AN ANALYSIS OF PRE-PLANNING RISK MANAGEMENT PRACTICES UTILIZED IN RESIDENTIAL AND COMMERCIAL CONSTRUCTION PROJECTS

By

Troy D. Bertagnoli

A Research Paper

Submitted in Partial Fulfillment of the
Requirement for the
Master of Science Degree
With a Major in

Risk Control

Approved: ____ Semester Credits

_____
Dr. Brian Finder
Investigation Advisor

The Graduate College
University of Wisconsin-Stout
December 2002

The Graduate School
University of Wisconsin-Stout
Menomonie, Wisconsin 54751

ABSTRACT

Bertagnoli Troy D
(Writer) (Last Name) (First) (Initial)

An Analysis of Pre-planning Practices Utilized in Residential and Commercial Construction Projects
(Title)

Risk Control Dr. Brian Finder December/02 52
(Graduate Major) (Research Advisor) (Month/Year) (No. Of Pages)

APA Format
(Name of Style Manual Used in this Study)

The construction industry is one of the most dangerous industries in the United States. In order to compete in today's industry, contractors must treat risk control like other essential company functions by allocating personnel and funding to ensure asset protection. An analysis was performed to identify deficiencies in the pre-planning practices of a general contractor located in northwest Wisconsin. The analysis identified losses associated with deficiencies in the risk management system as well as techniques contractors can utilize to significantly reduce their risk of experiencing human, equipment, environmental, and financial based loss. Guidelines for developing and implementing a successful pre-planning program were outlined as well key program components.

Acknowledgements

A sincere appreciation is extended to the University of Wisconsin-Stout and special thanks to the Risk Control Department Faculty, Dr. Brian Finder, Dr. Elbert Sorrell, Craig Jameson, Steven Senor, and Scott Staffon. Through their efforts and support I have acquired the knowledge and skills that will enable success as a risk control professional.

Table of Contents

CHAPTER 1

Statement of the Problem

Introduction

The construction industry is often considered one of the most important industries in the United States. In 1998, it accounted for $325 billion, or one tenth of the total gross national product, as well as the employment of millions of workers (Feirer, Hutchings, & Feirer, 1997). The Construction Industry is divided into three major divisions; building construction, heavy construction, and a combination of electrical, mechanical, and special trade. Construction Contractors in each division are referred to as general or specialty contractors. General contractors are responsible for the overall completion of a project. These contractors enter into a contract binding them to completion of a project by a set date and at a specific cost. Specialty contractors (also referred to as subcontractors), enter into agreement to complete specific portions of a project at a set price. The general contractor however, is responsible for all subcontractor performance as well as the job site. Given the number of subcontractors that could occupy a construction site at any given time, the wide variety of working conditions, and the vast number of tools used, a construction site is extremely difficult to control (Spence, 1998).

Difficulty controlling construction sites can be realized through analysis of data compiled by the Bureau of Labor Statistics for contractors specializing in the construction of single-family homes, residential buildings, industrial buildings, and warehouses. Based on this data, these contractors have accounted for an average of five hundred thirty six fatalities per year over the course of the past six years. In addition, the construction industry is surpassed only by the mining trade with regard to accidents involving lost-

time and work related fatalities (Fullman, 1993). However, these staggering statistics do not reflect the total loss incurred from a loss-producing situation or event. There are several additional and indirect costs associated with an accident, injury, illness, or a fatality. These direct losses often include settlements of medical fees, death claims, legal fees, equipment damage, and possible Occupational Safety and Health Administration (OSHA) citations. Indirect costs, which may be substantially greater, may include loss of production, training, increased insurance costs, and a detrimental loss of public confidence (Hammer, 1985).

These Bureau of Labor loss statistics, as well as Company XYZ loss records, clearly represent the propensity for loss in the construction industry. When this propensity for loss is coupled with an inadequate safety/loss control program, a company is greatly increasing the potential for loss. In the case of XYZ Company, this loss potential was realized in the form of an accident resulting in substantial human, equipment, and financial based loss. Although preplanning may not have completely prevented the accident, it would have minimized the amount of loss sustained, as well as decreased the amount of lost time and productivity. Poor planning, inadequate training, and inadequate insurance coverage resulted in direct losses in excess of $30,000.00 for this particular incident, and indirect losses are estimated to exceed $200,000.00. This situation reinforces the importance of preplanning and indicates that the lack of a comprehensive preplanning and assessment program is placing XYZ Company at an elevated risk of human, environmental, facility, equipment, and financial based loss.

Purpose of the Study

The purpose of this study is to determine the extent that pre-planning practices are being utilized at XYZ Builders.

Goals

There are two primary goals this research will address. They are:

1. Analysis of past losses related to pre-planning practices.
2. Analysis of XYZ Company's current pre-planning practices.

Background and Significance of this Study

Prior to the formation of the Occupational Safety and Health Administration (OSHA) in 1970, job related accidents accounted for more than 14,000 worker deaths, 2.5 million disabilities, and an estimated 300,000 cases of occupational disease each year. With the passing of the Occupational Safety and Heath (OSH) Act came a substantial decline in statistics. However, the existence of hazards and unsafe conditions still account for 56,000 deaths, six million injuries, and $125 billion cost to businesses annually (OSHA, 2000). Of these fatalities, the construction industry accounts for a substantial number, ranging from several hundred to several thousand each year. Based on these statistics, construction is classified as one of the most hazardous industries (OSHA, 1990) in the United States.

As one of the most hazardous industries in the United States, accidents, injuries, and fatalities are prevalent. Thus, placing a very heavy burden on employers in the construction industry. In 2001, the average cost of a work injury resulting in a disability, which includes only wage and productivity loss, medical expenses, and administrative fees, was estimated at $29,000 per case. The average cost of a work injury resulting in

death was estimated at $1,020,000 per case (NSC, 2002). The figures are considered direct costs associated with an injury or fatality. From an indirect cost standpoint, losses associated with and accident, injury, or fatality include new hire training, repair of damaged property, accident investigation time, schedule delays, and reduced morale. The ratio of indirect to direct costs can be as high as 40:1. Based on the 40:1 ratio provided by OSHA, a $5000.00 accident or injury could result in losses in excess of $200,000 (OSHA, 1996).

