# THE OWNER'S ROLE IN CONTRACTOR SAFETY MANAGEMENT:
# A PATTERN LANGUAGE

By

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**ABSTRACT**

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Construction is a dangerous industry that historically accounts for a disproportionate number of injuries and illnesses. Despite improvements in the last few decades, this trend of injuries compared to other industries persists year over year. The owner has been shown to be a pivotal member of construction projects with the ability to improve contractor safety performance. It has also been shown that owners ultimately reap the benefits of these improvements in safety performance, yet buyers of construction are still inconsistent in their focus on the importance of construction safety.

Previous research studied owners whose contractors exhibited exemplary contractor safety performance to establish recommended practices. These studies have not considered the reality owners must operate in, including what bad practices owners may unintentionally participate in that lead to an increase in problems and ultimately liability for the owner.

This research investigated *how an owner should interact with independent contractors when it comes to safety management.* To do this, pattern language and grounded theory methods were combined to examine the practices of owners, the preferences of safety professionals, and the existing academic recommendations to both determine the state of the industry and to identify the aspirational practices owners may seek to employ.

This study found that owner practices do not align with the practices identified in the literature, and that both owners and academics need to expand their perspective to maximize any potential

improvement. Thirty-six positive practices were identified across four major categories, including communication, site safety planning, contractual control, and owner involvement. Further, eleven potentially negative practices were also identified that often led to owners unknowingly and needlessly taking responsibility and, by extension, shouldering liability for their contractors. Finally, the forces that an owner must consider when balancing competing priorities were identified to help understand the often conflicting priorities that shape owner behavior.

Ultimately, the owner's role in construction safety is driven by their project risk, risk tolerance, capability, resources, and other characteristics specific to that owner, at that time, and in that space. Each situation remains a fact-intensive occurrence that deserves careful consideration and action. The work practices, identified in this research as patterns, allow owners to understand the recommended practices of the industry and allow each to make a careful assessment of their best course of action. Owners who understand the implication of their actions, as well as the impact of each related practice, will make decisions that more appropriately fit their needs.

Future work on this topic should take the practices laid out in this research and begin to assess the impact of each practice on the balance of the remaining practices of the pattern language. With this information, owners could identify their best course of action in a quantitative way. Likewise, research in this area must reevaluate prior findings in the light of the current environment in which these owners work. Some practices and solutions suggested in existing work are untenable in many owner situations. This is evident from the significant difference in the practices recommended by academia and the current practices of owners.

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Thank you to Todd and Jaime Hall, Kevin Stewart, and the rest of my family who I wish I had space to name here; brothers, sisters, cousins, aunts, uncles, and more, know that I love you all. I could not have imagined this possible without your support and encouragement.

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## KEY TO ABBREVIATIONS

| | |
|---|---|
| AIA | American Institute of Architects |
| ANSI | American National Standards Institute |
| ARM | Associate in Risk Management |
| ASSE | American Society of Safety Engineers |
| BLS | Bureau of Labor Statistics |
| CCIP | Contractor Controlled Insurance Program |
| CDM | Construction Design and Management (UK) |
| CFR | Code of Federal Regulation |
| CHMM | Certified Hazardous Materials Manager |
| CIH | Certified Industrial Hygienist |
| CII | Construction Industry Institute |
| CIP | Controlled Insurance Program |
| CPWR | The Center for the Protection of Workers Rights, also The Center for Construction Research and Training |
| CSP | Certified Safety Professional |
| CSR | Corporate Social Responsibility |
| CURT | Construction Users Round Table |

| | |
|---|---|
| EMR | Experience Modification Rating, also “X-Mod” |
| GOF | Gang of Four |
| ILO | International Labor Organization |
| NIOSH | National Institute of Safety and Health |
| NSC | National Safety Council |
| OCIP | Owner Controlled Insurance Program |
| OSHA | Occupational Safety and Health Administration |
| PE | Professional Engineer |
| PLoP | Pattern Language of Programming |
| QWAN | Quality Without A Name |
| SDS | Safety Data Sheet, formerly MSDS, Material Safety Data Sheet |

# 1 INTRODUCTION

## 1.1 Introduction

According to the Center for Construction Research and Training, construction is routinely among the most dangerous jobs in the world. Between 2003 and 2014 in the US alone, an average of 1027 people died each year on the job in the construction industry (BLS, 2014). According to the BLS, this industry accounts for under 4% of the American workforce but is responsible for over 8% of workplace injuries and nearly 20% of annual workplace fatalities. Worldwide, the construction industry performance follows a similar trend (Tymvios, 2015; Sun, 2010). This approximate trend persists year over year (Abdelhamid, 2000; Behm, 2005; Huang & Hinze, 2006; Hallowell, 2010; Hinze, 2013).

Responsibility for safety is typically left to the employer of each worker in current regulatory schemes. On a construction project however, this responsibility can become blurred, with multiple entities exerting some level of control. Toole (2002) found several reasons for this lack of clarity, including project documents lacking clear safety responsibility direction, OSHA's recent "Multi-Employer Policy" where other entities may be cited for non-employee safety violations, the court's tendency to ignore contract clauses assigning responsibility where they do appear, and research showing the benefits of non-employer involvement in safety performance.

The traditional legal perspective of the owner's responsibility for the safety of an independent contractor is captured by the "General Rule of Owner Non-Liability" found in the Second Restatement of Torts (1965), at §409. Citing this section, the court in *Funk v. General Motors* put the rule in lay terms when it said "Ordinarily a landowner is not responsible for injuries caused by a carefully selected contractor to whom he has delegated the task of erecting a structure…." Due to this lack of a legal role in the responsibility for safety, many owners have opted to avoid any involvement in independent contractor safety due to fear of added risk of liability exposure (Sikes, 2000). For example, the general rule of non-liability does not relieve the owner of responsibility where that owner has retained control of the contractor's operations. Although this control must rise to the level that "the contractor is not entirely free to do the work in his own way" (*Funk*) and is not created by having basic management rights like the right to stop work, make inspections, or receive reports among other rights, many owners still resist involvement. Even though the law clearly allows the owner to participate, this threat of liability and the case by case nature of this issue have contributed to a lack of clarity as to the role of the owner and the hesitation of owners to become involved as described by Sikes.

Academic research has pushed for increasing owner involvement. Levitt and Samelson (1982) identified a range of practices related to safety and found that owner organizations employing more of the described practices enjoyed higher safety performance than those organizations who employed fewer of the practices. Hinze (1997) advocated for an expanded owner role, stating "owners must be aggressive advocates of safety in order for significant improvements in safety to occur." Huang and Hinze (2006) conducted one of the first studies to thoroughly investigate the influence the owner's practices and requirements had on construction safety performance. They compared indicators of project safety performance and a number of different management practices and found that owners who conducted a given practice had a lower incident rate than owners who did not employ the same practice. More recent research has identified a significant number of owner practices that have been shown to improve contractor safety performance through a variety of methods (Musonda, 2012; Votano, 2014; Wu, 2015; Liu, 2017). Industry publications have also stressed the importance of the owner in contractor safety performance (ASCE, 1989; Construction Users Roundtable, 2012; Campbell Institute [Inouye], 2015).

In addition to the recent trend from academia and industry for owners to be more involved, many regulatory schemes also assign specific safety responsibilities to owners. Examples include the Scaffold Law in the State of New York, the Australian National Standard for Construction Work, and the Singapore Workplace Safety and Health Act. Additionally, the European Union's Council Directive 92/57/EEC applies to fifteen EU countries and assigns responsibility to owners based on their level of sophistication, while the International Labor Organization's "Safety and Health in Construction Convention C167," requiring safety consideration during design and planning (among other provisions), has been ratified by thirty member countries.

Beyond the moral, ethical, contractual, legal, and even regulatory reasons for an owner to be involved in the safety performance of a contractor, there is also a significant financial incentive, as the cost of these accidents is ultimately borne by the owner. According to Everett and Frank (1996), the total cost of accidents in new non-residential construction accounted for 7.9 to 15% of total project cost. Research in the UK from the Health and Safety Executive estimated the total cost of occupational injury and illness in construction accounts for 8.5% of total project cost (Qu, 2007). Other studies have identified safety as a "sustainable dynamic competitive advantage" to those committed to safety at a high level (Rechenthin, 2004). These benefits often manifest in the construction industry as improvements in morale, profitability, turnover, and productivity (ibid). Several authors have pointed to the uncertainty of the role and responsibility of an owner on a construction project as a major barrier of owner involvement (Ivensky, 2015; McDonald, 2009). For an owner who has considered the benefits of becoming involved with contractor safety discussed above and decided to become involved, a first step is often to benchmark with peers.

Publications from the Construction Users Roundtable and the Campbell Institute have evaluated the practices in use by "world class" owners and represent the only major published benchmarking study (CURT, 2012; Inouye, 2015). Unfortunately, these owners may not represent the average project owner and may instead best serve as aspirational models.

## 1.2 Problem Statement

Despite clear evidence that owners are able to positively impact the safety performance of contractors (Wu, 2015), and that such an impact carries a financial benefit (Rechenthin, 2004), current evidence shows a wide range of owner practices (Lopez del Puerto, 2013; Votano, 2015). Literature today discusses the "paradox" of conflicting forces owners are faced with when attempting to manage contractor safety (Malhotra, 2019). The product of previous research efforts has been a myriad number of practices and requirements that may improve contractor performance, but no research to date has provided guidance for how to avoid the pitfalls and challenges created by attempting to impact the safety management of independent contractors (Rajendran, 2013). *Current recommended practices in construction safety management do not inform the owner of the tradeoffs within those practices or information on those practices that may increase their risk, creating the potential for negative consequences resulting from either the owner's engagement or lack thereof.* A holistic view of the owner's role in construction safety is needed to provide owners with a thorough consideration of the risks and benefits of their involvement.

## 1.3 Research Question

Owners need clear and consistent guidance to be able to understand their liability and evaluate their risk management preference. They also require information on the pressures and considerations behind each decision. Many previous works have identified the actions owners can take that improve the performance of independent contractors. The central question of this work is: *how should an owner interact with independent contractors when it comes to safety management?*

In the Constructivist Grounded Theory, a basic set of questions of inquiry starts the process, and evolves as the theory ultimately produced by the study develops. The following subquestions will help to explore and understand the initial research question of this dissertation.

1. What are the current practices of owners as they relate to management of the safety of independent contractors?
2. What are the practices owners should adopt for contractor safety management?
3. What management practices, actions, roles, and structures should owners avoid?
4. What are the conflicting forces owners must consider behind each management practice or action?

The objectives of this work are to:

1. Identify the current trends and practices of owners in contractor safety management, along with the current recommendations from the literature.
2. Define the optimal procedures of owner management of construction safety as well as those practices owners should avoid.
3. Add context to these optimal procedures to understand both their positive and negative attributes.
4. Document the conflicting forces between these attributes so future users of this work can make informed decisions consistent with their values.

5. Document the completed recommended practices using the “Pattern Language” approach to contractor safety management.

## 1.4 Research Approach

Prior studies into the owner’s role in construction safety have almost exclusively used quantitative methods, producing convincing evidence on the benefit of owner involvement and the recommended practices to employ. The aim of this research is to further explore this relationship in order to better understand the complexity and variation of these relationships. As such, a mix of both qualitative and quantitative methods has been employed. The primary research methods employed by this approach are pattern language, developed by Christopher Alexander and Constructivist Grounded Theory (Charmaz, 2014). Patterns are a “three-part rule, which expresses a relation between a certain context, a problem, and a solution” (Alexander, 1979). Patterns can be combined in endless combinations to create a language that clearly communicates the essence of a topic in a way that other forms of communication cannot. Constructivist Grounded Theory is a collection of methods used to develop a theory from the ground up.

This research will use the iterative methods of constructivist grounded theory for creating a step by step method while relying on the pattern language approach for sharing lived experiences as inspiration and a framework for communicating findings. The similarity between these methods allows the research to be discussed in either paradigm.

Three main steps, adopted from pattern language, will be used to structure the process of the research: pattern mining, pattern writing, and pattern polishing. The pattern language methods include artifactual review, introspective review, sociological review, mining your own experience, and pattern equilibrium.

Grounded theory is an iterative process that evolves over time as the researcher probes into new and unforeseen areas of inquiry. This includes coding of data from a wide range of sources, including elicited and extant documents, interviews, observations, and records. From the coded data, researchers create memos that become an evolving statement of the reality participants experience as understood by the researcher. Memos are revised throughout the research process as new leads develop, earlier ideas are refined, and a better organization of these interconnected ideas coalesces.

These two parallel processes overlap and complement each other, while also eliminating potential deficiencies if used alone. The intent of this work is to use the framework established by the Pattern Language community as the guiding model for the structure and function of the completed report, while the generative procedures of constructivist grounded theory will be used to establish the procedural steps necessary to generate a pattern language, and ultimately, the quality without a name as suggested by Hentrich (2015).

To meet the proposed objectives of this work identified above, the following tasks and the steps inside the dotted line in *Figure 1-1. Research Method* Overview below outline the research process:

1. Collect extant documents on the topic of project owners and construction safety, including owner requirements, academic and industry literature, and case law.
2. Conduct a *horizontal analysis* of existing documents that may be helpful to understand the current state of the owner's role in construction safety management through initial coding. Extant documents include the existing literature on the topic, owner's requirement manuals

and specifications, and established relevant case law. The initial coding process seeks to identify potential repeating themes and categories found within the extant documents.

3. Perform a *vertical analysis* of the existing codes developed in the first step. Each instance of a code developed in the horizontal analysis will be collected and analyzed using focused coding techniques that "sift, sort, synthesize, and analyze the data generated" (Charmaz, 2014). The aim of this phase of the analysis is constant comparison to capture the variation and nuance contained within the data.
4. Collect researcher reflections on the information throughout the process and use this information during the formation of early draft memos.
5. Write draft memos using focused coding techniques.
6. Collect additional data in an iterative process as dictated by the draft memos. This may include a range of knowledge elicitation steps, such as surveys, interviews, and focus groups, among others. If a topic has not reached saturation, the process between step five and step six repeats.
7. Conduct confirmatory procedures, including peer debriefing interviews and member checking focus groups to ensure the pattern language meets the parameters for trustworthiness required by grounded theory.
8. Determine that saturation has been reached, finalize the pattern, and add it to the final pattern language. The pattern becomes a living document that changes as new experience and information comes to light.

Once saturation is reached, the pattern is finalized and added to the pattern language. The pattern language becomes a living document that changes as new experience and information comes to light.

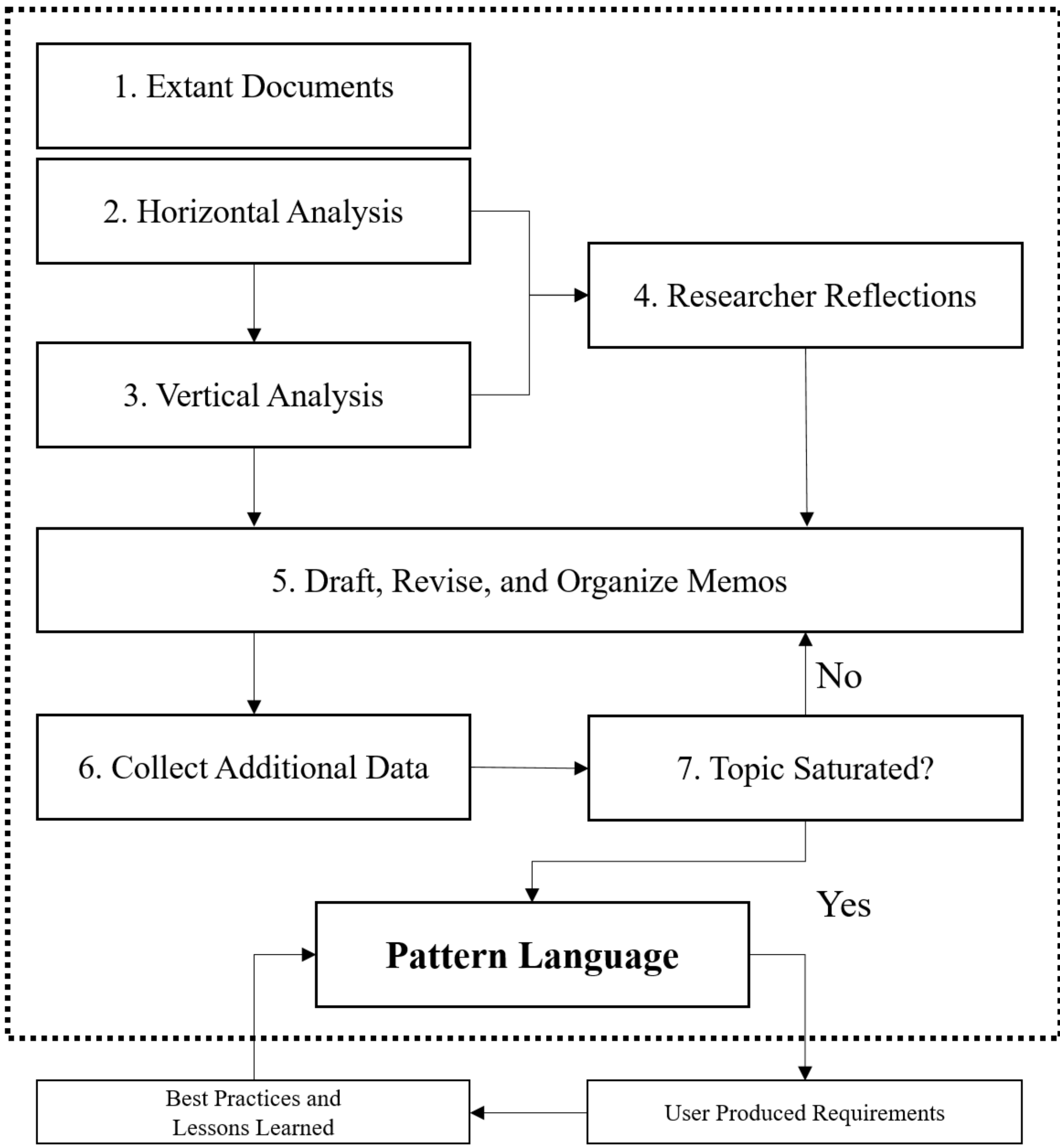



*Figure 1-1. Research Method Overview*

## 1.5 Dissertation Organization

This dissertation consists of six chapters, an appendix, and references.

Chapter one highlights the research problem, initial research question, research subquestions, and the basic approach to answering these questions.

Chapter two includes a review of the existing literature on the topic of the owner's role in construction safety, as well as the perspective from industry, government, standard contracts, and the current law. Chapter 2 also discusses the theoretical background which situates and supports the research method.

Chapter three outlines the research method for the work and provides specific steps incorporated to answer the initial research question.

Chapter four presents the findings of the work, including the analysis and results of each phase of the research outlined in chapter 3. An assessment of the trustworthiness of the work can also be found in chapter 4.

Chapter five offers the completed final product of the research: a pattern language for contractor safety management for use by owners, researchers, and the industry.

Chapter six discusses the findings of the research along with the strengths, limitations, implications, and ultimate contribution of the work.

Finally, chapter seven is an appendix with supporting materials. References can be found in chapter eight.

## 1.6 About the Researcher

Qualitative research, as featured in this dissertation, allows for the involvement of the researcher. As such, it is critical for the reader to understand the background, experience, and education of the researcher. My resume is included in *Appendix G: Researcher Resume*, and my current biography appears below:

> Zach Hansmann is the Contractor Safety Manager at Michigan State University, overseeing the University's engagement with contractor safety compliance. He is also an instructor of construction management in the School of Planning, Design and Construction at Michigan State University and the principal of The Hansmann Group, a consulting company focused on safety and risk management. He previously served as the Construction Safety Manager for the Department of Energy Funded Facility for Rare Isotope Beams (FRIB) Project at MSU and as the Environmental Coordinator for the University, where he was responsible for campus-wide compliance with asbestos, lead, and other hazardous material requirements. Zach maintains the Certified Safety Professional (CSP), Certified Hazardous Materials Manager (CHMM), and Associate in Risk Management (ARM) professional designations. He is the Executive Secretary/Treasurer and a member of the Construction Safety Division for the Michigan Safety Conference, is a member of the Mid-Michigan Chapter of the American Society of Safety Professionals, and is an authorized OSHA outreach instructor in construction. He holds degrees from Michigan State University in Human Biology (B.S.) and Construction Management (M.S.), and is currently an ABD Ph.D. Candidate in Planning, Design, and Construction, studying the owner's involvement in construction safety.

With this background and professional role in the industry and the precise topic of this dissertation, I am uniquely suited to lead a study of my peers in a new and different way. Many significant advances have been made in construction safety, and this new perspective will help add dimension and context to the existing body of work. *Section 3.3.2 Researcher Reflections and Expertise* states more explicitly how my expertise will impact this study, while *Section 6.3 Limitations and Strengths* discusses how my expertise and participation is both a strength and a limitation.

## 1.7 Definitions of Key Terminology

**Controlling Contractor** – The entity who manages a project on behalf of an owner. Typically this is a General Contractor, Construction Manager, or other primary contracting company.

**Employer –** Any business who hires a person to conduct work.

**Owner** – The project or property owner who will occupy or control the finished product of the project. Other works may refer to the owner as the client, landowner, or other similar terms.

**Requirement Manual** – A document produced and published by an owner to communicate minimum construction safety management practices required on their projects to independent contractors.

**Subcontractor –** Any contractor whose contract is held by another contractor. This includes sub-sub-contractors of all tiers. A subcontractor who holds the contract of a sub-sub-contractor does not become a controlling contractor.

# 2 LITERATURE REVIEW

This chapter will review the existing literature relevant to the owner's role in construction safety. Roles in safety management for all parties to construction will be discussed, including the owner. Many disciplines or areas of expertise shape the role of the owner, so literature and publications will be reviewed from academia, industry, government, standard contracts, and the legal precedent. Finally, a review of the philosophical foundation of the work and a brief summary of the methodological theories to be used in the work will be presented.

## 2.1 Injury, Illness, and Fatality Rates Paint a Grim Picture

The performance of the construction industry as a whole as it relates to safety creates interesting and complicated questions. Who is responsible for the safety of workers on a construction project? How are safety risks most appropriately managed? What types of risks are acceptable and what types of risks are not?

Historically, construction accidents were considered part of the cost of doing business. When the Golden Gate Bridge was constructed in the 1930s, it was expected that there would be one fatality for every million dollars of construction work. With an estimated cost of construction at 32 million dollars, it was considered a success when the project was completed with only 17 fatalities (Hislop, 1999). Similar examples of these attitudes reported by Levitt and Samelson (1993) include an expected fatality per two floors of high-rise construction or per half-mile of tunnel constructed. Hislop also illustrates negative attitudes in construction regarding safety, citing superintendents saying “construction is no place for sissies,” “I don't have money for frills like safety,” and “I am forced to choose between production and safety.” All of these statements illustrate common historical sentiment on safety. Construction is still frequently listed among the most dangerous occupations in the United States and abroad. In 2015, for example, 985 construction workers lost their lives on the job, more than any other industry (CPWR, 2018). *Figure 2-1. Number of Deaths by Major Industry, 2015* compares the fatality experience of the construction industry to the next highest ranking industries.

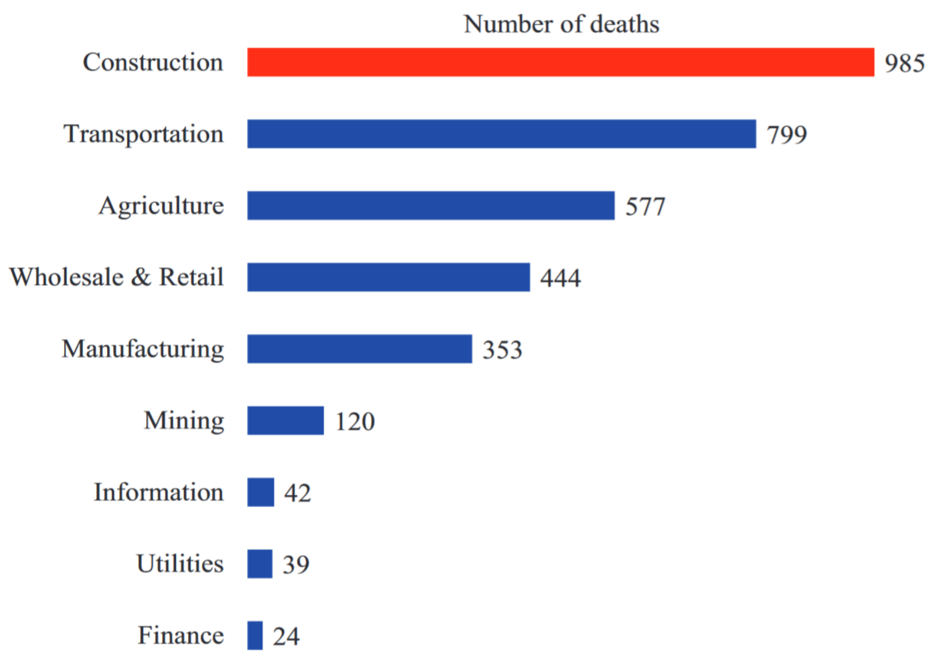



*Figure 2-1. Number of Deaths by Major Industry, 2015*

## 2.2 Roles in Construction Safety are Diverse

The industry can easily be characterized as a highly transient population, frequently facing risks that are ubiquitous and constantly changing. This results in an ever-changing set of safety requirements and risks with a low level of severity and a high probability of occurrence.

Roles in construction safety need to be more clearly defined. In 2002, Toole conducted a survey of architects and engineers, general contractors, and subcontractors, and found significant differences in how each group viewed their responsibility and the responsibilities of others for safety. Ultimately he identified four major reasons for this discrepancy:

First, his study found that detailed expectations about safety roles were not included in project documents, standards issued by government, or anywhere else. The only common discussion of safety in standard construction contacts was to identify the general contractor as having overall responsibility for site safety. No other parties were ever named. OSHA regulations further this issue because they specifically refer to the duty of the employer throughout, only mentioning the terms general contractor and subcontractor in a single section.

Second, Toole's study found that while OSHA regulations regularly refer to the employer's responsibility for safety, recent changes to OSHA's internal *field inspection resources manual* provide a mechanism to cite multiple employers on a worksite who may not even have employees exposed to a hazard. Commonly referred to as the "Multi-Employer Policy," OSHA can cite an employer who is *exposing* a worker to a hazard, *creating* a hazard, *controlling* a site with an uncorrected hazard, or derelict in its responsibility for *correcting* a hazard. This creates ambiguity and confusion as to who is truly responsible for safety.

The third factor identified by Toole is the relative indifference courts have shown to contractual clauses assigning responsibility for safety on construction projects. A developing trend in construction safety litigation is to link other parties to the responsibility for safety, and Toole points to several cases that held the construction manager or designer responsible for incidents where the contracts clearly limited their roles in site safety management.

The final factor cited by Toole is the focus in the literature on how other parties to construction projects might positively impact safety performance. While this is morally laudable, it creates confusion as to the line between responsibility and a “best practice.”

The complex nature of regulation, law, and moral responsibility in construction safety, combined with the lack of consistent agreement regarding site safety responsibility identified by Toole, show a clear challenge to the industry. To truly provide clarity on the issue, it is important to initially identify all potential players on a construction project and describe their contributions to site safety.

### 2.2.1 Employers

Safety on any construction site is typically the responsibility of the direct employer of a given worker. These employers must provide for training, personal protective equipment, permits, and safety procedures, among many other considerations. These employers also direct the day-to-day operations of the workers and pay their salary and benefits. The basic premise of the Occupational Safety and Health Act of 1970 is summarized in Section 5 of 29 USC 654, titled “Duties”. This section is commonly referred to as the “General Duty Clause.” It states:

> a) Each employer –
>
> 1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;
>
> 2) shall comply with occupational safety and health standards promulgated under this Act

### 2.2.2 General Contractor

The general (or controlling) contractor is also responsible for providing for worker safety on a construction site, just as an employer would under OSHA regulation. OSHA’s Construction Safety Standard, Section 29 CFR 1926.16(b) states:

> By contracting for full performance of a contract subject to section 107 of the Act, the prime contractor assumes all obligations prescribed as employer obligations under the standards contained in this part, whether or not he subcontracts any part of the work.

Contractors who exercise control of an entire site are typically seen as having the level of project control necessary to effectively create a safe work site. Safety provisions a general contractor is regularly accountable for include fall protection, work permitting, and hazard communication, among many others.

The duty is non-delegable. Language in the section quoted above is explicit that, although arrangements may be made for one party to provide a required safety item (first aid kits, fire extinguishers, etc), a general contractor's responsibility may not be waived by contract per 29 CFR 1926.16(a):

> The prime contractor and any subcontractors may make their own arrangements with respect to obligations which might be more appropriately treated on a jobsite basis rather than individually.
>
> Thus, for example, the prime contractor and his subcontractors may wish to make an express agreement that the prime contractor or one of the subcontractors will provide all required first-aid or toilet facilities, thus relieving the subcontractors from the actual, but not any legal, responsibility (or, as the case may be, relieving the other subcontractors from this responsibility).
>
> In no case shall the prime contractor be relieved of overall responsibility for compliance with the requirements of this part for all work to be performed under the contract.

The liability for private causes of action is a little less clear. A seminal case on general contractor liability is *Funk v. General Motors Corp.* In *Funk,* the court held:

> We regard it to be part of the business of a general contractor to assure that reasonable steps within its supervisory and coordinating authority are taken to guard against readily observable, avoidable dangers in common work areas which create a high degree of risk to a significant number of workmen.

This made the general contractor responsible for providing basic safety management and control that had not previously existed. A later case, *Latham v. Barton Malow Co.*, clarified a four-prong test to determine if a contractor could be held liable for an injury to a worker on a construction project. To succeed on a claim for liability, a plaintiff must be able to show:

1) The defendant contractor failed to take reasonable steps within its supervisory and coordinating authority…
2) to guard against readily observable and avoidable dangers…
3) that created a high degree of risk to a significant number of workers…
4) in a common work area.

If all four elements of this test are satisfied, a plaintiff may proceed with what is now referred to as a "Common Work Area" cause of action.

### 2.2.3 Subcontractor

Subcontractors are responsible for site safety to the extent that they are employers. Subcontractors, however, are not responsible for the safety of others. In a 2004 Michigan case, *Ormsby v. Capital Welding*, the court held that the existing doctrines of worksite control and common work area duty applied only to the general contractor. The subcontractor, who had no supervisory or coordinating authority of the site as a whole, could not be held liable for incidents unrelated to its work and its workers.

However, in *Krause v. Grace Community Church*, (an unpublished and consequently non-binding decision) the court held that a subcontractor who hires a sub-subcontractor does not become a general contractor. This was a somewhat surprising decision, and it limits the amount of liability a subcontractor may face.

### 2.2.4 Designer

Designers of projects are Architects and Engineers who take the vision and requirements of an owner and write the plans and specifications contractors use to create a finished structure. Like other parties to construction projects, they have a well-defined role and, traditionally, it has not included evaluation of safety considerations in design. Gambatese found that 45% of design professionals did not consider safety as part of a project design and only 16% actively sought to include it in design considerations (1997). This approach is often borne out of the idea that liability may be imposed upon a design professional for accidents during construction or later owner-related accidents (Gambatese, 1999).

In the United Kingdom, this issue was resolved with the enactment of the Construction, Design, and Management (CDM) regulations, most recently revised in 2015 (Gambatese, 1999). These rules require a designer to play a role in the identification of foreseeable risks while avoiding prescriptive standards. This allows a design professional to place an emphasis on identifying potential hazards and mitigating them in the most effective way.

### 2.2.5 Workers

Workers are responsible for their own safety to some extent. The decisions they make and the actions they are willing to accept play a role in their likelihood of injury. The OSHA general duty clause is frequently cited as an anchor point for safety responsibility of the worker. Part 5(b) of 29 USC 654 reads:

> Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

Although part b of the general duty clause exists to place some responsibility on the worker, there is little mechanism in the rules promulgated by OSHA to actually cite a worker under these regulations. OSHA enforcement is strictly on the employer.

Workers are still held responsible for their actions in other litigation. Some states have enacted comparative negligence standards that apportion fault in tort cases to the relative amount of fault of each party's actions. In most states, a 51% bar is established. Once a worker is found to be 51% or more culpable for their injury, economic damages are restricted and non-economic damages are no longer recoverable.

Other entities not discussed above each have a role in safety as well. The *government* creates and enforces safety standards meant to provide a minimum level of safety workers can expect to find in their workplaces. Workers who belong to *unions* often receive training and monitoring. Employers must meet the minimum requirements of their insurer, including safety requirements on construction sites. The manufacturers of equipment and materials similarly have a role in establishing the procedures associated with the use of their products. Collectively, whether directly or indirectly, everyone involved in these construction projects has the opportunity to positively impact the safety of the worker.

## 2.3 The Role of the Owner

The issue of the owner's role in construction has several unique sources of information, with varying and conflicting viewpoints.

First, the *academic* body of work on the topic will be reviewed. The basic principle the academic viewpoint will show is that the owner is integral to the safety performance of a construction project and is often in the most powerful position to change expectations related to safety. Authors have proposed multiple areas in which an owner can act to make that impact occur. Over time, these recommendations have expanded from a simple owner role to suggestions of comprehensive management and intense owner involvement.

On the opposite end of the spectrum from academic publications and industry groups, the *legal* body of knowledge generally holds that the owner should not become involved in construction safety management. American courts usually hold that the contractor, not the owner, is responsible for safety. The legal decisions show the owner often increases potential liability by becoming more involved.

*Industry* perspectives are captured in publications and guidance models, but must be carefully evaluated. Depending on what industry is represented, the product of these materials may place responsibility on one party and shield another. Nevertheless, these sources are a valuable voice. Examples of industry groups include the American Society for Civil Engineers, the Campbell Institute, the Construction Industry Institute, and the Construction Users Roundtable.

Safety *regulations* define the law of the land. The OSHA rules, found in chapter 29 of the Code of Federal Regulations (CFR) create responsibilities between an employer and their employee. For the owner, specific parts of the OSHA rules such as the Multi-Employer Worksite and the new Confined Spaces in Construction rule, have added specific responsibilities on projects and at facilities. Some states have enacted specific legislation requiring an owner to perform some function or to assure that a function has been delegated. Examples of states with specific laws are New York and Wisconsin. Outside of the U.S., many countries have added regulations which similarly add duties to the owner or “client” of a project.

Finally, there are several standard form *contract* families in use in the construction industry. Like the industry groups, different families of contract packages are written by different groups, and some bias may be present depending on the author. The main standard contracts are from the American Institute of Architects (A201) and a coalition of design and construction industry associations (ConsensusDocs).

The five main areas discussed above collectively inform the sophisticated owner on the range of safety management philosophies. It is unknown which of these areas provides the strongest influence on and motivation to owners. These areas will ultimately be compared to the survey results on actual owner practices to see what the current state of the art truly is.

### 2.3.1 Academic Research

The evolution of the body of knowledge on the owner's role in construction safety largely started in the early 1980s with work conducted by Levitt and Samelson. Research conducted in 1981, later published in the Business Roundtable (1982) and the book "Construction Safety Management" by Levitt and Samelson (1993), surveyed "construction buyers" whose projects either achieved average safety performance or excellent safety performance. A wide range of construction safety management practices were used on these projects. Some projects used few, if any, safety management techniques, while others employed all of them. The group with excellent safety performance tended to use more of the practices while the average group used fewer safety management practices. The ultimate conclusion from their work is that the owner can be actively involved in the construction safety performance of the contractor while respecting the contractor's legal independence, and that such activity will ultimately reduce accidents, and therefore costs, on a project. The findings started a deeper interest from the academic community in the owner's role in contractor safety.

Jimmie Hinze's 1997 book "Construction Safety" exclaims "safety can no longer be left solely in the hands of construction contractors" and "owners must be aggressive advocates of safety in order for significant improvements in safety to occur." Hinze shows trends of increasing involvement of owners in prequalifying contractors based on safety performance. These concerned owners have adopted policies for managing contractors and, according to Hinze, the owners with the strongest policies included many of the practices he identified.

In 2000, Gambatese attempted to simplify many of these recommendations into a six point model. This model has been widely cited and focuses less on specific practices and more on broad ideas that can be put into action in a number of ways. Examples of these recommendations include "address safety in the construction contract" and "participate in project safety during construction."

Later works, including Huang and Hinze (2006) and Musonda (2011), looked more specifically at the influence of the owner. Huang evaluated the influence of the owner's behavior and found the owner's direct involvement in the safety process during the construction phase to be the most important role an owner can play. By comparing the recordable incident rates of projects that did or did not participate in a given practice, the actual impact of the owner on safety performance was calculated as the difference in these average and median rates. Musonda studied the role of the health and safety culture of an owner or client and the impact that culture had on project performance. In developing the initial model of client interaction on a construction site, the authors assumed the owners would directly influence the safety on a construction site, and their indirect influence on both the contractor and the designer would also improve the safety performance of the project. Instead, they found that the owners did not directly improve construction performance, but through their culture, which includes their established safety procedures and their commitment to safety, they indirectly improved overall safety performance on the project.

