously monitor the progress of their sub-subcontractors to ensure proper performance. Worker supervision is a problem in every sector of employment and can only be remedied with trust and respect.

Problems on the jobsite with sub-subcontractors were researched in this study. The data showed that the general contractors and the subcontractors did not encounter many disputes with sub-subcontractors. In fact, the general contractors believed they were adequately managing the

sub-subcontractors, thereby mitigating the chance for disputes before they occur. Yet, the general contractors did not deem every action of sub-subcontracting as being praiseworthy. The main dilemma that perturbed the general contractors was the impossibility of determining which workers were employed by subcontractors or by sub-subcontractors. This catch-22 can disrupt the managing style of the general contractor.

The most noteworthy results revealed problems with sub-subcontractor safety. A substantial number of general contractors and subcontractors considered safety to be an issue of concern with sub-subcontracting. The prevailing issues with the practice of sub-subcontracting include no safety programs, language barriers, and ignoring jobsite safety requirements. These issues can be corrected if properly enforced.

Based on the findings of this study, the main conclusion is that sub-subcontracting is steadily increasing. The research concludes that productivity, quality, specialized labor, a strong economy, and insufficient workforce are the top factors driving the practice of sub-subcontracting. Although, sub-subcontracting is risky for both the general contractor and subcontractor, the services provided are worthy of the final product.

CHAPTER 6 RECOMMENDATIONS

Recommendations for the Construction Industry

General contractors need to recognize that the practice of sub-subcontracting occurs often and is on the rise. Since a contract agreement is not established between the general contractor and the sub-subcontractor the general contractor must maintain good control of the sub-subcontracting process. The general contractor must also monitor all subcontractors to make sure they are following the stipulations regarding sub-subcontracting in their subcontract agreements. Also, if the general contractor does not know whom to direct on the jobsite, effective management skills may be compromised. A simple solution can remedy the situation; all workers on the jobsite are required to display identification badges on their hard hats. This system would not only solve the problem, but also increase security within the premises.

Recommendations for Future Research

Additional research on this topic will greatly improve its relevancy to the construction industry. The first recommendation is for a future study that targets small to mid range general contractors and subcontractors to gain an understanding of their perspective on the use of sub-subcontracting. Previous studies have generally focused on large firms, but these studies excluded the residential and small commercial sectors of the construction industry.

The third recommendation is that the study be conducted on a larger scale through personal interviews and surveys. Personal interviews can lead to further explanations of the results obtained in this study. These interviews should take place on several jobsite locations with field personnel. Also, meticulous observation notes should be taken on the behavior of sub-subcontractors to gain insight into the subcontractors' dilemma of having to continuously monitor their sub-subcontractors.

The fourth recommendation is to have more in-depth research on the type of work that is sub-subcontracted. This will provide a list of pre-defined tasks that the general contractor can be aware of before subcontracting the work. By re-packaging work items, the general contractor might be able to subcontract directly with firms that would otherwise be sub-subcontractors.

The last area of suggested investigation is the frequency of multi-tier subcontracting in disaster areas. The purpose of such a study would be to examine the magnitude of sub-subcontracting in areas that have been devastated by natural disasters. These areas are more prone to less stringent building code enforcement and have been noted to be built by shoddy multi-tier contractors. This study would compare the issues discussed in this study with the prevailing issues found in disaster areas.

APPENDIX A
GENERAL CONTRACTOR AND SUBCONTRACTOR SURVEYS

Contractor Survey Questionnaire

General Contractor Experience with Sub-Subcontractors

The following questions are to identify the general contractor's familiarity with sub-subcontractors based on your experience. Please check the appropriate option(s) and give brief answers. The questionnaire can be finished within five minutes. Thank you for your participation.

1. In the past fiscal year, what was the approximate amount of the total revenues of your firm?
\$ _____ million

2. What percent of the construction work is self performed by your firm? _____ %

3. How many subcontractors are involved on a typical project? _____ subs

4. Is sub-subcontracting more common on some types of projects than others?
 YES NO

If yes, explain: _____

5. How many sub-subcontractors are involved with a typical project? _____

6. How is the issue of sub-letting work addressed in your subcontract agreements?

- the issue of sub-subcontracting is not addressed
- the subcontractors can sub-subcontract the work if approved by the general contractor
- the subcontractors are forbidden to sub-subcontract any of the work
- other: _____

7. What specialty(s) are most commonly sub-subcontracted on your projects?

(please check all that apply)

- insulation fire-safing framing roofing low-voltage specialty systems
- excavation drywall masonry traffic control landscaping
- caulking & sealants other _____

8. How would you generally rate the quality of work of sub-subcontractors?

- better than subcontractors
- about the same as subcontractors (no apparent difference)
- lower quality done by sub-subcontractor

9. How would you generally rate the productivity of work performed by the sub-subcontractor?

- better than subcontractors
- about the same as subcontractors (no apparent difference)
- lower productivity done by sub-subcontractor

Subcontractor Experience with Sub-Subcontractors

The following questions are to identify the subcontractor's familiarity with sub-subcontractors based on your experience. Please check the appropriate option(s) and give brief answers. The questionnaire can be finished within five minutes. Thank you for your participation.