Construction accidents and injuries also result in an increase in insurance premiums and possible termination of coverage. The fourth quarter results of 2001 were the worst in insurance history. Both the terrorist attacks of the World Trade Center on September 11, 2001 and the Tropical Storm Allison had a very adverse effect on reserve development, which caused a hardening of the insurance market. The depletion of company reserves coupled with the reduced profit margin of investments has caused insurance companies to increase rates and urge companies to focus more on loss control activities (Lagomarsino, 2002). Insurance Industry losses have had a dramatic impact on construction contractors from the standpoint of raising liability rates from 20 to 75 percent. In addition to increased premium rates, underwriters are adding more exclusions and imposing very stringent underwriting standards than ever before. Contractors may find a more reasonable rate through insurance bundling and selection, but it is becoming evident that safety is more crucial to the success of a company than ever before (Builder Online, 2002).

Assumptions of this Study

All information provided by participating parties is accurate and correct.

Definitions

Aggregate Limit: Limit used in liability insurance policies that states the greatest financial amount an insurer will provide during a policy term (Williams, Smith, & Young, 1988).

General Contractor: A contractor who assumes full responsibility for a project for a specific cost and by a specific date (Spence, 1998).

Hard Insurance Market: An insurance market that exhibits a rise in premium costs and decrease in availability (APA Insurance Trust, 2002).

Indemnification: An agreement in which one party agrees to compensate a second party for a loss that the second party would normally bear (Clough & Sears, 1994).

Insurance Bundling: Purchasing all required insurance from the same carrier (Builder Online, 2002).

Per Occurrence Limit (Single-limit liability): Policy limit on all claims per occurrence (Williams, et al., 1998).

Soft Insurance Market: An insurance market that exhibits low prices and increased availability (APA Insurance Trust, 2002)

Standard Industry Code (SIC)**:** numerical codes designed by the U.S. Government in order to create uniform descriptions of business establishments (ISO Properties, Inc., 2002).

Subcontractor: Also known as specialty contractors who perform work for general contractors in their technical area (Spence, 1998).

CHAPTER 2

Review of Literature

Introduction

The purpose of this review of literature is to examine preplanning methods and techniques that reduce or eliminate losses to construction contractors. Successful construction projects require detailed planning, coordination, and execution long before the actual construction begins. Various factors which must be considered to ensure the feasibility of the design and acceptance of a project include zoning, soil testing, building and fire codes, frost lines, groundwater levels, site access, local bylaws, service availability, weather conditions, and labor supply. When an owner and a General Contractor reach an agreement, the general contractor assumes all project liability including budget, deadlines, and adherence to project specifications. Defects or failures in these areas can result in substantial financial losses. In order to ensure efficiency and profitability, quality control and safety must be addressed in the preliminary planning stages and enforced throughout the entire project (Smith & Andres, 1993). During the remainder of this chapter, a chronological analysis will be used in this process as it relates to the undertaking of a construction project.

Contract Review

In order to properly assess all the risks associated with a project, a contractor must understand the construction contract completely. The contractor must examine the contract thoroughly to identify any alterations or deviations of the original proposal for work, as well as any clauses or exclusions that were not discussed during negotiations. Clauses and exclusions can present the risk of significant loss if not identified prior to

contract signing. For example, the lack of a change clause could require a contractor to perform additional work caused by changes in the plans without any form of financial compensation (Palmer, Maloney & Heffron, 1996). If the change required seventy-five man-hours at an average of $35.00 per hour for employee wage and benefits, it would cost the contractor $2625.00. This would be pure loss with no chance of reimbursement, which may also put a project behind schedule and cause a contractor to incur additional financial loss. Contract understanding must include contracts with subcontractors and suppliers providing service as well as owners. All proposed services and fees for service must be clearly presented in contracts. The contractor must verify that the contracts clearly state what is to be done and for what cost. A vaguely written contract could cause problems with regard to future claims (Palmer, et al., 1996). If not properly written or interpreted, contracts drafted and negotiated in the initial phase of a project can negate any possible form of profit. Thus, emphasizing the need for detailed contract drafting and review before entering into an agreement or engaging in production.

Contractual Risk Transfer and Project Insurability

General contractors entering into a contract with an owner assume a large amount of risk. In order to mitigate the loss potential of a project, contractors must identify risk exposures and develop an effective control strategy. The two primary areas of risk that must be addressed are contractual risks and insurability of projects. Contractual risk transfer commonly utilizes indemnification provisions in either broad or intermediate forms. In either case, a contractor should obtain legal counsel to interpret the contract to ensure compliance with statutes, which vary on a state-by-state basis. Project insurability relates to the facilitation of insurance, which is an efficient way to minimize loss through

transfer to an insurer based on the assumption that an accident will probably occur (C-Risk Inc., 2001).

The use of conventional insurance as a method of risk transfer has always been a common technique. However, the terrorist attacks on the World Trade Center and the Tropical Storm Allison have had an adverse effect on the reserve development of insurance companies that has led to an increase in premiums and the termination of certain coverages for companies with an elevated loss history. Therefore, contractors must approach the purchase of insurance policies cautiously to ensure that the policy will provide the necessary coverage for a project (Lagomarsino, 2002).

Insurance selection

Insurance selection may be critical to the success of a project. In order to ensure that all aspects of liability have been addressed, a contractor must set up a comprehensive insurance program. In many cases an owner may choose to purchase a policy to keep overall project costs down, however that coverage may not provide adequate protection for the contractor. In either case, a contractor must analyze the risks associated with a project and purchase coverage based on those risks. A comprehensive insurance program will address the following:

- Appropriate perils are covered.
- All exclusions are recognized and accounted for.
- Policy provides full replacement costs.
- Policy covers tools, equipment, and materials
    - -On site
    - -In transit to site

-When temporarily stored off site.

- Temporary works are covered

-Scaffolding

-Falseworks

-Shoring

-Fences

-Lighting

-Temporary structures

- Coverage begins and ends on dates appropriate to a project (Pierce, 2001).