Votano and Sunindijo recognized the significant role and influence an owner has on safety. In a 2014 study, they confirmed how important the owner's engagement is to project safety on small and medium projects, and defined six principle safety roles owners should focus on.

In China, research efforts from Wu (2015) found the owner's leadership during construction to be critical in creating new safety management approaches and improving project safety performance. Specific activities were broken down into four necessary categories of leadership: safety influence and role modeling, safety motivation and coaching, safety caring and individual respect, and safety controlling and performance management. Each of these four main categories includes subcategories of specific actions which actively promote the essence of the leadership principle

More recently, Liu (2017) attempted to create an "Owner's Role Rating Model," or ORRM, based on the theory of "Operational Excellence." This final model is intended for use by owners in evaluating their safety programs and determining what practices should be improved or added. Thirty-eight "critical to expectation" owner practices were identified as indicators of one of six "critical to safety" factors and their level of importance was identified by expert interviews.

Each of these studies have recommended practices that owners should use to control and improve contractor safety performance. In evaluating the evolution of these recommendations, several themes emerged in repeated studies, regardless of the era or of the theory of the owner's actual effect on safety. Eight of these themes are presented below. These themes are not inclusive of every study or practice recommended, but illustrate the most common findings within the literature.

#### 2.3.1.1 Selection

An interesting finding from the Levitt and Samelson research is that excellent performing buyers (owners) employed differing strategies for achieving high levels of safety performance from contractors. Some owners aggressively prequalified contractors and hired only contractors with proven track records of safety success. Past indicators mentioned in the study include Experience Modification Rates (EMR, sometimes referred to as X-Mod), OSHA incidence rates, and references from past clients. Levitt and Samelson urge owners to prequalify contractors as the "cheapest and least invasive means to reduce construction accidents" and to rely on aggressive monitoring strategies where prequalification is not practicable or possible.

Hinze also discusses prequalification as a primary role of owners in creating safe construction sites. He recommends owners prequalify contractors based on multiple criteria, including:

1. *Injury incident rates*
2. *Experience Modification Rates (EMR)*
3. *Loss ratio*
4. *Record of OSHA citations and fines.*
5. *Litigation related to injuries.*
6. *Performance records of key personnel.*
7. *Project safety plan.*
8. *Contractor qualification safety surveys.*

Gambatese (2000) recommends that an owner screen potential constructors based on prior safety performance. In addition to monitoring EMR, OSHA violations, and litigation history as previously suggested, Gambatese suggests evaluating the constructor's safety program. This program is likely to describe the scope and mission of the program, personnel responsibilities, safety meetings and training, substance abuse policies, and other issues concerning safety administration on the jobsite. If it is found insufficient, Gambatese suggests that the owner consider working with the contractor to develop an appropriate program for the project.

Levitt and Samelson (1982) also address the need for owners to clearly stress the safety requirements prior to the contractor submitting any type of price or bid. Safety does carry a cost and unprepared bidders may not have appropriate resources accounted for if they are not aware of the requirements. Contractors in this situation may choose to cut corners to make up the difference. They wrote:

> *Stressing safety as part of the contract during the pre-job walk-around*, which allows contractors to consider safety costs in their bid and shows that the owner is serious about safety.

Liu (2017) assessed the owner's level of influence in the contractor selection practice in his "owner role rating model" by asking questions like "*does the owner prequalify contractors*," "*does the owner consider safety in prequalifying contractors for bidding on projects*," and "*does safety have a high priority when selecting a contractor*?"

#### 2.3.1.2 Responsibility

Many of the studies recommend owners make clear that the responsibility for safety rests with the contractor, going so far in a few of the examples to require the contractor to designate the overall oversight duties to a specific individual. For example, Levitt and Samelson stated:

> *Require the contractor to assign safety coordination responsibility to someone on-site.* If the contractor does not have a safety professional on the site, this step requires that the contractor assign a line manager to coordinate safety matters.

Gambatese (2000) also recommended clearly declaring who is responsible for safety:

> *Assign safety responsibility during construction.* Designating a specific organization or individual responsibility for safety eliminates any confusion as to who is responsible. This could be the project architect or engineer, construction manager, constructor, or a third-party safety consultant, as long as they are "qualified in construction safety principles, rules, and practice appropriate for the particular project."

#### 2.3.1.3 Planning

Gambatese (2000) focuses much of his work on the value of a carefully planned and designed construction project, advocating early on for a movement that would later become prevention through design (PtD). Specifically, he recommends that owners "*Ensure that safety is addressed in project planning and design.*" A significant focus of Gambatese's work is on the benefits a project can gain when safety is a driving factor of the project design. By selecting design features and materials that lead to safer means and methods of construction, an architect or designer can have a significant impact on site safety. This also ultimately results in improved performance; fewer accidents and injuries, lower costs of construction, decreased redesign costs, and less exposure to third-party liability suits. Gambatese also acknowledges that designers are often reluctant to design for, or even acknowledge, safety in their work. This can be overcome by an owner who makes decisions regarding selection and continued employment of designers based in part on their willingness to consider safety in design. The owner is also able to impact safety in design by making decisions during planning and design reviews that consider and improve safety performance.

Gambatese also recommended owners *"address safety in the construction contract."* Omission of safety from a construction contract does not allow the contractor to perform work in an unsafe manner. The contractor is still fully bound by applicable safety regulation. Gambatese still suggests owners include safety in contract language, however, because it sends a clear signal that the owner is committed and proactive regarding safety. He suggests inclusion of clauses requiring the contractor to abide by all applicable safety regulations, delineate responsibility on the jobsite, submit written safety programs before work commences, require substance abuse programs, and define emergency response and accident reporting.

Similarly, Levitt and Samelson (1982) focus most of their discussion on the control afforded by a carefully crafted contract:

> *Set general safety guidelines into the body of the contract*. By safety guidelines we mean more than a single paragraph requiring the contractor to conform with state and federal regulations. We mean several pages of specific, required procedures or actions that constitute minimum acceptable safety practices that all contractors must follow on a particular project.

Another contract item suggested by Levitt and Samelson (1982) is use of short term permits to force a contractor to plan in a forward-looking manner, on a nearly day-to-day basis:

> *Require short-term permits rather than ongoing permits, for hazardous activities*. This forces the contractor to plan hazardous activities and to coordinate their activities with other contractors and the owner's own workforce.

Much later work by Wu (2015) also identifies the need to plan activities in an aggressive nature due to the continually changing nature of construction:

> Owners should manage safety risks in a systemic, proactive and real-time manner because construction risks are everywhere and constantly changing. Managerial mechanisms should be established to integrate planning, hazard inspection, risk evaluation, safety responsibility allocation and risk mitigation together into a system.

#### 2.3.1.4 Training

Levitt and Samelson (1982) identify the value of providing a site orientation to construction workers as a means of reducing incidents and costs on construction projects:

> *Require safety training of contractors' employees*. Buyers may be more aware of the hazards at their facilities, and even when that is not the case, orientation will help prevent injuries to vulnerable new construction workers.

Hinze (1997) seems to indicate that the owner may actually train the workers when he says owners should "*require all contractors to go through safety orientation," "provide contractor safety training,"* and *"require the contractors to adhere to owner-developed safety practices*."

The training requirement also combines with the planning theme, as illustrated by Levitt and Samelson (1982):

> *Provide contractors with special safety guidelines they must follow*. Any site-specific procedures such as emergency travel routes, evacuation procedures, special hazards, etc., should be covered in these guidelines.

#### 2.3.1.5 Monitoring

Levitt and Samelson (1982) also recommend monitoring. Some owners in their study constructed elaborate selection and prequalification programs while others chose to work with contractors without thoroughly evaluating their historical safety performance, opting instead to rigorously monitor activities on-site. The researchers concluded that the buyers who chose to become actively involved in monitoring the safety performance of their contractors could obtain excellent safety performance even from average contractors. In their recommendation, Levitt and Samelson differentiated between audits (which focus on monitoring systems), and inspections (which are directed at controlling hazards):

> *Conduct safety audits of the contractor during construction*. These audits are performed by the owner's staff and ensure compliance with the contract requirements and state and federal regulations. They are aimed at systems and procedures rather than at specific hazards.

Levitt and Samelson (1982), also discuss several issues that arise with the stringent monitoring of contractors. The first concern is that an owner must respect the contractor's independence. Owners must be careful to work through the contractor's chain of supervision at all times and to "scrupulously avoid giving direct instructions to the contractors' craft workers except in the event of a work practice or situation which they deem to be imminently dangerous and which needs to be corrected on the spot." The second caution is to avoid specifying particular work methods. Where a contractor can show that they bid the work under an alternative method allowable by applicable safety regulations (such as OSHA), the owner could be held to have made a "constructive change" to the contract and may be found to be liable for any differences in cost.

As part of the monitoring requirement, Levitt and Samelson also note the need for specialized staff in order for the owner to fully participate and manage the contractor, stating:

> *Set up a construction safety department to monitor contractor safety*. Most buyers in our survey had one or more construction safety specialists in their corporate industrial safety departments. A few had special departments for construction safety. If a buyer is too small and/or contracts too infrequently to do this, then it should retain specialists for this function on a project by project basis.

Inspections of the site are also a major component of the monitoring theme.

> *Conduct periodic safety inspections.* This is to ensure that contractors are controlling physical hazards and complements the safety audits practice.

The following all also identified inspections as part of the monitoring cluster: Hinze (1997) "*making independent job-site safety inspections," "conducting regular audits of contractor safety performance*," Musonda (2011) "*conduct health and safety inspections and audits,"* and Votano (2014) "*perform regular checks on plant/equipment."*

As Gambatese's (2000) recommendation for participation makes clear, the monitoring requirement can manifest in or connect to many other themes.

> *Participate in project safety during construction.* The most effective way an owner can influence safety is through jobsite participation, which shows that safety is as important as other construction goals. Participation could include attending or conducting safety meetings, making independent site safety inspections, providing

> safety training for special site hazards, and participating in and funding safety incentive programs.

More recent research focuses the monitoring theme away from simple contractor oversight by the owner to a more cohesive project management approach. Wu (2015), for example, focused on the owner's impact on safety climate and safety culture and the focus on continuous improvement:

> Owners should be fully engaged in project safety by implementing managerial measures itself and working with contractors and subcontractors. By working with stakeholders, owners can gauge safety culture and safety management efforts of them, and design specific measures to improve project safety culture and drive safety management innovation.

#### 2.3.1.6 Reporting

Throughout the literature, reporting of incidents is also identified as a practice owners should require from their contractors. Levitt and Samelson (1982) recommended:

> *Require immediate reporting of contractor accidents.* Immediate rather than periodic reporting gives the buyer or its agent more time to intervene and ensure that the contractor has corrected any identified hazard before others can be injured by it. Such notification can also serve to initiate consultations with the contractor's senior management, if needed.
>
> *Investigate the contractor's accidents.* The buyer's involvement in investigating the contactor's accidents gives the client valuable insights about generic safety hazards on the project, as well as additional insight into the contractors' organization and capabilities in the area of safety.

Also addressing these reporting practices, Hinze (1997), recommended owners "r*equire notification of any major accident"* and Musonda (2011), stressed that owners "a*lways be involved in accident and incident investigations"* also addressed these reporting practices.

Another component to the reporting theme is the tracking of reported statistics, such as number of incidents, hours worked, and safety-related activities completed. According Levitt and Samelson (1982), owners should:

> *Maintain statistics on the contractor's safety performance.* These statistics can provide the basis for dividend sharing as well as for selecting contractors on future work.

These compiled statistics apply to current project and contractor monitoring as well as future prequalification and selection of the contractors. If the contractors are required to submit information on completed safety activities, they can use the information as a starting point for contractor auditing. Owners may also use this information to assess whether they have met their stated safety goals and in determining incentives.

Wu (2015) found that the application of these reported incidents impacted both incident investigation and task-specific training:

> Owners should promote organizational learning in hazard and accident management. At the time of monitoring and rectifying hazards and accidents, deep root-cause analysis should be made to extract knowledge, which should in turn be documented and database should be built to generate more useful statistics. Continuous improvement and innovation can be driven by spreading the knowledge and statistics to all project personnel.

#### 2.3.1.7 Meetings

Levitt and Samelson (1982) also found that high performing contractors included safety as a standing agenda item for regular progress meetings:

> *Always include safety on the agenda at owner-contractor meetings*. Past safety performance of the contractor, special hazards involved in upcoming work, and interface safety issues are appropriate items to discuss at such meetings.

Hinze (1997) "*conducting safety meetings with the contractors,"* and Musonda (2011) "*set health and safety as a major agenda item in project meetings"* and *"always attend health and safety meetings at the construction site"* also stressed the importance of holding regular safety meetings and the owner's genuine interest and participation in the same.

#### 2.3.1.8 Goals

Goal-setting practices were suggested by many of the studies. Levitt and Samelson (1982) identified the need for project-wide goals in addition to goals for individual subcontractors or those with poor prior track records:

> *Set goals for construction safety*. Project-wide safety goals should be set, along with specific goals for contractors who need special attention because of past poor performance or particularly hazardous work operations. The goal of "Zero Accidents" is now becoming a norm in the industry.

Gambatese (2000) also identified goal setting as a critical task of the owner to communicate the value placed by the owner on this area of responsibility when he said "*establish a clear position on safety."* Effectively communicating the owner's position on safety is viewed as a meaningful way to influence project members and to improve safety performance. Possible owner positions on safety management include avoiding OSHA citations, limiting exposure to third-party liability suits, and minimizing safety responsibility, but Gambatese ultimately suggestes that the position on safety relate to the focus on eliminating accidents and injuries. By reducing accidents and injuries, an owner would ultimately experience lower construction costs and reduced exposure to third-party liability suits. The position should be communicated both verbally and in writing, and the actions of all members of the owner's organization must "reflect and reinforce the established position."

Hinze (1997) recommends owners consider "*Implementing safety incentive programs on all construction projects*," while Musonda's (2011), high performing projects were found to "*have clear project health and safety goals*."

Most recently Liu (2017) identified owner attitudes toward safety as a "critical to safety" role of the owner:

> The owner's attitude toward safety is a key part to the safety performance of the contractor. Once the owner establishes his or her attitude to safety, it will affect the safety performance in two ways. The attitude will determine the effort the owner is willing to make to the safety work, and it affects other stakeholders on what is acceptable.

Indicators of the owner's competence in these roles include questions such as "*does the owner understand that his or her involvement contributes to safety*," "*does the owner set zero injury as the objectives for the project*," and "*does the owner go beyond a regulatory compliance approach to prevent injuries*?"

### 2.3.2 Industry Publications

Industry publications do not carry the force of law, but often represent state of the art and current best practices and may sometimes be adopted by reference in a regulation or written into a contract. These are considered in addition to and separate from the academic literature because they are not the result of empirical study.

#### 2.3.2.1 ASCE Policy Statement 350

In 1989 the American Society of Civil Engineers (ASCE) adopted a policy statement aimed at improving site safety by drawing attention and gaining commitment from all parties involved in construction. To accomplish this, they describe the ideal safety role of each construction party, including owners, designers, contractors, educators, employers, workers, OSHA, and the industry as a whole. Owner specific responsibilities discussed include:

1. Assigning overall project safety responsibility and authority to a specific organization or individual, (or specifically retaining that responsibility);
2. Designating an individual or organization to develop a coordinated project safety plan and monitor safety performance during construction;
3. Designating responsibility for the final approval of shop drawings and details through contract documents; and
4. Including prior safety performance as a criterion for contractor selection.

#### 2.3.2.2 Construction Users Roundtable

The Construction Users Roundtable (CURT) is a consortium of construction buyers, contractors, and industry associations. The philosophy of the group is that construction safety leadership is up to the owners, and that owners who choose not to engage in safety management are "courting disaster in both a human and a business sense." The guiding principles for safety identified by CURT are:

1. *No construction-related injury, illness, or damage to property or the environment is acceptable.*
2. *Owners should work to prevent all such injury, illness, or damage.*
3. *An organization will achieve whatever performance level it is willing to accept.*
4. *"Zero incidents" is the only justifiable goal.*

CURT publishes the Construction Owners' Safety Blueprint (R-807), which identifies five safety expectations owners should have, based on the guiding principles:

1. *Safety will be a core value of all parties involved in a project.*

Core values represent a long-term commitment from owners that will not change with time or circumstances. With safety as a core value, any illness, injury, or near miss is unacceptable. Employees at all levels have safety related responsibilities integrated into their work process, and owners go beyond regulatory compliance in their approach to planning.

2. *Safety will be integrated into all parties' work processes.*

Integrating safety into the work process is a vital part of work control. Owners should ensure those in project management roles evaluate safety along with impact on cost, schedule, and quality. Examples of decisions that compromise safety include excessive overtime with fatigued workers, lower-cost materials and tools that may be more hazardous to work with, and work performed on live systems where unnecessary.

3. *Operational discipline will be practiced at all levels.*

Simply, "the right things are done the right way, every time." This includes setting standards for behavior, behavior in line with those standards, and a process for managing behavior not meeting established standards. This results in contractors and employees feeling valued and rewarded.

4. *Owner expectations will be understood and met.*

This places responsibilities on both the owner and contractor. Once expectations have been communicated, the contractor is responsible for understanding what is in the contract, communicating with the owner on safety expectations, holding subcontractors to the same standards, taking initiative, and working to meet the owner's expectations without prompting.

5. *All stakeholders will manage safety as a business deliverable.*

Safety metrics must be meaningful to all parties and apply to individual and organizational performance. It is up to owners to establish the requirements and provide the resources necessary for contractors to meet them.

The Construction Owners' Safety Blueprint also provides guidance on establishing safety culture and monitoring safety performance. It encourages unusually high levels of owner involvement, including discussing project matters with craft-level workers, engagement in corrective actions and discipline, and enforcing safety standards through auditing.

Finally, the document ends with the a framework for an Owner's Construction Health and Safety Management System. Specific examples of management practices that fall under each of the following fifteen major topics are also provided:

1. Policy and leadership
2. Risk management
3. Legal requirements and standards of operation
4. Strategic planning, goals, and objectives
5. Structure and responsibility
6. Programs and procedures
7. Asset and operations integrity
8. Emergency preparedness
9. Awareness, training, competency
10. Investigation and corrective action
11. Communication
12. Document control and records
13. Measuring and monitoring
14. Audits
15. Review

#### 2.3.2.3 ANSI A10.33

The American National Standard by the National Safety Council (NSC) entitled ''Safety and Health Program Requirements for Multi-Employer Projects'' (ANSI A10.33) also addresses site safety responsibilities and procedures in construction. Other standards impacting the owner's role in construction safety include OSHAS 18001, ANSI 45001, and ANSI Z10.

### 2.3.3 Government Regulations

Regulations covering safety management can exist on many levels of government. Local ordinances and codes, state specific laws and OSHA plans, Federal OSHA and other agencies, and the international community all regulate safety in some way. Rules that potentially add requirements for property owners are covered below.

#### 2.3.3.1 Federal Occupational Safety and Health Administration (OSHA)

Examples of OSHA regulations that add requirements (and ultimately liability) to the owner of a property are becoming more common. The 2015 release of the "Confined Spaces in Construction," 29 CFR 1926.1200 (Subpart AA), created the role of the "host employer," or the employer that owns or manages the property where the construction work is taking place. As a host employer, the owner is responsible for providing:

1. The location of each known permit space;
2. The hazards or potential hazards in each space or the reason it is a permit space; and
3. Any precautions that the host employer or any previous controlling contractor or entry employer implemented for the protection of employees in the permit space.

Even more concerning, the rule requires the Owner to assume the role of controlling contractor if no other controlling contractor is present, stating:

> If there is no controlling contractor present at the worksite, the requirements for, and role of, controlling contactors in §1926.1203 must be fulfilled by the host employer or other employer who arranges to have employees of another employer perform work that involves permit space entry.

OSHA has also published a multi-employer citation policy, which allows for a more broad assignment of safety responsibility to other employers on a site. Specifically, employers may be cited as:

> **Exposing:** An employer whose employees are exposed to the hazard.

> **Creating:** The employer who caused a hazardous condition that violates an OSHA standard.
>
> **Controlling:** An employer who has general supervisory authority over the worksite, including the power to correct safety and health violations itself or require other to correct them.
>
> **Correcting:** An employer who is engaged in a common undertaking. On the same worksite, as the exposing employer and is responsible for correcting a hazard.

These employers may be engaged in a wide range of activities on-site or have different roles, or may not be present on the site at all. The employers may be general contractors, subcontractors, suppliers, vendors, owners, or any other entity on-site. As long as one of the four categories above can be met, that employer is responsible for acting to mitigate a hazard. Toole (2002) has shown that this policy has contributed to general confusion on the role of each party on a construction project.

#### 2.3.3.2 Other Federal Safety Standards

Other Federal agencies have adopted specific safety standards, such as 10 CFR 851 from the US Department of Energy and 23 CFR 655 from the Federal Highway Administration, U.S. Army Corps of Engineers' Safety and Health Requirements Manual EM 385-1-1.

#### 2.3.3.3 New York – Labor Law §200, §240, and § 241

Construction activities have an additional level of scrutiny in New York. After years of accidents and high-profile height-related construction accidents, the State of New York enacted a series of regulations to provide for safe working conditions on jobsites. Section 200 is ultimately a "codification of the common-law duty of a landowner to provide workers with a reasonably safe place to work" *Lombardi v. Stout.* The regulation reads:

> All places to which this chapter applies shall be so constructed, equipped, arranged, operated and conducted as to provide reasonable and adequate protection to the

> lives, health and safety of all persons employed therein or lawfully frequenting such places.

Section 240, commonly referred to as the "Scaffold Law," goes further. It requires contractors and owners to furnish or erect suitable devices to protect workers when work is being performed on a building or structure.

> All contractors and owners and their agents, except owners of one and two-family dwellings who contract for but do not direct or control the work, in the erection, demolition, repairing, altering, painting, cleaning or pointing of a building or structure shall furnish or erect, or cause to be furnished or erected for the performance of such labor, scaffolding, hoists, stays, ladders, slings, hangers, blocks, pulleys, braces, irons, ropes, and other devices which shall be so constructed, placed and operated as to give proper protection to a person so employed.

As discussed in *Lombardi v. Stout*, "liability against the landowner under section 240 (1), in contrast to Labor Law § 200, is absolute and does not require notice of a defect nor the exercise of supervisory control by the owner." Section 241 provides more specific responsibilities in the areas of construction, demolition, excavation, and elevators.

#### 2.3.3.4 Wisconsin – Safe Place Statute

The Wisconsin Safe Place statute is an example of a state law which has codified most of the requirements regularly identified under common law and added specific responsibilities. The statute states that owners must "take precautions to ensure that the premises are reasonably safe" and "construct, repair or maintain the premises in as safe a condition as the nature of the premises reasonably permits." Stated another way, the Safe Place Statute simply establishes a duty greater than that of ordinary care imposed at common law.

#### 2.3.3.5 Safety Regulations Impacting the Owner from Other Countries

Many examples of regulations impacting the owner's role in safety exist from other countries throughout the world, both in large multi-country organizations and within single country governments.

##### 2.3.3.5.1 ILO – Safety and Health in Construction Convention – C167

The International Labor Organization (ILO) is a specialized agency of the United Nations. Formed in the wake of World War I in 1919, it adopts standards related to social justice in labor conditions. These standards are then ratified by member countries. Convention C167, Safety and Health in Construction, addresses construction safety. While the owner is not mentioned specifically in the convention, Article 9 states:

> Those concerned with the design and planning of a construction project shall take into account the safety and health of the construction workers in accordance with national laws, regulations and practice.

*Table 2-1* shows the countries which have adopted Convention C167:

*Table 2-1. Countries Which Have Adopted ILO Convention C167*

| Country | Date Status | Note |
|---|---|---|
| Albania | 24-Apr-14 | In Force |
| Algeria | 6-Jun-06 | In Force |
| Belarus | 21-Nov-01 | In Force |
| Belgium | 8-Jun-16 | In Force |
| Bolivia | 10-Feb-15 | In Force |
| Brazil | 19-May-06 | In Force |
| China | 7-Mar-02 | In Force |
| Colombia | 6-Sep-94 | In Force |
| Czech Republic | 1-Jan-93 | In Force |
| Denmark | 10-Jul-95 | In Force |
| Dominican Republic | 4-Jun-98 | In Force |
| Finland | 23-Jan-97 | In Force |
| Gabon | 28-Jul-15 | In Force |
| Germany | 18-Nov-93 | In Force |
| Guatemala | 7-Oct-91 | In Force |
| Guinea | 25-Apr-17 | In Force |
| Hungary | 22-May-89 | In Force |
| Iraq | 17-Sep-90 | In Force |
| Italy | 12-Feb-03 | In Force |
| Kazakhstan | 18-Jun-08 | In Force |
| Lesotho | 27-Jan-98 | In Force |
| Luxembourg | 8-Apr-08 | In Force |
| Mexico | 5-Oct-90 | In Force |
| Montenegro | 18-Sep-15 | In Force |
| Norway | 24-Jun-91 | In Force |
| Panama | 31-Jan-08 | In Force |
| Russian Federation | 29-Oct-18 | Not in force (expected 29-Oct-19) |
| Serbia | 16-Sep-09 | In Force |
| Slovakia | 1-Jan-93 | In Force |
| Sweden | 7-Oct-91 | In Force |
| Turkey | 23-Mar-15 | In Force |
| Uruguay | 25-May-05 | In Force |

(From ILO.org. Accessed 4-Sep-19)

#### 2.3.3.5.2 European Union – Council Directive 92/57/EEC

The European Union's Council Directive 92/57/EEC states "the client or project supervisor nominates person(s) responsible for the coordination of health and safety at sites where several firms are present. Where a person responsible for coordination is appointed, the project supervisor or client remains responsible for safety and health." *Table 2-2* below shows the date of implementation of the directive for each EU member.

*Table 2-2. Date of Implementation of EU92/57/EEC*

| Country | Date of National Legislation | National Law |
|---|---|---|
| Denmark | 1994 | Ministry of Labour Order No. 1017 of 15 Dec 1993 on the Conditions at Construction Sites and Similar Places of Work |
| France | 1994 | Law No. 93-1418 of 31 December 1993 amending provisions of Labor Code applicable to building and civil engineering to ensure security and protect the health of workers. |
| Finland | 1994 | Council of State Decision on Safety of Construction Work (629/1994). |
| Netherlands | 1994 | Decree of 3 August 1994. Regulations regarding work at temporary and mobile construction sites |
| Luxembourg | 1994 | Law No. A-94/1104 h/ RGD Grand-Ducal Regulation of November 4, 1994. Minimum Safety and Health requirements to be observed at temporary or mobile construction sites |
| United Kingdom | 1995 | S.I. 1994/3140, the Construction (Design and Management) Regulations of 1994 |
| Sweden | 1995 | AFS 1994: 52, published on 20 February 1995 and enacted on 1 April 1995 |
| Portugal | 1995 | Decree-Law No. 155/95 of 1 July 1995 implementing Directive 92/57/EEC |
| Ireland | 1995 | S.I. No. 138 of 1995. Safety, Health and Welfare at work (construction) |
| Italy | 1996 | Legislative Decree No. 494 of 14 August 1996 implementing Directive 92/57/EEC |
| Greece | 1996 | Presidential Decree No. 305 of 29 August 1996 on the implementation of the EEC Directive No. 92/57 |
| Spain | 1997 | Royal Decree 1627/1997. Minimum provisions for health and safety at building sites |
| Germany | 1998 | Construction Site Order (Baustellenverordnung) 18 June 1998, Part I, No. 35 |
| Austria | 1999 | Act on the Coordination of Construction Work. No. 37. Bundesgesetzblatt, Part I, 1999, No. 37. |
| Belgium | 1999 | Royal Order of 3 May 1999 concerning temporary or mobile construction sites. |

(Adapted from Aires, 2010)

#### 2.3.3.5.3 United Kingdom – CDM 2015

The United Kingdom enacted the Construction Design and Management regulations, commonly referred to as CDM 2015, in response to the EU Council Directive. Specific responsibilities attach to the client, who is defined as "anyone who has construction work carried out for them." Commercial clients are defined as "anyone who has construction work carried out for them" and can include an individual, partnership, or company, and specifically include property developers and companies managing domestic properties. A domestic client is anyone who has construction work carried out for them, but not in connection with any business. This is usually work done on their own home or the home of a family member. These regulations ultimately assign "client duties" that apply in full to commercial clients and in limited circumstances to domestic clients. The main duty of a commercial client is to make suitable arrangements for managing a project and ensure that they have been completed. This includes making sure:

- Other dutyholders are appointed as appropriate;
- Sufficient time and resources are allocated to the safety efforts of the project;
- Relevant information is prepared and provided to other dutyholders;
- The principal designer and principal contractor carry out their duties; and
- Welfare facilities are provided

Domestic client duties are frequently transferred to the contractor for single contractor projects, or the principal contractor for projects with more than one contractor. The domestic client may choose to carry out the required duties through a written agreement.

#### 2.3.3.5.4 Singapore – Workplace Safety and Health Act

In 2006, Singapore enacted the Workplace Safety and Health Act. Under these regulations, the Owner and Occupier of a building have specific roles to play in construction safety. An Occupier is "the person who has control of the premises, regardless of whether they are the owner of those premises." The act also delegates broad authority to the Ministry of Manpower to create regulations which "may impose duties on any person who has control or influence over any aspect of workplace safety or health, including but not limited to any occupier, owner, employer, manufacturer, designer or employed person." (Workplace Safety and Health Act, 2006).

#### 2.3.3.5.5 Australia – National Standard for Construction Work

The National Occupational Health and Safety Commission's National Standard for Construction Work [NOHSC:1016 (2005)] establishes clear Occupational Health and Safety (OHS) responsibilities for construction clients. This standard is described as "instruments of an advisory character," except where a state or territory within Australia adopts them as law. As of 2016, each jurisdiction has adopted the standards as law, with the exception of Victoria and Western Australia. These responsibilities include requirements for clients to:

1. Consult with designers to ensure that any construction work in connection with the design can be undertaken without risk to the health and safety of any person undertaking the construction work

2. Consult with contractors to ensure that persons undertaking the construction work can do so without risk to health and safety, as well as to ensure that no person on or near the construction site is put at risk from the construction work

3. Communicate OHS risk information arising in the planning and design stages to the contractor and the eventual owner/operator of the facility.

A guidance "framework," known as the Model Client Framework, was developed by the Office of the Federal Safety Commissioner (OFSC) in Australia to improve OHS performance across the construction industry. Although originally intended for government-led projects, the framework provides a mechanism for any client to follow the quasi-regulations of the National Occupational Health and Safety Commission. The guidance is published in five booklets, the first describing the principles of the framework, and booklets two through five describing actions taken in the planning, design and procurement, construction, and completion stages, respectively. The foundation of the framework is eight best practice safety principles:

1. *Developing a safety culture*
2. *Leadership and Commitment*
3. *Developing cooperative relationships*
4. *Promoting OHS in planning and design*
5. *Consulting and communicating OHS information to project stakeholders*
6. *Managing OHS risks and hazards*
7. *Maintaining effective OHS measures across the project lifecycle*
8. *Monitoring and evaluating OHS performance*

### 2.3.4 Contract Documents

A 2002 study by Toole evaluated three main contract families commonly used in the United States – the AIA A201, the AGC 200 (now ConsensusDocs), and the EJCDC 1910-8. He found that these contracts, as well as the ASCE's policy on construction safety (ASCE 350) varied significantly in what responsibilities were assigned to each party to a construction contract.

#### 2.3.4.1 American Institute of Architects

The American Institute of Architects maintains a series of standard form contracts for use in contracting. The AIA A201 is the most common standard form contract used in construction today (Toole, 2002). It addresses construction safety specifically in six sections, and indirectly in several others.

Section 10 is the main section addressing construction safety. It starts out with a broad statement of responsibility in section 10.1:

> The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the contract.

#### 2.3.4.2 ConsensusDOCS

Section 3.4.3 of ConsensusDOCS form 200 states in part:

> The **Contractor** shall enforce safety procedures, strict discipline and good order among persons performing the Work. If the **Owner** determines that a particular person does not follow safety procedures, or is unfit or unskilled for the assigned work, **Contractor** shall immediately reassign the person upon receipt of the **Owner's** written notice to do so.

Section 3.11 is the main entry in the ConsensusDOCS 200 standard contract that details responsibilities for safety on the construction site. It does not assign specific responsibilities to the owner, but does provide a mechanism for the owner to become involved in section 3.11.6:

> If the Owner deems any part of the Work or Worksite unsafe, the Owner, without assuming responsibility for the Contractor's safety program, may require the Contractor to stop performance of the Work or take corrective measures satisfactory to the Owner, or both. If the Contractor does not adopt corrective measures, the Owner may perform them and deduct their cost from the Contract Price.

Article 5 is the primary section detailing the responsibilities of the Owner.

#### 2.3.4.3 Engineers Joint Contract Documents Committee (EJCDC)

''Standard General Conditions of the Construction Contract'' (EJCDC 1910-8) is a form created and issued by the Engineers Joint Contract Documents Committee. Co-publishers include the American Society of Civil Engineers, the American Consulting Engineering Council, and the National Society of Professional Engineers. The EJCDC's contract does address the owner's role in safety on the construction site, however, only to the extent that the owner has no role:

> The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.''

### 2.3.5 Legal Precedent

The case law regarding the owner's role in construction safety is very difficult to pin down in the US. Legal doctrines, statutes, and binding decisions exist and evolve on a state-by-state basis and can vary wildly depending on a multitude of factors. Where possible, the restatement of torts is referenced to provide a generic legal principle. The cases and concepts discussed below are intended to illustrate the major principles at work but will not apply in all jurisdictions.

#### 2.3.5.1 Privette Doctrine

The Privette Doctrine is the result of a 1993 California case, *Privette v. Superior Court*. In this case, the court held that property owners and general contractors are not liable for injuries to employees of subcontractors absent an affirmative act or omission causing injury. A major rationale for this decision is the presence of workers compensation legislation as an exclusive remedy for injured workers on a construction site. The court, analyzing *Privette* in *Toland v. Sunland Housing Group, Inc.*, said "it is illogical and unfair that a landowner or other person who hires an independent contractor should have greater liability for the independent contractor's negligence towards the contractor's employees than the independent contractor whose liability is limited to providing workers' compensation coverage." In many jurisdictions, this principle is referred to as the "general rule of non-liability" and can be found at §409 of the Restatement (Second) of Torts (1965). It states:

> Except as stated in §§ 410-429, the employer of an independent contractor is not liable for physical harm caused to another by an act or omission of the contractor or his servants.

This rule is the starting point for common law actions regarding owner liability and independent contractors. As the court in *Pacific Fire Ins. Co. v. Kenny Boiler & Mfg. Co.* described it: "indeed it would be proper to say that the rule is now primarily important as a preamble to the catalog of its exceptions." The catalog of exceptions is found in sections 410 to 429.

### 2.3.5.2 Retained Control Doctrine

Of the "catalog of exceptions" described by the *Pacific Fire* court, the idea of retained control may be the most common. The court in the seminal Michigan case *Funk v. General Motors* stated an expression of the §409 "General Rule of Owner Non-Liability" when they said:

> Ordinarily a landowner is not responsible for injuries caused by a carefully selected contractor to whom he has delegated the task of erecting a structure…

But, citing section 414 of the Second Restatement of Torts, the court went on to say:

> One who entrusts work to an independent contractor, but who retains the control of any part of the work, is subject to liability for physical harm to others for whose safety the employer owes a duty to exercise reasonable care, which is caused by his failure to exercise his control with reasonable care.

The court's reasoning for this was explained by their holding that General Motors, as owner, "exercised an unusually high degree of control over the construction." Where a typical owner is not a professional builder, they found GM to have drawn building plans, written contractual specifications, acted as architectural supervisor, directly hired and fired contractors, and interpreted contract plans and specifications. This finding created what is commonly referred to as the "Retained Control Doctrine." This doctrine applies to owners in cases where they effectively behave as a general contractor.

Several comments to section 414 provide insight into how the courts view the retained control doctrine. In comment (a), the American Law Institute says:

> The employer may, however, retain a control less than that which is necessary to subject him to liability as master. He may retain only the power to direct the order in which the work shall be done, or to forbid its being done in a manner likely to be dangerous to himself or others. Such a supervisory control may not subject him to liability under the principles of Agency, but he may be liable under the rule stated

> in this Section unless he exercises his supervisory control with reasonable care so as to prevent the work which he has ordered to be done from causing injury to others.

This comment (a) to section 414 of the Second Restatement of Torts was relied upon by the Pennsylvania Supreme Court in *Byrd v. Merwin*. By retaining the ability to "mandate the order in which the work should be done," the homeowner retained the power to direct *how* the work should be done, not merely the *results* of the work. This distinction led the court to hold the owner liable for an accident suffered by an independent contractor.

Another comment to section 414, comment (c), states:

> In order for the rule stated in the Section to apply, the employer must have retained at least some degree of control over the manner in which the work is done. It is not enough that he has merely a general right to order the work stopped or resumed, to inspect its progress or to receive reports, to make suggestions or recommendations which need not necessarily be followed, or to prescribe alterations and deviations. Such a general right is usually reserved to employers, but it does not mean that the contract is controlled as to his methods of work, or as to operative detail. There must be such retention of a right of supervision that the contract is not entirely free to do the work in his own way.