1. In the past fiscal year, what was the approximate amount of the total revenues of your firm?
\$ _____ million

2. What is your firm's specialty trade? _____

3. What percent of the construction work is self performed by your firm? _____%

4. How many sub-subcontracts are awarded by your firm on a typical project? _____

5. Is sub-subcontracting more common on some types of projects than others?
 YES NO

If yes, explain: _____

6. How is the issue of sub-letting work addressed in the subcontract agreements your firm executes with general contractors?

- the issue of sub-subcontracting is not addressed
- the subcontractors can sub-subcontract the work if approved by the general contractor
- the subcontractors are forbidden to sub-subcontract any of the work
- other: _____

7. What types of construction specialty(s) does your firm most commonly sub-subcontract on your projects? (please check all that apply)

- insulation fire-safing framing roofing low-voltage specialty systems
- excavation drywall masonry traffic control landscaping
- caulking & sealants other _____

8. How would you generally rate the quality of work of sub-subcontractors?

- good
- improvement desired
- not observed
- unsatisfactory

9. How would you generally rate the productivity of work performed by the sub-subcontractor?

- good
- improvement desired
- not observed
- unsatisfactory

10. Which of the four services do sub-subcontractors provide most commonly for your firm?

APPENDIX B
INSTITUTIONAL REVIEW BOARD SURVEY COVER LETTER

November 11, 2006

To: Potential Study Participants

Subject: Practice of Sub-Subcontracting

We, the M. E. Rinker, Sr. School of Building Construction at the University of Florida, are conducting a study in the United States on the practice of sub-subcontracting. The focus of the study is to examine the practice of sub-subcontracting and the effects it has on the construction industry.

The study will be conducted through a survey in which a variety of questions will be asked about your background and your experience with sub-subcontracting in the construction industry. There are no risks associated with participating in this study and the survey can be completed in about five minutes. A copy of the results summary will be provided to any interested participants. Naturally, you are asked to answer only those questions that you feel comfortable in answering.

Your individual responses will be kept strictly confidential to the extent provided by law. Research data will be summarized so that the identity of individual participants will be concealed. You have my sincere thanks for participating in this valuable study.

Sincerely,

Joshua Markowitz

Building Construction Graduate Student

Phone: (954) 609-0249

Fax: (352) 392-4537

Email: humes1@ufl.edu

hinze@ufl.edu

P.S. For information about participant rights, please contact the University of Florida

Institutional Review Board at (352) 392-0433 or Email: IRB2@ufl.edu.

LIST OF REFERENCES

- Arditi, D., and Chotibhongs, R. (2005). "Issues in subcontracting practice." *J. Constr. Eng. and Manage.*, 131(8), 866–876.
- Elazouni, A. M., and Metwally, F.G. (2000). "D-SUB: Decision support system for subcontracting construction works." *J. Constr. Eng. and Manage.*, 126(3), 191–200.
- Hsieh, Ting-Ya. (1998). "Impact of subcontracting on site productivity: Lessons learned in Taiwan." *J. Constr. Eng. and Manage.*, 124(2), 91–100.
- Hinze, Jimmie, and Andrew Tracey. (1994) "The contractor-subcontractor relationship: The subcontractors view." *J. Constr. Eng. and Manage.*, 120(2), 274–287.
- Proctor, Joseph R. (1996). "Golden rule of contractor-subcontractor relations." *Pract. Periodical on Struct. Des. and Constr.*, 1(1), 12–14.

BIOGRAPHICAL SKETCH

Joshua Markowitz received his Bachelor of Science in political science from Florida State University, Tallahassee, Florida, in April 2005. After graduation, he enrolled in the graduate program in the M.E. Rinker, Sr. School of Building Construction at the University of Florida, Gainesville, Florida, to pursue a Master of Science in building construction.

Joshua was born in Miami, Florida. Upon graduation, he will move to Columbus, Ohio to work as a Project Engineer. He hopes to become very successful and someday contribute to the development of collegiate construction education.