Every project will have specific needs that must be addressed, and although projects may be similar, they will yield significantly different risk control issues. The vast number of risk control issues that are unique to each project increase the importance of pre-project analysis and risk identification procedures in the prevention of accidents. Through analysis and identification procedures, contractors break down the phases of a project and determine whether or not coverage's are appropriate based on the components listed in the previous paragraph (Pierce, 2001).

In addition to coverage needs, insurance must also be selected based on the company's financial strength. A contractor must examine deductibles to determine whether the company has the financial strength to cover that cost as well as maintaining all other essential company functions. It would not be feasible for a small company to assume a large deductible plan ($250,000.00 or more), if their annual gross intake is less than five million dollars due to the narrow profit margin in the construction industry. In addition, contractors must also determine if per-occurrence and annual aggregate

limitations are appropriate for the scope of work being performed. A contractor must examine past and potential loss amounts to determine if the per occurrence and annual aggregate limits are sufficient to cover potential losses and determine whether additional insurance coverage is appropriate (Palmer, et al., 1996).

Pre-project Planning

Construction projects are commonly based on some type of critical path planning method (CPM). Contractors utilizing CPM have diverted from the once prominent lean construction philosophy in which waste is not planned or accepted. With regard to loss control however, waste is never planned, thus requiring companies to revert to a modified version of the lean philosophy called the Generated Plan (GP) if they want to be successful (Ghio, Valle & Rischmoller, 1997). Through analysis of crew composition, daily construction volume, crew sizes, applicable tools and equipment, and construction rhythms, a detailed plan is developed. The analysis methodology is as follows:

- Subdivide the project into phases and assign production responsibilities.
- List all activities and associated risks, as well as individuals responsible for completion.
- Form optimum crews based on experience and qualifications.
- Set safe and cost effective production rates.
- Divide all activities as primary or secondary.
- Calculate construction volumes.
- Calculate the time required to build each area and divide by the construction volume calculations to modify time-periods.

- Adjust the number and composition of crews to ensure that they will be performing productive work continuously.
- Develop a Line of Balance (LOB) to avoid conflict (Too many workers in one area) (Mendes & Heineck, 1998).

This planning method allows for accurate planning, project control, proper utilization of labor, and can easily be updated and verified. The Generated Plan's success lies in the five principles that ensure project success. These principle include:

1. The elimination of waste through scheduling of work to promote the continuity of labor teams, achieving maximum performance.
2. The minimization of variances through the grouping of activities, which promotes attention to quality assignments and problem solving.
3. The use of visual management is essential to the line of balance method, which promotes better learning, planning and control tools, and the development of an individual form of understanding.
4. The production of flexible plans that permit change of a group schedule without affecting the overall plan.
5. The scheduling sequence promotes higher productivity of whole groups and pays little attention to intermediate dates (Mendes, et al., 1998).

The Generated Plan is not aimed specifically at safety planning, but at the elimination of waste. Through detailed research and pre-project planning, contractors are able to determine the essential steps in completing a project, who will be responsible for the completion, and appropriate production rates. In addition, contractors are able to design the most effective work teams to insure quality, safety, and success. Using the GP,

contractors are able to eliminate uncertainty, ensure project success, and increase bottom line profits (Mendes, et al., 1998), therefore emphasizing the financial benefit of integrating the Generated Plan method into a pre-project planning program.

Crime Prevention and Loss Control

Due to the competitiveness of the construction industry, profit margins tend to be very slim. In order to minimize loss and realize profit potential contractors must develop and maintain an active site security program. A successful program will prevent theft and vandalism, protect the public, improve job conditions, enhance productivity, and increase bottom line profits. By reducing the frequency of insurance claims and eliminating employee attempts to replace a stolen piece of equipment with a makeshift solution, a contractor dramatically reduces both loss and loss potential (MCISC, n.d.).

Material and hand tool theft may seem insignificant when looking at profitability of a multi-million dollar project, however, the theft of these items can actually add up to very significant financial loss. An analysis of insurance records by the Milwaukee Construction Industry Safety Council and the Associated General Contractors of Greater Milwaukee revealed that the total loss incurred from the theft or vandalism of an item is four to six times it's original cost. Additional losses stemming from theft or vandalism include the loss of production and wages paid to employees who must purchase and deliver the replacement item (MCISC, n.d.). Therefore, the theft of a $125.00 circular saw may cost a company as much as $600.00.

In order to eliminate losses associated with theft, vandalism, and the public, contractors must utilize all of the necessary security methods that are available. Granted, even though the needs may vary on a site-by-site basis, most sites have similar hazards

and loss producing potential. By installing items such as security fencing, lighting, alarms, storage trailers, electrical shutoffs, and lockouts, contractors greatly reduce the risk of theft and vandalism from the public sector. In addition to the public sector, contractors must also prevent loss associated with employee sabotage and theft of tools, equipment, and materials. By maintaining proper key control, vehicle check in, and spot checking, contractors may eliminate the risk of loss associated with their own and subcontracted employees (MCISC, n.d.).

In order to ensure success, these tasks must be carried out before the inception of a project and until project completion. A contractor's liability is extended until the owner assumes possession of the project, therefore, the contractor must ensure that the project is not damaged in any way before the change of possession. Thus, emphasizing the importance of pre-planning and assessment of the site to ensure the safety of the public, employees, subcontractors, and the employer's own financial well being (MCISC, n.d.).

Multi-Employer Work Sites

OSHA defines a multi-employer worksite as one in which two or more companies are performing tasks toward the completion of a project. The companies may or may not be contractually bound, however in most cases the general contractor is considered the controlling employer because they are responsible for overall site coordination, scheduling, and project completion. Under OSHA regulations, the general contractor may be cited if they have employees exposed to a hazard, created a hazard, had the responsibility to correct the hazard and failed to, or knew about the hazard and failed to inform others (ACCSH, 1999). This standard significantly increases the amount of risk a general contractor assumes when hiring a subcontractor to complete a specific task.