Given the contents of comments (a) and (c), there are conflicting results in the case law. In *Duplantis v. Shell Offshore, Inc.*, a Louisiana court found that defendant Shell Offshore took "an active interest in the safety of the employees of its independent contractor," but that did not "in and of itself, constitute direct operational control." Shell's on-site employee held safety meetings with the general contractor and subcontractors and had previously been involved in removing a crane operator who he observed performing his duties in an unsafe manner. But the employee lacked the authority to remove or give orders to contractor personnel. "Rather, he had to go through [the chief general contractor/subcontractor employee on the rig] in the form of suggestions or advice."

Contrasting with the *Duplantis v. Shell Offshore, Inc.* decision is the Michigan case *Plummer v. Bechtel.* In *Plummer*, the court found that the project owner, Edison, retained control of the project. Edison, not Bechtel, had actually hired the subcontractor (Babcock and Wilcox). Edison employed a site safety coordinator who observed and reported concerning the basic safety operation throughout the project and assured that the safety provisions of the project contract were performed. The site safety coordinator often walked the site and spoke about safety directly with employees of the subcontractors. The court found that the presence and actions of the Edison employee effectively led to a retention of supervision of the project and, citing comment (c), that "the contractor was not entirely free to do the work in his own way."

In Illinois, with the repeal of the Structural Work Act in 1995, construction accident claims that had previously been handled under the provisions of the Act instead were brought as common law actions. In effect, this forced the Illinois courts to create many of the determinations other states had made since the era of *Funk* in a much shorter window of time. According to the Illinois Supreme Court Committee on Jury Instructions (2002), some of the factors courts have used to determine whether an individual is in "control" of the work include:

1. *The right to stop work for safety reasons*
2. *Authority to implement safety rules/procedures*
3. *If a safety consultant is consistently present on job site*
4. *Supervision and control of the work*
5. *Retention of the right to supervise and control the work*
6. *Supervision and coordination of subcontractors*
7. *Responsibility for taking safety precautions at the job site*
8. *Authority to issue change orders*
9. *Holding meetings in which safety issues are discussed*
10. *Ownership of the equipment used at the job site*
11. *Authority to order unsafe equipment removed.*

The question of what the owner can and cannot do if they wish to avoid liability for construction accidents is still open. It is clear that owners can have *some* role in construction safety. As discussed in *Samodai v. Chrysler Corp*:

> The requisite nature of this standard requires that the owner retain at least partial control and direction of the actual construction work, which is not equivalent to safety inspections and general oversight.

The court in *Candelaria v. BC Gen. Contractors Inc.* summed up the state of the retained control case law as it stands today:

> Although formulations such as "high degree of actual control" and "dominant role" suggest a fact-specific inquiry, one clear rule can be gleaned from Funk and its progeny. At a minimum, for an owner or general contractor to be held directly liable in negligence, its retention of control must have had some actual effect on the manner or environment in which the work was performed.

#### 2.3.5.3 Common Work Area Doctrine

The Common Work Area Doctrine does not typically apply to owners. It is worth mentioning here, however, because an owner may be held to have "retained control" (as discussed in the previous section) of a contractor's operation. In some jurisdictions, once an owner retains control, they may be subject to the Common Work Area Doctrine as if they were a general contractor.

The Common Work Area Doctrine, established in *Funk v. General Motors* and clarified in *Latham v. Barton Malow*, established a four-prong test to determine if a contractor is responsible for control of safety in a particular area. The four prongs are:

1) *The defendant contractor failed to take reasonable steps within its supervisory and coordinating authority…*

2) *to guard against readily observable and avoidable dangers…*

3) *that created a high degree of risk to a significant number of workers…*

4) *in a common work area.*

A plaintiff must satisfy all four elements of the *Latham* test to proceed with an action against a contractor, or an owner who has retained control. The original intent of the Common Work Area Doctrine, as described in *Funk,* is to attach the responsibility for safety to the party most capable of delivering it.

#### 2.3.5.4 Peculiar Risk and Inherently Dangerous Activity Doctrine

In cases where a subcontractor is hired to conduct work that poses a peculiar danger or significant risk of physical harm to others, owners are potentially liable for injuries. The Second Restatement of Torts, section 416, sometimes referred to as the "Peculiar Risk Doctrine," states:

> One who employs an independent contractor to do work which the employer should recognize as likely to create during its progress a peculiar risk of physical harm to others unless special precautions are taken, is subject to liability for physical harm caused to them by the failure of the contractor to exercise reasonable care to take such precautions, even though the employer has provided for such precautions in the contract or otherwise.

Section 427, often referred to as the "Inherently Dangerous Activity Doctrine," states:

> One who employs an independent contractor to do work involving a special danger to others which the employer knows or has reason to know to be inherent in or normal to the work, or which he contemplates or has reason to contemplate when making the contract, is subject to liability for physical harm caused to such others by the contractor's failure to take reasonable precautions against such danger.

In early cases, the liability identified in these sections was only applied to innocent third parties, such as neighboring property owners and pedestrians, who were injured as a result of an inherently dangerous work activity. Over time, injured subcontractor employees began filing civil claims against property owners under the inherently dangerous activity doctrine, in addition to receiving worker's compensation benefits from their employers (Crow, 2004). In 2004, the Michigan Supreme Court rejected this practice in *DeShambo v. Nielsen.* The court held that the particular language "to others" referenced in sections 416 and 427 specifically excluded workers employed on the site. Many other courts have set precedent similar to *DeShambo* and refused to extend the Peculiar Risk and Inherently Dangerous Activity Doctrines to subcontractor employees. Even with the tendency to limit these doctrines, a significant number of lawsuits still claim damages under these theories of liability.

#### 2.3.5.5 Reasonable Care

The possessor of land is not generally liable to an invitee for injuries caused by a condition on the land whose danger is known or obvious to them unless the possessor should anticipate the harm despite such knowledge or obviousness. *Restatement (Second) of Torts §343 (1965).*

As stated by the court in *Lugo v. Ameritech Corp, Inc.*, "a possessor of land owes an invitee a duty to exercise reasonable care to protect the invitee from unreasonable risks of harm caused by dangerous conditions on the premises. This duty does not extend to the removal of open and obvious dangers."

#### 2.3.5.6 Negligent Hiring

Despite the recurring recommendation from the academic community to prequalify contractors, and the language in *Funk* and similar cases regarding the general rule of non-liability and a "carefully selected contractor," the courts have not recognized hiring competent contractors at the duty of an owner. Although employing higher performing contractors will inherently produce higher performing projects, several decisions from the courts show this is not expected. The Michigan case of *Campbell v. Kovich*, held that "no cause of action exists for the negligent hiring of a subcontractor." *Reeves v. Kmart Corp* went further, finding "Michigan has not recognized a duty requiring an employer to exercise care in the selection and retention of an independent contractor. Furthermore, we hold that such a duty does not exist.” The Wisconsin case of *Wagner v. Continental Cas. Co* echoed the sentiment, holding that “a building owner’s failure to check the credentials of an independent contractor does not constitute active misconduct sufficient to hold the owner liable to the contractor’s employee for an injury sustained in the course of construction.”

## 2.4 Philosophical Worldview and Research Design

This section will review background information that helps to position this work in a philosophical and methodological context and supports the evolution of the research method described fully in Chapter 3.

With the objectives described in Chapter 1 in mind, a philosophical foundation must be carefully considered and clearly articulated. This foundation will help to define the research approach, the meaning of the data, and the applicability of the final conclusion of the research. Creswell (2009) identifies the term “worldview” to refer to this foundation at its most basic level, and adopts Guba’s definition: “a basic set of beliefs that guide action” (1990, p. 17). According to Creswell, worldview is similar to the terms *paradigm* (Lincoln & Guba, 2000; Mertens, 1998), *epistemologies* and *ontologies* (Crotty, 1998), and others.

The first philosophical worldview identified by Creswell is that of the postpositivist. This worldview assumes that the world is deterministic and that causes most likely lead to outcomes. This position leads researchers to favor experimental approaches to research, with a strict adherence to the scientific method and a tendency toward quantitative methods. The postpositivist focuses on empirical observation, measurement, and theory verification.

The social constructionist worldview, by contrast, assumes that “individuals seek understanding of the world in which they live and work” (Creswell, 2009, p. 8). This subjective understanding of the world is unique to each individual that experiences it, and multiple perspectives can result from similar situations for different people. Unlike the postpositivist, who seeks to unify a theory, social constructionists look for complexity and variability to arrive at a more nuanced and detailed explanation of the world. Reality is hence a construction of the social and subjective interpretation of each individual as they interact with the world. Social constructionist research focuses on understanding others perspective of the world, building a theory out of findings rather than collecting information to verify a theory.

A more recent worldview is that of the advocacy or participatory perspective, where the focus is advancing a particular agenda or political message. A researcher with this particular worldview starts with a given social issue, be it empowerment, gender, discrimination, racism, or other broad issues, and crafts research to support and provide a voice for members of groups subject to these issues. Kemmis and Wilkinson (1998) summarize this perspective by saying advocacy and participatory-based research ends with an agenda for change, focuses on helping individuals, aims to create debate and discussion, and features participants as active contributors in the work.

The final perspective advanced by Creswell is that of the pragmatist. Researchers in the pragmatic worldview are primarily focused on answering questions with real-world application and solutions to problems. A pragmatist is concerned with application of the research, meaning what works, and what solves real problems (Patton, 1990). Unlike other worldviews,f which more directly dictate the research design and method, a researcher with a pragmatist worldview focuses on the problem and ultimately uses the best available methods to understand the problem (Rossman & Wilson, 1985).

With worldview in mind, the next question is that of research design. While quantitative research is most often found within the postpositivist worldview, and qualitative research more frequently used with constructionist and participatory/advocacy worldviews, a pragmatist is free to select among all of the methods, often resulting in a mixed-methods approach (Creswell, 2009. p. 16). A pragmatist's concern generally focuses on using whatever strategy is necessary to understand a phenomenon, generate a theory, and advance knowledge. This perspective is not incongruous with either qualitative or quantitative research; these mixed-method approaches are simply somewhere in a middle ground between two ends of a continuum (Newman & Benz, 1998).

"Strategies of inquiry" is a term used by Creswell (2009) to refer to the "types of qualitative, quantitative, and mixed-methods designs or models that provide specific direction for procedures in a research design." Within mixed-methods approaches, Creswell identifies three major strategies: sequential mixed methods, concurrent mixed methods, and transformative mixed methods. In a sequential approach, a researcher starts with an approach that is entirely qualitative or quantitative and then follows with a second phase of a different method. An example of this may include beginning with a qualitative interview to populate questions for a later quantitative survey. Using a concurrent mixed methods strategy on the other hand, a researcher collects both qualitative and quantitative data throughout the study to look at an issue in the most comprehensive way. By integrating insights from both approaches, a researcher is able to analyze data in ways not available to one method or the other. Finally, transformative mixed methods allow a researcher to use a theoretical lens to look at a problem and design a study. This approach allows a researcher to apply a unifying theme to a study and provides a framework for data collection and the outcomes generated by the study. Sequential and concurrent designs are often found within the transformative mixed methods approach (Creswell, 2009, p. 14).

### 2.4.1 Pattern Language

In the early 1960s, Christopher Alexander, then a Fellow at Harvard, was asked to design a village in India, where he had previously spent time studying small villages. In refusing what would have been his first "sizeable commission," he explained to the Indian official that there was no way for him to understand the intricacies of local life, the culture, and the needs of the individuals who lived there. As Alexander himself put it, "it's classic for someone who thinks he's a semi-anthropologist to come in and completely misunderstand or screw it up" (Hopkins, 2010). Struggling with this aggravating inability to communicate, Alexander realized each different culture lived by a set of voluntary rules. These rules were not written or communicated, but simply "rules that everyone understood and which had to be used to get a good result" (Hopkins, 2010). The need for a way to communicate these invisible qualities and unsaid rules led Alexander to work toward the development of a language capable of capturing and sharing knowledge in a natural way: A pattern language.

A pattern is simply one of these rules, broken down to an empirical level. As stated in *A Pattern Language* (1977):

> Each pattern describes a problem that occurs over and over again in our environment and then describes the core of the solution to that problem in such a way that you can use this solution a million times over without ever doing it the same way twice. (p. x)

Alexander (1979) further defines patterns with a great deal of labor in *The Timeless Way of Building*:

> *Each pattern is a three-part rule, which expresses a relation between a certain context, a problem, and a solution.*
>
> As an element in the world, each pattern is a relationship between a certain context, a certain system of forces which occurs repeatedly in that context, and a certain spatial configuration which allows these forces to resolve themselves.

> As an element of language, a pattern is an instruction, which shows how this spatial configuration can be used, over and over again, to resolve the given system of forces, wherever the context makes it relevant.
>
> The pattern is, in short, at the same time a thing, which happens in the world, and the rule which tells us how to create that thing, and when we must create it. It is both a process and a thing; both a description of a thing which is alive, and a description of the process which will generate that thing. (p. 247)

A pattern is more than just a detailed answer to a recurring question. A well written pattern describes the conflicting forces at work behind the scenes that generate the problem in the first place. Then, as described by Appleton (2000), "a pattern does more than just identify the solution, it also explains *why the solution is needed*" (p. 4). Coplien (1996) simply describes the benefit of a pattern with an analogy:

> I like to relate this definition to dress patterns. I could tell you how to make a dress by specifying the route of a scissors through a piece of cloth in terms of angles and lengths of cut. Or, I could give you a pattern. Reading the specification, you would have no idea what was being built or if you had built the right thing when you were finished. The pattern foreshadows the product: it is the rule for making the thing, but it is also, in many respects, the thing itself. (p. 3)

These individual patterns can be taken and used by anyone seeking to resolve a similar recurring problem in an infinite number of combinations. In this way, the collection of patterns creates a pattern language. Appleton (2000) attempts to define a pattern language, stating:

> If a pattern is a recurring solution to a problem in a context given by some forces, then a pattern language is a collective of such solutions which, at every level of scale, work together to resolve a complex problem into an orderly solution according to a pre-defined goal. (p. 17)

### 2.4.2 Constructivist Grounded Theory

Grounded theory has evolved over time. Initially described in 1967 by Glaser and Strauss, grounded theory is "a strategy of inquiry in which the researcher derives a general, abstract theory of a process, action, or interaction grounded in the views of the participants" (Creswell, 2009, p. 13). Researchers start with open-ended questions, seeking recurring themes within the experiences of the research participants in a process called initial or open coding. As themes are identified, they are assigned "codes" to represent the essence of the theme. Codes are grouped into categories through focused and theoretical coding, and a theory is ultimately developed that is "grounded" in the original experience of the participant. Differing perspectives between Glaser and Strauss led to the development of two competing grounded theory methods. The process advocated by Glaser calls for a researcher to start interviewing participants with little to no exposure to the existing literature on a topic, allowing for the emergence of ideas from the process instead of a researcher attempting to fit the data into a preexisting framework. This included restricting researchers from defining research questions a priori. Strauss and Corbin, by contrast, often start with a novel research question and look at grounded theory with verification (not emergence) as the primary purpose. In this sense, Glaser is interpretative, while Strauss and Corbin are behaviorist.

A third approach, constructivist grounded theory, was introduced by Charmaz (2000, 2014). In this take on grounded theory, Charmaz finds the mid-point between the Glaser and Strauss camps, finding the continuum of ideas between objectivist and constructivist. To Charmaz, "grounded theory methods offer a set of general principles, guidelines, strategies, and heuristic devices rather than formulaic prescriptions" (2014, p.3). She further identifies (2014) the general practices of a grounded theorist, noting that some projects will achieve all of these steps, while others may select those that are most useful.

Grounded theory research incorporates some of the following practices:

1. Conduct data collection and analysis simultaneously in an iterative process
2. Analyze actions and processes rather than themes and structures

3. Use comparative methods
4. Draw on data (e.g., narratives and descriptions) in service of developing new conceptual categories
5. Develop inductive abstract analytic categories through systemic data analysis
6. Emphasize theory construction rather than description or application of current theories
7. Engage in theoretical sampling
8. Search for variation in the studied categories or process
9. Pursue developing a category rather than covering a specific empirical topic

In constructivist grounded theory, a literature review is seen as one of the data points among many other rich sources of data. Other sources of data include "observations, conversations, formal interviews, autobiographies, public records, organizational reports, respondents' diaries and journals, and the researchers own reflections" (Charmaz, 2000). Regardless of the source of the data studied, the analysis is centered on creating codes to capture the essence of the idea, comparing these codes to existing information, and creating memos to thoroughly describe the complexity and interplay within this idea.

With documents potentially forming the primary data source, a further exploration of coding and analysis methods is necessary to identify the research process. Chenail (2012) describes a relational system of coding and analysis which addresses these data sources for "complementary analytical tensions," both in a horizontality sense and in a verticality sense. In this process, individual codes are established in a horizontal analysis, where the theoretical separation between codes is evaluated. The verticality of a code is also evaluated for the metaphoric relationship and consistency to the actual phenomena the code is meant to represent. In this case, the horizontal coding is meant to identify *different* phenomena and ensure each code reflects different content, while the vertical coding is intended to explore the differences within a phenomena to establish the full meaning of the initially coded material. These procedures align with the initial and focused coding procedures identified by Charmaz (2014) and provide additional focus to the process.

The combination of these methods as part of this work will be fully described in Chapter 3.

### 2.4.3 Assessing Trustworthiness

While validity and reliability are the hallmarks of good quantitative research, the post-positivist underpinning of these qualities strain their application to qualitative research within the social constructivist paradigm (Wolcott, 1994; Morrow, 2005). Lincoln & Guba (2000) identified extrinsic parallel criteria that, while not originally contemplated in the qualitative genre, loosely achieved the same purposes. They compared credibility to the quantitative internal validity, transferability to external validity, dependability to reliability, and confirmability to objectivity (Morrow, 2005). This longstanding approach, Morrow argues, has been used to shape qualitative research in ways that make it more acceptable to conventional audiences, but has led to logical inconsistencies and been widely criticized. For example, if we accept that truth is socially constructed and that truth exists in multiple constructed individual realities, how can we assure we have uncovered the actual correct truth that is capable of verification and validation? In advocating for shifting to an intrinsic standard born within the qualitative paradigm, she reasons:

> As long as qualitative researchers are apologetic for our unique frames of reference and standards of goodness, we perpetuate an attitude on the part of postpositivist researchers that we are not quite rigorous enough and that what we do is not 'real science' (2005, p. 252).

Wolcott likewise examines the true impact of forcing postpositive perspectives and assumptions on the usefulness of qualitative research:

> A concern for validity in [a person's lived experience] seems not only an unfortunate choice of objectives but a dangerous distraction. What I seek is something else, a quality that points more to identifying critical elements and wringing plausible

> interpretations from them, something one can pursue without becoming obsessed with finding the right or ultimate answer, the correct version, the Truth (1994, p. 366-7).

To ensure a quality assurance plan that is coherent with the current study, it must consider the theoretical and epistemological bedrock on which it is conceived. The social constructionist worldview adopted along with pragmatism in Constructivist Grounded Theory assumes that "individuals seek understanding of the world in which they live and work" (Creswell, 2009, p. 8). This subjective understanding of the world is unique to each individual that experiences it and multiple perspectives can result from similar situations for different people. Reality is therefore a construction of the social and subjective interpretation of each individual as they interact with the world.

If we seek to find a standard assessment rubric for the current qualitative research, other measures beyond validity, such as credibility, dependability, transferability, and confirmability, are more suited to the philosophical and methodological assumptions that shape this worldview (Lincoln & Guba, 1985; Olson, 2008). Olson, relying on the works of Lincoln & Guba (1985), and Isaac & Michael (1997), offers the following definitions (p. 85):

> **Credibility** – the extent to which the research findings are believable and convincing.
>
> **Dependability –** the extent to which the findings are consistent with similar investigations.
>
> **Transferability** – the extent to which the findings may be applied to contextually similar settings
>
> **Confirmability** – the extent to which the process of data collection and analysis, as well as the resulting products or findings, may be audited by an outside party.

Within the differing philosophies of Classic or Glaserian Grounded Theory, Straussian Grounded Theory, and the Constructivist Grounded Theory of Charmaz, various evaluation criteria are also promoted. A main difference between the two early grounded theory proponents (Glaser and Strauss) is the focus on verification from Strauss, while Glaser promoted categories that **fit** the data, a **working** theory, a **relevant** theory, and a theory that is **modifiable** in the face of new conflicting data. Strauss, by contrast, and later Corbin, set seven criteria for the research process and eight criteria for the empirical grounding of the resulting theory. Charmaz (2014) however, recommends a focus on "originality and credibility, which increases resonance, usefulness, and the subsequent value of the contribution" (p.338). Selected examples of each of these qualities include (p.337):

**Credibility**

Are the data sufficient to merit your claims?

Do the categories cover a wide range of empirical observations?

Has your research provided enough evidence for your claims to allow the reader to form an independent assessment – and agree with your claims?

**Originality**

Does your analysis provide a new conceptual rendering of the data?

Do your categories offer new insights?

**Resonance**

Do the categories portray the fullness of the studied experience?

Does your grounded theory make sense to your participants or people who share their circumstances?

Does your analysis offer them deeper insights about their lives and worlds?

**Usefulness**

> Does your analysis offer *useful* interpretations that people can use in their everyday worlds?
>
> Can the analysis spark further research in other substantive areas?

There are a number of evaluation criteria similarly suggested by Alexander throughout his works. As part of "the way," Alexander describes the maturation of the Pattern Language as *piecemeal growth*, expanding and contracting as a living language. This leads to an effective *density* that makes the language useful and usable. *Embedded networks* are needed to have a useful pattern language that explains the interactions and consequences of the implementation of patterns. Appleton (2000) has also suggested evaluating patterns based on their ability to *encapsulate* a problem and the level of theoretical *abstraction* they achieve. Patterns should also reflect *openness, generativity,* and *composability.*

## 2.5 Conclusion

In conclusion, significant disagreement exists between the five major influences on owner safety management practices. The research outlined in the academic literature has repeatedly shown that the owner is in the best position to impact the safety performance of a construction project, and that owners' influence over safety culture and presence on a jobsite is an indicator of high-performing construction sites. Case law in the area of owner involvement in construction safety, however, shows the added liability an owner may incur if they are too involved in construction safety management. Any of the activities an owner is encouraged to undertake by the academic community may directly increase the liability of the owner, even if the overall risk of an accident is reduced. Owners regularly find themselves in a no-win position: remain disengaged in safety management and deal with a higher frequency of accidents (while maintaining lower liability exposure overall), or become involved in safety and reduce accident frequency, but add potential liability when an accident does occur. This conflict, coupled with the ambiguity and variability of contract documents, regulatory drivers, and industry publications shows a clear need for further study into the owner's role in construction safety management. No research to date has explored the actions that owners may take that actually increase their liability. Existing recommendations need to be critically reviewed and revised to accommodate this potential for harm.

This chapter also identifies a unique philosophical worldview and research methodology which will support a research design that allows the researcher to explore these issues in a new way. A pragmatist worldview supports a mixed methods approach and seeks to pair methods likely to generate the right information from multiple domains. Chapter 3 will outline this approach.

# 3 RESEARCH METHODS

This chapter will explain the objective of this research and provide detail on the specific deliverables that will be produced. The underpinning philosophical perspective that drives decision making and ultimately supports this unique research design will also be established and supported. This work represents a new approach to answer the question of the owner's ideal role in impacting and improving independent contractors' management of safety. Prior studies have quantitatively evaluated the impact of different safety practices utilized by owners and made suggestions for actions the owners could take to improve contractor safety performance. As this chapter will outline, this new approach will combine a number of different methods, data sources, and expert perspectives to explore this tricky issue facing owners in a way that accommodates the variation found in industry.

## 3.1 Philosophical Foundation

The current research seeks to build on the advancing body of knowledge on the owner's role in and impact on construction safety. *Section 2.4* described the philosophical foundation of this research. The pragmatist worldview allows the researcher to adopt a perspective that is inclusive of many of the strengths of the other worldviews. The focus on observation and factual proof from postpositivists can be combined with the multiple rich meanings within a social context from the constructivist. A collaborative and change-oriented outcome can be the ideal outcome of a pragmatist's research just as the focus is with an advocacy and participatory worldview.

This research will adopt multiple tools from other methods along the qualitative-quantitative continuum. In early phases, open coding from constructivist grounded theory will be used to create an initial list of management practices. This list will lead to a survey of professionals' opinions. Once draft patterns are created, additional data collection efforts, such as interviews, surveys, and focus groups, will be used to refine, edit, extend, and ultimately validate the research. The research method is fully discussed in detail in *Section 3.3*.

In summary, this research will proceed from a pragmatist's worldview, adopting a transformative mixed methods approach. The pattern language method advanced by Iba (2016) will be used as a guiding vision for the work, while the process of constructivist grounded theory from Charmaz (2014) will be used to provide method, structure, and detail to the research process. This approach has been conducted by previous researchers including Hentrich (2015) and Rauhamaki (2017). Tools from both qualitative and quantitative disciplines, including, document review, survey, interview, and evidence-based practice will be used to provide the type of deep understanding that the topic of the owner's role in construction safety needs.

## 3.2 Research Objective

All owners interact with construction companies in different ways. Some simply hire a contractor and pay the bill once the work is complete. Others staff projects with embedded professionals who control many aspects of the work. Construction safety is no different. Each of these approaches produces an experience. This experience serves to inform the individual of what to do and what to not do in future efforts. By collecting the experience, both positive and negative, of many individuals, a repeatable "pattern language" of safety management will be developed to inform owners seeking to improve their interaction with contractors and their management of safety. The research question we seek to answer is *how should an owner interact with independent contractors when it comes to safety management?*

The subquestions that will be answered and that ultimately guide the work are:

1. What are the current practices of owners as they relate to management of the safety of independent contractors?
2. What are the recommended practices for contractor safety management from the owners?
3. What management practices, actions, roles, and structures should owners avoid?
4. What are the conflicting forces owners must consider behind each management practice or action?

The objectives of this work are to:

1. Identify the current trends and practices of owners in contractor safety management.
2. Identify recommendations from the literature on the owner's role in construction safety management.
3. Approach consensus on the optimal procedures of owner management of construction safety.
4. Document the conflicting forces facing owners, where consensus is not possible, so future users of this work are aware of these issues.
5. Document recommended practices using "Pattern Language" approach to contractor safety management.

## 3.3 Research Process: Combining Grounded Theory and Pattern Language

To answer the subquestions and meet the objectives of this work identified above, the following tasks outline the research process:

1. Collect extant documents on the topic of project owners and construction safety, including owner requirements, academic and industry literature, and case law.
2. Conduct a *horizontal analysis* of existing documents that may be helpful to understand the current state of the owner's role in construction safety management through initial coding. Extant documents include the existing literature on the topic, owner's requirement manuals and specifications, and established relevant case law. The initial coding process seeks to identify potential repeating themes and categories found within the extant documents.
3. Perform a *vertical analysis* of the existing codes developed in the first step. Each instance of a code developed in the horizontal analysis will be collected and analyzed using focused coding techniques that "sift, sort, synthesize, and analyze the data generated" (Charmaz, 2014). The aim of this phase of the analysis is constant comparison to capture the variation and nuance contained within the data.
4. Collect researcher reflections on the information throughout the process and use this information during the formation of early draft memos.
5. Write draft memos using focused coding techniques.
6. Collect additional data in an iterative process as dictated by the draft memos. This may include the use of a various range of knowledge elicitation steps such as surveys, interviews, focus groups, among others. If a topic has not reached saturation, the process between step 5 and 6 repeats.
7. Conduct confirmatory procedures, including peer debriefing interviews and member checking focus groups to ensure the pattern language meets the parameters for trustworthiness required by grounded theory.

8. Determine that saturation has been reached, finalize the pattern, and add it to the final pattern language. The pattern becomes a living document that changes as new experience and information comes to light.

The method is illustrated in *Figure 1-1. Research Method* Overview.

This research uses the pattern language approach for sharing lived experiences as inspiration and a framework for communicating findings while relying on the process of grounded theory for creating a step-by-step method, similar to Hentrich (2015) and Rauhamaki (2017). The similarity between both of these methods allows for the research to be discussed in either paradigm. *Table 3-1. Similarities between Constructivist Grounded Theory and Pattern Language* illustrates the similarities in the process between grounded theory and pattern language.

There are many sources of pattern specific methods that have been used to create pattern languages. In all of these methods, three main steps are covered: Pattern Mining, Pattern Writing, and Pattern Polishing. The method developed by the Iba Lab (Iba and Isaku, 2016) at Keio University in Keio, Japan was identified as an ideal framework to incorporate into the research method due to its prior application to many subject areas, broad incorporation of prior pattern literature, and its relative currency among other pattern language approaches. The strength of the pattern language as compared to other methods is the unique structure for sharing findings. By producing comparable information for every theme or practice identified through the research process and presenting this information in a consistent format, users of the final work will be able to quickly and easily find the information they are looking for.

Grounded theory is itself a “set of general principles, guidelines, strategies, and heuristic devices rather than formulaic prescriptions” (Charmaz, 2014, p.3). Researchers ‘ground’ the theory in evidence created from participants lived experience. It is an iterative process that often evolves over time as the researcher probes into new and unforeseen areas of inquiry. A central process of grounded theory involves coding of data from a wide range of sources, including elicited and extant documents, interviews, observations, and records. From the coded data, researchers create memos that become an evolving statement of the reality participants experience as understood by the researcher. Memos are revised throughout the research process as new leads develop, earlier ideas are refined, and a better organization of these interconnected ideas coalesces. For these reasons, grounded theory is an ideal method to capture, evaluate, and corroborate a complex management process such as contractor safety management. Grounded theory allows the researcher to identify the experience of owners and build an accurate picture of both the good and the bad, and to take this information to inform future owners.

As shown in Table 3-1, the two methods enjoy significant overlap and complement each other, while also eliminating potential deficiencies if used alone. The intent of this work is to use the framework established by the Pattern Language community as the guiding model for the structure and function of the completed report, while the generative procedures of constructivist grounded theory will be used to establish the procedural steps necessary to generate a pattern language, and ultimately, the “quality without a name” suggested by Hentrich (2015).

*Table 3-1. Similarities between Constructivist Grounded Theory and Pattern Language*

| | **Constructivist Grounded Theory** | | **Pattern Language** | |
|---|---|---|---|---|
| Task | Phase | Method | Phase | Method |
| Owner Requirement Review | Extant Document Review | Initial/Focused Coding | Pattern Mining | Artifactual Review |
| Literature Review | Extant Document Review | Initial/Focused Coding | Pattern Mining | Artifactual Review |
| Researcher's Own Experience | Sensitizing Concepts | Researcher Reflections | Pattern Mining | Introspective Review |
| Survey | Elicited Document Review | Focused Coding | Pattern Mining | Sociological Review |
| Interview | Intensive Interview | Focused Coding | Pattern Mining | Mining Experience |
| Writing | Researcher prepared documents | Memoing | Pattern Writing | Alexandrian Format |
| Finish Point | Saturation | Theoretical Sampling, Coding, and Sorting | Pattern Polishing | Equilibrium |

### 3.3.1 Extant Document Collection and Evaluation

The first step in this research effort will be to conduct a review of the existing owners' contractor safety management plans and specifications, academic and industry literature, and other related documents available to the researcher.

A *Safety requirements manual* is the controlling document published by an owner to set minimum standards for construction safety on a project or across the owner's enterprise. In essence, the manuals represent past solutions similar entities have produced to answer the same question. To this end, a thorough search of documents published by owner entities with the intent of controlling contractor safety will be conducted. To adequately capture differences among different types of owners, different industries will be intentionally sampled. Plans will be collected from throughout the United States, from states with Federal OSHA enforcement, as well as states with State specific OSHA programs such as CalOSHA in California and MIOSHA in Michigan. Key words to be used in online requirements manual searches include: construction safety requirements, contractor safety management, construction owner, safety best practices.

*Academic and industry literature* represents the leading knowledge on the state of the art in construction. These articles, reports, and theses were collected and saved for analysis if they spoke to both the construction safety aspects and the role of the owner as their primary research question. Many of the same keywords used to find the requirements manuals above were used to find these academic and industry literature. In addition, a traditional literature review on the owner's role in construction safety was completed.

*Published case law* represents the breakdowns in normal operations on a construction project. The details of these cases provide valuable insight into the "what not to do" of any legal relationship. By including case law and associated writings on the topic, both the practices and the consequences of not effectively following these practices will be included in the resulting analysis and report.

These documents will be discovered via repeated internet searches using combinations of the key words identified in *Table 3-2. Requirement Manual Keyword Search Terms*. Case law searches will be conducted using legal databases in LexisNexis under keywords including the terms found in *Table 3-2* and more legal-specific terms such as construction accident, owner liable, retained control, and wrongful death. Cases will also be identified by cross-referencing cases discussed within a written decision. All cases will be shepardized to ensure the law is current, but those cases in which the precedent has changed in subsequent appeals or decisions will also be included to understand the facts at issue in the case and the logic applied by the court to substantiate their reasoning at the time. In many cases, even if a decision is not current, it may point to many other relevant cases worthy of inclusion in the review. Cases will be identified from across the United States, and both State and Federal courts.

*Table 3-2. Requirement Manual Keyword Search Terms*

| | | |
|---|---|---|
| Owner | Safety | Manual |
| Contractor | Risk | Plan |
| Management | Requirement | Guideline |
| Construction | Control | Procedure |

The intent in this phase of sampling is to use maximum variation sampling, as described by Patton (1990) to create a sample pool with the most practices, variance, and industry representation possible, while maintaining a minimum number of samples from each industry. For a plan to be accepted and included in this work, it must be produced by an owner for control of and use by contractors, inclusive of management procedures, and not simply a restatement of regulatory (OSHA) procedures. It must also be standalone from standard specifications. Model manuals published by regulators for general adoption, contractor requirements for sub-contractors, and programs by owners for their own employees will be specifically excluded from the sample.

Charmaz (2014) describes the process of conducting grounded theory research as “gathering rich data.” In this process, any available data source is used to understand a phenomenon and all variations of grounded theory use theoretical sampling as the primary qualitative sampling strategy. In this sampling method, the criteria used to select data points emerge as the study evolves, rather than prior to the start of analysis. Koerber and McMichael (2008) describe this approach to sampling as follows:

> Grounded theory is based on the idea that the data provide the theory. The researcher identifies a situation or phenomenon that cannot be adequately explained by existing theories and then initiates a research project to glean data that will build and test a new theory. The researcher then adjusts the theory according to trends that appear in the data. In other words, in theoretical sampling, every time researchers start to see a trend emerging in the data, they purposely look for new data that will either call that trend into question or confirm it (p. 465).

This process of analyzing existing documents relevant to the inquiry also draws from the pattern languages' *artefactual approach* originally described by Kerth and Cunningham (1997). As they describe it, this approach "studies systems built by different teams working on similar problems." This allows the researcher to be more objective when reviewing the materials. Similarly, in Constructivist Grounded Theory procedures, extant document review is one of many major sources of initial information. Charmaz (2014) goes so far as to say "rather than using texts as an auxiliary source of data, a grounded theorist's research question may focus solely on documents." (p. 48).

#### 3.3.1.1 Horizontal Coding

Phase I of this review consists of what the researcher has termed a *horizontal analysis* of every extant document available to the researcher. A horizontal analysis in this case takes each document discovered in the above step and scours the document in its entirety for the management practices chosen, recommended, or required within. The *initial coding* technique from Grounded Theory similarly examines, occurrence by occurrence, each identified topic. This process allows the researcher to survey a wide range of source documents to discover trends and themes present in the material.

Topics covered in the documents will be given alpha-numeric codes to initially identify and group like occurrences. As new practices are identified, new codes will be created. Examples of these initial codes could be anything from "daily safety meeting" to "prequalify contractors." As the coding progresses, newly identified practices will trigger reassessment of previously reviewed management plans to search those specific manuals for the newly identified practice and recode if warranted. Using constant comparison, each developing code will be compared against others to ensure each truly unique practice is identified and characterized. With this process in place, the practices identified will be grounded in the material reviewed; no preconceived idea of what practices are in use within the industry will be considered as these categories are developed. This process of horizontal analysis via initial coding is ultimately focused on identifying the practices that are most commonly utilized and to establish initial codes for a working "universe" of topics addressed by owners.

An additional quantitative step will be added to the general procedures common to grounded theory. In this process, for each topic or code included in a given document, a "1" will be recorded on a matrix list; if the topic does not appear, a "0" will be recorded, producing an average score between 0.00 and 1.00 for each topic. In this way, the most commonly occurring practices will be ranked, from among all of the practices discovered and within the subcategories of practices as they emerge. This process will also allow the researcher to evaluate each owner's level of involvement relative to the other owners included in the sample. The researcher will also be able to compare one sector to the others in the sample, and draw general inferences on the activity of an owner or sector in relation to the remaining samples in the study. These quantitative procedures will ultimately allow the researcher to provide insight to subquestion one, regarding the current construction safety management practices employed by owners. A sample of the horizontal coding matrix used for this research process is included in *Appendix A: Example of Horizontal Coding Chart*.

To display these quantitative assessments, a color scale function available in excel will be used to create a heat map, from the lowest score which will appear in red to the highest scores, appearing in green, with yellow and orange appearing in the middle. A sample of this gradient shading convention is shown in *Table 3-3. Sample Scoring and Color Gradient Scheme*. Each practice will also include a rank based on the score.

*Table 3-3. Sample Scoring and Color Gradient Scheme*

| **Practice** | **Score** | **Rank** |
|---|---|---|
| Practice 1 | 100 | 1 |
| Practice 2 | 93 | 2 |
| Practice 3 | 80 | 3 |
| Practice 4 | 80 | 3 |
| Practice 5 | 75 | 5 |
| Practice 6 | 50 | 6 |
| Practice 7 | 48 | 7 |
| Practice 8 | 30 | 8 |
| Practice 9 | 25 | 9 |
| Practice 10 | 5 | 10 |

In comparing and contrasting the frequency of practices or recommendations from different sources, the same ranking, sorting, and heat mapping process can be utilized. In this case, the difference between scores can be calculated to allow for an inference between the relative values placed on a given practice by the two different sources. This is shown in the “variance” column, and is shaded from red on the positive side, to blue on the negative side. These values can be combined as absolute values to show total variance associated with a given practice. A sample showing this process is shown in *Table 3-4. Sample Scoring Comparison, Variance, and Color Gradient Scheme.*

*Table 3-4. Sample Scoring Comparison, Variance, and Color Gradient Scheme*

| Variance | Practice | Score A | Rank A | Score B | Rank B |
|---|---|---|---|---|---|
| 20 | Practice 1 | 100 | 1 | 80 | 3 |
| 15 | Practice 5 | 75 | 5 | 60 | 5 |
| 10 | Practice 3 | 80 | 3 | 70 | 4 |
| 4 | Practice 8 | 30 | 8 | 26 | 9 |
| 1 | Practice 2 | 93 | 2 | 92 | 1 |
| 0 | Practice 7 | 48 | 7 | 48 | 7 |
| -3 | Practice 4 | 80 | 3 | 83 | 2 |
| -5 | Practice 9 | 25 | 9 | 30 | 8 |
| -5 | Practice 10 | 5 | 10 | 10 | 10 |
| -8 | Practice 6 | 50 | 6 | 58 | 6 |

These graphic conventions will be used throughout this dissertation to share quantitative insights from within the qualitative data, where possible.

#### 3.3.1.2 Vertical Coding

In phase II, each coded management practice identified in the horizontal analysis will be subjected to what the researcher has termed a *vertical analysis*. In this case, the vertical analysis involves finding the text specifically related to each instance of a code identified by the horizontal analysis and combining this related text from many owners into a single document. The researcher will then evaluate the resulting collection of text using *focused coding* techniques from constructivist grounded theory. According to Charmaz (2014), focused coding is used to “sift, sort, synthesize, and analyze large amounts of data” (p.138). This coding process is used to identify the themes and nuance common to each of these specific management practices. A focus on constant comparison will allow for all of the differences to be captured and added to researcher notes. A major advantage of the constructivist grounded theory method is the flexibility to incorporate procedures from other methods and paradigms. Hentrich (2015) for example, combined grounded theory and pattern language, using the Alexandrian pattern format as a framework for writing notes and memos. The standardized format of the pattern allows the pattern author to focus on how all of the pieces fit together as they are generated in an organized and consistent manner. In this phase of the analysis, each code becomes more robust as more examples are evaluated. Links between the initial codes are also noted and are used to take the codes from the early literal state to a more theoretical network of practices which considers how all of the management practices work together to deliver safety within an owner's construction project. Blank patterns using the Alexandrian 10-part format will be used to keep notes on each management practice as well; when new conflicting forces, interesting problems, novel solutions, or examples are identified, they will be noted to assist in future writing steps.

The primary method of analysis for this phase of the research was constant comparison as required in grounded theory. To achieve a consistent and repeatable process, a standardized system of note making was used. As a new facet, noteworthy practice, or otherwise meaningful difference was identified it was highlighted with a green color and notes were made in the same green color detailing what about the text was of interest. If the same material was encountered again, it was highlighted with a yellow color. Where the primary practice being evaluated interacted with other practices identified in the horizontal coding phase, they were noted in blue highlight and text which was later used to help establish the related patterns and antipatterns sections of the completed patterns. General notes, observations, trends, and other items of interest that may be useful in writing thick and rich descriptions in initial patterns were kept in black text. Practices that the researcher identified as potentially problematic were marked with red highlighting and text and added to a separate vertical coding document for antipattern development. An example of this marking convention from the process is included in *Appendix B: Example of Vertical Coding*.

### 3.3.2 Researcher Reflections and Expertise

One major distinction constructivist grounded theory makes from Glaserian and Straussian grounded theory is the active role of the observer. “The constructivist approach perspective shreds notions of a neutral observer and value-free expert” (Charmaz, 2014, p.13). Instead, “insider experience [gives a researcher] comparative knowledge,” which makes the researcher particularly able to pick up on minute themes and variation between participants (Charmaz, 2014, p.30).

Pattern language literature also commonly uses the knowledge of the researcher as a starting point. Rising (1999) describes this as *mining your own experience.* This approach is well documented and also identified as the *introspective approach* by Kerth and Cunningham (1997), and *mining based on individual contributions* by DeLano (1998). DeLano further distinguishes two separate focuses when mining individual contributions: individual contributions based on experience and individual contributions based on expertise.

While the initial horizontal and vertical coding is conducted, the researcher will keep field notes and observations in pattern format for use in the initial creation of memos. This information is helpful in capturing the variation and nuance among different sources of information on the same topic and is also useful in discovering those management practices that conflict with established recommendations or require the owner to make a decision where like minds may differ.

### 3.3.3 Converting Memos into Draft Patterns

Following the initial coding and analysis, the next step of the research process will be to “draft, revise, and organize the memos.” The next two sections detail the transformation from memos to draft patterns.

#### 3.3.3.1 Initial Pattern Development

After the initial coding and analysis steps are completed, many ideas, concepts, and practices will have been created and somewhat elucidated. Grounded theory uses the memo as a vehicle for the ideas contained within a code. As more is learned about the given code, the memo is updated to reflect this new knowledge. Similarly in the pattern language process, the pattern writing step, which is part two of the three step process of pattern development, looks to create initial patterns of owner's contractor safety management, which are then revised and reviewed. This iterative process of writing memos and then seeking additional data where gaps and uncertainty exist is reflected in the next two sections.

The first step of the memo writing process is to create a draft set of memos from the results of the horizontal and vertical analysis and the Alexandrian-formatted pattern language notes. In this case, the pattern format will be again used to start draft memos, just as it was used above to stimulate critical thinking during the vertical document analysis. The writing will follow many of the recommendations outlined in "Creating a Pattern Language for Creating Pattern Languages" from Iba and Isaku (2016). As part of the Pattern Language for Creating Pattern Languages, Iba and Isaku list 121 patterns related to writing productive and meaningful patterns. Meszaros and Doble also created "A Pattern Language for Pattern Writing" (1997) which outlines the desirable structure and qualities of well-written patterns.

Given the experience of the researcher, a logical starting point in the writing phase of pattern creation is for the researcher to create the initial draft patterns. Le Pechoux (2000), started the creation of a *Pattern Language for Apparel Design* in this manner (p. 122). Olson (2008), also starting the creation of his *Pattern Language for Improving the Quality of Instruction in Higher*

*Education Settings* by writing draft patterns from his notes and journals kept during the mining phase (p. 84).

#### 3.3.3.2 Initial Antipattern Development

A review of the case law surrounding the owner's role in construction safety will be conducted and will provide the basis for early antipattern development. Examples from different State and Federal courts will be evaluated because many different jurisdictions have legal precedent that evolved in concurrent but separate paths. Potentially problematic practices identified in this process will be listed and evaluated throughout the research process. Subsequent interviews and other data collection methods will help the researcher to expand and refine the universe of practices that have led owners to bad practices and decision making when managing contractor safety.

With this summary of the state of jurisprudence, the researcher will review the owner requirement manuals for examples of language or requirements that potentially create owner liability. These excerpts of text will be saved into a separate vertical coding file for review and analysis. Themes that emerge will be discussed with preliminary and confirmation interviews as well as with the focus group.

### 3.3.4 Iterative Data Collection and Evaluation Phase

In grounded theory practice, the data collected by the researcher drives subsequent data collection efforts. When gaps or uncertainty exist in the draft memos, the researcher contacts the appropriate expert or population in a way that seeks to answer why. Several additional data collection steps are often completed. These additional data collection and evaluation phases are described in *Section 3.3.4.1* through *Section 3.3.5.2*. This iterative cycle allows the data to drive the line of questioning and only stops once new details and variations are no longer discovered. In constructivist grounded theory, this is referred to as "saturation" and is further discussed in *Section 3.3.5 Saturation, Equilibrium, and Pattern Evaluation*.

#### 3.3.4.1 Preliminary Semi-Structured Expert Interviews

A major part of both grounded theory and the pattern language method is interviewing experts to generate a deeper understanding of a phenomenon. In this case, industry representatives will be recruited to participate in a semi-structured interview using the *mining by interviewing* technique described by Rising (1997), DeLano (1998), and many others. Iba and Yoder (2014) created interview patterns which describe steps they have found that lead to productive and meaningful interviews with subject experts. As Iba and Yoder (2014) point out, it is often unrealistic to ask experts to take the time necessary to understand the pattern language, mine their experience, and write effective patterns. In this case, an effective interviewer can guide the expert through the process and develop the best practices known only to the expert.

Participants for this phase of the additional data collection process will be selected via purposive sampling methods as described by Devers (2000). For this phase, the ideal participants are defined as contributors in the construction process that represent one of the six voices informing the owner (attorney, contract administrator, risk manager, regulator, safety professional, and safety academic). Further participant identification and recruitment criteria are listed in *Table 3-5*.

*Table 3-5. Participant Identification and Recruitment for Additional Data Collection*

| **Role, Achievement, or Experience** |
|---|
| Attorney, contract administrator, risk manager, regulator, safety professional, or academic |
| Experience representing owners who manage the safety operations of contractors |
| Participant in the construction delivery process at any level, including contractor's safety managers |
| Member of a domain specific industry association (ABA, ASSE, COAA, CII, ASCE, RIMS, etc) |
| Previous participant as an expert in similar studies |

The level of experience, academic progress, and other indicators of “expert” status were used to qualify participants at this stage. The minimum score necessary to qualify as an expert was reduced to 6 from at least 3 categories, from the 11 across 4 categories originally identified by Hallowell and Gambatese (2010). *Table 3-6* illustrates the participant qualification criteria:

*Table 3-6. Assessment Rubric for Participant Qualification in Sociological Mining*

| **Achievement or Experience** | **Points (each)** |
|---|---|
| Professional Registration (CSP, PE, ARM, etc.) | 3 |
| Year of professional experience | 1 |
| Conference presentation | 0.5 |
| Member of a committee | 1 |
| Chair of a committee | 3 |
| Peer-reviewed journal article | 2 |
| Faculty member at an accredited university | 3 |
| Writer/editor of a book on contractor safety | 4 |
| Writer of a book chapter on contractor safety | 2 |
| Relevant advanced degrees: | |
| BS | 4 |
| MS | 2 |
| PhD | 4 |
| JD | 3 |

A copy of the questionnaire to be used to initiate the interview is included in *Appendix D: Semi-Structured Interview Questionnaire*. The intent of these questions is to start a natural conversation with the expert and to allow the conversation to lead the discovery of ideas. Responses will be summarized on a form from each interview and a journal with researcher reflections will be kept with ideas for patterns and antipatterns, similar to the method used in Olson (2008).

The interview will consist of two parts: a first part looking to explore the experience of the experts without a significant amount of direction and a second part looking to confirm the results of the prior mining phases.

The first part of the interview will follow a simple mining process described by a pattern language proposed by Iba and Yoder (2014). They describe, via patterns, a multi-point interview where they seek to find the keys worth sharing. They define this as:

> **Keys Worth Sharing:** Ask the expert to explain the important points that colleagues or newcomers need to know when dealing with the area of interest.

To fully describe these keys, the patterns "Problem Digging" and "Context Catching" describe the steps the interviewer should use to get a fuller, deeper meaning from the interviewee:

> **Problem Digging:** Ask what will happen if they do not practice their "Keys Worth Sharing" in order to underline their importance. To be concrete, be sure to focus on each individual solution one by one getting the necessary details for each.
>
> **Context Catching:** Ask when or where the problems solved by the "Keys Worth Sharing" occur.

The remaining patterns for mining interviews are based on interviewer techniques, responses during conversation, and sorting through the seeds developed during the interview. They include:

> **Venture of Asking:** Venture to ask the questions and listen to the answers of the interviewee, even if you think you know their answer before asking.
>
> **Empathetic Response:** Respond lively to the answer received from the interviewee. For example,
>
> **Experience Overlapping:** Note or point out any experience that you have had that is similar to the experience the interviewee tells, and overlap them.

**Interesting Point:** Select topics from interviewee's answers according to your interest and what you learned during the interview. Guide the discussion based on your interests.

The second part of the interview will consist of a more structured question and answer phase. Seeds of antipatterns will be presented to the participant and they will be asked to comment on any experiences they may have had with the topic. Similarly, the topics found to be infrequently used in the review of practices found in existing requirements manuals will be vetted by the participants at this stage and potentially eliminated from future inclusion in the pattern language.

#### 3.3.4.2 Survey of Expert's Practice Preferences and Values

As part of an early verification from the horizontal and vertical coding process, the early codes will be summarized and a survey will be created to gauge the practitioner's relative agreement with the practices. These results will help to refine and shape the codes and draft patterns that will again be revised and combined by interviewing experts in the next step.

A summary of each code will be loaded into a Qualtrics based online survey, and participants will be asked to rate each coded practice on a five point Likert scale from "not useful at all" to "very useful." Safety professionals will be recruited via social media, online forums, and through publicly available industry lists and organizations.

#### 3.3.4.3 Determining Recommended Practices Using Evidence Based Practice (EBP)

Completion of the horizontal coding of both the academic recommendations and the owner practices, along with the survey of expert's practice preferences and values, will allow the researcher to use evidence-based practice methods to produce insight into subquestion two for this research: what are the practices available to owners?

For the owner practices and the academic recommendations, a score will be created by multiplying the percent of documents employing and recommending the practice respectively. The results of the expert safety professional survey, based on a five point Likert scale, will be converted to a total of 100 possible points to match the owner and academic scores. This will be accomplished by simply multiplying the resulting average by 20. An overall score will be determined by adding these three total sub-scores together for a possible score of 300. Because these rankings are from three separate sources, Kendall's Tau will be used to report the association between these different rankings and to assess their relative correlation.

This type of analysis will also allow the researcher to attempt to quantify the difference in focus and perceived practice value between the academic community, the owners who contract this work, and the safety professionals who operate and enforce these owner requirements. These differences will be calculated as variance in each of the scores. The absolute value of each of these three "variances" will be added together to assess the relative alignment of perspectives on each practice. The higher the cumulative variance score result, the greater the combined disagreement. Ranking this disagreement will help to illustrate the practices that are most controversial.

### 3.3.5 Saturation, Equilibrium, and Pattern Evaluation

Saturation is the term used in constructivist grounded theory to identify the point in time where additional data collection ceases to add new or meaningful information to the topic. Charmaz references Glaser's (2001) definition of saturation:

> Saturation is not seeing the sample pattern over and over again. It is the conceptualization of comparisons of these incidents which yield different

> properties of the patter, until *no new properties* of the pattern emerge. This yields the conceptual density that when integrated into hypotheses make up the body of the generated grounded theory with theoretical completeness. (p.191)

Alexander also addressed this concept when he discussed the piecemeal growth of patterns that establish density and equilibrium. “When a pattern is used in an application, equilibrium provides a reason for each design step, traceable to situational constraints” (Lea, 1994). The idea of equilibrium goes to the basic appeal of the pattern approach: by understanding the tradeoffs between forces and constraints made by each plausible solution a pattern language user can be aware of the benefits of the implementation of each solution and choose according to their needs. Ultimately these forces must reach an equilibrium. “Each pattern must realize some kind of balance among its forces and constraints” (Appleton, 2000).

As additional data collection progresses, draft patterns are ultimately deemed saturated when the patterns have concrete links among other patterns and no new properties emerge. After the pattern reaches saturation it is added to the completed pattern language.

#### 3.3.5.1 Pattern Confirmation Interviews

Once the pattern language is established, the patterns will be reviewed by experts who will then be interviewed. The purpose of these interviews is to confirm that the patterns reflect the current practice within the industry and to ensure that the major components of each practice have been appropriately captured. These experts will be selected from among those participants in the survey of expert’s practice preferences and values who chose to leave their name and contact information for participation in future research efforts. Each pattern will be reviewed by at least three experts, and experts will be qualified by the same method used in the preliminary semi-structured expert interviews.

The interviews will consist of a review of each of the five patterns, seeking comment from the expert on whether the pattern reflects their professional experience and expectation for the practice. In cases where ambiguity was noted in a prior phase of the research, this discrepant case and detail on how it was resolved by the researcher will be discussed with the participant. Finally, reactions to the five patterns and to the pattern language broadly will be solicited from the participants.

Interviews will be recorded and transcribed to produce participant comments sufficient to illustrate their feedback and critique of both the patterns and the pattern language. This interview serves as peer debriefing and discrepant case review as a part of the quality assurance procedure (discussed in *Section 3.4.2 Quality Assurance: An Output-Oriented Perspective*). This phase also functions as a saturation check (discussed in *Section 3.3.5 Saturation, Equilibrium, and Pattern Evaluation*).

#### 3.3.5.2 Focus Group Feedback and Verification

A final data collection and verification step will be to host a focus group to review and discuss the patterns for relative agreement, capture any missing forces affecting decisions, and collect any other comments participants have which may impact the usefulness and applicability of the final pattern language. The overall mission of the focus group is to identify any gaps in coverage areas and to further explore the forces, solutions, and resulting contexts of the patterns. The focus group will be formed from knowledgeable members of the Michigan State University administration, including safety experts, construction representatives, risk managers, and academics. These members will be recruited through direct contact.

Ganguly et.al. (2010) illustrate the struggle between an established technology holding a majority of the market and a newcomer offering an entirely new technology with the example of Napster and the rise of online music file sharing, distribution, and sales in the early 2000s. By reviewing literature and interviewing industry experts, they developed a set of key performance metrics that could be evaluated to assess the utility of a disruptive technology compared to an incumbent technology. The equations for making this comparison are given in equations 3.1 and 3.2.

$U_{Incumbent} = \Sigma\ u_i w_i$ **Equation 3.1**

$U_{Disruptive} = \Sigma\ u_j w_j$ **Equation 3.2**

Together these equations represent the defined utility function, where the expected utility is $u_i$ and $u_j$ for incumbent technology and disruptive technology, respectively, while $w_i$ and $w_j$ is the measure of importance for each measure for each technology. Importance ratings are developed from the preferences and values of the focus group member and are used to provide a relative weight of the utility. The outcome of Equation 3.3 is the final utility measure:

$U = U_{Disruptive} / U_{Incumbent} < 1 \text{ or } > 1$ **Equation 3.3**

For any score greater than one (maximum score of 5), the disruptive technology is expected to provide greater utility than the incumbent management practice. If the score is less than one (minimum possible score of 0.2), the incumbent management practice is preferred over the disruptive technology.

Prior to the focus group, the participants will be provided an overview of the patterns to be covered in person and allowed to review them at their own pace. The group will meet on campus to conduct the focus group. Initially, each participant will complete forms seeking demographic information, a six-question risk profile assessment, and the preliminary values assessment, discussed above, that will be used to calculate the utility scores for each pattern. This values assessment will ask participants to rank forces affecting owner's use of safety practices that have been identified during the research, similar to the performance metrics used by Ganguly.

To begin the focus group, the researcher will provide an overview of the research to date, including a discussion of the preliminary findings. The focus group will then follow a specific process for presentation, reflection, discussion, and assessment, reviewing patterns by category. First, the researcher will present specific information on the patterns in a given category, including the results of the horizontal and vertical coding along with the evidence-based findings, which include the survey of safety professionals. After this initial presentation is complete, the participants will be given time to conduct a self-review, writing their initial thoughts that are free from group influence. After this step, the group will hold a discussion on their respective reactions to the patterns, issues they foresee and benefits they feel the patterns may hold. Individual participants will then be asked to rank each pattern within the category based on the values they scored prior to the start of the focus group. Table 3-7 shows the instrument that will be used to collect these scores for each pattern that is reviewed by the focus group.

*Table 3-7. Focus Group Pattern Evaluation Instrument*

| Product Utility Metrics $u_i u_i$ | Very Inferior to Incumbent (1) | Inferior to Incumbent (2) | Same as Incumbent (3) | Superior to Incumbent (4) | Very Superior to Incumbent (5) | Importanc e (1-5) $w_i w_i$ |
|---|---|---|---|---|---|---|
| Contractor Safety Performance | | | | | | |
| Cost Impact | | | | | | |
| Project Delay | | | | | | |
| Public Image/Perception | | | | | | |
| Contractor Relationship | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Satisfying Regulatory Requirements | | | | | | |
| Owner Risk/Liability | | | | | | |
| Safety Culture | | | | | | |
| Overall Pattern Value | | | | | | |

Should the Pattern Be Adopted? Yes No

The researcher will combine the scores from each member of the focus group for each pattern assessed. These results will be presented in rank order to compare to and contrast with the findings of the evidence-based practice phase. This process will help to assess the consistency of the findings of the focus group with these prior findings. The initial force assessment scores from the participants will also be compared to the actual values assigned by the participants during the pattern evaluation process. This will allow the researcher to determine if the participant's relative ranking of forces changes once they are assessing these forces within the context of the pattern. The focus group will also have the opportunity to provide written feedback on specific patterns and the entire pattern language during the in-person meeting.

## 3.4 Research Quality and Trustworthiness

The protocols established within this section seek to ensure *credibility*, *dependability*, *transferability*, and *confirmability* as discussed in Chapter 2, while making clear the strengths, weaknesses, biases, and other conditions inherent within the work. The preservation of an audit trail allows future users the opportunity to lay bare the reasoning and decision-making behind the conclusions, to draw their own, and to make a determination on the true *credibility*, *originality*, *resonance*, and *usefulness* of the work. Only with these elements can we ensure a research product that is *trustworthy*.

With this in mind, the search for quality in this work does not seek to determine if the answer to a question is right or wrong, but to evaluate the research process in terms of adherence to the stated method; to highly ethical interaction with research materials, participants, and end-users; and to faithfulness to the high standards of credibility, transferability, dependability, and confirmability from Lincoln and Guba. Olson used the trustworthiness approach described by Lincoln & Guba (1985) and Isaac & Michael (1997) to discern the nuanced differences between the ultimate standard of "proof" between quantitative and qualitative research, and this definition will ultimately be the standard used in this work.

The overall purpose in creating and following a clear quality control plan is to allow for the researcher to deliver high quality dependable research. The conversation of quality in qualitative research studies often centers on two related but different focuses: quality of the research *output* and the quality of the research *process* (Reynolds et al, 2011; Reynolds et al, 2013). The split is described by Reynolds (2013, p.4) as:

> *A process-oriented perspective:* a series of mechanisms adopted throughout the research process to assure quality, guided by a set of key principles of 'good practice' for qualitative research;
>
> *An output-oriented perspective:* adopting techniques that can demonstrate to an external audience that the quality of the research has been assured.

These two inter-related perspectives will be used to create research methods that will both provide for methodological checks along the research process as well as ensuring the final product is reliable and useful to outside audiences and potential end users. Several of the practices used in this research help to assure both of these aspects of quality, although they are separated by their primary purpose in the sections below.

### 3.4.1 Quality Control: A Process-Oriented Perspective

#### 3.4.1.1 The Audit Trail

The audit trail is a common feature of qualitative research (Lincoln & Guba, 1985; Morrow, 2005). Morrow defines an audit trail as "a detailed chronology of research activities and processes; influences on the data collection and analysis; emerging themes, categories, or models; and analytic memos" (2005, p.252). This audit trail is used by consumers of the work and future researchers to further examine the work and to make independent assessments of the dependability and credibility of the process of the researcher.

In this work, the audit trail will primarily consist of analytic memos in the form of draft patterns and notes maintained in a research journal. In grounded theory research, the *Analytic Memo* is the primary method for providing an audit trail of the work as it produces the record of the process of data analysis (Corbin & Strauss, 2008). For this research, iterative analytic memos in the form of draft patterns will be preserved. Future users of the work will be able to follow the evolution of the draft pattern by looking at multiple versions saved along the path of their generation. Notes maintained in researcher files and journals are used to document the research process. *Methodological Notes* are used to document decisions made along the research path pertaining to the operation of the method, in this case, grounded theory generating a pattern language. *Observational Notes* are generated primarily through interview and focus group work, where the researcher identifies answers related to the "who, what, when, and where" questions responsive to the initial research question, the research subquestions, and the overall objectives of the work (Schatzman & Strauss, 1973). *Reflexive Notes* will also be kept to capture the ideas and questions that are generated internally by the researcher. These notes are also reflected in the previously outlined research process as "researcher reflections."

#### 3.4.1.2 Interrater Reliability Checks

A separate quality control approach used by quantitative researchers is independent rater checks, called interrater reliability checks. The horizontal coding phase of the research lends itself well to the purpose of the task: to identify the universe of management practices used by the project owners. These interrater reliability checks will be conducted by the supervisor of the research on a random sampling of 10% of the owner’s manuals evaluated for the research. Results from the researcher’s initial horizontal coding and from those of the supervisor will be compared for their agreement. Where disagreement exists, additional codes may be added for consideration in the vertical phase of the research process, where they may be included, modified, absorbed, discarded, or otherwise included in the final pattern language.

Later phases of the analysis, including vertical coding and saturation determinations, become more nuanced and abstract and thus less appropriate for simple interrater reliability checks. These later phases will be evaluated using peer debriefing and discrepant case review as discussed below.

### 3.4.2 Quality Assurance: An Output-Oriented Perspective

#### 3.4.2.1 Triangulation

Triangulation is one method of creating trustworthiness in the qualitative research arena and the design of this research has been advanced with this as a guiding principle. Initial research materials include owner requirement manuals, existing academic literature, case law, project documents, standard contracts, and any other relevant material the researcher is able to find. Later phases of the research will involve interviews, surveys, and a focus group with experts. Throughout the entire process, the researcher will be able to add experience and perspective to the process. Each of these different sources of material or approaches to knowledge elicitation strengthen the process.

As mentioned by Kerth and Cunningham in the pattern language literature, the three approaches (introspective, artifactual, and sociological) all carry advantages and weaknesses. For example, the *introspective approach* is driven by a deep understanding of an individual's experience with the, world but it largely misses a working philosophy until a pattern violates some philosophical value. *Artifactual approach* researchers only look at past work from an outside point of view to draw conclusions, missing the deeper philosophy of the original creator. Finally, methods for using the *sociological approach* are underdeveloped, and skills for listening, interviewing, and observation need to improve for the method to deliver true significance. By combining these three mining methods and supplementing them with existing qualitative approaches outlined above, the accuracy, dependability, and value of data produced by these methods only increase. This research uses multiple points of information, including the researcher's perspective (introspective), document analysis (artifacts), and interviews and focus groups (sociological) to best answer the initial research question and subquestions.

#### 3.4.2.2 Constant Comparison

Grounded theory advances using constant comparison as a primary analytic method. When a researcher identifies a new example of an item of interest, that item is compared to what has already been established about the class of items. Where variance is identified, it is noted and further explored. This analysis is critical because "it allows the researcher to differentiate one category/theme from another and to identify properties and dimensions specific to that category/theme" (Corbin & Strauss, 2008, p. 73). If the new item ultimately aligns with the existing understanding of the category, its nuances are added to the body of knowledge. If however, this new item conflicts with the existing understanding, it is flagged and further examination, called a discrepant case review, explores the item in further detail.

#### 3.4.2.3 Peer Debriefing and Discrepant Case Review

Peer review or peer debriefing is an opportunity for the researcher to check the research and add credibility by allowing an outside individual to play "devil's advocate" and ask the tough questions that may debunk a line of reasoning drawn from the analysis. The process for conducting these peer debriefing sessions is discussed in *Section 3.3.5.1 Pattern Confirmation Interviews.* This process is "much in the same spirit as interrater reliability found in quantitative research" (Creswell, 2013, p.251).

A negative or discrepant case is simply a case that does not fit the established understanding of a theme or category (Corbin & Strauss, 2008). To find instances of these discrepant or negative cases, the process of constant comparison includes explicitly analyzing data for fit to other alternative categories or rival interpretations or explanations of the phenomenon. Where identified, these cases were noted in the reflexive journal and further discussed during peer debriefing. Questions remaining after regular peer debriefing sessions were clarified in subsequent interviews and during member checking phases, discussed below. As Corbin and Strauss point out, the point of these negative case reviews is not necessarily to explain the reason for their divergence from the majority, but to highlight the potential alternative explanation. Doing so allows a researcher to "provide for a fuller exploration of the dimensions of a concept" (Corbin & Strauss, 2008, p.84). Often, upon deeper evaluation or expanded time with the negative case, it turns out to "represent a dimensional extreme or variation on the conceptualization of the data" and not a true divergence from the theory (Corbin & Strauss, 2008, p.263).

#### 3.4.2.4 Member Checking

Member checking is another approach to corroborating work in qualitative settings and is defined by Creswell (2013) to mean “the researcher solicits participants’ views of the credibility of the findings and interpretations” (p. 252). Treharne and Riggs also refer to this process as “end-user involvement,” which looks “outwards to other by consulting members of the community being researched during the planning, actualization, and/or dissemination of the study” (2014, p.60). By asking participants to review the product of the research in which they participated, they can confirm the intent and meaning of their original contributions have been accurately captured. Sparkes (1998) cautions against the use of member checking as validation or verification of results. Instead he argues, it should be treated as part of the continuous elaboration of emerging findings and ultimately as additional data.

This will be specifically addressed by soliciting feedback from interview participants after their interview and by working with a focus group to receive comments. The feedback from these sessions will be included in the reflexive journal and changes may be made to the individual patterns or the network which forms the pattern language if warranted.

## 3.5 Conclusion

This research is a fusion of philosophical perspectives, methods, data sources, and objectives that make it unique from other studies that have been conducted in this domain. The pragmatist’s worldview supports the transformative mixed methods approach to research design, and allows the researcher to blend the pattern language approach, constructivist grounded theory, and other analytic procedures to effectively investigate a complex issue. Answering the initial research question and subquestions with this method will provide a deeper understanding of the nuance and complicated nature of the owner's role in independent contractor safety management, and will help to shift the conversation on this topic to a more holistic paradigm. This shift is necessary to encourage more owners to fully participate in contractor safety, which has been shown to be an effective approach to further reduce the impact of incidents on all participants in the industry.

# 4 RESULTS

This chapter will review the findings produced by the method established in Chapter 3. Specific outcomes for each of the research steps will be presented in *Section 4.1*, while *Section 4.2* will present each of the initial patterns along with findings from the review of academic recommendations and the horizontal coding. Finally, reporting on the assessment of the quality of the work is presented in *Section 4.3.*

## 4.1 Methodology Overview

The central question of this work was: *how should an owner interact with independent contractors when it comes to safety management?* Subquestions that guided this work dealt primarily with the current and recommended practices of the industry, the potentially problematic practices, and the forces that owners must choose between when deciding how to proceed in interacting with contractors on the topic of the management of safety of their employees, the owner's employees, and the public.

The method used to answer this research question and subquestions (and to deliver on the objectives of this research project) is based in both grounded theory and pattern language. *Figure 1-1. Research Method* Overview illustrates the process used in this research, from beginning to end. The iterative nature of the method allows for the preliminary findings to dictate subsequent methods, steps, and directions of inquiry. Once the pattern language is created, future work can provide a similar iterative feedback and correction loop to the original research process. In this way, the construction safety management pattern language produced in this study is a living language that evolves with the current practices of the industry as needed.

### 4.1.1 Extant Document Collection and Evaluation

The primary data source for this work is owner-produced safety requirement manuals. While the titles for these documents may vary between owners and across industries, they are generally defined as the written procedures developed by owners for contractors detailing procedures for delivering safety on those owners' projects.

These search terms and acceptance criteria yielded 42 management plans. These management plans are based on companies from the United States and they span multiple industry sectors, including energy production, government, healthcare, manufacturing, petrochemical, transportation, and universities. The complete sample is further described in *Table 4-1. Owner Requirement Manual Sample.*

*Table 4-1. Owner Requirement Manual Sample*

| Code | Pages | Year | Sector | Code | Pages | Year | Sector |
|---|---|---|---|---|---|---|---|
| E1 | 145 | 2007 | Energy | P2 | 54 | 2015 | Petrochemical |
| E2 | 36 | 2014 | Energy | P3 | 45 | 2017 | Petrochemical |
| E3 | 67 | 2016 | Energy | P4 | 51 | 2015 | Petrochemical |
| E4 | 110 | 2014 | Energy | P5 | 19 | 2016 | Petrochemical |
| E5 | 343 | 2016 | Energy | T1 | 35 | 2009 | Transportation |
| G1 | 495 | 2009 | Government | T2 | 63 | 2013 | Transportation |
| G2 | 97 | 2015 | Government | T3 | 101 | 2012 | Transportation |
| G3 | 92 | 2012 | Government | T4 | 95 | 2002 | Transportation |
| G4 | 88 | 2014 | Government | T5 | 372 | 2016 | Transportation |
| G5 | 112 | 2011 | Government | U1 | 18 | 2013 | University |
| H1 | 44 | 2006 | Healthcare | U2 | 32 | 2014 | University |
| H2 | 91 | 2010 | Healthcare | U3 | 29 | 2004 | University |
| H3 | 13 | 2015 | Healthcare | U4 | 12 | 2012 | University |
| H4 | 31 | 2013 | Healthcare | U5 | 78 | 2014 | University |
| H5 | 90 | 2008 | Healthcare | U6 | 22 | 2006 | University |
| M1 | 19 | 2015 | Manufacturing | U7 | 9 | 2012 | University |
| M2 | 127 | 2014 | Manufacturing | U8 | 19 | 2010 | University |
| M3 | 57 | 2015 | Manufacturing | U9 | 51 | 2011 | University |
| M4 | 101 | 2015 | Manufacturing | U10 | 47 | 2009 | University |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| M5 | 56 | 2011 | Manufacturing | U11 | 11 | 2012 | University |
| P1 | 19 | 2007 | Petrochemical | U12 | 42 | 2012 | University |

Another type of extant document serving as a source of data for this study was academic studies and industry publications. For inclusion in this work, the study must have addressed the owner's role in construction safety and specifically offered practices that owners should employ to perform that role. As described in Chapter 2, this literature review identified eleven specific works that met this criteria. *Table 4-2. Owner's Role in Construction Safety Literature Sample* describes the selected studies.

*Table 4-2. Owner's Role in Construction Safety Literature Sample*

| Author(s) | Year | Title |
|---|---|---|
| Levitt & Samelson | 1982 | Improving Construction Safety Performance: The User's Role. |
| American Society of Civil Engineers (ASCE) | 1989 | Policy Statement 350 – Construction Site Safety. |
| Hinze | 1997 | Construction safety. |
| Gambatese | 2000 | Owner involvement in construction site safety. |
| Huang & Hinze | 2006 | Owner's role in construction safety. |
| Musonda | 2012 | Assuring health and safety performance on construction projects: Clients' role and influence. |
| Construction Users Roundtable (CURT) | 2012 | Construction Owners' Safety Blueprint (Rep. No. R-807). |
| Votano | 2014 | Client safety roles in small and medium construction projects in Australia. |
| Wu | 2015 | Roles of owners' leadership in construction safety: The case of high-speed railway construction projects in China. |
| Campbell Institute | 2015 | Best practices in contractor management. |
| Liu | 2017 | Establishing the Influence of Owner Practices on Construction Safety in an Operational Excellence Model. |

#### 4.1.1.1 Horizontal Coding of Owner Requirements

The owner-produced safety requirements manuals were first reviewed using the initial coding technique. This process involved an in-depth review of each owner's requirements manual or document where each was evaluated in its entirety. During this review, when a yet-to-be-encountered management practice was identified, it was entered into the working spreadsheet as a potential practice. Each subsequent similar management practice employed by an owner was added to the same initial coding category. These 42 management plans yielded a total of 3,438 pages of requirements to be reviewed for their topic coverage and content. 41 codes were initially identified and described. An example of the horizontal coding chart developed in this process appears in *Appendix A: Example of Horizontal Coding Chart*.

To ensure that the researcher accurately assessed each of these 42 management plans, an *interrater reliability check* procedure was created wherein 10% of the manuals and at least one from each major industry category was selected at random and assessed by an independent reviewer for coverage and content. A random number generator function was used to select one manual from each group. A total of seven manuals were selected and independently assessed. A significant convergence of codes was observed, where the independent coder conducting interrater reliability checks agreed with the researcher in 98.3% (113/115) of the yes/no decisions on practice engagement. This provided evidence that the researcher was able to accurately identify practices in use by each owner.