In addition to responsibilities and requirements identified in the construction contract, general contractors must perform several additional activities in order to mitigate the elevated loss potential assumed by subcontracting work. The process must begin during the pre-job planning phase of the project in which the general contractor must identify and communicate with subcontractor safety representatives, establish primary safety responsibility issues, and establish requirements for regular pre-construction, progress, and safety meetings. In addition, the general contractor must establish a program to promote cooperation among contractors, monitor overall site safety, conduct safety audits, require the presence and posting of Material Safety Data Sheets (MSDS), and monitor and assist in accident investigations (Emmerich, 2001). These additional responsibilities increase the contractor's role in project completion and liability rather than transferring the risk, which is likely to be a common misconception in the construction industry.

Subcontractor Selection

The selection of construction partners (commonly referred to as subcontractors) is crucial to both the safety and success of a project. This selection practice may rule out subcontractors with the lowest bid, or even rule out subcontractors that have a record of being extremely efficient, however it will decrease the potential of incurring loss arising from the poor safety behavior of contractors. As a rule, subcontractors with a poor history of safety performance are ruled out and subcontractors with a comprehensive, well communicated, and enforced safety program are selected. Selecting a subcontractor with a proven record of accomplishment is well worth the differential in bid amounts when a contractor examines the project from a holistic standpoint. The bid difference,

which is usually marginal, is very cost-effective considering the financial burden, administrative time, and business interruption incurred from an accident arising out of the behavior of a subcontractor with a lackadaisical approach to safety (Hislop, 1998).

According to Turner Special Projects Corporation, the subcontractor selection process can be broken down into seven primary areas that will allow for subcontractor selection as soon as possible following the request for bid exercise. The process consists of:

- Proactive solicitation of competitive prices using a pre-selected list of subcontractors based on their financial and performance record.
- Early release of identified materials and coordinating equipment and services to facilitate compliance with project deadlines.
- Establish an information loop in which owners, architects, and project coordinators, are kept up to date on changes and have the option of adding or deleting bidders from the proposed list.
- Distribution of invitation letters before the release of the bid package to inform prospective contractors of preliminary schedule information, scope of work to be bid, bid date, and architectural firm responsible for design. Letters are specific to each trade and designed to assure competitive bids, reduce exposure, risks, and surprises.
- Following the distribution of bid packages and before bid receipts, the general contractor will hold a pre-bid meeting to provide relevant information and field any questions.

- Upon reception of bids, subcontractor bids are analyzed and compiled into summaries for review.
- Award of bids will be based on the contractor's ability to comply with schedules, standards, insurance requirements, and complete contract requirements (Turner Corporation, 2002).

The proper selection of contractors based on these seven principles will ensure cost and quality control (Turner Corporation, 2002). It is crucial to award bids to subcontractors that have an excellent history of past performance, but they must also carry adequate insurance coverage. If the contractor's insurance coverage is not adequate, it may pose a significant risk to the general contractor or require the purchase of additional insurance to protect their assets. The selection of quality subcontractors can enhance project success and increase bottom line profits, however the selection of poor contractors increases risk and loss potential.

Summary

Measurement and benchmarking of the pre-project planning process in construction projects has been performed and yielded significant results. The data analysis of 62 projects with more than $3.4 billion in authorized costs revealed as much as 20 per cent increases in cost performance, as much as 40 per cent increase in schedule performance, and reduced project risk (Hamilton & Gibson, 1996). The effectiveness and financial benefits of pre-project planning in the 62 projects in the study may not be indicative of all projects that utilize pre-project planning, however the potential benefits may provide significant reason to perform the operations.

Pre-project planning practices may be part of another program or be utilized under a different name, however the utilization of the key elements will enhance a company's profit potential and reduce the probability of loss. The planning procedure must begin at the inception of a project before any negotiations or bids. When it is determined that a project is feasible and constructible, a general contractor will enter into an agreement with an owner which is bound by a contract. The contract between the general contractor and the owner is a binding agreement in which the contractor agrees to perform a specific task at a set price within a specified timeframe. In order to protect company assets, the contractor must completely understand the construction contract and ensure that all aspects of the project are listed and understood. Following contract signing a contractor must begin to plan for the completion of a project including risk transfer, insurance selection, project specific pre-planning, crime prevention, and subcontractor selection. The failure to follow through with any of these aspects of pre-project planning will significantly increase the potential of human, equipment, environmental, and financial based loss.

CHAPTER 3

Methodology

The purpose of this study was to determine the extent that pre-planning practices are being utilized at XYZ Company. The company's history of elevated loss suggests deficiencies in their management practices that may be contributing to that loss. To decrease the potential for loss, the company's pre-planning practices were selected to undergo analysis.

Objectives

1. Evaluate XYZ Company's current pre-planning practices to identify any deficiencies.
2. Analyze links between deficiencies in the company's pre-planning practices and past losses.
3. Determine the role of inadequate pre-planning practices with regard to the success and profitability of a project.

Evaluation

An evaluation form, which is located in the Appendix, was developed through review of the predominant pre-planning practices utilized by similar contractors in the construction industry. The form addresses pre-planning practices that are critical to the success of a project. The evaluation entailed a document review, as well as the observation of pre-project planning procedures related to a large commercial construction project. The form was designed in a chronological fashion addressing the critical pre-planning practices in the order they are implemented in a project. Each critical practice was addressed through document review and/or observation to determine whether or not

it has been performed effectively. Upon completion of both the evaluation and the project, losses were identified through review of applicable loss records and linked to pre-planning practice deficiencies through review of the company's accident investigation report and the application of the ILCI Loss Causation Model.

CHAPTER 4

Results and Discussion

The purpose of the study was to determine the extent that pre-planning practices are being utilized at XYZ Company. An evaluation form was developed to analyze the pre-planning practices being utilized in a large commercial construction project and to determine the amount of loss associated with deficiencies in those practices.

This chapter will present the results of this study in three sections. The first section presents the completed evaluation form, including losses and a project summary. The second section will summarize the losses sustained during the project and specific links to deficiencies in pre-planning practices. The third section will discuss the role of inadequate pre-planning practices with regard to the success and profitability of a project.