The codes were initially scored, ranked, colored, and sorted based on the convention described in *Section 3.3.1.1 Horizontal Coding* and as illustrated in *Table 3-3. Sample Scoring and Color Gradient Scheme.* These processed codes appear in *Table 4-3. Owner Practices by Percent Usage* *and Overall Rank.* At this time, the researcher also grouped the practices into approximate categories, as grounded theory seeks to move from specific practices to a general theoretical description or over-arching category. These initial categories included communication practices, site safety planning requirements, contractual control, and owner presence, and were further explored within preliminary (*Section 4.1.4.1*) and confirmation interviews (*Section 4.1.5.1*) as well as the focus group (*Section 4.1.5.2*).

*Table 4-3. Owner Practices by Percent Usage and Overall Rank*

| Practice | Owner Score | Owner Rank |
|---|---|---|
| Immediate Reporting of Accidents | 98 | 1 |
| Permitting | 81 | 2 |
| Required Site Orientation Training | 81 | 2 |
| Set Construction Safety Goals | 77 | 4 |
| Emergency Planning | 77 | 4 |
| Activity Hazard Analysis | 74 | 6 |
| Flow Down Requirements | 67 | 7 |
| Task Specific Training | 65 | 8 |
| Project-Specific Safety Plan | 61 | 9 |
| Substance Abuse Program | 61 | 9 |
| Stop Work Authority | 60 | 11 |
| Escalating Discipline | 60 | 11 |
| Pre-Construction Safety Meeting | 58 | 13 |
| Document Does not Relieve Contractor | 58 | 13 |
| Owner Evaluation of Contractor (Audits) | 58 | 13 |
| Independent Contractor Inspections | 51 | 16 |
| Company Safety Program | 48 | 17 |
| Designated Safety Manager | 47 | 18 |
| Regular EHS Meetings | 47 | 18 |
| Toolbox Talks | 47 | 18 |
| Maintain Contractor Safety Statistics | 42 | 21 |
| Safety Concern Reporting | 40 | 22 |
| Owner Construction Safety Manager | 40 | 22 |
| Safety Inspections (Site) | 37 | 24 |
| Daily Task Safety Planning | 35 | 25 |
| Provide Emergency Contact to Owner | 33 | 26 |
| Manual/policy signed by executive | 33 | 26 |
| Defined Competent Persons | 32 | 28 |
| Owner Concurrence | 30 | 29 |
| Daily Safety Coordination Meeting | 28 | 30 |
| Injury and Illness Prevention Plan | 23 | 31 |
| Job Safety Board | 23 | 31 |
| Prequalify Contractors | 21 | 33 |
| Contractor Sign-Off on Requirements | 21 | 33 |
| Required Safety Management Program | 19 | 35 |
| High Hazard Planning Procedure | 16 | 36 |
| High Hazard Plan to Owner | 14 | 37 |
| 10-Hour Training | 14 | 37 |
| Owner Construction Safety Committee | 12 | 39 |
| Implementing Safety Incentive Programs | 12 | 39 |
| Controlled Insurance Programs | 9 | 41 |

These codes were then quantified by frequency of occurrence within each code, within each broader category, and by sample, as a reflection of each owner's approach to contractor safety management. *Figure 4-1.* illustrates the percent of practice use by each of the 42 participants.

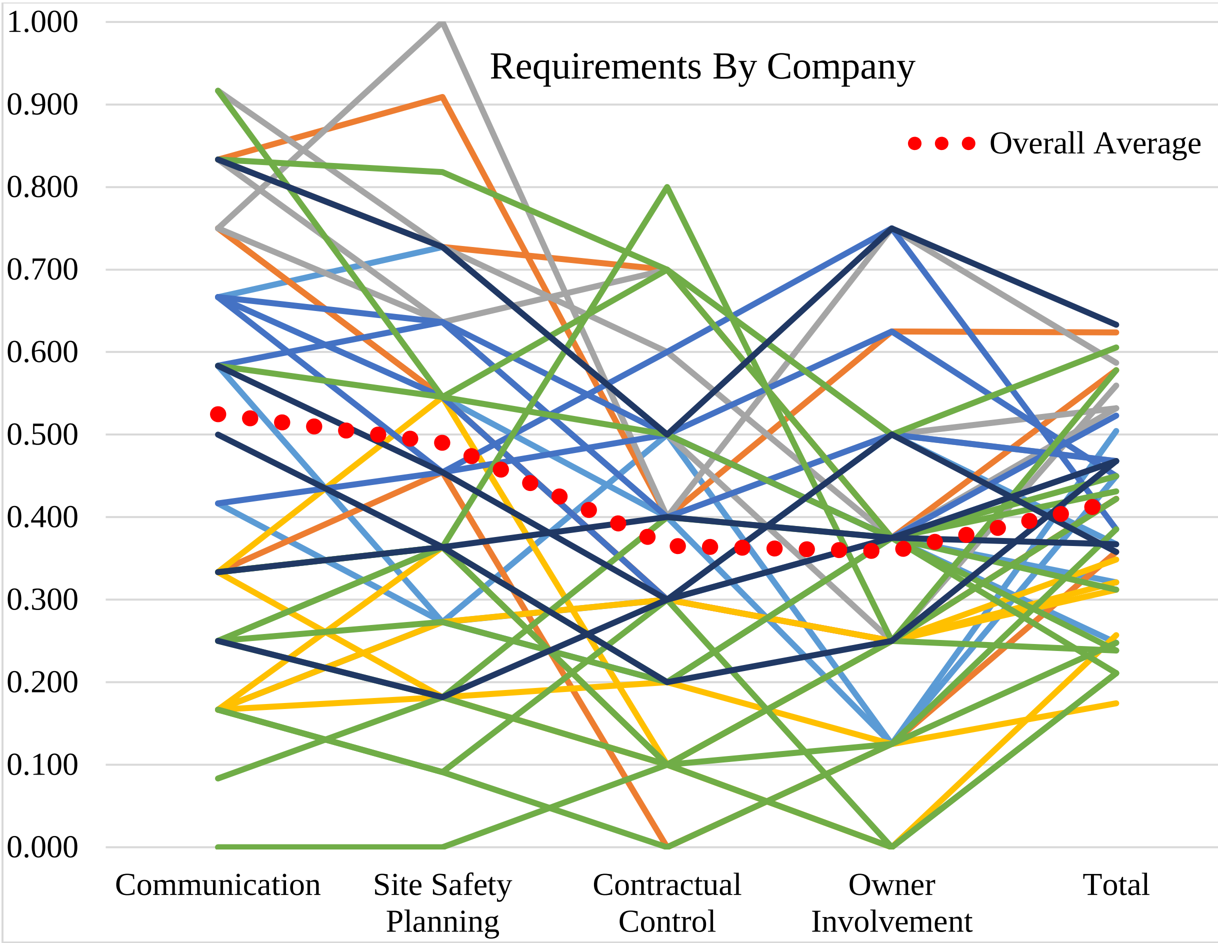



*Figure 4-1. Requirements Used by Major Category for Every Owner Evaluated*

Energy and Government collectively showed the highest usage of communication requirements, while transportation and manufacturing showed higher levels of owner engagement on average. Universities and hospitals consistently used fewer requirements than their industry peers. It is not surprising that different sectors take different approaches to contractor safety management. Interestingly, this variation persists not only between sectors, but within sectors as well. *Figure 4-2* and *Figure 4-3* illustrate examples of the variation observed within the seven industry sectors.

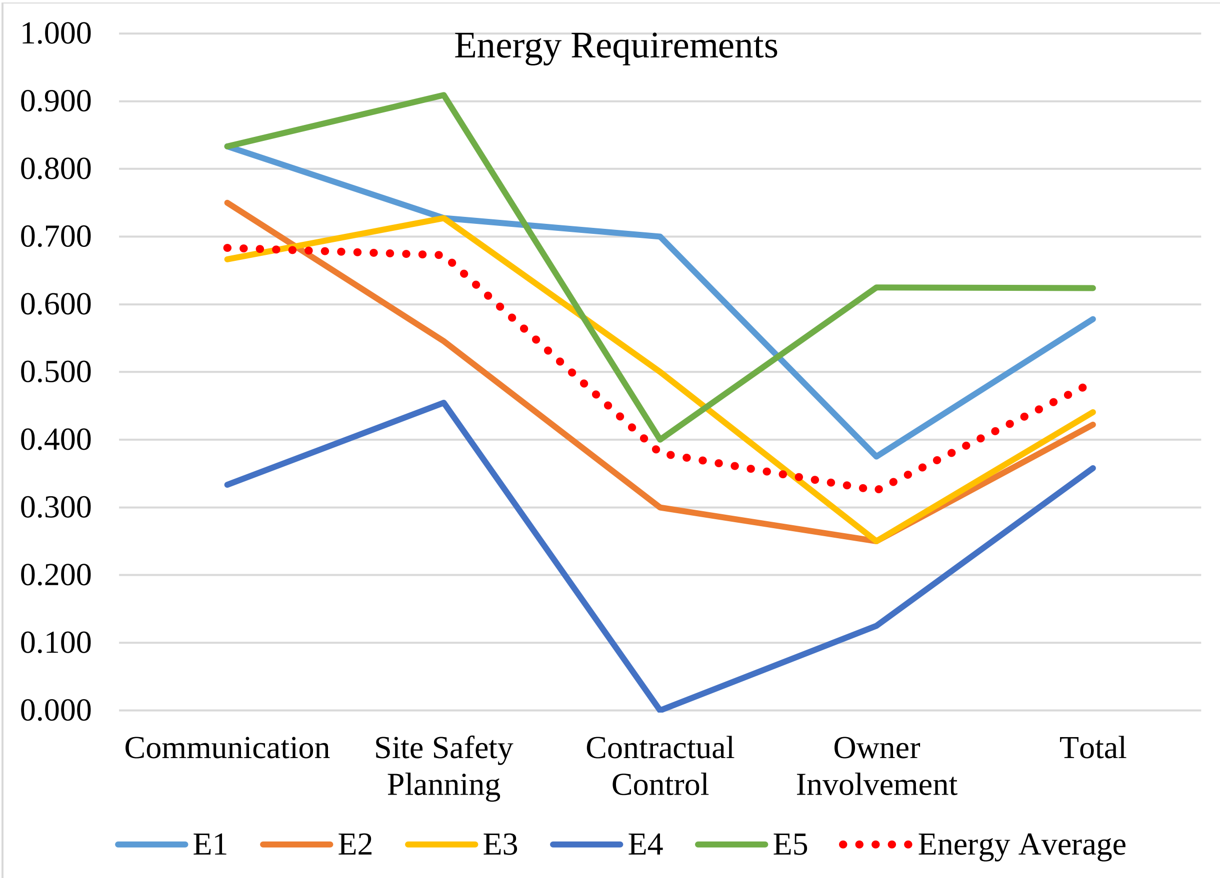



*Figure 4-2. Energy Sector Requirements*

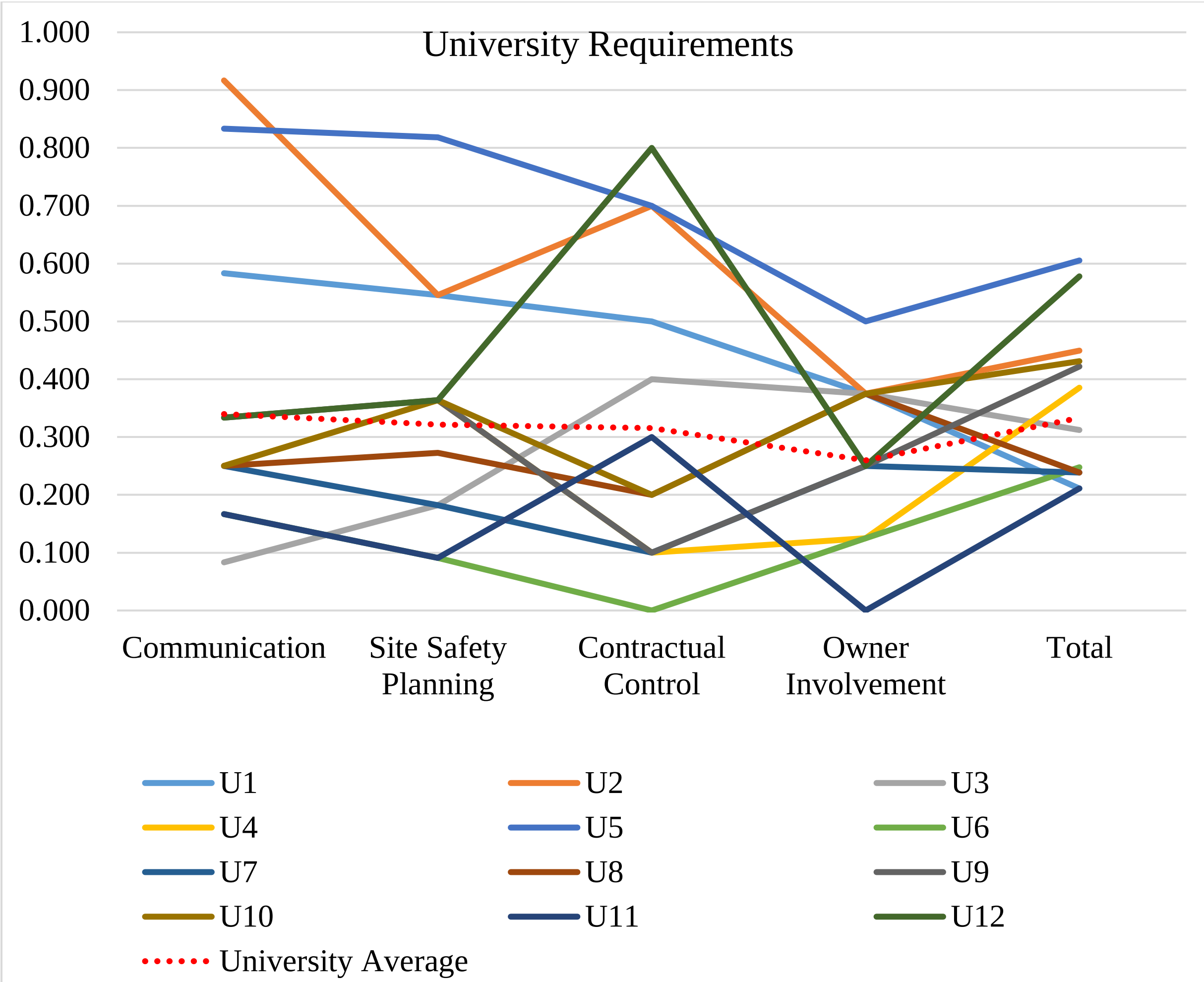



*Figure 4-3. University Sector Requirements*

#### 4.1.1.2 Horizontal Coding of Academic Recommendations

A similar analysis was completed based on the findings of the literature review. A total of 11 academic studies that specifically recommended owner practices were reviewed, this time following the codes established from the review of the construction safety requirements manuals. Here again the percent of academic studies recommending a given practice was converted to a whole number between 0 and 100 and then ranked. Because the codes established by the requirements manuals were used for consistency, some of the practices found from the owner practices not addressed directly by the academic research received a score of zero. The ranked practices recommended by the literature are shown in *Table 4-4. Ranking of Practices Based on Frequency of Academic Recommendation*.

*Table 4-4. Ranking of Practices Based on Frequency of Academic Recommendation*

| **Practice** | **Academic Score** | **Academic Rank** |
|---|---|---|
| Owner Evaluation of Contractor (Audits) | 91 | 1 |
| Designated Safety Manager | 91 | 1 |
| Task Specific Training | 82 | 3 |
| Safety Inspections (Site) | 82 | 3 |
| Maintain Contractor Safety Statistics | 82 | 3 |
| Set Construction Safety Goals | 73 | 6 |
| Owner Construction Safety Manager | 73 | 6 |
| Prequalify Contractors | 73 | 6 |
| Implementing Safety Incentive Programs | 73 | 6 |
| Immediate Reporting of Accidents | 64 | 10 |
| Project-Specific Safety Plan | 64 | 10 |
| Regular EHS Meetings | 64 | 10 |
| Activity Hazard Analysis | 55 | 13 |
| Pre-Construction Safety Meeting | 55 | 13 |
| Flow Down Requirements | 45 | 15 |
| Emergency Planning | 45 | 15 |
| Independent Contractor Inspections | 45 | 15 |
| Owner Construction Safety Committee | 45 | 15 |
| Permitting | 36 | 19 |
| Required Site Orientation Training | 36 | 19 |
| Substance Abuse Program | 36 | 19 |
| Escalating Discipline | 36 | 19 |
| High Hazard Planning Procedure | 36 | 19 |
| Document Does not Relieve Contractor | 27 | 24 |
| Company Safety Program | 27 | 24 |
| Daily Task Safety Planning | 27 | 24 |
| Owner Concurrence | 27 | 24 |
| Stop Work Authority | 18 | 28 |
| Toolbox Talks | 18 | 28 |
| Defined Competent Persons | 18 | 28 |
| 10-Hour Training | 18 | 28 |
| Safety Concern Reporting | 9 | 32 |
| Daily Safety Coordination Meeting | 9 | 32 |
| Manual/policy signed by executive | 9 | 32 |
| Required Safety Management Program | 9 | 32 |
| High Hazard Plan to Owner | 9 | 32 |
| Provide Emergency Contact to Owner | 0 | 37 |
| Contractor Sign-Off on Requirements | 0 | 37 |
| Injury and Illness Prevention Plan | 0 | 37 |
| Job Safety Board | 0 | 37 |
| Controlled Insurance Programs | 0 | 37 |

These coded and ranked academic recommendations will be used in *Section 4.1.4.3 Determining Recommended Practices Using Evidence Based Practice (EBP)* to represent the current state of the academic recommendations.

#### 4.1.1.3 Vertical Coding

The vertical coding phase shifts from *open coding* used in the horizontal analysis to *focused coding*, which Charmaz describes as a process designed to "sift, sort, synthesize, and analyze large amounts of data" (2014, p.138). Once the horizontal coding phase was completed, the researcher returned to each of the 41 different codes initially identified and captured the text and other content relevant to each code. Vertical coding documents were created featuring the selected text from each manual where it was identified. This process created documents entirely focused on an individual code. In total, 564 pages of practice-specific information was compiled for use in the vertical coding phase.

As the researcher evaluated each collection of text related to a specific code, the marking conventions described in *Section 3.3.1.2 Vertical Coding* were followed. This visual analysis process facilitated the constant comparison by allowing the researcher to quickly identify new facets to a practice, compare new owner's processes to processes previously reviewed, and ultimately get a feel for the variation of the practices observed. As the researcher went through the document, highlighted text that was initially green (indicating a new idea or practice) ultimately turned increasingly yellow (indicating an idea or practice that has already been reviewed and considered for inclusion in the pattern). The areas where a given practice impacted or was impacted by other practices were identified in blue and were ultimately used to create the "related patterns" and "related antipatterns" sections of the completed patterns found in Chapter Five. Finally, practices of potential concern were noted in red and collected in a separate vertical coding document as described in *Section 4.1.3.2*. A sample of the vertical coding document with these marking conventions in use is provided in *Appendix B: Example of Vertical Coding.*

*Figure 4-4. Noteworthy Practice* shows an example of the initial encounter with a noteworthy practice in the vertical coding phase. This example from E1 was identified in the SAFETY CONCERN REPORTING MECHANISM vertical coding document.

Employee Responsib
· Report ·understand
· Refuse ?

2) Each employee is responsible for learning and abiding by those rules and regulations that are applicable to their work and for reporting observed, or anticipated hazards to their immediate supervisor. If the hazard is not corrected, the affected employee will refuse to perform this work and will report the conditions to the Contractors Designated Safety Representative.

Haz. Notification to Owner!

5.3.5 Notification of Hazards: Each Contractor shall notify the [E1] Project Manager in writing of the existence of any hazardous conditions, property, or equipment at the work site which are not under the Contractor's control. It is the Contractor's responsibility to take all necessary precautions against injury until corrected by the responsible party.

*Figure 4-4. Noteworthy Practice Example: Safety Concern Reporting Mechanism*

In this example, the owner requires employees to report observed or anticipated hazards to their management, and ultimately refuse work if their safety is compromised. This noteworthy practice also requires the contractor to notify the owner if an unsafe condition is present that is outside of their authority to control. *Figure 4-5. Comparison of a Second Noteworthy Practice* initially seems to show the same process, but note that the first sample focuses on reporting hazards and refusing work if not corrected, while the second sample focuses on the supportive environment the owner wishes to create for reporting concerns. A similar comparison can be made in the requirement to notify the owner that is found in the bottom of both of these examples. In the first instance, the owner is focusing on the contractor reporting instances of safety hazards that are not under control or are the contractor's responsibility to the owner. In the second example, however, the owner's requirement is focusing on the contractor reporting all instances of unsafe or hazardous condition reports along with the corrective actions taken by the contractor.

Positive Reporting Environment

However, employees may report hazards by any available method. Oral reports shall be recorded in writing by supervisors. Reports may be submitted anonymously. At the employee's option. The Contractor shall advise all employees that they invite reports of hazards and pledges to take no disciplinary action against any employee as a result of the employee's submission of a hazards report. Employees may submit hazard report to their supervisor or directly to the safety committee. Supervisors are directed to route all hazard reports to the CM Manager of Safety, along with what corrective action has been taken.

Notification to Owner

A6/A7

With regard to hazards that are uncovered by periodic inspections, reported by

*Figure 4-5. Comparison of a Second Noteworthy Practice*

A similar set of requirements from G3 was discovered in a later entry, shown in *Figure 4-6. First Repeat Occurrence of Noteworthy* Practice below.

Work Safe
Correct bad prac.

Pursuant to this goal, all workers on this project have the following responsibilities:
-To conduct their work in a safe manner.
-To immediately correct any unsafe act and/or condition pertaining to their work.
-To take prompt corrective action and ensure that work activities proceed in a safe manner.

Report?
Stop Work?

[THE GC SHALL]
... take immediate corrective measures to eliminate hazards directly under the control of the employer, or report violations of OSHA regulations and unsafe practices to the responsible employer.

*Figure 4-6. First Repeat Occurrence of Noteworthy Practice*

These two occurrences discuss a similar requirement, but take different paths to achieve the desired outcome. Note that the practice illustrated in *Figure 4-6* does not discuss workers stopping work or reporting compliance issues to the owner, but places this responsibility on the employer. A third example of a similar requirement is shown in *Figure 4-7. Second Repeat Occurrence of Noteworthy Practice*. This occurrence does not give the workers authority to stop work, but does require employees to report safety or health hazards and also mentions that all accidents or incidents must be reported, which is covered in a related pattern, INCIDENT REPORTING.

A1

Each employee is responsible for immediately reporting recognized safety or health hazards on the job to their supervisor or safety representative. Employees shall report immediately all accidents or incidents occurring on the job including near-misses. Employees shall cooperate and assist in the investigation of all

*Figure 4-7. Second Repeat Occurrence of Noteworthy Practice*

*Figure 4-8. Vertical Coding Entry with Related Pattern and Potential Antipattern* illustrates another vertical coding example from G1 where the pattern topic being evaluated, SITE SPECIFIC SAFETY PLAN, included a noteworthy practice that linked to another horizontal code, STOP WORK AUTHORITY. *Figure 4-8* also includes a practice from the sample that was identified as a potentially problematic practice and added to the potential antipattern vertical coding document.

Stop work if no SSSP
C3!

Stop Work Orders shall be issued to Contractors on projects requiring site safety plans when the contractor has failed to provide same.

2. Prior to allowing the start of work, the PO [OWNER'S PROJECT OFFICER] shall obtain a Site Safety Plan from the Contractor and submit to the Safety Unit for review. The Site Safety Plan (4 copies) shall be accompanied by the Site Safety Plan Submission Form. No field work shall commence until the Plan is approved and returned to the PO and implemented at the site.

R. control

*Figure 4-8. Vertical Coding Entry with Related Pattern and Potential Antipattern*

This process allows the researcher to use constant comparison practices to identify the nuance and variation of similar, but not identical, sections. By evaluating many similar practices in such a manner, the researcher is able to explore the current practices of owners and identify the common language owners use, as well as completely identify the relevant pieces of a practice owners intend to implement. Notes on these comparisons were captured as "researcher reflections," as described in the next section through the process. The color convention aids the researcher in assessing whether all of the noteworthy practices have been previously identified and to ensure all relevant material is considered.

### 4.1.2 Researcher Reflections and Expertise

Researcher reflections were noted as the research progressed in two main areas. First, during the horizontal coding phase, new ideas, questions, or potential conflicts discovered were noted in a research journal. These notes allowed the researcher to return to these ideas during the initial pattern development and later phases to ensure the final product considered these initial reactions. Notes with potential for development into an antipattern were marked with "AP", while ambiguous or conflicting concepts were flagged with "disamb" for disambiguation. Many of these notes later formed the newly created "disambiguation" pattern section and were used during the pattern confirmation interviews to question experts as part of the discrepant case evaluation.

Examples of these notes are provided below. For example, the entry shown in *Figure 4-9* was made when evaluating several programs with conflicting orientation practices. In this case, the researcher made a note to clarify whether most owners surveyed included owner-led or contractor-led orientations. Further analysis would later show that most owners required the contractor to develop and lead orientation programs, but, under specific circumstances, owners would provide orientation to contractor personnel. Examples of these specific circumstances include owner operations that pose a significant or unusual hazard outside of the scope of construction work, a closed or controlled facility, or situations where the owner intentionally brought the contractor in as a captive employee.

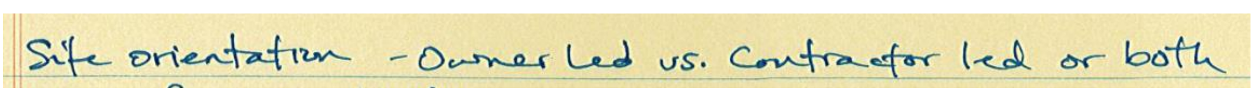



*Figure 4-9. Reflections on Owner or Contractor Led Orientations*

A related note, shown in *Figure 4-10,* questions whether separate codes should be developed to separate the functions of a site orientation training from that of a pre-construction safety meeting.

Ultimately, the decision was made to create a **SITE ORIENTATION TRAINING** pattern to focus on the site-specific orientation delivered to workers prior to their assignments on the project and a PRE-CONSTRUCTION SAFETY MEETING pattern to focus on planning, coordination, and orientation of a contractor to an owner's operation.

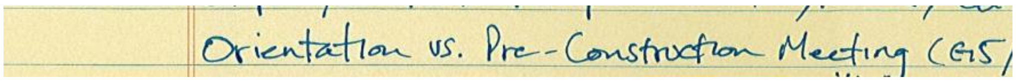



*Figure 4-10. Orientation vs. Pre-construction Safety Meeting Note*

The ambiguity in the orientation question also led the researcher to look at other education and hazard identification practices required by owners. The note shown in Figure 4-11 identifies the ambiguity in the owner's use of the terms *orientation*, *task-specific training*, *tool box training*, and *activity hazard analysis*. This note led to the disambiguation section in four patterns, clarifying what each pattern included and did not include, and helped to point users to the correct pattern.

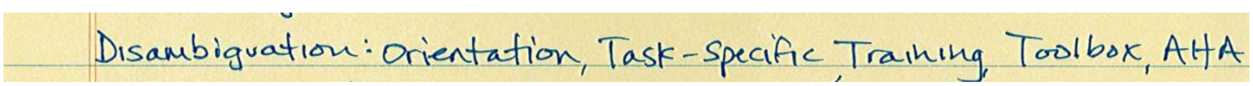



*Figure 4-11. Ambiguity in Training and Hazard Analysis Practices*

Another note identified the conflicting nature of owner's use of the terms *daily coordination*, *toolbox talks*, *tailgate training*, and *pre-work meeting*, among others, as shown in *Figure 4-12* below. Ultimately, it was determined, through reviewing many of the samples, that the owners were either attempting to require a pre-work coordination meeting by the contractor, or they wanted contractors to hold regular, semi-formal jobsite education sessions with the workforce. These two separate desires were later divided into two patterns: **DAILY SAFETY COORDINATION** and **TOOLBOX TALKS**.

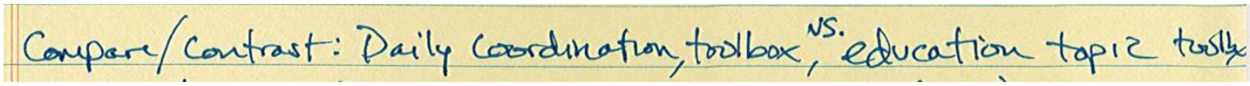



*Figure 4-12. Understanding Toolbox and Coordination Requirements*

Researcher reflections also helped the researcher to trace coding decisions made during the coding and initial pattern development phases. *Figure 4-13* is a note that reflects the researcher debating whether to merge an early code, *injury and illness prevention plans,* into one of two other codes, COMPANY SAFETY POLICY or SITE SPECIFIC SAFETY PLAN.


*Figure 4-13. Initial Code Evaluation and Evolution*

Researcher reflections were also captured in the vertical coding phase as described in the prior section, *Section 4.1.1.3.*

As these examples illustrate, this note taking process allowed the researcher to identify areas to focus on during the later analysis steps using constant comparison. It also allowed potential antipatterns to be noted for further investigation in the case law and legal guidance. In other instances, practices that were initially included as a simple facet of a broader pattern were separated out and a standalone pattern was created. Finally, ambiguous, conflicting, ill-defined, or other practices with issues were highlighted for attention in the following phases.

### 4.1.3 Converting Memos into Draft Patterns

At this point in the research process, it was clear that some of the codes identified in the horizontal coding phase and refined in the vertical coding phase were important to owners, but lacked major disagreement or variation among academic recommendations or owner practices. These codes were maintained in the final pattern language, but were not selected for complete analysis as described in the following sections. A total of 21 patterns from the 4 main categories identified and 5 antipatterns were selected for further analysis at this point.

#### 4.1.3.1 Initial Pattern Development

Once the document was initially reviewed, the researcher used a memoing process to document the major components, themes, and nuanced variation which emerged from the coding process. To make this memoing process more efficient, an Alexandrian pattern format was used to organize ideas into the major categories of problem, context, forces, solution, examples, resulting context, rationale, related patterns, related antipatterns, and disambiguation. An example of this blank note taking template is found in *Figure 4-14. Alexandrian Note Taking Template* below.

Code – Draft Pattern Name

_Name_ - *alias or also known as*

_Problem_ - *statement of the specific problem must remain "context-free"*

_Context_ - *Initial configuration of the system before the pattern is applied to it*

_Forces_ - *Often contradictory considerations that must be taken into account when choosing a solution to a problem*

_Solution_ - *Each solution will resolve some forces at the expense of others*

_Examples_ - *Information on the initial context, pattern application, solution process, and resulting context*

_Resulting Context_ - *consequences of implementing a pattern, both positive and negative, as well as new problems*

_Rationale_ - *tells us how the pattern actually works, why it works, and why it is good*

_Related Patterns_ - *allows a user of the language to fully explore the interrelated nature of one pattern and the next*

_Related Antipatterns_

_Known Uses_

*Figure 4-14. Alexandrian Note Taking Template*

For each code, the researcher started with the text identified as newly observed or exemplary practice, marked in green under the established marking convention. These concepts were sorted into the relevant Alexandrian section and compared to other similar text. The researcher reviewed the entire document in this manner. As the concepts began to resurface, this time in yellow text indicating they had been identified previously in the vertical coding document, they were compared to the existing draft. Through this process of constant comparison, the practices grew in scope and complexity, were repeatedly refined, rewritten to form a coherent amalgam of the concepts identified, and ultimately presented as a pattern. Specific examples from the vertical coding document that were illustrative of the final practice (or a major portion of it) were cited to provide reference to the original data.

Blue text and notes in the vertical coding documents were also reviewed for inclusion in the related pattern sections. This critical section of the pattern allows the end user to explore the pattern language as an interconnected web of practices. By understanding how an extended collection of other patterns relate to the pattern being reviewed, a more complete perspective of the pattern's role emerges. Similarly, any text highlighted in red was reviewed to begin to form related antipatterns and identify their links to patterns. Antipattern development is further discussed in the following section, *Section 4.1.3.2 Initial Antipattern Development.*

Throughout this process, the researcher attempted to find examples of both high and low involvement from owners for each code. In many cases, owners are simply bounded by the limited resources they are able to dedicate to a role in safety that they are not legally obligated to fulfill. These variable levels of engagement from owners speak to the fact that owners must always balance their engagement in these practices in furtherance of a goal to reduce injuries and the impact of incidents with other business objectives and deliverables, many of which carry significant importance.

The pattern-formatted memos were saved in iterative files by date and time to allow the researcher to return to earlier versions of the memo and track the evolution of ideas and concepts. A total of ninety-seven memos were created in this process. Researcher reflections were also noted in a journal to be used in the initial pattern development phases and included in the pattern-formatted memos.

#### 4.1.3.2 Initial Antipattern Development

During the vertical coding process, a separate document with potential problematic practices was collected as they were observed. The researcher used a combination of the principles identified in the legal review, presented in *Section 2.3.5*, the comments and experiences shared by participants, and the researcher's own experience in managing contractor safety to identify potentially problematic practices of owners. The common theme discovered in most of the documents centers around retained control: the owner's tendency to step into the shoes of a controlling contractor and assert management authority. Selected quotes from the owner's requirement manual samples are discussed below.

Retained control is relatively easy to demonstrate when the owner's documents explicitly state their intent. For example, some owners simply stated that they were responsible for construction safety:

> The [Owner's] Project Executive has *full responsibility for the implementation and execution* of the project safety program. (E1)
>
> Where the programs differ, the *[E1] master project safety guideline will be the governing factor*. (E1)
>
> The [OWNER CONSTRUCTION SAFETY MANAGER] inspects jobsites for occupational and user safety, and *directs changes* in practices and procedures pro-actively before emergency measures are necessary. (H2)
>
> CONTRACTOR and SUBCONTRACTORS *will comply with the safety standards established by the OWNER*, the Owner Controlled Insurance Program: Safety Program Requirements and all applicable federal, state and local regulations. (G4)

Some of the owner samples reserved the authority to step in and correct an unsafe situation. Several cases, however, overstepped and asserted that the owner "shall" or "will" step in to correct unsafe scenarios. This has the potential to create a situation where an owner retains the responsibility, not merely the right, to intervene and their failure to do so may subject them to liability:

> WHEN A CONTRACTOR FAILS TO IMMEDIATELY CORRECT UNSAFE ACTS OR CONDITIONS, *THE OWNER OR HIS DESIGNEE WILL UNDERTAKE CORRECTIVE ACTIONS* AND DEDUCT THE COST OF THE CORRECTIONS FROM THE RESPONSIBLE CONTRACTOR'S PROGRESS PAYMENT. (E1)
>
> Contractors and all Subcontractors shall be required, in accordance with OSHA regulations and contract inclusions, to comply with all safety directives. When a contractor fails to correct unsafe conditions, *the [G1] Project Officer shall undertake corrective actions*, and deduct the cost from the responsible contractor's progress payment. (G1)

The case law reviewed also considers whether an owner has overstepped if they retain the right to make personnel decisions:

> [E1] and all Contractors retain the *right to remove any employee* at any time, for any reason, and without notice. (E1)
>
> If necessary, the [G1] reserves the right to have the contractor *remove and replace* a superintendent, or site safety representative. (G1)

Owner endorsement and concurrence was also a practice frequently used by courts to ascertain the owner's level of control after the fact:

> The Site Safety Plan (4 copies) shall be accompanied by the Site Safety Plan Submission Form. No field work shall commence until the Plan is *approved* and returned to the PO and implemented at the site. (G1)
>
> Construction may not start until contractor's Safety Program and Project Safety Plan has been reviewed and *approved*. (G5)

In some cases, the owners simply repeated their understanding of applicable regulations, such as those from OSHA. In some cases however, this understanding fell short of guidance that would allow the contractor to achieve compliance. In the case of lead-based paint discussed below, while it is true that paint generally contained lower amounts of lead after 1978, this does not eliminate the need to treat the paint as lead-containing until a laboratory sample confirms lead is not present:

> Paint should be tested for lead (Pb) prior to grinding, cutting or blasting activities if it was *applied before 1978*. (G4)

These antipatterns are not necessarily problematic practices in all situations, and owners should not feel as though they are unable to take action on issues that would force them to take the level of ownership illustrated above. In these cases, owners must be aware of both their risk and their liability, and make a conscious decision about how they want to proceed. In cases where owners take on additional responsibilities, and the resulting additional liability, this decision must be carefully considered and dutifully executed to ensure owners live up to the new standard of care that will be established. Many owners do choose to exercise this heightened level of care. Many, however, do not. Owners are driven by their need to deliver on business necessities, such as the primary purpose of creating shareholder value. In this sense, each owner must make a decision about their preferred course of action and act in a way that is consistent with this decision.