Completed Pre-planning Practices Evaluation Form

I. Project Information

1. Company Name: *XYZ Company*
2. Project Location: *Withheld*
3. Designed by: □ Contractor ■ Owner □ Professional Design Firm: _____
4. State Approval: ■ Yes □ No
5. Contractors Role: ■ General Contractor □ Subcontractor □ Construction Manager
6. Scope of Work: *Construction of an 86,000 square foot post framed commercial storage facility.*
7. Bid Amount: *$275,000.00 (Labor and Equipment Only)*
8. Bond Required: □ Yes ■ No

   □ Performance: $_____

□ Bid: $_____

II. Contract Review

1. Contracted by: *Owner*

2. Type of Contract: ■ Formal □ Informal □ Verbal

3. Contract drafted by: *Owner*

4. Reviewed by Attorney: □ Yes ■ No

5. Contract negotiated: ■ Yes □ No

6. Change clause: ■ No □ Yes: (List terms of clause: _____)

7. Contract content interpretation/understanding (Based on retrospective analysis):

Check one:

□ Inadequate ■ Adequate □Exceptional

III. Subcontract Review

1. Contracted to: *Withheld*

2. Type of Contract: □ Formal □ Informal ■ Verbal

3. Contract drafted by: *N/A*

4. Reviewed by Attorney: □ Yes ■ No

5. Contract negotiated: □ Yes ■ No

6. Change clause: ■ No □ Yes: (List terms of clause: _____)

7. Contract content interpretation/understanding (Based on retrospective analysis):

Check one:

■ Inadequate □ Adequate □ Exceptional

8. Additional information: *The subcontract was a verbal agreement requiring the general contractor (XYZ Company) to provide $45.00 per hour to the subcontractor for labor, equipment, and services.*

IV. Insurance Selection

1. OCIP (Owner Controlled Insurance Program): ☐ Yes ☒ No

2. CCIP (Contractor Controlled Insurance Program: ☐ Yes ☒ No

3. Policies purchased/held: Check all that apply and list specific limits:

   ☒ General Liability: $1,000,000.00

   ☐ Per project aggregate limit: $ _____

   ☐ Umbrella/excess liability: $ _____

   ☒ Auto: $ (Withheld)_____

   ☒ Worker's Compensation: $ (Withheld)_____

   ☐ Completed operations: $_____

   ☐ Environmental/pollution liability: $_____

   ☐ Damage to owner's adjacent property: $_____

   ☒ Builders risk: $ (Withheld)_____

   ☐ Owned equipment: $_____

   ☐ Rental equipment: $_____

   ☒ Tool Coverage: $ (Withheld)_____

4. Additional Information: *No project specific insurance was purchased for this project.*

V. Pre-project Planning Practices:

1. Practices performed or planned into project: Check all that apply:

- ☐ Written policy
- ☐ Provided necessary information to project foreman
  - ☐ Job hazard analysis information
  - ☐ Hazard analysis cards
- ☐ Formal Hazard analysis
- ☐ Purchase or preparation of personal protective equipment
- ☐ Subdivision of project
  - ☐ Responsibilities
  - ☐ Tasks
- ☐ Set production rates
- ☐ Formed crews based on experience/qualifications
- ☐ Pre-project meetings
  - ☐ Safety
  - ☐ Progress
- ☐ Verified training
- ☐ Developed emergency plan
- ☐ Assigned responsibilities
  - ☐ Production
  - ☐ Safety
- ☐ Review of project plan

2. Additional Information: *Contractor purchased fall protection equipment.*

VI. Crime Prevention and Loss Control

1. Check all that apply

- ☒ Security fencing
- ☒ Lighting
- ☐ Alarms
- ☒ Storage trailer(s)
- ☐ Electrical shut-offs
- ☐ Key control program: (Performed by: _____)
- ☒ Vehicle check-in: (Performed by: *Owner*_____)
- ☐ Inventory control: (Performed by: _____)
- ☒ Vehicle passes: (Provided by: *Owner*_____)
- ☐ Spot checking: (Performed by: _____)
- ☐ Secured area for materials
- ☐ Written policy

2. Additional Information: *Project was located in secure area operated by owner. Owner provided gates and check-in, but did not provide services to secure contractors assets*.

VII. Multi-employer Considerations

1. Check all that apply

- ☐ Written policy
- ☐ Communicated with subcontractors

- □ Held pre-project meetings
- □ Held pre-construction meetings
- □ Held pre-construction safety meetings
- □ Developed progress meeting schedule
- □ Developed audit plan
- □ Developed site monitoring plan

2. Additional Information: *There were no meetings held or planned.*

VIII. Subcontractor Selection

1. Check all that apply:

- □ Held pre-bid meetings
- □ Utilized pre-qualification
- □ Obtained subcontractor safety information
- □ Obtained subcontractor certificate of insurance

2. Additional information: *The subcontractor was selected based on low bid only.*

IX. Project outcome

1. Was completion date met: □ Yes □No: (Explain: *XYZ Company was removed by owner prior to completion.*)

2. Near hit/accidents: *One serious accident occurred during the project. The employees injured during the collapse of the roof system components required medical attention.*

3. Losses

3.1. Insured (*Direct costs only): Approximate loss total: *$166,985.00*

- *$4985.00 for damaged roof system components.*
- *Hospitalization of employees in excess of $125,000.00*
- *Worker's Compensation payments to injured employees in excess of $37,000.00.*

3.2. Uninsured (*Direct costs only): *Approximate loss total: $26,485.00*

- *$8100.00 for damage to rental equipment.*
- *$845.00 wages paid for removal and disposal of damaged trusses.*
- *$2400.00 paid for crane rental during down time.*
- *$1075.00 paid for rental equipment during down time.*
- *$2440.00 wages paid during down time and OSHA investigation.*
- *$195,000.00 lost revenue as a result of being removed from the project. At 3% profit margin pure profit losses would exceed $5850.00*
- *$3500.00 OSHA citations*
- *$1200.00 paid to subcontractor due to misunderstanding in verbal agreement.*

3. Projected indirect losses: *Expected to exceed $200,000.00 due to negative publicity, reduced morale, new-hire training, and elevated insurance rates (Based on OSHA direct to indirect cost ratio, OSHA 1996).*

4. Profit from project: *$15,000.00 (*Does not reflect indirect losses)*

X. Summary

1. Pre-planning practice deficiencies: *The contractor did not take any steps to protect their assets with regard to this specific project. The lack of insurance and planning resulted in substantial human, equipment, and financial based loss.*

2. Losses associated with pre-planning deficiencies: *The lack of pre-project planning and a nonchalant approach to safety resulted in direct losses in excess of $26,000.00 out-of-pocket for the contractor. In addition, the contractor was removed from the project resulting in $195,000.00 in lost revenues, and over $5000.00 in pure potential profit.*

Loss summary

The project sustained only one loss producing event, however the losses associated with that event were very significant. The three employees involved in the incident were treated as follows:

Employee 1: Transported to hospital by emergency ambulance service and treated for injuries including laceration to tongue, dislocated shoulder, and bruising. Employee was released the same day and unable to work for four weeks, on restricted duty for four weeks, and finally returned to full duty.