Ultimately, the principles discovered in the case law and legal literature review, the researcher's experience, and the examples uncovered in the vertical coding process formed the basis for the antipatterns summarized in *Section 4.2.5* and later presented in *Section 5.1*.

### 4.1.4 Iterative Data Collection and Evaluation Phase

#### 4.1.4.1 Preliminary Semi-Structured Expert Interviews

As the vertical coding progressed, seven preliminary interviews were also conducted to review the initial findings with experts in the field and to solicit any additional examples of good practices, bad practices, or other experience that may inform the direction of the pattern language. These interviews involved experts selected based on their education, experience, credentialing, and willingness to participate in the research process. *Table 4-5* identifies these characteristics for each interviewee. The Michigan State University Institutional Review Board (IRB) reviewed this phase of the research and determined it to be conditionally exempt. The MSU IRB memo is provided in *Appendix C: IRB Approval for Interviews*. The interview process followed the semi-structured interview process described in *Section 3.3.4.1*. An example of the initial questions appears in *Appendix D: Semi-Structured Interview Questionnaire.*

*Table 4-5. Preliminary Interviewee Qualifications*

| Reviewer | Title | Years of Experience | Certifications | Degrees | Points |
|---|---|---|---|---|---|
| A | Regional HSE Manager | 30 | CHMM | B.S. | 37 |
| B | Mgmt Supervisor Safety and IH | 24 | CSP | B.S. | 31 |
| C | Contractor Safety Manager | 34 | CSP | B.S., MBA | 43 |
| D | Director of Occupational Safety and Health | 20 | STS | BSCE, JD | 29 |
| E | Senior EHS Specialist | 20 | CSP, LEED AP | B.S., MBA | 32 |
| F | Construction Safety | 20 | COSS | N/A | 26 |
| G | Contractor Safety Manager | 7 | CSP, GSP, CHST | B.S., M.S. | 22 |

From the interviews, the theme of communication repeatedly arose with respect to issues faced by owners of construction projects. These issues stemmed from singular incident root cause scenarios to systemic failures within complex organizational processes. Communication-related comments from interviews ranged from simple health and safety performance communication (such as accident reporting and statistic reporting), to EHS meetings with coordination objectives. Another major category established via interviews with experts was site safety planning. This core area represented many of the state-of-the-art practices found both in industry and within the literature. Examples include site-specific written safety programs and other health and safety based written programs to pre-task risk assessment and hazard analysis. The third major area identified was methods of control, especially through contractual methods. Interviewees regularly discussed prequalification and selection of contractors, as well as discipline and control of sub-tiers of contractors. Finally, owner specific practices were noted by the experts and formed the fourth major branch of patterns. Many of the respondents discussed the presence of the owner as critical for establishing the culture of a project, as well as audits and management of the contractor's performance. These clusters aligned with the emerging results of the horizontal and vertical coding phases and were ultimately adopted as the main subcategories for use in the pattern language.

#### 4.1.4.2 Survey of Expert's Practice Preferences and Values

With the horizontal and vertical coding completed and preliminary interviews and pattern development underway, it became apparent that the recommendations discovered from academia did not align with the practices observed in the owner's requirement manuals.  To illustrate this issue, the difference between the two is shown across all 41 initial codes in *Table 4-6*. The practices are shown sorted by disagreement between rank order of use. Items with greater variance indicate the highest level of disagreement. The darker blue values are recommended highly by the literature but not used by the owners; items in red are used extensively by owners but not studied widely or recommended within the literature. Practices closer to zero in the first column show relative agreement, whether both find the practice important, or both have avoided a practice.

*Table 4-6. Difference in Rank between Academic Recommendation and Owner Practice*

| Variance | Practice | Academic Rank | Owner Rank |
|---|---|---|---|
| -33 | Implementing Safety Incentive Programs | 6 | 39 |
| -27 | Prequalify Contractors | 6 | 33 |
| -24 | Owner Construction Safety Committee | 15 | 39 |
| -21 | Safety Inspections (Site) | 3 | 24 |
| -18 | Maintain Contractor Safety Statistics | 3 | 21 |
| -17 | Designated Safety Manager | 1 | 18 |
| -17 | High Hazard Planning Procedure | 19 | 36 |
| -16 | Owner Construction Safety Manager | 6 | 22 |
| -12 | Owner Evaluation of Contractor (Audits) | 1 | 13 |
| -9 | 10-Hour Training | 28 | 37 |
| -8 | Regular EHS Meetings | 10 | 18 |
| -5 | Task Specific Training | 3 | 8 |
| -5 | Owner Concurrence | 24 | 29 |
| -5 | High Hazard Plan to Owner | 32 | 37 |
| -4 | Controlled Insurance Programs | 37 | 41 |
| -3 | Required Safety Management Program | 32 | 35 |
| -1 | Independent Contractor Inspections | 15 | 16 |
| -1 | Daily Task Safety Planning | 24 | 25 |
| 0 | Pre-Construction Safety Meeting | 13 | 13 |
| 0 | Defined Competent Persons | 28 | 28 |
| 1 | Project-Specific Safety Plan | 10 | 9 |
| 2 | Set Construction Safety Goals | 6 | 4 |
| 2 | Daily Safety Coordination Meeting | 32 | 30 |
| 4 | Contractor Sign-Off on Requirements | 37 | 33 |
| 6 | Manual/policy signed by executive | 32 | 26 |
| 6 | Injury and Illness Prevention Plan | 37 | 31 |
| 6 | Job Safety Board | 37 | 31 |
| 7 | Activity Hazard Analysis | 13 | 6 |
| 7 | Company Safety Program | 24 | 17 |
| 8 | Flow Down Requirements | 15 | 7 |
| 8 | Escalating Discipline | 19 | 11 |
| 9 | Immediate Reporting of Accidents | 10 | 1 |
| 10 | Substance Abuse Program | 19 | 9 |
| 10 | Toolbox Talks | 28 | 18 |
| 10 | Safety Concern Reporting | 32 | 22 |
| 11 | Emergency Planning | 15 | 4 |
| 11 | Document Does not Relieve Contractor | 24 | 13 |
| 11 | Provide Emergency Contact to Owner | 37 | 26 |
| 17 | Permitting | 19 | 2 |
| 17 | Required Site Orientation Training | 19 | 2 |
| 17 | Stop Work Authority | 28 | 11 |

A third data source was available to the researcher in the form of the preferences of safety professionals who implement owner requirements. As described in *Section 3.3.4.2 Survey of Expert's Practice Preferences and Values,* an online survey using Qualtrics software was completed. 81 responses were collected from safety professionals. These raw scores, out of a possible 5 points, are shown in the first data column of *Table 4-7. Safety Professional Preferences and Values.* These 5 point scores collected in the survey were scaled to a possible 100 points by multiplying each average score by 20 to allow for equal comparison to the percent-based values of the owner practices and academic recommendations scores. This portion of the research received a separate review for the protection of human subjects from the Michigan State University Institutional Review Board (IRB). This online survey was also determined to be exempt, and the IRB memo to the researchers is provided in *Appendix E: IRB Approval for Online Survey*.

The scores were ranked, as with the owner requirements and academic recommendations. The safety professionals strongly supported the use of practices that would afford them more input and control of the contractors. Examples of practices more favored by safety professionals than academics or owners are: flow-down requirements, stop work authority, and high hazard planning procedure requirements. These safety professionals were also less likely to prefer regular EHS meetings, maintaining contractor safety statistics, and setting construction safety goals from the owner.

*Table 4-7. Safety Professional Preferences and Values*

| Practice | Safety Professional Raw Score | Safety Professional Score | Safety Professional Rank |
|---|---|---|---|
| Permitting | 4.75 | 95 | 1 |
| Task Specific Training | 4.56 | 91 | 2 |
| Flow Down Requirements | 4.54 | 91 | 3 |
| Stop Work Authority | 4.52 | 90 | 4 |
| High Hazard Planning Procedure | 4.51 | 90 | 5 |
| Immediate Reporting of Accidents | 4.43 | 89 | 6 |
| Pre-Construction Safety Meeting | 4.41 | 88 | 7 |
| Document Does not Relieve Contractor | 4.38 | 88 | 8 |
| Prequalify Contractors | 4.36 | 87 | 9 |
| High Hazard Plan to Owner | 4.36 | 87 | 9 |
| Independent Contractor Inspections | 4.31 | 86 | 11 |
| Contractor Sign-Off on Requirements | 4.26 | 85 | 12 |
| Activity Hazard Analysis | 4.24 | 85 | 13 |
| Provide Emergency Contact to Owner | 4.19 | 84 | 14 |
| Owner Evaluation of Contractor (Audits) | 4.19 | 84 | 14 |
| Required Site Orientation Training | 4.16 | 83 | 16 |
| Project-Specific Safety Plan | 4.16 | 83 | 16 |
| Designated Safety Manager | 4.16 | 83 | 16 |
| Daily Task Safety Planning | 4.15 | 83 | 19 |
| Safety Concern Reporting | 4.11 | 82 | 20 |
| Substance Abuse Program | 4.11 | 82 | 20 |
| Required Safety Management Program | 4.11 | 82 | 20 |
| Safety Inspections (Site) | 4.06 | 81 | 23 |
| Company Safety Program | 4.03 | 81 | 24 |
| Owner Construction Safety Manager | 4.02 | 80 | 25 |
| Daily Safety Coordination Meeting | 3.97 | 79 | 26 |
| Set Construction Safety Goals | 3.97 | 79 | 26 |
| Emergency Planning | 3.95 | 79 | 28 |
| Owner Concurrence | 3.92 | 78 | 29 |
| Defined Competent Persons | 3.9 | 78 | 30 |
| Escalating Discipline | 3.82 | 76 | 31 |
| Regular EHS Meetings | 3.8 | 76 | 32 |
| Manual/policy signed by executive | 3.69 | 74 | 33 |
| Toolbox Talks | 3.68 | 74 | 34 |
| Controlled Insurance Programs | 3.68 | 74 | 34 |
| Injury and Illness Prevention Plan | 3.65 | 73 | 36 |
| Maintain Contractor Safety Statistics | 3.64 | 73 | 37 |
| Owner Construction Safety Committee | 3.34 | 67 | 38 |
| Job Safety Board | 3.29 | 66 | 39 |
| 10-Hour Training | 3.26 | 65 | 40 |
| Implementing Safety Incentive Programs | 2.91 | 58 | 41 |

#### 4.1.4.3 Determining Recommended Practices Using Evidence Based Practice (EBP)

Combining the respective practice rankings from 1 to 41 for each of the three information sources, the overall practice rank can be determined. This is shown in *Table 4-8. Overall Rank of Practices*. This ranking is the best triangulation of the current state of the art, leveling the voice of the academic, the owner, and the safety professional. As with the other tables comparing ranking of practices, the variance between each of these voices is shown, and a total variance is calculated as the sum of the absolute value of each variance difference. A complete chart showing all of the columns in one view is provided in *Appendix F: Complete Pattern Analysis Chart.*

*Table 4-8. Overall Rank of Practices*

| Total Variance | Safety Pros and Academics | Safety Pros and Owners | Academic and Owners | Practice | Overall Rank | Academic Rank | Owner Rank | Safety Pro Rank |
|---|---|---|---|---|---|---|---|---|
| 18 | -4 | 5 | 9 | Immediate Reporting of Accidents | 1 | 10 | 1 | 6 |
| 12 | -1 | -6 | -5 | Task Specific Training | 2 | 3 | 8 | 2 |
| 26 | 13 | 1 | -12 | Owner Evaluation of Contractor (Audits) | 3 | 1 | 13 | 14 |
| 44 | 20 | 22 | 2 | Set Construction Safety Goals | 4 | 6 | 4 | 26 |
| 34 | 15 | -2 | -17 | Designated Safety Manager | 5 | 1 | 18 | 16 |
| 14 | 0 | 7 | 7 | Activity Hazard Analysis | 6 | 13 | 6 | 13 |
| 36 | -18 | -1 | 17 | Permitting | 7 | 19 | 2 | 1 |
| 14 | 6 | 7 | 1 | Project-Specific Safety Plan | 8 | 10 | 9 | 16 |
| 24 | -12 | -4 | 8 | Flow Down Requirements | 9 | 15 | 7 | 3 |
| 48 | 13 | 24 | 11 | Emergency Planning | 10 | 15 | 4 | 28 |
| 12 | -6 | -6 | 0 | Pre-Construction Safety Meeting | 10 | 13 | 13 | 7 |
| 42 | 20 | -1 | -21 | Safety Inspections (Site) | 12 | 3 | 24 | 23 |
| 34 | -3 | 14 | 17 | Required Site Orientation Training | 12 | 19 | 2 | 16 |
| 68 | 34 | 16 | -18 | Maintain Contractor Safety Statistics | 14 | 3 | 21 | 37 |
| 38 | 19 | 3 | -16 | Owner Construction Safety Manager | 15 | 6 | 22 | 25 |
| 44 | 22 | 14 | -8 | Regular EHS Meetings | 16 | 10 | 18 | 32 |
| 10 | -4 | -5 | -1 | Independent Contractor Inspections | 17 | 15 | 16 | 11 |
| 54 | 3 | -24 | -27 | Prequalify Contractors | 18 | 6 | 33 | 9 |
| 22 | 1 | 11 | 10 | Substance Abuse Program | 19 | 19 | 9 | 20 |
| 32 | -16 | -5 | 11 | Document Does not Relieve Contractor | 20 | 24 | 13 | 8 |
| 40 | 12 | 20 | 8 | Escalating Discipline | 21 | 19 | 11 | 31 |
| 48 | -24 | -7 | 17 | Stop Work Authority | 22 | 28 | 11 | 4 |
| 14 | 0 | 7 | 7 | Company Safety Program | 23 | 24 | 17 | 24 |
| 12 | -5 | -6 | -1 | Daily Task Safety Planning | 24 | 24 | 25 | 19 |
| 70 | 35 | 2 | -33 | Implementing Safety Incentive Programs | 25 | 6 | 39 | 41 |
| 62 | -14 | -31 | -17 | High Hazard Planning Procedure | 26 | 19 | 36 | 5 |
| 32 | 6 | 16 | 10 | Toolbox Talks | 27 | 28 | 18 | 34 |
| 10 | 5 | 0 | -5 | Owner Concurrence | 28 | 24 | 29 | 29 |
| 24 | -12 | -2 | 10 | Safety Concern Reporting | 29 | 32 | 22 | 20 |
| 4 | 2 | 2 | 0 | Defined Competent Persons | 30 | 28 | 28 | 30 |
| 48 | 23 | -1 | -24 | Owner Construction Safety Committee | 31 | 15 | 39 | 38 |
| 46 | -23 | -12 | 11 | Provide Emergency Contact to Owner | 32 | 37 | 26 | 14 |
| 14 | 1 | 7 | 6 | Manual/policy signed by executive | 33 | 32 | 26 | 33 |
| 12 | -6 | -4 | 2 | Daily Safety Coordination Meeting | 33 | 32 | 30 | 26 |
| 56 | -23 | -28 | -5 | High Hazard Plan to Owner | 35 | 32 | 37 | 9 |
| 30 | -12 | -15 | -3 | Required Safety Management Program | 35 | 32 | 35 | 20 |
| 50 | -25 | -21 | 4 | Contractor Sign-Off on Requirements | 37 | 37 | 33 | 12 |
| 24 | 12 | 3 | -9 | 10-Hour Training | 38 | 28 | 37 | 40 |
| 12 | -1 | 5 | 6 | Injury and Illness Prevention Plan | 39 | 37 | 31 | 36 |
| 16 | 2 | 8 | 6 | Job Safety Board | 40 | 37 | 31 | 39 |
| 14 | -3 | -7 | -4 | Controlled Insurance Programs | 41 | 37 | 41 | 34 |

To assess the relative correlation and to more clearly report on the relationship between these three different data sources, the non-parametric rank correlation procedure Kendall’s Tau was used. All three data sources show low levels of correlation. *Table 4-9. Rank Correlation by Data Source* illustrates the correlation between each of the three data sources, with Owners and Safety Professionals the most highly correlated and Academics and Safety Professionals showing the lowest level of correlation.

*Table 4-9. Rank Correlation by Data Source*

| | Academic Rank | Owner Rank | Safety Professional Rank |
|---|---|---|---|
| Academic Rank | 1.0000 | 0.4337 | 0.1837 |
| Owner Rank | 0.4337 | 1.0000 | 0.4580 |
| Safety Professional Rank | 0.1837 | 0.4580 | 1.0000 |

Similarly, *Table 4-10. Kendall's Tau Pair-wise Rank* reports the Kendall’s Tau score for each pair of rankings, showing the relative lack of a relationship between all three pairs. The strongest of the weak relationships is again between owners and safety professionals, while safety professional and academic ranking show the lowest relationship score. The first and third pair was statistically significant. These findings are again illustrative of the lack of alignment between these three different groups that have influence on the management of safety of independent contractors from the owner’s perspective.

*Table 4-10. Kendall's Tau Pair-wise Rank*

| Variable | By Variable | Kendall τ | Probability > \| τ \| |
|---|---|---|---|
| Owner Rank | Academic Rank | 0.3126 | 0.0058* |
| Safety Professional Rank | Academic Rank | 0.1417 | 0.2095 |
| Safety Professional Rank | Owner Rank | 0.3371 | 0.0022* |

### 4.1.5 Saturation, Equilibrium, and Pattern Evaluation

The following two sections detail the later phases of the pattern language and grounded theory hybrid model. These phases of the research shift the focus from exploratory to a more confirmatory approach, but the final product is still evolving and accommodating new information, true to the iterative nature of these methods.

#### 4.1.5.1 Pattern Confirmation Interviews

After the draft patterns were completed, sixteen interviews were used to check individual pattern content saturation, conduct peer debriefing, and evaluate discrepant cases. *Table 4-11. Expert Characteristics for Pattern Confirmation Interviews* details the experience and qualifications of these experts as well as the points their characteristics score based on the selection criteria discussed in Chapter 3.

*Table 4-11. Expert Characteristics for Pattern Confirmation Interviews*

| Reviewer | Title | Years of Experience | Certifications | Degrees | Points |
|---|---|---|---|---|---|
| 1 | Attorney | 34 | -- | BBA, JD | 40 |
| 2 | Safety Manager | 39 | CSP | B.S. (2) | 46 |
| 3 | Safety and Loss Prevention Specialist | 22 | CHSP, CUSA | B.S. | 33 |
| 4 | Safety Officer | 10 | CSP, CFPS, SCTPP | B.A., B.S. | 27 |
| 5 | Associate Director, EHS | 32 | ARM, CHMM, CSP | B.S., M.S. | 47 |
| 6 | AVP Risk Management | 15 | -- | BA, MBA | 21 |
| 7 | Regional HSE Manager | 30 | CHMM | B.S. | 37 |
| 8 | Management Supervisor Safety and IH | 24 | CSP | B.S. | 31 |
| 9 | Contractor Safety Manager | 34 | CSP | B.S., MBA | 43 |
| 10 | Sr. Safety and Health Engineer | 39 | CSP | B.S., M.S. | 48 |
| 11 | Contractor Safety Director | 9 | CSP, SMS, CET | B.S., M.S. | 24 |
| 12 | Assistant Director, EHS | 34 | PE, CIH, CSP | B.S. | 47 |
| 13 | OHS Director | 15 | CSP | B.S., M.S. | 24 |
| 14 | Senior EHS Specialist | 20 | CSP, LEED AP | B.S., MBA | 32 |
| 15 | Health and Safety Officer | 30 | -- | B.S. | 34 |
| 16 | OHS Director | 26 | -- | B.S., J.D. | 32 |

Each pattern confirmation interview participant was assigned five completed patterns for review, and each pattern was assigned to at least three different expert interview participants. *Table 4-12. Pattern Confirmation Interviews* shows how the patterns were assigned to each of the experts. Experts were also provided with the complete list of patterns identified within the pattern language. Once the expert indicated they had reviewed the materials, a phone interview was conducted to receive feedback on the content of each of the patterns, identify any concerns the expert had, and discuss the decisions made by the researcher on resolving ambiguity present in the initial data. The conflict behind the content in these disambiguation sections is a result of discrepant case reviews and is included as part of the quality assurance process.

*Table 4-12. Pattern Confirmation Interviews*

| Reviewer | Anti Patterns | | | | | Communication | | | | | | | | Safety | | | | | Control | | | | | Owner | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5.1.1 | 5.1.2 | 5.1.3 | 5.1.4 | 5.1.5 | 5.2.1 | 5.2.2 | 5.2.3 | 5.2.4 | 5.2.5 | 5.2.6 | 5.2.7 | 5.2.8 | 5.3.1 | 5.3.2 | 5.3.3 | 5.3.4 | 5.3.5 | 5.4.1 | 5.4.2 | 5.4.3 | 5.4.4 | 5.4.5 | 5.5.1 | 5.5.2 | 5.5.3 |
| 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | |
| 6 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | 1 |
| 7 | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | | |
| 11 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | 1 | 1 |
| 12 | | | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | |
| 13 | | | | | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| 15 | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | | | |
| 16 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 |

The interviews indicated a significant level of agreement between the experts and the content of the patterns. Selected comments on specific patterns as well as general comments about the pattern language and the research topic area generally, are included below.

One of the most common themes discussed by the interview participants centered on the conflict between the owner's involvement and the risk of retained control. Many were aware of this issue, and several shared specific examples to illustrate how they attempt to conduct oversight while not running afoul of legal guidance.

> I do, and our contractor's safety guides are available at our website. We very specifically do not dictate means or methods. We have the ability to stop work if it affects our employees or the public. But, you know, violations by the contractor,

> they own them and they control them, so we have a very good demarcation on that. I completely agree with the statement in here about the owner taking ownership that they don't act if they indicate that they should act. I think that's a very good summary of what the risks are. (REVIEWER 12)

The fact that this is a challenge for owners was not lost on the interview participants. Reviewer 8 discussed how challenging this can be to owners as they attempt to balance many of these considerations when interacting with contractors:

> I really appreciate how much emphasis you put in there about means and methods because I think that hangs a lot of people up. About avoiding dictating means and methods. We fight that battle on a daily basis – it's easy to do. (REVIEWER 8)

For example, Reviewer 5 shared a story about a colleague who struggled with the hands-off approach required by his employer:

> He was really into this, you know, like what you're saying, "review and approval." You know, he really he wanted to go that way. And you know, our attorneys were losing their minds. And yet he insisted on this and eventually I think he actually left the job at the university because he just couldn't be successful here because he felt that he needed to actually put some kind of stamp of approval on what they were doing. (REVIEWER 5)

Reviewer 12 shared an instance where the lack of awareness about the issue of control became a major financial burden for the owner he worked for after an unfortunate fatal accident involving an independent contractor being treated as an employee:

> There was actually an interesting case [here] back in the 80s. It was a contractor who was self-employed who was performing work on [site] and was killed on the job. His widow sued to get worker's compensation and because we were directing his work activities and essentially treating him as an employee we owned the workers comp so we were painfully aware of that exposure. (REVIEWER 12)

Finally, Reviewer 13 talked about how, sometimes, owners are willing to accept the risks that may come with their involvement, and focused on owners making informed and consistent decisions when it comes to interacting with the contractor:

> When I was reading it I was thinking that it aligned with how we operate. I'm very aware of trying to maintain the separation between us as an owner and not getting

> involved in the means and methods, but ensuring that they're done nonetheless. But, you know, if someone manages risk and makes business decisions based on whether the risk is acceptable, and if we accept it, a lot of times it's really difficult for me not to get involved on our capital projects or when they are built by third parties. (REVIEWER 13)

The idea of antipatterns also resonated more broadly with the participants. While retained control is largely the main problematic practice of owners that the participants addressed, several participants liked the idea of providing more detail found in the remaining antipatterns:

> I think this works. I like the organization of it. I mentioned I like the piece on the antipatterns for the owners. You know, what we get in trouble on, what you need to stay away from. So I really appreciate that piece in here which makes this unique and in and of itself. (REVIEWER 2)

> Well, like I said, I think you have identified the bad practices. (REVIEWER 1)

The reviewers were also tasked with evaluating the practice patterns to ensure the summary of the industry practice was accurate and reflective of their experience. Regarding Incident Reporting:

> Yes so we currently do not require reporting of incidents to us unless they are major, the rationale being that an accident on a construction project on our campus will carry our name with it so from a PR perspective we need to know. But we've been directed by legal counsel to essentially be as hands off or as much as we possibly can be. That may change with your new construction model, we will see. But I think your summary is again on target. Under forces, I think the first bullet is specifically correct. We do want to be aware of those that may affect our operations, but may not need to be aware of every instance. I think the last bullet is again right on target. (REVIEWER 12)

Regarding Statistic and safety activity reporting:

> I think what you've laid out is correct. I don't see any issues or deficiencies in what you've reported. It's not a practice that we do ourselves. (REVIEWER 12)

Regarding orientation disambiguation, asked if the disambiguation of the three types of orientations made sense:

> It does, yeah. You know, in the real world application for us it also depends on what type of facility the work is being done in, because we have a level one trauma center and teaching hospital as well as, of course, the academic side, and then the facilities. The support facilities, like a coal fired heat plant for example. So our power structure is – it's all three of those. We use one version or another. More or less

> depending on where it is because the command and control might be different for those types of sites, if that makes sense. For example, the heat plant. Restricted access in and out and there are some specific requirements that we want everybody to adhere to. Just because the hazards that are in there. So the training requirements for those contractors may be a little bit a little bit more site-specific and would be provided by our personnel because it's almost like working on a military base, right? But yeah to specifically answer your question, what you mentioned does make sense in is applicable in my experience, here and at another university I worked at." (REVIEWER 13)

Daily safety coordination meeting:

> We do that. However, we will risk classify those that we determine we will want to do that on. Because as you can imagine, as you know, with large state university capital projects, with a very large hospital with major project multi-year projects. Those types of projects we will do, we will get the subcontractors involved. We'll have the general, we will have them involved, our project managers, infrastructure managers for the university, and then the subcontractor representatives to do the same thing with walk-throughs. And if you want to fix problems, that's how you do it. We could get stuff fixed so quickly that way because everybody there and everybody can agree that it is an issue or not, is yours, or whatever. And then we have a mechanism in place to follow up to ensure that they get to fix. So, yeah, absolutely. Now, we might have a capital project that is smaller in scope so say a renovation of a couple of floors of a laboratory building. While still a big project, we might not require that, it just depends. (REVIEWER 13)

Regarding Group Safety Inspections:

> I think it's one of the most important things that you can do on a construction site is have that group together and have that continuity of who's fixing what, you're doing what. (REVIEWER 8)

> The final thing I had on 5.2.5 was at the very end paragraph, where it says 'safety inspections are not owner evaluations of contractors.' I agree totally with that. Do they have programs in place for inspections? I think it needs to be clear that there is no punishment due to the numbers or types of findings as long as adverse trends are identified and mitigated. So if I have a contractor that found a thousand things wrong, I'm okay because they're finding the thousand things. For the next week, if it's the same thousand things, I think that's an evaluation issue. (REVIEWER 8)

Regarding incident reporting mechanism.

> We tell them at the kick-off meeting that this is an option. The intent, however, you know, I really didn't know where this was, this was an experiment that I didn't really want to get into... I didn't want it to be a snitch line. What I instruct everybody is "hey you need to let your management know that there is an issue." But we do have

> this option to get things to let us know about things. It has been tremendously successful, believe it or not. I really had no idea I was going to go and it's going really well. But before they get to that point we want them to work within the confines of their management and follow that line and then let our project managers need to know as well. (REVIEWER 13)

Several of the owners interviewed also shared their perspective on the reasons owners become involved in construction safety. For example, Reviewer 5 discussed the fact that many large owners have their reputation at stake, even for projects they do not control or have any affiliation with:

> What had happened is there was an accident in a construction site directly across the street from the university. So it's not only not our construction site, it's not even on our - It's on the other side of the road, not [UNIVERSITY] at all, right, but it made its way into the news that there was a construction accident at [UNIVERSITY]. And you know, we kind of worked with legal on that too. Yeah. This is this is what can happen when it's not even us. Imagine when it's on our side of the street. (REVIEWER 5)

Similar to the risk of reputational harm, this owner shared the reality of operating adjacent to contractors, especially as a trained safety professional. In many cases, these situations start small, with observations from afar, and become increasingly engaged and involved:

> Are you familiar with the book "If You Give a Mouse a Cookie?" (Yes). All right. So, you know that you asked for one thing and because of that then you get a little something else, and a little something else, and then - you know - the next thing you know you've got the whole thing. We started out with "If we walk by a construction site that has a fence around it and we can see a hazard from our side of a fence, are we not duty bound to say something or stop that work?" Yeah, yeah you are. You know you can, you can do that. OK. "Well so if we randomly walk by and see that can we actively walk by the fence lines and look for things?" Yes. Yes you can. "So if we walk by a fence actively and see something, wouldn't it make sense for us to enter the construction site and go to the construction trailer?" Yes. And we follow this if you give a mouse a cookie too. And that's my advice to people you know because you're absolutely right. A whole bunch of our peers will tell you "we sign a contract, we put a fence around it. We transfer the property to the contractor." So this is a definitely a new paradigm. And so your work is extremely relevant. (REVIEWER 5)

In addition to moral and ethical questions about when to become involved in managing contractor safety, other participants pointed to a changing emphasis from regulators, specifically OSHA, in how they deal with multiple employers on a specific site where infractions are observed:

> Lately the agency's [OSHA] been muddling that dividing line. There has been more and more enforcement actions and court cases where the dividing line between contractor and host facility is becoming blurred, mainly because of what you are talking about with retaining control and perceived control. (REVIEWER 7)

Finally, major incidents, significant project impacts, and fatalities are, unfortunately, often still the impetus for an owner's management to take notice of the risks associated with independent contractors delivering work. Several participants discussed this. Reviewer 7, for example, discussed how these incidents push the owner to action:

> One of the main things that my company has been going through over the last two years is to really focus on contractor management because of the fact that we've had a number of fatalities overseas. Because of that we're really trying to ratchet up how closely we look at contractors and at how we do it. Preapproval process and periodic reappraisals. And also how far we extend ourselves as far as management of the contractors on the day-to-day basis, and I think that your paper does a good job of dealing with that. I think your characterization of the situation with this particular safety area is very accurate. And you're right, in general, there really hasn't been really good 'soup to nuts' kind of guidance on how to put together an effective contractor management program. (REVIEWER 7)

Reviewer 13 agreed that the patterns they reviewed aligned with their expectations and how they approach contractor safety, and that a project-specific risk analysis plays a major part in determining how the owner should approach their role:

> I would agree. I would say that that is how we operate. You know, there's some gray areas in there and I think it can be - it can be project specific. Just because I do operate on, as do many of us, on a risk-based approach. So I do have to prioritize to a certain extent on what are we willing to accept on our own risk level and then accordingly how many resources are we going to pour into it. But I'm looking at the items here, the training, the tool box talks, actually four of the five is pretty much aligned perfectly with what we're doing with the exception of the tool box talks. We don't have a requirement there for our contractors to do it. (REVIEWER 13)

Regarding the pattern language structure:

> I think the way they're set up, because I was making so many notes on them, is that in my mind I wanted to go and see that know it's creating that link to where, okay, activity hazard analysis. What's that? And then flip over there get my clarification and say “okay, now I see how these all relate.” Things like that. That's - I think that's a good part. I think it leads to the investigation of all the other patterns. (REVIEWER 8)

Finally, several of the interviewees provided general feedback on the progress and direction of the pattern language, saying “I think you're definitely on the right course” (REVIEWER 2) and “overall I thought it summarized some of the major issues that we have to deal with.” (REVIEWER 7)

#### 4.1.5.2 Focus Group Feedback and Verification

The focus group was used to check for saturation of the completed pattern language as a network. Where the pattern confirmation interviews were specific to small sets of patterns given to individual interviewees, the focus group reviewed the pattern language as a whole, both to ensure complete topic coverage and to “solicit participants' views of the credibility of the findings and interpretations” as described by Creswell (2013, p. 252). The overall mission of the focus group was to identify any gaps in coverage areas and to further explore the forces, solutions, and resulting contexts of the patterns.

The focus group consisted of members of the university's administration, construction delivery staff, and safety experts from within the departments of Infrastructure Planning, and Facilities (IPF), Risk Management, and the School of Planning, Design, and Construction (SPDC). They are identified in *Table 4-13. Focus Group Participants*.

*Table 4-13. Focus Group Participants*

| Title | Experience | Certification(s) | Degree(s) |
|---|---|---|---|
| Safety Manager | 25 | -- | B.S. |
| Risk Manager | 38 | CPCU | B.A., MBA |
| Director (Retired Regulator) | 40 | OSHA 510 | -- |
| Performance Manager | 20 | LEED | B.S. |
| Construction Representative | 25 | -- | -- |
| Safety Instructor | 35 | OSHA 510 | B.S., M.S., Ph.D. |

In the first step of the focus group, participants were asked to assign an "involvement impact" score to eight different forces affecting the owner's use of safety practices, from a score of (1), not at all important, to a score of (5), extremely important. Slightly (2), moderately (3) and very important (4) options were available in the middle. The ratings assigned to each force by each of the focus group participants is shown in *Table 4-14. Initial Force Ratings*. These forces were identified during the initial phases of the coding process as well as from the preliminary semi-structured expert interviews. Each pattern presented as part of the pattern language includes forces specific to the issues at hand within that pattern. The forces presented below represent a summary of the major issues that appeared within the pattern language. Satisfying regulatory requirements, contractor safety performance, and safety culture were the top rated forces in this initial participant assessment.

*Table 4-14. Initial Force Ratings*

| **Force** | **1** | **2** | **3** | **4** | **5** | **6** | **Average** |
|---|---|---|---|---|---|---|---|
| Satisfying Regulatory Req. | 5 | 4 | 5 | 5 | 5 | 5 | 4.8 |
| Contractor Safety Performance | 5 | 5 | 5 | 5 | 5 | 3 | 4.7 |
| Safety Culture | 5 | 4 | 5 | 5 | 5 | 3 | 4.5 |
| Owner Risk/Liability | 3 | 4 | 5 | 5 | 5 | 5 | 4.5 |
| Contractor Relationship | 5 | 4 | 4 | 5 | 4 | 4 | 4.3 |
| Project Delay | 4 | 4 | 5 | 5 | 4 | 4 | 4.3 |
| Public Image/Perception | 4 | 3 | 5 | 5 | 4 | 4 | 4.2 |
| Cost Impact | 3 | 3 | 5 | 2 | 4 | 2 | 3.2 |

The focus group was asked to rate each pattern from the perspective of each of these eight forces owners might consider. Possible responses ranged from one (very inferior to incumbent) to five (very superior to incumbent), with a score of three (same as incumbent) possible at the center of the scale. By multiplying the initial value score, also ranging from one to five, collected from the participant prior to the start of the focus group and the assigned utility score, the raw utility practice ratings were calculated. The maximum possible raw score for each pattern is 200, which would represent an initial rating of five and a utility assessment of five for each of the eight forces. These calculated utility ratings appear in *Table 4-15. Raw Utility Rating for Selected Patterns* below.

*Table 4-15. Raw Utility Rating for Selected Patterns*

| Practice | No. | 1 | 2 | 3 | 4 | 5 | 6 | Average |
|---|---|---|---|---|---|---|---|---|
| On-Site Safety Mgr | 5.4.1 | 127 | 117 | 151 | 124 | 147 | 126 | 132.0 |
| Daily TSP | 5.3.4 | 114 | 117 | 147 | 144 | 123 | 138 | 130.5 |
| AHA | 5.3.3 | 118 | 105 | 147 | 129 | 147 | 134 | 130.0 |
| Site Specific Plan | 5.3.2 | 121 | 121 | 147 | 134 | 140 | 116 | 129.8 |
| Orientation | 5.2.4 | 129 | 116 | 122 | 131 | 141 | 139 | 129.7 |
| Daily Coordination | 5.2.3 | 126 | 113 | 137 | 143 | 136 | 111 | 127.7 |
| Incident Reporting | 5.2.1 | 124 | 106 | 142 | 146 | 126 | 112 | 126.0 |
| Owner Eval of Contractor | 5.5.3 | 124 | 109 | 137 | 111 | 146 | 122 | 124.8 |
| Group Insp | 5.2.5 | 124 | 110 | 142 | 141 | 140 | 83 | 123.3 |
| EHS Meeting | 5.2.7 | 124 | 110 | 143 | 128 | 131 | 91 | 121.2 |
| Flow Down | 5.4.3 | 115 | 101 | 147 | 119 | 126 | 114 | 120.3 |
| Concern Reporting | 5.2.8 | 129 | 117 | 128 | 116 | 117 | 105 | 118.7 |
| Review of Plans | 5.5.2 | 114 | 93 | 137 | 119 | 132 | 114 | 118.2 |
| Stop Work | 5.4.2 | 113 | 121 | 117 | 124 | 136 | 96 | 117.8 |
| Discipline | 5.4.4 | 109 | 109 | 132 | 124 | 122 | 110 | 117.7 |
| Toolbox | 5.2.6 | 121 | 109 | 117 | 121 | 121 | 116 | 117.5 |
| Stat Reporting | 5.2.2 | 117 | 109 | 122 | 133 | 122 | 98 | 116.8 |
| Company Policy | 5.3.1 | 119 | 106 | 117 | 126 | 127 | 95 | 115.0 |
| Permitting | 5.3.5 | 103 | 121 | 117 | 137 | 108 | 98 | 114.0 |
| Requirements Do Not Relieve | 5.4.5 | 101 | 112 | 132 | 119 | 112 | 107 | 113.8 |
| Goal Setting | 5.5.1 | 119 | 93 | 127 | 124 | 122 | 90 | 112.5 |

With the forces evaluated in each of the twenty-one practices presented to the focus group, revisiting the total score for each force confirms the initial value assessments collected. These total scores for each force as rated within the patterns are presented in *Table 4-16. Total Calculated Force Ratings for All Twenty-One Patterns.* The total score possible, if the force was originally rated at five and that force was rated a five for each of the twenty-one patterns, is 525. Contractor safety performance and safety culture were the top two rated forces, while the traditional forces impacting construction decisions, cost and schedule, were again the two lowest ranked forces. These findings are further discussed in *Section 6.2.4*.