Employee 2: Transported to hospital by emergency ambulance services and treated for injuries including fractures in right foot and ankle. Employee was released the same day and unable to work for sixteen weeks and remains on restricted duty.

Employee 3: Transported to hospital by emergency helicopter service and treated for severe laceration to right forearm. Employee was released the following day and to date

is still unable to work. The employee will require numerous surgeries to repair muscle and tendon damage, and may not regain full use of right hand.

Repair of the trusses involved in the collapse was deemed unsafe by engineers requiring the company to remove and dispose of the trusses, as well as purchase replacements. The loss related to the trusses included several lost man-hours in the initial setting, removal, disposal, and re-installation of the new trusses. The collapse also resulted in damage to a rented personnel lift, which was not insured by the company. The final loss associated with the event involves the OSHA investigation and citation process. The losses are expected to exceed $390,000.00 in insured, direct and indirect costs.

Pre-planning Deficiency Effects

Although the determination of underlying causes is subject to interpretation, the company and OSHA accident investigation processes yielded similar results and revealed several deficiencies, which may have led to the loss-producing event. The effect of the accident was the collapse of the five trusses and accompanying injuries. The cause can be attributed to the following:

OSHA Investigation Results: The officer determined that the lack of a temporary bracing schedule, training, and hazard recognition led to the event. The company's failure to obtain a temporary bracing schedule was linked to the lack of planning, and the employee's mistakes were linked to inadequate job and hazard recognition training.

Pre-planning deficiency links: The following deficiencies can be linked to the corresponding loss:

- Losses in excess of $8000.00 for damage to rental equipment could have been mitigated through the purchase of an insurance policy. The absence of a required

policy can be attributed to poor insurance selection during the pre-project planning phase.

- Losses associated with the inadequate temporary bracing could have been prevented through the review of the project plan during the pre-project planning phase. The practices would have revealed the requirement for an engineered temporary bracing schedule and provided guidelines to ensure safe installation.
- Losses associated with employee wages during down time would have been reduced through the development of an emergency plan. The plan would have provided the steps and actions to be taken following an emergency to substantially reduce the amount of lost wages.
- Effective formation of work teams during the pre-planning phase would have decreased the potential of loss by placing experienced and proficient employees on the team involved in the incident.
- Effective subcontractor selection would have prevented the verbal contract misunderstanding and saved the contractor $1200.00. The contractor understood the contract to be $45.00 per hour for equipment, materials, and labor team, however the subcontractor billed the contractor $45.00 per hour per employee and filed an intent to impose lean requiring the contractor to pay.

It is not possible to determine whether a comprehensive pre-project planning program would have completely prevented the accident and corresponding loss, however based on practices utilized by similar contractors in industry, it would at least have reduced the potential for the adverse event to occur as well as the amount of loss sustained. XYZ Company losses are expected to exceed $240,000.00 of direct and indirect costs. Pre-

planning program deficiencies may not yield this type of loss in every project, but would most likely increase the potential for loss to occur. Some risk control professionals support Heinrich's domino theory that the removal of a single factor can prevent an accident (Heinrich, 1931), however that theory tends to put too much emphasis on employee mistakes rather than addressing root causes of accidents. Had this theory been applied during the accident investigation, employee error would have been identified as the root cause and substantially increased the probability of accidents occurring in the future. Through the application of the ILCI Loss Causation Model however, deficiencies in the management system can be identified and corrected to ensure future success. According to the preceding model, accidents occur because of a lack of standards, inadequate standards, or a lack of accountability (Bird & Germain, 1992). Based on the data collected the lack of effective pre-planning standards and practices is placing XYZ Company at an elevated risk of human, equipment, facility, environmental, and financial based loss.

Chapter 5

Conclusions and Recommendations

The purpose of this study was to determine the extent that pre-planning practices are being utilized at XYZ Company. The pre-planning practices were compared to current best practices utilized by similar contractors in the construction industry to identify deficiencies.

The goals of this study were to:

1. Analyze past losses related to pre-planning practices.
2. Analyze XYZ Company's current pre-project planning practices.

Conclusions

Based on the data gathered during the evaluation performed on a large commercial construction project, XYZ Company's pre-planning practices are placing them at an elevated risk of experiencing human, equipment, facility, environmental, and financial based loss. The substantial losses sustained during the project emphasize the importance of pre-planning practices to ensure success and enhance profitability. In addition, the lack of effective management controls suggests deficiencies in the overall management system that must be addressed.

Recommendations

In order to ensure the minimization of loss in profits and revenues, XYZ Company must address the deficiencies in not only their pre-planning practices, but their management practices as well. By utilizing the process developed by Serge Ogranovitch of the Potomack Group, XYZ Company may begin to realize their true profit potential. The process involves the following three essential steps:

1. Perform an assessment of the management system to identify weaknesses and deficiencies that may be contributing to the elevated history of loss. If the company does not have a competent person to assess, plan, and implement a successful risk management program, the contracting of a third party auditor should be considered. The following list identifies deficiencies revealed during this study.

    - *Contract Review:* The lack of a written policy outlining procedures required to assess the risks associated with a project and identify alterations or deviations from an existing proposal significantly increase the risk of experiencing financial loss.
    - *Subcontract Review:* The lack of a written policy addressing the risks associated with the subcontracting of work increases the risk of experiencing financial loss associated with contract errors and/or misunderstandings.
    - *Insurance Selection:* The Company lacks a planning program to identify risks, appropriate insurance requirements, and policy limits related to specific projects.
    - *Pre-Project Planning Practices:* The Company lacks a formal pre-project planning program to ensure safety, production, quality, and schedule compliance. In addition, the lack of pre-project safety and production meetings hinders employee performance and increases the risk of accidents or injuries.

- *Crime Prevention and Loss Control:* The Company does not have a policy in place to ensure public safety or prevent the theft of tools, equipment, and materials on the construction site. In addition, the company does not have an inventory program to facilitate the identification of loss or theft of materials.
- *Multi-employer Considerations:* XYZ Company has no formal process for ensuring subcontractor safety and compliance with applicable standards or a system in place to inform subcontractors of their responsibilities to ensure the safety of their employees as well as employees of XYZ Company.
- *Subcontractor Selection:* The selection of subcontractors is based solely on proposed bid amounts and fails to exclude contractors with a history of poor safety performance, quality issues, inadequate insurance coverages, and an inability to comply with project schedules.

2. Upon identification of system deficiencies (Ogranovitch, 2002), develop programs or processes to bridge the gap between what is currently being done and what should be done. The improvement process must be developed around core values, which promote continuous assessment and improvement in the management system. The program must focus on compliance with local, state, and federal codes as well as best risk management practices while providing for the following:
   - Identification and prioritization of system deficiencies
   - Formalized information management

- Availability of information necessary to ensure employee safety and health as well as company assets
- Information system that promotes effective communication
- Policies and procedures to minimize risks and reduce loss
- Assignment of responsibilities and accountability
- Program assessment and correction

3. Implement the processes or programs developed based on the identified deficiencies in the management system (Ogranovitch, 2002). In order to ensure success, a contractor must develop an effective implementation strategy that incorporates some or all of the following:
    - Employee involvement and buy-in
    - Coordinated and consistent communication with employees
    - Dissemination of lessons learned to reinforce proper procedures, enhance employee performance, and integrate employees into risk control processes
    - Established management structure and support system that encourages supervisors and line workers to contribute to the risk management plan
    - Assignment of responsibilities and accountability

The process may not be easily implemented as well as provide an instant success, however commitment from senior management and employee buy-in will virtually guarantee an increase in profits and a substantial reduction in losses. Successful implementation of a pre-planning program may provide the company with the competitive edge needed to excel in the construction industry.

References

Advisory Committee on Construction Safety & Health (ACCSH). (1999, July 10). *Multi-employer citation policy*. Retrieved October 27, 2002 from: http://www.osha.gov/doc/accsh/accshwkgrpdoc/multiemployercitwkgrp.html

American Psychological Association Insurance Trust (APAIT). (2002). *Resources: Insurance definitions*. Retrieved November 12, 2002 from: http://www.apait.org/resources/definitions/

Bird, F.E., & Germain, G.L. (1992). *Loss control management: Practical loss control leadership*. Loganville, GA: International Loss Control Institute, Inc.

Builder Online. (2002). *Insurance costs for businesses are on the rise*. Retrieved on October 10, 2002 from: http://www4.builderonline.com/search/article.asp

C-Risk, Inc. (2001). *Construction Risk*. Retrieved October 8, 2002 from: http://www.c-risk.com/Construction_Risk/Const_Risk_Dir01.htm

Clough, R.H., & Sears, G.A. (1994). *Construction contracting.* United States: John Wiley & Sons, Inc.

Emmerich, B. (2001, February). *Multi-employer relationships on the job site.* Retrieved October 27, 2002 from: http://www.cdc.gov/niosh/elcosh/docs/d0400/d000456/d000456.html

Feirer, J.L., Hutchings, G.R., & Feirer, M.D. (1997). *Carpentry and building construction*. United States: Glenco/McGraw-Hill.

Fullman, J.B. (1993). *Construction safety.* New York: Random.

Gambetese, J., Hinze, J., & Haas, C. (1997, March). Tool to design for construction worker safety. *Journal of Architectural Engineering, 3,* 32-41.

Ghio, V.A., Valle, E., & Rischmoller, L. (1997). *Preplanning: A rewarding experience*. Retrieved October 11, 2002 from: http://web.bham.ac.uk/d.j.crook/lean/iglc5/ghio2/ghio.htm

Hamilton, M.R., & Gibson, G.E. (1996). Benchmarking preproject planning effort. *Journal of Management in Engineering, 12*(2), 25-32.

Hammer, W. (1985). *Occupational safety management and engineering.* Englewood Cliffs, NJ: Prentice-Hall, Inc.

Heinrich, H. W. (1931). *Industrial Accident Prevention.* New York, NY: The McGraw-Hill Companies.

Hislop, R.D. (1998). Who is responsible for construction site safety? *Professional Safety, 43*(2), 26-28.

ISO Properties, Inc. (2002). *ISO pinpoint: Marketing intelligence.* Retrieved November 13, 2002 from: http://iso.zapdata.com/marketingintelligence/siccodes.asp

Lagomarsino, M. (2002, May 27). P/C Industry: Its worst year ever. *A.M. Best: Special Report*. Retrieved October 23, 2002 from: http://www.bestweek.com

Mendes, R., & Heineck, L.F.M. (1998). Preplanning method for multi-story building construction using line of balance. *Proceeding IGLC '98*.

Milwaukee Construction Industry Safety Council (MCISC). (n.d.). *Crime prevention and loss control for contractors*. Milwaukee, WI: Author.

National Safety Council (NSC). (2002, October 3). *Estimating the costs of unintentional injuries, 2001*. Retrieved October 10, 2002 from: http://www.nsc.org/lrs/statinfo/estcost2001.htm

Occupational Safety and Health Administration (OSHA). (1990, November). *Analysis of construction fatalities – The OSHA database 1986-1989.* Washington, DC: U.S. Department of Labor. Retrieved on October 10, 2002 from: http://www.osha.gov

Occupational Safety and Health Administration (OSHA). (1996). *Safety pays: Do you know how much accidents are really costing your business?* Retrieved October 10, 2002 from: http://www.osha.gov/SLTC/safetyhealth_ecat/images/safpay1.gif

Occupational Safety and Health Administration (OSHA). (2000). *All about OSHA* (OSHA Publication No. 2056). Washington, DC: U.S. Government Printing Office.