*Table 4-16. Total Calculated Force Ratings for All Twenty-One Patterns*

| Force | 1 | 2 | 3 | 4 | 5 | 6 | Average |
|---|---|---|---|---|---|---|---|
| Contractor Safety Performance | 405 | 385 | 385 | 435 | 420 | 237 | 377.8 |
| Safety Culture | 420 | 328 | 390 | 450 | 425 | 252 | 377.5 |
| Satisfying Regulatory Req. | 355 | 288 | 365 | 430 | 375 | 405 | 369.7 |
| Owner Risk/Liability | 207 | 328 | 375 | 240 | 350 | 415 | 319.2 |
| Contractor Relationship | 375 | 308 | 248 | 420 | 272 | 276 | 316.5 |
| Public Image/Perception | 316 | 222 | 315 | 390 | 328 | 292 | 310.5 |
| Project Delay | 236 | 264 | 355 | 220 | 292 | 300 | 277.8 |
| Cost Impact | 177 | 192 | 375 | 108 | 260 | 138 | 208.3 |

The disruptive technology decision process designed by Ganguly et al. (2010) also calculates the utility rating by comparing the utility of the disruptive practice to the utility of the incumbent, or current status quo. By taking the inverse of the score a participant assigned a given practice, we are able to calculate these scores. Practices can be mathematically rated between 0.2 and 5.0, and Ganguly proposes that any score above 1.0 suggests the disruptive practice should be adopted. *Table 4-17. Pattern Utility Ratings by Disruptive Scoring Procedure* shows the scores calculated by using this procedure. It is worth noting that every one of the 21 patterns reviewed by the focus group achieved a score greater than 1.0.

*Table 4-17. Pattern Utility Ratings by Disruptive Scoring Procedure*

| **Practice** | **No.** | **1** | **2** | **3** | **4** | **5** | **6** | **Average** |
|---|---|---|---|---|---|---|---|---|
| Orientation | 5.2.4 | 3.15 | 2.97 | 1.67 | 2.43 | 3.62 | 12.64 | 4.41 |
| Daily TSP | 5.3.4 | 2.04 | 3.08 | 3.06 | 3.51 | 2.16 | 11.50 | 4.22 |
| AHA | 5.3.3 | 2.27 | 2.10 | 3.06 | 2.30 | 4.45 | 8.38 | 3.76 |
| On-Site Safety Mgr | 5.4.1 | 2.95 | 3.08 | 3.43 | 2.03 | 4.45 | 5.25 | 3.53 |
| Site Specific Plan | 5.3.2 | 2.47 | 3.56 | 3.06 | 2.63 | 3.50 | 3.41 | 3.10 |
| Owner Eval of Contractor | 5.5.3 | 2.70 | 2.37 | 2.36 | 1.50 | 4.29 | 4.36 | 2.93 |
| Daily Coordination | 5.2.3 | 2.86 | 2.69 | 2.36 | 3.40 | 3.09 | 2.85 | 2.88 |
| Incident Reporting | 5.2.1 | 2.70 | 2.16 | 2.68 | 3.74 | 2.33 | 2.95 | 2.76 |
| Group Inspections | 5.2.5 | 2.70 | 2.44 | 2.68 | 3.20 | 3.50 | 1.24 | 2.63 |
| EHS Meeting | 5.2.7 | 2.70 | 2.44 | 2.75 | 2.25 | 2.67 | 1.54 | 2.39 |
| Flow Down | 5.4.3 | 2.09 | 1.87 | 3.06 | 1.80 | 2.33 | 3.17 | 2.39 |
| Concern Reporting | 5.2.8 | 3.15 | 3.08 | 1.91 | 1.68 | 1.86 | 2.33 | 2.33 |
| Stop Work | 5.4.2 | 1.98 | 3.56 | 1.50 | 2.03 | 3.09 | 1.78 | 2.32 |
| Toolbox | 5.2.6 | 2.47 | 2.37 | 1.50 | 1.89 | 2.05 | 3.41 | 2.28 |
| Review of Plans | 5.5.2 | 2.04 | 1.50 | 2.36 | 1.80 | 2.75 | 3.17 | 2.27 |
| Stat Reporting | 5.2.2 | 2.21 | 2.37 | 2.21 | 2.56 | 2.10 | 1.88 | 2.22 |
| Discipline | 5.4.4 | 1.79 | 2.37 | 2.10 | 2.03 | 2.10 | 2.75 | 2.19 |
| Permitting | 5.3.5 | 1.54 | 3.56 | 1.50 | 2.85 | 1.50 | 1.88 | 2.14 |
| Company Policy | 5.3.1 | 2.33 | 2.16 | 1.50 | 2.14 | 2.40 | 1.73 | 2.04 |
| Requirements Do Not Relieve | 5.4.5 | 1.46 | 2.60 | 2.10 | 1.80 | 1.65 | 2.49 | 2.02 |
| Goal Setting | 5.5.1 | 2.33 | 1.50 | 1.87 | 2.03 | 2.10 | 1.50 | 1.89 |

## 4.2 Findings: Construction Safety Patterns by Category

Four main areas of owner management practices were discovered throughout this research, both in the review of owner-produced documents and in the review of the literature. These included communication practices, safety planning practices, contractual control practices, and owner engagement practices. A fifth category, antipatterns, were those practices owners adhered to that led to eventual problems for them. Antipatterns were derived from a review of the literature and owner documents, relevant case law, and interviews conducted with experts in the field. Twenty-one patterns and five antipatterns were selected for further analysis from the forty-seven initial practices identified in the horizontal and vertical coding phases. These twenty-six patterns and antipatterns appear in the summary tables in **bold** text, and are completely presented in Chapter 5.

### 4.2.1 Communication

*Table 4-18. Communication Patterns of Construction Safety Management*

| Pattern | Description |
|---|---|
| **INCIDENT REPORTING** | Owners require contractor to report a wide range of incidents within a specified amount of time. |
| **STATISTIC AND SAFETY ACTIVITY REPORTING** | Owners require contractors to report metrics necessary to track safety performance, including hours worked and type and number of safety activities completed. |
| **DAILY SAFETY COORDINATION** | A daily meeting is held to cover the work to be completed that day, including the safety considerations necessary to deliver the work. |
| **SITE ORIENTATION TRAINING** | Each worker must be provided training specific to the project location and scope of work. |
| TASK SPECIFIC TRAINING | Each worker must be properly trained for the tasks they are required to complete. |
| **GROUP SAFETY INSPECTIONS** | Project management, subcontractors, and the owner conduct a regularly scheduled inspection of the site. |
| INDEPENDENT CONTRACTOR SAFETY INSPECTIONS | Each contractor is responsible for conducting both inspections of their work area and task specific inspections explicitly required by OSHA. |
| **TOOLBOX TALKS** | Owners may require contractors to continually educate workers on safety topics and lessons learned. |
| **REGULAR EHS MEETINGS** | Regular EHS meetings held by the contractor allow for dissemination of safety information, safety performance data, and to collect feedback. |
| PROVIDE EMERGENCY CONTACT TO OWNER | The owner must have accurate contact information for project leadership in the event of an emergency or other unforeseen circumstance. |
| **SAFETY CONCERN REPORTING MECHANISM** | The owner or project should create a mechanism for workers and the public to report safety concerns. |
| JOB SAFETY BOARD | A dedicated area for posting information specific to safety should be created and maintained. |
| INCIDENT INVESTIGATION | All incidents should be investigated, with the findings shared with all workers on site to prevent recurrence. |

Communication requirements were identified as requirements owners developed to ensure effective coordination between all parties involved in the work. Twelve total requirements were initially identified and ranged from a use of 100% (incident reporting) to 21% (job safety board).

*Figure 4-15* shows the communication requirements and their relative frequency of use discovered in the horizontal coding phase.

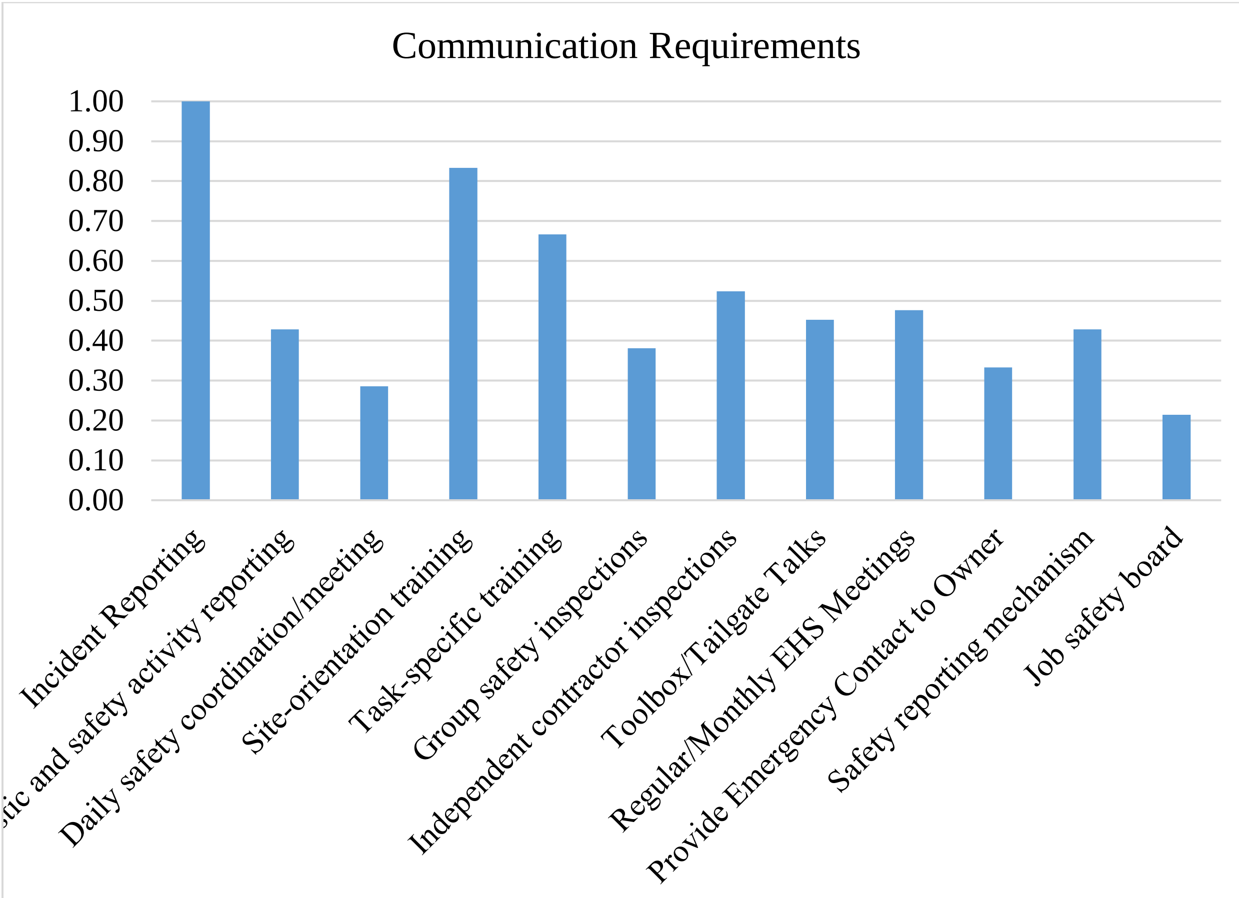



*Figure 4-15. Communication Requirements*

The literature is similarly interested in communication based safety management practices. Clusters found within the literature related to communication include reporting incidents and statistics, training of workers and meetings, and audits, inspections, and other oversight activities.

*Table 4-19. Academic Recommendations for Communication Practices*

| Author(s): | Levitt & Samelson, 1982 | ASCE, 1989 | Hinze, 1997 | Gambatese, 2000 | Huang & Hinze, 2006 | Musonda, 2012 | CURT, 2012 | Votano, 2014 | Wu, 2015 | Campbell Institute, 2015 | Liu, 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Communication** | | | | | | | | | | | |
| Require Immediate Reporting of Accidents | X | | X | X | X | X | X | | | | X |
| Maintain Contractor Safety Statistics | X | | X | X | X | X | X | X | | X | X |
| Daily Safety Coordination Meeting | | | | | | | X | | | | |
| Required Site Orientation Training | | | X | | X | | X | | | X | |
| Task Specific Training | X | X | X | X | X | | X | | X | X | X |
| Safety Inspections (Site) | X | | X | X | X | X | X | X | X | X | |
| Independent Contractor Inspections | | X | | | | X | X | | X | X | |
| Toolbox Talks | | | | | X | | X | | | | |
| Regular EHS Meetings | X | | X | X | X | X | X | | X | | |
| Provide Emergency Contact to Owner | | | | | | | | | | | |
| Safety Concern Reporting | | | | | | | | | | X | |
| Job Safety Board | | | | | | | | | | | |

### 4.2.2 Site Safety Planning

Site safety planning patterns were those that dealt with traditional health and safety management practices from both the owner and the contractor, and are summarized in *Table 4-20*.

*Table 4-20. Site Safety Planning Patterns of Construction Safety Management*

| Pattern | Description |
|---|---|
| **COMPANY SAFETY POLICY** | The contractor must submit a manual that details the companies approach to compliance with OSHA and other applicable safety requirements. |
| **SITE SPECIFIC SAFETY PLAN** | The contractor must create a site specific plan for the management of safety which considers unique owner requirements, local issues, and interfaces. |
| PRECONSTRUCTION SAFETY MEETING | The contractor must meet with the owner prior to the start of construction to cover any remaining coordination issues. |
| **ACTIVITY HAZARD ANALYSIS** | The contractor must evaluate each task to be conducted during their scope of work, their potential hazards, and what mitigating actions must be taken. |
| **DAILY TASK SAFETY PLANNING** | The hazard analysis for each activity to be performed that day is used to create a task specific planning tool. |
| **PERMITTING** | Various types of permits are required by both owners and contractors to manage contractor safety |
| DEFINED COMPETENT PERSONS | Both management of the project and specific tasks require designated competent persons. The owner requires a current listing for the duration of the project. |
| HIGH HAZARD PLANNING PROCEDURE | For specific activities that have an inherently higher risk, owners require contractors to follow specific planning procedures. |
| SUBSTANCE ABUSE PREVENTION POLICY | Contractors must have a program in place to prevent impaired workers from participating in the project. |
| EMERGENCY ACTION PLAN | The contractor must develop a plan to be followed in the event of an emergency and disseminate it broadly. |

Site safety planning requirements were those items expected by the owner that contributed to site safety planning, served as a major step of site safety planning, or otherwise allowed the contractor to integrate into the owner's operation more effectively. The most common requirement in this section was permitting (83%), while the least common was the requirement of an injury and illness prevention plan (19%) and high hazard planning procedure (14%). Ultimately the injury and illness prevention plan was eliminated due to the fact that it was only found in a limited number of owner programs and is directly responding to state specific requirements, such as requirements found in California. *Figure 4-16. Site Safety Planning Requirements* shows the frequency of each practice's use as discovered in the horizontal coding phase.


*Figure 4-16. Site Safety Planning Requirements*

The academic recommendations identified during this process also revealed a significant focus on many of these activities and are shown in *Table 4-21. Academic Recommendations for Site Safety Planning Practices*. The project-specific site safety plan was regularly discussed through the literature and varied significantly among academics, often incorporating other site safety planning elements into their site-specific safety planning recommendation. Preconstruction activities were often highly recommended by academics, and are included in the site safety planning subcategory due to the constructive planning nature of these meetings as compared to other project based meetings, which focused more on coordinating existing project elements.

*Table 4-21. Academic Recommendations for Site Safety Planning Practices*

| Author(s): | Levitt & Samelson, 1982 | ASCE, 1989 | Hinze, 1997 | Gambatese, 2000 | Huang & Hinze, 2006 | Musonda, 2012 | CURT, 2012 | Votano, 2014 | Wu, 2015 | Campbell Institute, 2015 | Liu, 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Site Safety Planning** | | | | | | | | | | | |
| Company Safety Program | | | X | X | X | | | | | | |
| Project-Specific Safety Plan | | X | X | X | X | | X | X | | | X |
| Injury and Illness Prevention Plan | | | | | | | | | | | |
| Pre-Construction Safety Meeting | X | | | X | X | X | | | X | | X |
| Activity Hazard Analysis | | | X | | X | X | X | | X | X | |
| Daily Task Safety Planning | | | | | X | | X | | | X | |
| Permitting | X | | | | X | | X | | | X | |
| Defined Competent Persons | | | | | | | X | | X | | |
| High Hazard Planning Procedure | | | | X | | X | | | X | X | |
| Substance Abuse Program | | X | | X | X | | X | | | | |
| Emergency Planning | | | | X | X | | X | | X | | X |

### 4.2.3 Contractual Control

The Contractual Control patterns are those patterns that were actual practices either stipulated or required within the contract to ensure control was maintained on a project site, or were specific provisions that owners included in their contracts to ensure owners retained and controlled the safety responsibility and control of the work. These patterns appear in *Table 4-22* below.

*Table 4-22. Contractual Control Patterns of Construction Safety*

| Pattern | Description |
|---|---|
| PREQUALIFY CONTRACTORS | The owner should develop a process for screening contractors based on their safety performance. |
| **DESIGNATED ON-SITE SAFETY MANAGER** | The owner should require the contractor to designate an on-site safety manager who is responsible for the contractor's safety management. |
| **STOP WORK AUTHORITY** | Stop work authority must be clearly delineated and communicated to all who participate in the construction process. |
| **FLOW DOWN CONTRACTUAL REQUIREMENTS** | The owner should develop an expectation that requirements apply to all contractors, subcontractors, and lower tier contractors, suppliers, and vendors. |
| **ESCALATING DISCIPLINARY PROCEDURES** | The owner should create or require the contractor to create a system where contractor and/or worker non-conformance is progressively disciplined. |
| **OWNER REQUIREMENTS DO NOT RELIEVE CONTRACTOR** | The owner must make clear to the contractor that the existence of construction safety requirements and owner involvement does not relieve the contractor of their responsibility for safety. |

Owners widely incorporated flow down requirements to their manuals and contract language, while stop work authority and escalating disciplinary procedures were also relatively common. *Figure 4-17. Contractual Control Requirements* details these patterns and their frequency.

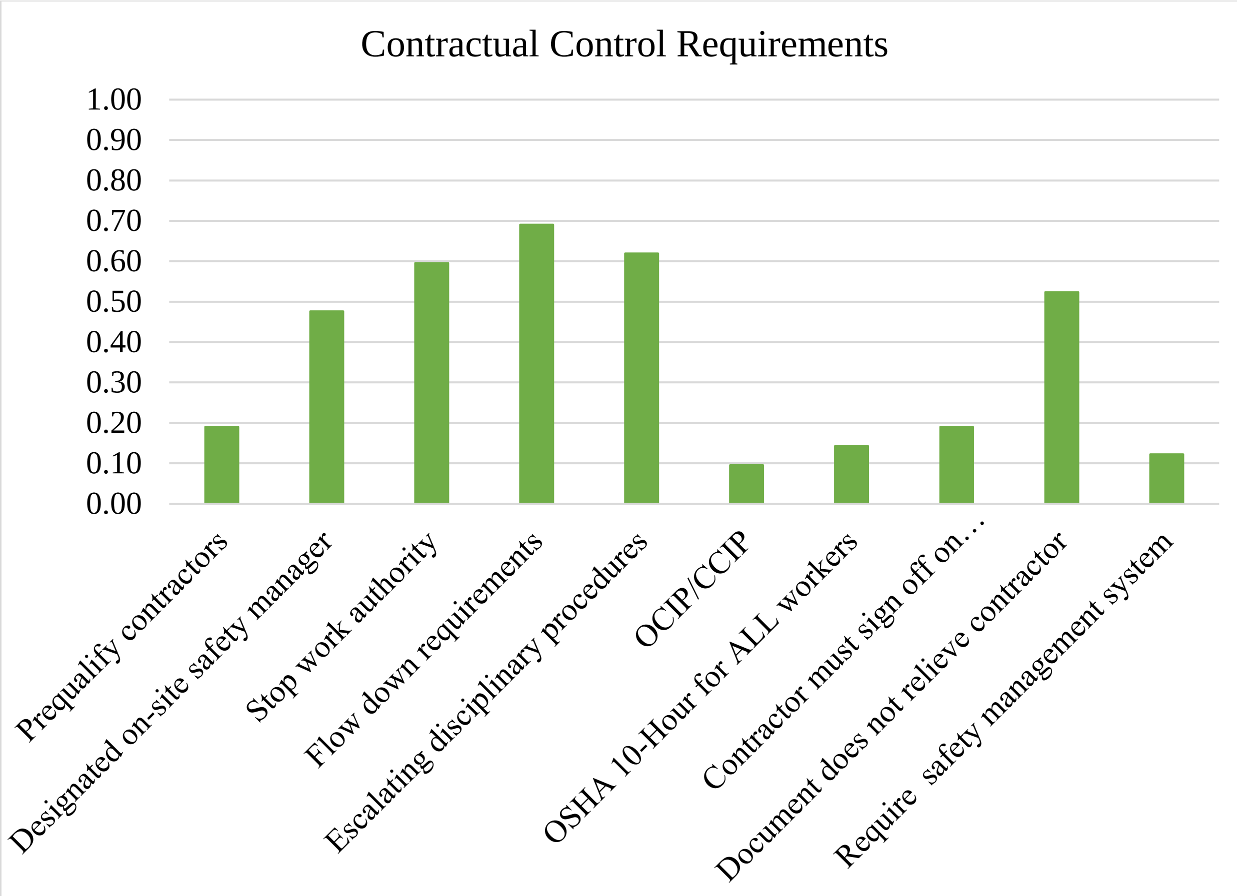



*Figure 4-17. Contractual Control Requirements*

*Table 4-23. Academic Recommendations for Contractual Control Practices* is shown below and highlights the academic viewpoint. Most of the academic works highly recommended prequalification of contractors and requiring the presence of an on-site safety manager. The academic community was not specifically interested in stop work requirements or contract provisions specifying the contractor's responsibility for safety. Safety of employees remains with the contractor more often than compared to the owner requirements and the safety professional scores.

*Table 4-23. Academic Recommendations for Contractual Control Practices*

| Author(s): | Levitt & Samelson, 1982 | ASCE, 1989 | Hinze, 1997 | Gambatese, 2000 | Huang & Hinze, 2006 | Musonda, 2012 | CURT, 2012 | Votano, 2014 | Wu, 2015 | Campbell Institute, 2015 | Liu, 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Contractual Control** | | | | | | | | | | | |
| Prequalify Contractors | | X | X | X | X | | X | X | | X | X |
| Designated Safety Manager | X | X | X | X | X | | X | X | X | X | X |
| Stop Work Authority | | | | | | | X | | | X | |
| Flow Down Requirements | | | X | | X | | X | | | X | X |
| Escalating Discipline | | | | | | | X | X | X | X | |
| Controlled Insurance Programs | | | | | | | | | | | |
| 10-Hour Training | | | | | | | X | | | X | |
| Contractor Sign-Off on Requirements | | | | | | | | | | | |
| Document Does not Relieve Contractor | | | | X | X | | | | | | X |
| Required Safety Management Program | | | | | | | X | | | | |

Specific training requirements, in this case the OSHA 10-hour training requirement, were ultimately dropped from consideration for inclusion in the Construction Safety Pattern Language as these requirements are not yet very common and in the cases discovered in the sample, were only required due to a state specific labor law in Connecticut (which required the workers on funded projects to have such a certification). Other municipalities and authorities are known to have similar requirements, but these are still the exception and the general safety knowledge covered in these OSHA training programs have been covered in the Site Orientation Training and in Task Specific Training patterns. The requirement for contractors to sign off on requirements was merged with the "document does not relieve the contractor" pattern. Similarly, the required safety management program requirement was also eliminated in the vertical coding phase because it is an umbrella program that covers specific management practices that are instead addressed directly in the pattern language.

### 4.2.4 Owner Involvement

Owner involvement patterns are those patterns that instruct owners directly on how they should manage their contractors. While the contractors are ultimately impacted by these patterns, they are meant for the owner to manage directly, which sets them apart from the other patterns. *Table 4-24. Owner Presence Patterns of Construction Safety Management* presents a summary of these patterns.

*Table 4-24. Owner Presence Patterns of Construction Safety Management*

| Pattern | Description |
|---|---|
| **GOAL SETTING** | The owner publicly states their construction safety program objective to ensure their interest in performance is communicated clearly. |
| **OWNER REVIEW OF SUBMITTED SAFETY PLANS** | The owner requires contractors to submit plans for the delivery of safety, but does not accept final responsibility for their content. |
| **OWNER EVALUATION OF CONTRACTOR** | The owner regularly evaluates the contractor, before, during, and after the construction process. |
| OWNER ON-SITE SAFETY MANAGER | The owner includes a dedicated on-site safety manager to coordinate the owner’s involvement in the contractor’s safety process. |
| OWNER CONSTRUCTION SAFETY COMMITTEE | The owner has their own safety committee responsible for oversight and setting owner-specific requirements that exceed minimum requirements. |
| OWNER SUPPORTED SAFETY INCENTIVE PROGRAM | Owner creates incentive programs to reward contractors with exemplary safety performance. |
| OWNER SAFETY POLICY SIGNED BY EXECUTIVE | The owner demonstrates leadership level commitment to construction safety. |

Owners who developed contractor safety requirements usually introduced these requirements by stating a goal for their construction and contracting partners’ safety. Nearly 4 in 5 owners (79%)

met this practice. Many owners also included provisions describing some type of monitoring or oversight the owner would conduct on the contractor's operation, as well as the expectation that the owner would review safety-specific plans when submitted. *Figure 4-18. Owner Presence Requirements* illustrates the horizontal coding findings in this area of contractor safety management.

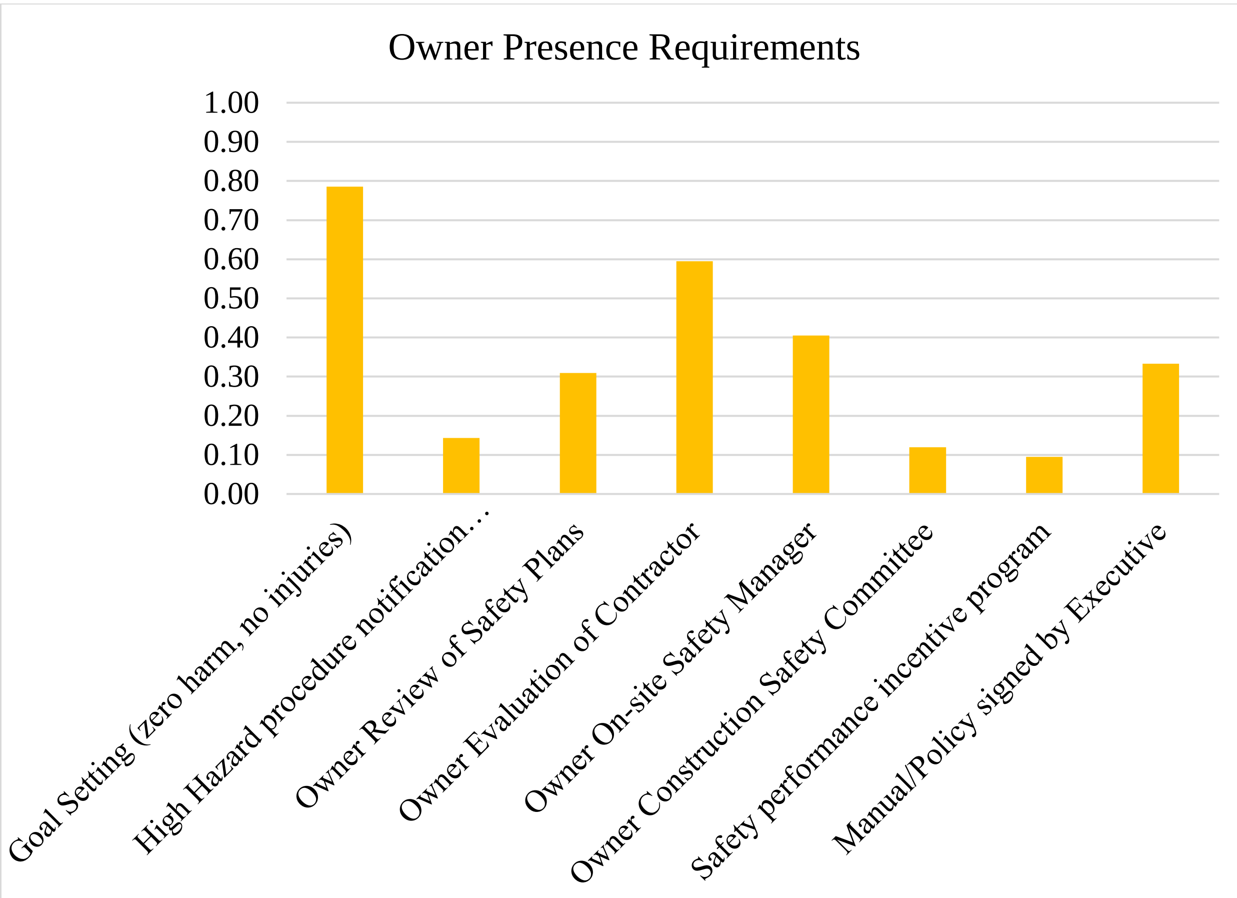



*Figure 4-18. Owner Presence Requirements*

Finally, although the academic work to date highly prioritizes contractor safety incentive programs, many of the owners had no interest in this practice. Comments collected during the interviews and focus group stages indicated quite clearly that these representatives wanted nothing to do with incentive programs due to perceived issues with their execution. *Table 4-25. Academic Recommendations for Owner Involvement* summarizes the academic findings in this area of contractor safety management

*Table 4-25. Academic Recommendations for Owner Involvement*

| Author(s): | Levitt & Samelson, 1982 | ASCE, 1989 | Hinze, 1997 | Gambatese, 2000 | Huang & Hinze, 2006 | Musonda, 2012 | CURT, 2012 | Votano, 2014 | Wu, 2015 | Campbell Institute, 2015 | Liu, 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Owner Presence** | | | | | | | | | | | |
| Set Construction Safety Goals | X | | | X | X | X | X | X | X | | X |
| High Hazard Plan to Owner | | | | | | | | | X | | |
| Owner Concurrence | | | | X | | | X | X | | | |
| Owner Evaluation of Contractor (Audits) | X | | X | X | X | X | X | X | X | X | X |
| Owner Construction Safety Manager | X | | X | X | X | X | X | X | | | X |
| Owner Construction Safety Committee | X | | | | | | X | X | X | | X |
| Implementing Safety Incentive Programs | | | X | X | X | X | X | X | X | | X |
| Policy Signed by Executive | | | | | | | X | | | | |

### 4.2.5 The Problematic Practices: Antipatterns

The antipatterns listed below and in *Section 5.1 Anti-Patterns of Owner Construction Safety Management* describe the practices discovered through the review of the existing case law and guidance and the apparent problematic practices discovered in the vertical coding phase of the research. *Table 4-26. Antipatterns of Construction Safety Management* below summarizes these problematic practices.

*Table 4-26. Antipatterns of Construction Safety Management*

| Pattern | Description |
|---|---|
| **RETAIN CONTROL** | The owner is too engaged, creating liability |
| **REPEATING REGULATION WHICH ALREADY APPLY** | The owner unnecessarily repeats the regulations in their requirements |
| **OWNER ENDORSEMENT AND CONCURRENCE** | The owner "signs off" on plans and procedures before use |
| **FAILURE TO FOLLOW THE WRITTEN PLAN** | Owner establishes a plan but fails to adhere to it |
| **FAILURE TO FOLLOW UP ON A DOCUMENTED NONCONFORMANCE** | Owner identifies an issue but does not ensure its correction |
| THE ABSENT OWNER | The owner shows no interest in the safety performance of the contractor, sending the wrong signal |
| NEGLIGENT CONTRACTOR SELECTION | The owner knowingly selects a contractor who is unwilling or incapable of completing the scope of work in a safe manner |
| IMPLIED WARRANTY OF PLANS AND SPECIFICATIONS | Publishing plans and specifications without ensuring their accuracy |

## 4.3 Assessment of Quality: Process, Output, and Saturation

Charmaz (2014) describes several attributes necessary for knowledge created by constructivist grounded theory to be assessed. Specifically, the originality, credibility, resonance, and usefulness are the primary points of emphasis. In this work, the research design allowed for assessments of the findings in the process, output, and saturation-focused quality approach.

### 4.3.1 Process

The Audit Trail produced in this work will allow others to follow the process created and used to drive the research. Decision points surrounding this research design and process have been preserved in the *methodological notes*, while *researcher reflections* captured the questions that were specifically raised by the often conflicting and inconsistent data.

#### 4.3.1.1 Interrater Reliability Check

After the initial horizontal coding phase was completed, an interrater reliability check was completed to assess the replicability of the coding process and to ensure practices were appropriately included or excluded based on the content of the requirements manuals.

10% of the manuals were randomly selected for independent verification. The original 42 manuals were sorted into their seven categories, and a random number generator was used to select a minimum of one manual from each category. The independent rater agreed with the assessment of the researcher in 113 of the 115 possible yes or no practice decisions, indicating a high level of interrater reliability.

### 4.3.2 Output

#### 4.3.2.1 Peer Debriefing and Discrepant Case Review

Peer debriefing interviews were conducted as a part of the research process to complement the earlier interrater reliability checks, as suggested by Creswell (2013). The purpose of peer debriefing is to check the research and add credibility by allowing an outside individual to play "devil's advocate" and ask the tough questions that may debunk a line of reasoning drawn from the analysis.

Sixteen peer practitioners were brought in as experts in safety, construction management, risk management, or other related areas of expertise. Their years of experience, certifications, and degrees are identified and scored in *Table 4-11. Expert Characteristics for Pattern Confirmation Interviews*.

These reviewers were specifically presented discrepant cases as part of their assessment of the patterns. In many cases, these discrepant cases represented variation within the practice as an artifact of the owner's characteristics such as size, risk, sector, or sophistication. In other cases, these discrepancies represented ambiguous use of terms and ideas common to construction safety. Where this was the case, a disambiguation note was included in the pattern that explains the confusion and directs the end user of the pattern language to the appropriate pattern.

#### 4.3.2.2 Member Checking

Member checking was completed as part of the focus group described in *Section 3.3.5.2* and *Section 4.1.5.2*. The six representatives that participated generally felt that the pattern language was useful and reflective of the practices available to owners today. Several quantitative procedures were conducted along with the focus group discussion to illustrate this group's evaluation of the completed pattern language.

First, the initial scoring of the importance of the forces an owner must manage when implementing construction safety programs was conducted. Then, the 21 reviewed patterns were assessed based on the eight forces. Using both the initial assigned "force rating" and the force score assigned to each of these 21 patterns, the researcher is able to assess the perceived and actual importance of these forces.

Next, the patterns were ranked, allowing the researcher to compare the results of the focus group to the results of the earlier evidence based practice assessment of the patterns. *Table 4-27* shows the comparison of the final EBP ranking of the practices to the focus group panel.

*Table 4-27. Comparison of the Focus Group Pattern Ratings and the Final EBP Findings*

| **Practice** | **Overall Rank** | **Focus Group Rank** |
|---|---|---|
| Designated Safety Manager | 5 | 1 |
| Daily Task Safety Planning | 24 | 2 |
| Activity Hazard Analysis | 6 | 3 |
| Project-Specific Safety Plan | 8 | 4 |
| Required Site Orientation Training | 12 | 5 |
| Daily Safety Coordination Meeting | 33 | 6 |
| Immediate Reporting of Accidents | 1 | 7 |
| Owner Evaluation of Contractor (Audits) | 3 | 8 |
| Safety Inspections (Site) | 12 | 9 |
| Regular EHS Meetings | 16 | 10 |
| Flow Down Requirements | 9 | 11 |
| Owner Concurrence | 28 | 13 |
| Stop Work Authority | 22 | 14 |
| Escalating Discipline | 21 | 15 |
| Toolbox Talks | 27 | 16 |
| Maintain Contractor Safety Statistics | 14 | 17 |
| Company Safety Program | 23 | 18 |
| Permitting | 7 | 19 |
| Document Does not Relieve Contractor | 20 | 20 |
| Set Construction Safety Goals | 4 | 21 |

The focus group was more willing to invest in the time-intensive coordination activities, including requiring contractors to conduct written daily task safety plans, hold a daily safety coordination meeting, and require site orientation training than the balance of the owner, academic, safety professional samples were. The focus group was also less interested in practices directed toward contract compliance, including permitting and flow down requirements. Interestingly, the focus group did not value "setting construction safety goals" to the same degree as the other data sources. On average however, the focus group largely agreed with the other data sources on the general direction of the content of the pattern language.