Ogranovitch, S. (2002). Building a leaner faster organization. *Professional Builder, 67,* 74-76.

Palmer, W.J., Maloney, J.M., & Heffron, J.L. (1996). *Construction insurance, bonding, and risk management.* United States: The McGraw-Hill Companies.

Pierce, T.L. (2001). *Builders Risk Strategies.* Retrieved October 10, 2002 from: http://www.irmi.com/construction/wrkbks/crc21wrkbk.asp

Smith, R.C., & Andres, C.K. (1993). *Principals and practices of heavy construction*. Englewood Cliffs, NJ: Regents/Prentice Hall.

Spence, W.P. (1998). *Construction materials, methods, and techniques*. United States: Delmar Publishers.

The Turner Corporation. (2002). *Special projects division: Project approach*. Retrieved November 5, 2002 from: http://www.turnernw.com/spdapproach.asp

Williams, C.A., Smith, M.L., & Young, P.C. (1988). *Risk management and insurance*. United States: The McGraw-Hill Companies

Appendix

Pre-planning Practices Evaluation Form

Pre-planning Practices Evaluation Form

I. Project Information

1. Company Name: _____
2. Project Location: _____
3. Designed by: □ Contractor □ Owner □ Professional Design Firm: _____
4. State Approval: □ Yes □ No
5. Contractors Role: □ General Contractor □ Subcontractor □ Construction Manager
6. Scope of Work: _____

_____

_____

_____

_____

7. Bid Amount: $_____
8. Bond Required: □ Yes □ No

   □ Performance: $_____

   □ Bid: $_____

II. Contract Review

1. Contracted by: _____
2. Type of Contract: □ Formal □ Informal □ Verbal
3. Contract drafted by: _____
4. Reviewed by Attorney: □ Yes □ No
5. Contract negotiated: □ Yes □ No

6. Change clause: □ No □ Yes: (List terms of clause: _____

_____

_____)

7. Contract content interpretation/understanding (Based on observation during negotiation): Check one:

□ Inadequate □ Adequate □Exceptional

III. Subcontract Review

1. Contracted to: _____

2. Type of Contract: □ Formal □ Informal □ Verbal

3. Contract drafted by: _____

4. Reviewed by Attorney: □ Yes □ No

5. Contract negotiated: □ Yes □ No

6. Change clause: □ No □ Yes: (List terms of clause: _____)

7. Contract content interpretation/understanding (Based on observation during negotiation): Check one:

□ Inadequate □ Adequate □ Exceptional

8. Additional information: _____

_____

_____

_____

_____

_____

IV. Insurance Selection

1. OCIP (Owner Controlled Insurance Program): □ Yes □ No

2. CCIP (Contractor Controlled Insurance Program: □ Yes □ No

3. Policies purchased/held: Check all that apply and list specific limits:

   □ General Liability: $: _____

   □ Per project aggregate limit: $ _____

   □ Umbrella/excess liability: $ _____

   □ Auto: $_____

   □ Worker's Compensation: $_____

   □ Completed operations: $_____

   □ Environmental/pollution liability: $_____

   □ Damage to owner's adjacent property: $_____

   □ Builders risk: $_____

   □ Owned equipment: $_____

   □ Rental equipment: $_____

   □ Tool Coverage: $_____

4. Additional Information: _____

_____

_____

_____

_____

_____

_____

V. Pre-project Planning Practices:

1. Practices performed or planned into project: Check all that apply:

- ☐ Written policy
- ☐ Provided necessary information to project foreman
  - ☐ Job hazard analysis information
  - ☐ Hazard analysis cards
- ☐ Formal Hazard analysis
- ☐ Purchase or preparation of personal protective equipment
- ☐ Subdivision of project
  - ☐ Responsibilities
  - ☐ Tasks
- ☐ Set production rates
- ☐ Formed crews based on experience/qualifications
- ☐ Pre-project meetings
  - ☐ Safety
  - ☐ Progress
- ☐ Verified training
- ☐ Developed emergency plan
- ☐ Assigned responsibilities
  - ☐ Production
  - ☐ Safety
- ☐ Review of project plan

2. Additional Information: _____

_____

_____

_____

_____

VI. Crime Prevention and Loss Control

1. Check all that apply

- □ Security fencing
- □ Lighting
- □ Alarms
- □ Storage trailer(s)
- □ Electrical shut-offs
- □ Key control program: (Performed by: _____)
- □ Vehicle check-in: (Performed by: _____)
- □ Inventory control: (Performed by: _____)
- □ Vehicle passes: (Provided by: _____)
- □ Spot checking: (Performed by: _____)
- □ Secured area for materials
- □ Written policy

2. Additional Information: _____

_____

_____

_____

VII. Multi-employer Considerations

1. Check all that apply

- ☐ Written policy
- ☐ Communicated with subcontractors
- ☐ Held pre-project meetings
- ☐ Held pre-construction meetings
- ☐ Held pre-construction safety meetings
- ☐ Developed progress meeting schedule
- ☐ Developed audit plan
- ☐ Developed site monitoring plan

2. Additional Information: _____

_____

_____

_____

_____

VIII. Subcontractor Selection

1. Check all that apply:

- ☐ Held pre-bid meetings
- ☐ Utilized pre-qualification
- ☐ Obtained subcontractor safety information
- ☐ Obtained subcontractor certificate of insurance

2. Additional information: _____

_____

_____

_____

_____

IX. Project outcome

1. Was completion date met: □ Yes □No: (Explain: _____

_____

_____

_____

_____

2. Near hit/accidents: _____

_____

_____

_____

_____

_____

_____

3. Losses

3.1. Insured (*Direct costs only) Approximate loss total: $_____

List losses separately:

- _____
- _____

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

3.3. Uninsured (*Direct costs only) Approximate loss total: $_____

List losses separately:

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

3. Projected indirect losses: Approximate loss total: $_____

List losses separately:

- _____

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

4. Profit from project: $_____

X. Summary

1. Pre-planning practice deficiencies: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____