### 4.3.3 Saturation

A common requirement of all grounded theory studies is the drive to reach saturation. Saturation in this case is not simply a lack of new ideas or information, but instead a point where no new properties emerge. In typical grounded theory studies, the researcher provides a written description of saturation and an assessment of whether it was reached in their study.

In this work, four separate check points for saturation were included within the existing research quality and trustworthiness approach. These saturation checks were conducted throughout the research instead of simply assessing whether it was reached at the end. *Figure 4-19. Research Method with Saturation Checks* references the model for the method presented in Chapter 1 and illustrates these four saturation check points.

The first of these check points, interrater reliability was presented in *Section 4.1.1.1*. After the initial horizontal coding was completed, an independent reviewer who had not worked with the requirements manuals checked the determinations made by the researcher. Out of 115 individual assessment points, the independent reviewer agreed with the determination of the researcher 113 times. This shows the initial categories of patterns are accurate depictions of the practices found in the sample.

The second check comes within the vertical coding phase. In this process, the initial codes were reviewed in preliminary open-ended interviews. The four main categories identified by the researcher in the horizontal coding phase – communication, site safety planning, contractual control, and owner engagement – were supported by the interviewed participants. This laid the groundwork for practice arrangement and later graphical and quantitative analysis by using these larger theoretical categorical groupings.

The third saturation check was conducted by the pattern confirmation interview process. These interviews paired sixteen experts with five patterns each and asked them to evaluate (1) whether the material was consistent with their experience, (2) if it was accurate to their knowledge, and (3) if they agreed with the content of the patterns. In this phase of the research, discrepant cases were reviewed and, where the researcher made decisions impacting how the resulting material would be presented, these decisions were vetted by interview participants.

Finally, the focus group served as a member checking panel, reviewing the completed pattern language in its entirety and assessing the utility of patterns. The focus group utility assessment scoring process indicated that the group would adopt each of the twenty-one patterns presented as a practice if they were deciding how to manage contractor safety on behalf of an owner.

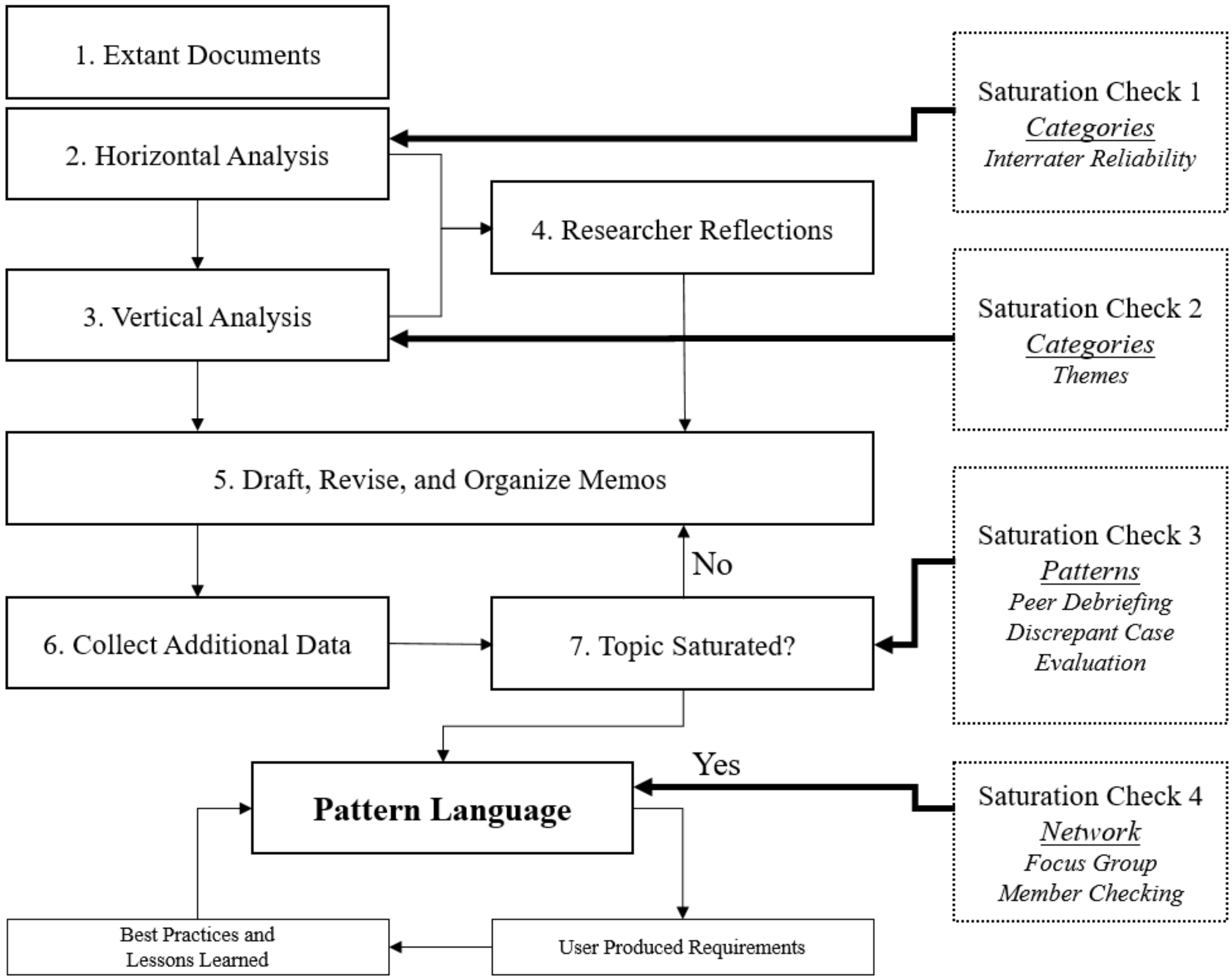



*Figure 4-19. Research Method with Saturation Checks*

## 4.4 Conclusion

This chapter has presented both the data collection and analysis of the research methods described in Chapter 3. Using both Grounded Theory and Pattern Language methods, the owner's role in construction safety has been considered in a new and insightful way, allowing multiple sources of data and expert opinions to generate a clear and consistent set of potential practices for owners.

Analysis has revealed a total of 36 positive patterns across the four main categories of communication, site safety planning, contractual control, and owner involvement. Another 11 problematic practices, identified as antipatterns in this chapter, have also been identified and defined. The relative recommendations of the literature were found to poorly align with those actual current practices of owners. Safety professionals were recruited to add a third voice to the conversation and these three perspectives were combined to create the best available information for the owner's recommended practices through an evidence based practice (EBP) approach. Initial findings were vetted with confirmation interviews and evaluated by an expert focus group. Both process and output based controls were included throughout the work to ensure the final product is both applicable to users and trustworthy to the expanded community who will use it.

# 5 THE CONSTRUCTION SAFETY PATTERN LANGUAGE

This chapter will present the 21 patterns and 5 antipatterns that were fully analyzed through the established pattern language research method. The pattern language as developed in this dissertation includes patterns of management from owners that address practices for communication, site safety planning, contractual control, and owner presence. These patterns have been developed with guidance from the existing body of literature on the owner's influence in the safety of independent contractors, the current practices of owners, and the expert opinion of safety professionals.

The Antipatterns developed through this dissertation, found in section 5.1, are the critical "lessons learned" that have been missing from guidance provided to owners to date. The following sections, 5.2 to 5.5 detail the remaining patterns critical practices that owners must consider when developing a contractor management system.

Patterns with titles in **BOLD UPPERCASE LETTERING** are patterns that have been through the process of creating the pattern language as outlined in Chapter 3. Patterns only appearing in UPPERCASE LETTERING were identified in the horizontal and vertical coding phases, but were not selected to be included for further analysis as part of this work as described in *Section 3.3.3*. Antipatterns appear in UPPERCASE ARIAL FONT to easily distinguish them from the patterns in text, and may similarly be **BOLD** or NOT to indicate whether they are included in the pattern language presented in this chapter or not.

## 5.1 Anti-Patterns of Owner Construction Safety Management

*Table 5-1. Anti-Patterns of Owner Construction Safety Management Summary*

| Number | Name | Description |
|---|---|---|
| 5.1.1 | RETAIN CONTROL | The owner is too engaged, creating liability |
| 5.1.2 | REPEATING REGULATION WHICH ALREADY APPLY | The owner unnecessarily repeats the regulations in their requirements |
| 5.1.3 | OWNER ENDORSEMENT AND CONCURRENCE | The owner "signs off" on plans and procedures before use |
| 5.1.4 | FAILURE TO FOLLOW THE WRITTEN PLAN | Owner establishes a plan but fails to adhere to it |
| 5.1.5 | FAILURE TO FOLLOW UP ON A DOCUMENTED NONCONFORMANCE | Owner identifies an issue but does not ensure its correction |

### 5.1.1 RETAIN CONTROL

*Aliases:*
Negligent direction
Dictation of means and methods

*Problem:*
Owners who seek to play a role in contractor safety management run the risk of "retaining control" of the contractors work, exposing them to liability for any incidents arising from this supervision.

*Context:*
The general rule of non-liability states that an owner is not liable for the actions of an independent third-party employer, but there are exceptions to this exclusion.

*Forces:*
- Owners often want to ensure that safety is managed on a construction site, but may become too involved, adding responsibility and ultimately liability.
- General Rule of Owner Non-Liability (Restatement 3$^{rd}$ of Torts, §55-56/Restatement 2$^{nd}$ of Torts, §414)

*Solution:*
The owner must be careful to not control the contractor to the level that constitutes retained control. This is a fact-specific level that is typically determined by a court on a case by case basis. An owner who understands the contractor's role in managing their work can develop a sound approach to interacting with a contractor.

Cases litigating the question of retained control have focused on comments A and C in the Restatement 2$^{nd}$ when determining what actions do and do not constitute retained control. While comment A states liability may attach to an owner who retains "only the power to direct the order in which the work shall be done, or to forbid its being done in a manner likely to be dangerous to himself or others" comment C states:

> For this rule to apply, the employer must have retained at least some degree of control over the manner in which the work is done. It is not enough that he has merely a general right to order the work stopped or resumed, to inspect its progress or to receive reports, to make suggestions or recommendations which need not necessarily be followed, or to prescribe alterations and deviations. Such a general right is usually reserved to employers, but it does not mean that the contract is controlled as to his methods of work, or as to operative detail. There must be such retention of a right of supervision that the contract is not entirely free to do the work in his own way.

*Examples:*
An owner should publish a requirements manual when engaging a contractor. This requirements manual forces a contractor to develop and submit a health and safety plan that describes how they will comply with the owner's requirements. The owner is able to audit the work in the field against

this plan and deviances from this plan are handled as contract non-compliance instead of safety specific findings. The owner is not telling the contractor how to do the work; they are simply stating the observed practice on the site does not meet the procedures submitted by the contractor.

*Resulting Context:*
A requirement-based approach to managing contractor safety, as advocated here, allows the contractor to manage the work and the owner to audit to the submitted plan. The owner is asking questions, not providing direction. Non-compliance can be escalated by the owner as a contract compliance issue.

*Rationale:*
The contractor controls the operations of their workers. The owner is simply ensuring they follow the contractors submitted safety plan.

*Related Patterns:*
**INCIDENT REPORTING** – The owner must be careful to not exert too much control over the post-incident protocol. While the owner has an interest in the handling of an incident, the contractor and/or employer of involved employees maintains responsibility.

**DAILY SAFETY COORDINATION** – Owners are free to maintain an interest in and participate during the daily safety coordination meeting, but must ensure the contractor runs the meeting as their own.

**SITE ORIENTATION TRAINING** – Facilities or organizations that have specific hazards contractors must handle or be made aware of are more likely to have a need to conduct an owner-led orientation. For instances where the hazards are typical to the construction activities regularly performed by contractors, owners are best suited in allowing the contractor to manage the orientation process.

**GROUP SAFETY INSPECTIONS** – Owners should participate in the group safety inspection process, but must make observations to the controlling contractor for documentation and management.

**TOOLBOX TALKS** – Owners should not specify or provide content to be covered in toolbox talks unless it is content aimed at specific owner-generated hazards the workers may encounter.

**REGULAR EHS MEETINGS** – The contractor must hold the regular project EHS meeting. An owner may choose to hold their own meetings as part of their CONSTRUCTION SAFETY COMMITTEE.

COMPANY SAFETY POLICY – The owner uses the contractors' submitted company safety plan as a standard for assessment during PREQUALIFYING CONTRACTORS and for conducting site audits. The owner must use caution to not accept responsibility for any specific plans submitted. See **OWNER REVIEW OF SUBMITTED SAFETY PLANS**

**SITE SPECIFIC SAFETY PLAN** – The owner uses the contractors' submitted site specific safety plan to ensure the contractor understands the unique hazards and coordination requirements of the work and for conducting site audits. The owner must use caution to not accept responsibility for any specific plans submitted. See **OWNER REVIEW OF SUBMITTED SAFETY PLANS**

**ACTIVITY HAZARD ANALYSIS** – The contractor is responsible for conducting all appropriate hazard analyses. The owner may review these, but their review, comment, or lack thereof should not constitute acceptance.

**PERMITTING** – The owner should not require contractors to deviate from their company permitting process. Owner required permits may function "in addition to" the contractors own control system.

**DESIGNATED ON-SITE SAFETY MANAGER** – The owner must ensure they allow the contractor to control the work.

**STOP WORK AUTHORITY** – While all parties should be able to stop work with reasonable cause, the owner must stop work and then notify the contractor's site management of their observations. The contractor should retain the right to investigate and correct.

**FLOW DOWN CONTRACTUAL REQUIREMENTS** – The owner must ensure that any flow-down provisions are management by the controlling contractor.

**ESCALATING DISCIPLINARY PROCEDURES** – While an agreed to disciplinary program is necessary, the control of the program should run through each employee's employer.

**OWNER REQUIREMENTS DO NOT RELIEVE CONTRACTOR** – This language is essential for an owner to make clear to all contractors and subcontractors that they retain the overall control of the work conducted on the site.

**GOAL SETTING** – The owner has "purse-string authority" for their projects, but must ensure that their actions are direct to the contractor's leadership and not to control each individual worker.

**OWNER REVIEW OF SUBMITTED SAFETY PLANS** – Language from the owner stating that any review of submitted plans does not constitute approval should be included to ensure contractors understand the purpose of the owner's review. It is also critical that owners avoid dictating changes to means and methods.

**OWNER EVALUATION OF CONTRACTOR** – The owner's evaluation of the contractor should use submitted safety plans and documentation of safety activities as a basis for assessment. Owners must ensure they do not dictate corrective actions or performance improvement plans to contractors. Instead, the contractors should be made aware of potential deficiencies in their work and asked to respond appropriately.

*Related Antipatterns:*
**OWNER ENDORSEMENT AND CONCURRENCE** – The owner must ensure their actions do not control the operations of contractors on-site, including through any interaction that may be construed as the owner "signing off" on an activity or plan.

IMPLIED WARRANTY OF PLANS AND SPECIFICATIONS – Owners must be aware of the contractor's ability to rely on plans and specifications created by the owner and their agents.

*Disambiguation:*
None

### 5.1.2 REPEATING REGULATION WHICH ALREADY APPLY

*Aliases:*
The safety standard "bible"
Death by paper

*Problem:*
Owners who produce safety requirements which merely repeat these regulations run the risk of providing conflicting, inaccurate, or outdated information. In the event of an incident or dispute, a contractor may use the requirements included in a contract as evidence of the owner's control or direction of their work. In cases where a dispute arises and many standards are reproduced, but others are not, uncertainty over what the contract covers is highly likely.

*Context:*
Typical language from any standard contract will require a contractor to comply with "all applicable regulations" which apply to their work, but owners still feel the need to reproduce standards such as those produced by OSHA.

*Forces:*
- Owners feel they are unable to "enforce" safety requirements unless they are specifically included in a contract.
- Site specific safety requirements must be clearly communicated to the contractor

*Solution:*
Requirements manuals should explicitly state that contractors must comply with all applicable regulations, matching the language found in the contract. In situations where an owner has determined they expect a contractor to exceed the requirements found in regulatory requirements such as OSHA, it must be explicitly stated. The resulting section of technical safety requirements becomes a list of areas where the owner's expectations are higher or where a specific procedure exists at the work area.

*Examples:*
A common example of this is the extension of the six foot fall protection requirement. In some situations, specific trades are given leniency by OSHA on when they must tie off. Many owners however recognize the significant risk falls pose to workers and the fact they are a leading cause of fatal injuries in construction. An owner who wishes to enforce a stricter requirement may simply state the expanded expectation wherever it exceeds the published regulation.

*Resulting Context:*
The owner is able to specify any desired addition to safety procedures without needing to reproduce the entire body of knowledge on a given topic.

*Rationale:*
This allows the contractor to read the requirements document as a "compared to" document instead of an entire reproduction of a standard. The specific intent of the owner is clearer in this fashion because the manual consists of only those expectations which exceed the existing regulations.

*Related Patterns:*
**COMPANY SAFETY POLICY** – Owners must not specify what or how to comply with various regulatory requirements. Instead, comprehensive plans should be submitted by the contractor. If the owner wants contractors to exceed certain minimum regulatory requirements, they should indicate this to the contractor.

**SITE SPECIFIC SAFETY PLAN** – The site specific safety plan is a document created by the contractor and submitted to the owner for their review. Owners should avoid repeating specific regulations to the contractor in their requirement for site specific safety plans.

*Related Antipatterns:*
**RETAIN CONTROL** – Owners who recite the relevant OSHA regulations to contractors run the risk of the appearance of retained control.

*Disambiguation:*
None

### 5.1.3 OWNER ENDORSEMENT AND CONCURRENCE

*Aliases:*
Blessing the plan

*Problem:*
Owners seeking to manage contractor safety often find themselves in a situation where a contractor advances a plan seeking approval. An owner may increase their liability if they approve or sign-off on a plan as "safe".

*Context:*
Contractors are required to manage their owner work.

*Forces:*

- Owners seek to control the contractor by not permitting work until the owner has *approved* a written safety plan or other similar document
- Restatement 3rd of Torts, §55-56

*Solution:*
Owners should review the procedures of a contractor against the requirements of the contract as well as applicable regulations which apply to the contractor. Where concerns arise as to the adequacy of a proposed set of methods, the owner should notify the contractor in writing that the plan does not meet requirements. The owner must ensure a revised plan is submitted by the contractor which meets the requirements established for the work.

*Examples:*
*"The Site Safety Plan (4 copies) shall be accompanied by the Site Safety Plan Submission Form. No field work shall commence until the Plan is approved and returned to the PO and implemented at the site."* (G1)

*"Construction may not start until contractor's Safety Program and Project Safety Plan has been reviewed and approved."* (G5)

*Resulting Context:*
Owners maintain a mechanism to provide feedback to contractors without submitting their judgement and control for that of the contractor.

*Rationale:*
The owner is not powerless to suggest the means and methods employed by the contractor do not meet minimum contractual and regulatory requirements. The prudent owner must however raise any concerns it has in a formal (written) manner and follow the corrective actions from the contractor to resolution.

*Related Patterns:*
**OWNER REQUIREMENTS DO NOT RELIEVE CONTRACTOR** – The owner's requirements, and the owner's right to review the contractor's plan, do not relieve the contractor

of their obligation to control the work. Owners should include the contract language suggested in the OWNER REQUIREMENTS DO NOT RELIEVE CONTRACTOR pattern in their contracts to ensure their review of written plans is clearly

**OWNER REVIEW OF SUBMITTED SAFETY PLANS** – The owner may run into the issue of endorsement and concurrence where they review plans submitted by the contractor.

**OWNER EVALUATION OF CONTRACTOR** – Owners must conduct their evaluation and provide related feedback in a way that does not endorse or concur with the contractor for purposes of approving their plan.

*Related Antipatterns:*
**RETAIN CONTROL** – By endorsing or concurring with a written plan, the owner is potentially showing a retaining of the right of supervision that could be used to prove retained control.

*Disambiguation:*
None

### 5.1.4 FAILURE TO FOLLOW THE WRITTEN PLAN

*Aliases:*
Promising action

*Problem:*
An owner who creates a specific task for their self or the contractor, and then neglects to ensure the task is completed may increase their responsibility for the task's completion, and resulting liability when it is not.

*Context:*
Many owners create safety requirements and plans that dictate responsibilities and expectations

*Forces:*

- Owners who seek to retain the ability to "step in" when a contractor is not completing their work safely run the risk of creating an obligation to perform that action.

*Solution:*
Owners must be careful to only commit to a task in a published requirements manual or contract if they intend to conduct the action in all cases.

*Examples:*
Text stating "the owner shall stop work" or "the owner will correct the deficiency and charge the contractor" may create a responsibility for action from the owner where one may not have existed. Similarly, any text stating the contractor must follow a process or a procedure that is regularly ignored by the owner may create a negative precedent that could be used against the owner at a later time.

*"Contractor's (SIC) shall be required, in accordance with OSHA regulations and contract inclusions, to comply immediately with all safety directives verbal or written. WHEN A CONTRACTOR FAILS TO IMMEDIATELY CORRECT UNSAFE ACTS OR CONDITIONS, THE OWNER OR HIS DESIGNEE WILL UNDERTAKE CORRECTIVE ACTIONS AND DEDUCT THE COST OF THE CORRECTIONS FROM THE RESPONSIBLE CONTRACTOR'S PROGRESS PAYMENT."* (E1)

*"Contractors and all Subcontractors shall be required, in accordance with OSHA regulations and contract inclusions, to comply with all safety directives. When a contractor fails to correct unsafe conditions, the [G1] Project Officer shall undertake corrective actions, and deduct the cost from the responsible contractor's progress payment."* (G1)

*Resulting Context:*
A carefully created requirements manual provides the owner with clearly defined roles and responsibilities and does not assign tasks that are not regularly completed by the assignee.

*Rationale:*
Unfulfilled responsibilities can easily turn into evidence of the owner's negligence after the fact.

Related Patterns
**STOP WORK AUTHORITY** – The owner may be required to stop work in the event of a non-conformance.

**ESCALATING DISCIPLINARY PROCEDURES** – If the owner accepts a role in the discipline process they must enforce it consistently.

**OWNER EVALUATION OF CONTRACTOR** – If the owner takes an active role in evaluating the contractor during the work, they must fulfil that responsibility with reasonable care.

*Related Antipatterns:*
**FAILURE TO FOLLOW UP ON A DOCUMENTED NONCONFORMANCE** – Owners must ensure that any time they become aware of an issue involving the contractor's safety management that they promptly take appropriate action. In most cases, this action involves notifying the contractor of the issue and stopping the work if necessary.

*Disambiguation:*
None

### 5.1.5 FAILURE TO FOLLOW UP ON A DOCUMENTED NONCONFORMANCE

*Aliases:*
Knowing acquiescence

*Problem:*
While an owner may not be legally responsible for the safety of an independent contractor, there is some level of control and knowledge and owner holds. Any observed or reported incidents of non-compliance with major safety standards should be satisfactorily resolved to prevent harm and any risk of liability

*Context:*
The owner has a duty to ensure that any reported or observed incidents are resolved.

*Forces:*

- Owners who choose to become involved in contractor safety management may become aware of hazardous conditions or unacceptable actions on their jobsites.
- Owners, by design, do not directly control the means and methods of the work, which creates questions as to what they should do with this information.
- The owner may expose themselves to added liability in situations where they were aware of a hazard but took no actions to remedy the situation.

*Solution:*
The requirements manual should clearly spell out the owner expectations related to the contractor's response to a report of non-compliance.

*Examples:*
*"Collins and his assistants did more than observe whether the contract was being properly performed. In many instances, what they said, or left unsaid, determined how the work would be performed. In the area of job safety their knowing acquiescence in nonperformance encouraged, if not legitimized, the derelictions of the sub- and general contractors. Having assumed a dominant role in this construction job, General Motors can properly be held responsible for the failure to implement adequate safety precautions."* (Funk v. GM, 1972)

*Resulting Context:*
The owner ensures that any observation they make or report they receive detailing a safety-related nonconformance is directed to and corrected by the contractor.

*Rationale:*
The owner must not be complicit with obvious unsafe work standards from contractors. The failure to act on documented issues can lead to proof of an owners knowing acceptance of improper safety standards which could lead to potential liability in the event of an incident.

*Related Patterns:*
**INCIDENT REPORTING** – By choosing to receive incident reports, an owner must ensure that the issues leading to the incident are addressed by the contractor.

**STATISTIC AND SAFETY ACTIVITY REPORTING** - By choosing to receive contractor safety performance data, an owner must ensure that instances of poor contractor performance are brought to the attention of and addressed by the contractor.

**GROUP SAFETY INSPECTIONS** – The owner's participation in group safety inspection or receipt of the inspection findings places responsibility on the owner to ensure the identified issues are directed to the appropriate contractor and addressed by the contractor.

**SAFETY CONCERN REPORTING MECHANISM** – Any reported concerns should be investigated with a resolution documented.

**OWNER EVALUATION OF CONTRACTOR** – The owner should ensure that any evaluation of the contractor they conduct is shared with the contractor in a productive way. These evaluations do not necessarily eliminate a contractor with a poor record, but they do put the owner on notice that additional management of the contractor may be necessary.

*Related Antipatterns:*
**FAILURE TO FOLLOW THE WRITTEN PLAN** – In instances where an owner takes the responsibility for a specific action, whether in a contractor safety management plan or project contract documents, they must ensure they complete their stated role. Where they are informed of issues and have created a role for themselves, the onus is with the owner to respond.

THE ABSENT OWNER – Owners who are made aware of problems and do not respond in any fashion send the wrong message to the project participants and may open themselves up to liability at a later time.

*Disambiguation:*
None

## 5.2 Communication Patterns of Construction Safety

*Table 5-2. Communication Patterns of Construction Safety Summary*

| Number | Name | Description |
|---|---|---|
| 5.2.1 | INCIDENT REPORTING | Owners require contractors to report a wide range of incidents within a specified amount of time. |
| 5.2.2 | STATISTIC AND SAFETY ACTIVITY REPORTING | Owners require contractors to report metrics necessary to track safety performance, including hours worked and type and number of safety activities completed. |
| 5.2.3 | DAILY SAFETY COORDINATION | A daily meeting is held to cover the work to be completed that day, including the safety considerations necessary to complete the work. |
| 5.2.4 | SITE ORIENTATION TRAINING | Each worker must be provided training specific to the project location and scope of work. |
| 5.2.5 | GROUP SAFETY INSPECTIONS | Project management, subcontractors, and the owner conduct a regularly scheduled inspection of the site. |
| 5.2.6 | TOOLBOX TALKS | Owners may require contractors to continually educate workers on safety topics and lessons learned. |
| 5.2.7 | REGULAR EHS MEETINGS | Regular EHS meetings held by the contractor allow for dissemination of safety information, safety performance data, and to collect feedback. |
| 5.2.8 | SAFETY CONCERN REPORTING MECHANISM | The owner or project should create a mechanism for workers and the public to report safety concerns. |

### 5.2.1 INCIDENT REPORTING

*Also Known As*

*Problem*

Incidents that occur during a project could impact both the project and the owner's organization.

*Context*

By design, contractors are independent of owners and may be reluctant to share information regarding injuries or incidents to the owner without a specific owner requirement. This may leave the owner unaware of the safety performance on a project and ultimately unaware of any potential resulting risk.

*Forces*

- Owners want to be aware of incidents that have to potential to impact their owner operations, but may not need to have information on every instance of minor events.
- The time needed for contractors to comply with reporting requirements can become extensive if all of the following solutions are applied.
- Some incidents may require immediate notification for the owner to respond, while other incidents may simply require an after-the-fact notice.
- Owners must be careful not to **RETAIN CONTROL** of the contractor's operation.

*Solution*

Owners should set a basic incident notification requirement, compelling the contractor to report incidents they are interested in knowing about in a prescribed amount of time. The following solutions may be included as components to the **INCIDENT REPORTING** pattern:

**Incident Response**

Many owners require the contractor to develop an incident response plan, sometimes as a part of their EMERGENCY ACTION PLAN. These response plans detail how incident response is handled and may include components of this solution.

**Notification**

Often a verbal for initial report, written report of incident within timeframe.

*"The Contractor shall immediately report to the [Owner] all accidents arising out of, or in connection with, the performance of the work on the site, which cause death, personal injury, or property damage. A written report shall be submitted within 24 hours"* (T3).

**Reporting by Incident Type or Severity**

Owners require contractors to inform them of incidents that occur on their projects. Examples of incidents include:

- Property Damage
- Near-miss
- Injury to 3rd party or public
- OSHA Recordable Injury or Illness
- Lost-Work Day
- OSHA Reportable Injury
- Fatality
- Fire
- Explosion
- Environmental Spills
- Hazardous condition

Often owners will include statements such as *"All incidents, no matter how serious"* or *"or any other serious incident"* to ensure no major issues are withheld from the owner.

**Timeliness**
Requirements include a timeframe to report an injury. Range includes immediate to within 7 days. These are also often based on incident type or severity.
Timelines are also provided from the contractor to file a written report and in some cases, to meet with the owner for a follow-up meeting.

*"Incidents that occur when a Contractor is working for [E5] shall be reported verbally immediately to the specified [E5] Representative."* (E5)

**Post-accident security**
Owners often require contractors to secure the scene of an accident. Care must be taken to ensure that this is not written in a way that could be construed as to restrict the contractor from providing emergency response.

*"Except to cooperate with rescue personnel and to address imminent safety hazards, Contractor shall not disturb the scene of any incident that may require investigation by Company or a regulatory agency until authorized to proceed by Company."* (P2)

*"Within immediate area of accident scene, nothing is to be disturbed nor removed after proper evacuation of injured employee. Investigating personnel must be able to inspect the undisturbed scene."* (G1)

*"The scene of any major accident must be secured until documentary, photographic, and physical evidence can be preserved. No material, machinery, or equipment should be moved until approval is given by the [G4] RR, unless the condition or physical position poses an additional hazard. In the case of a fatality, the site will be preserved until OSHA states otherwise (unless such preservation poses a greater hazard)."* (G4)

**Media and News Releases**
In some cases, owners require Contractors to coordinate public response following an incident. This must be done in such a way that the owner does not **RETAIN CONTROL** of the contractor's operation.

*"Make no comments to the media, general public, or all others. Refer all inquiries to the [G1] Project Officer."* (G1)

*"Prior to making any Contractor's verbal or written (on or off the record) press statements concerning the serious accident or emergency conditions, the Contractor's Project Manager must first clear the Contractor's press statement with [G3]'s Project Management Team and the General Contractor prior to release to the press."* (G3)

**Written Report**
A written report is required for each notification by many owners. This is covered more in-depth in this report under the INCIDENT INVESTIGATION pattern. In a few cases, owners do not specify a comprehensive incident investigation, and instead simply request the contractor provide a final accident report that includes medical information and basic details about the incident. This report is often completed via a fillable form, including some or all of the information below:

- Date/time/location of the Incident
- Type of Incident
- Detailed Incident description
- Persons involved
- Injured Worker information
- Nature of injury; body part and location
- Classification of incident
- Description or nature of property or other damage
- Follow-up actions taken by the Contractor

**Corrective Actions and Follow-Up**
This is also treated more specifically in the INCIDENT INVESTIGATION pattern. Those owners who choose to only require a written report and do not specify a comprehensive investigation still require the contractor to submit corrective actions and a mechanism for ongoing monitoring of the corrective action.

<u>*Examples*</u>
Owners may seek to simply require the contractor to share with them a verbal notification when incidents occur:

*"Contractor shall immediately report any incident which involves treatment beyond first aid to the Project Manager."* (H3)

*"The Subcontractor shall report all incidents and near misses, no matter how minor, to the [G2] Project manager as soon as the scene is stabilized, but in all cases notification shall be made within one hour of occurrence."* (G2)

*Resulting Context*
A new problem in the resulting context may occur when a contractor regularly produces significant accidents and the owner fails to take any remedial action.

*Rationale*
Forward looking in an effort to prevent a similar recurrence

An owner who is aware of the types of incidents happening on their projects may be able to focus compliance and oversight efforts on those areas with a history of issues. Specific plans and procedures can be added to control for known trouble spots.

*Related Patterns*
INCIDENT INVESTIGATION – Incident investigation is a critical task very closely related to incident reporting. Many owners include these provisions in the same requirement section. Most call for in-depth analyses including root cause analysis, failure modes effects analysis,

**SITE ORIENTATION TRAINING** – Employees must be briefed on the site-specific reporting expectations and emergency procedures. This is most frequently accomplished through orientation. *"All workers must know to report any accident involving injury or property damage, no matter how slight or small."* (G1)

EMERGENCY ACTION PLAN – The emergency action plan can house the incident response plan that must be communicated to new employees at orientation. It directs contractors to develop response procedures all staff must follow during an incident, including providing notification to the owner of the incident.

**TOOLBOX TALKS** – Reports of incidents and their resulting INCIDENT INVESTIGATION must be communicated with all workers on a project for the incident to have any impact on preventing future reoccurrences.

*"The incident shall be communicated to all workers at the project site, to prevent re-occurrence."* (M4)

PREQUALIFY CONTRACTORS – Information compiled by the owner through incident reports is included when assessing a contractor for additional future work.

**FLOW DOWN CONTRACTUAL REQUIREMENTS** – In cases where a subcontractor's employee is injured or involved in the incident, it is that subcontractor/employer who is responsible for initially reporting to the controlling contractor the details of the incident. The controlling contractor is then responsible for making the actual notification to the owner.

*Related Antipatterns*
**REPEATING REGULATION WHICH ALREADY APPLY** – Owners should not dictate that the contractor report incidents to OSHA or other regulators. Owners including blanket statements such as:

> *In the event an employee of a contractor or subcontractor is involved in a construction accident leading to death, or should three or more workers be hospitalized as a result of the same accident, the Occupational Safety & Health Administration is to be notified within 8 hours of accident by calling the local OSHA number or OSHA Hot line at 1-800-321-OSHA*

Where contractors are required to report an incident, they should be directed to comply with all applicable regulations. For example: *"The contractor/subcontractor's obligation to report the matter to government agencies, etc. shall remain irrespective of this requirement* [to report incidents to owner]*"* (M1) or *"Providing notice to Company does not relieve Contractor's responsibility to notify appropriate regulatory agencies when applicable."* (P2)

In instances where owners say *"Ensure all involved employees are tested for substance abuse"* (G3) or *"Injured employees must be drug tested in conformance with the applicable policy"*, the owner may be directly instructing the contractor to violate OSHA guidance on post-incident drug testing.

**RETAIN CONTROL** – Owners should require the contractor to report and manage incidents in some way, while avoiding prescribing actions or requirements that are not legitimately required. Examples of owners over-stepping their responsibility include *"personnel shall use the closest Emergency Department"* (H3) and *"All official notification to the family of an injured employee shall be made by an individual designated by the employer."* (G4)

ILL DEFINED TERMS – OSHA currently defines *recordable* injury in section 29 CFR 1904.7(a):

> *You must consider an injury or illness to meet the general recording criteria, and therefore to be recordable, if it results in any of the following: death, days away from work, restricted work or transfer to another job, medical treatment beyond first aid, or loss of consciousness. You must also consider a case to meet the general recording criteria if it involves a significant injury or illness diagnosed by a physician or other licensed health care professional, even if it does not result in death, days away from work, restricted work or job transfer, medical treatment beyond first aid, or loss of consciousness.*

While a *reportable injury* criteria is defined in section 29 CFR 1904.39 (a)(1) and (2) as:

> *Within eight (8) hours after the death of any employee as a result of a work-related incident, you must report the fatality to the Occupational Safety and Health Administration (OSHA), U.S. Department of Labor.*
>
> *Within twenty-four (24) hours after the in-patient hospitalization of one or more employees or an employee's amputation or an employee's loss of an eye, as a result of a work-related incident, you must report the in-patient hospitalization, amputation, or loss of an eye to OSHA.*

In addition to failing to clearly define terms, Owners frequently **REPEATING REGULATION WHICH ALREADY APPLY**, and in many cases, confuse these two OSHA criteria. For example:

> *Reportable events such as spills, injuries, and OSHA reportable injuries must be reported to the [H4] Program Manager as soon as they occur."* (H4)

*Disambiguation*
None

### 5.2.2 STATISTIC AND SAFETY ACTIVITY REPORTING

*Also Known As*
Monthly HS&E/Audit Reports

*Problem*
Contractors do not regularly share safety performance information with the owner.

*Context*
Owners may be unaware of the level of safety performance by their contractors because the contractor has no responsibility to share the information with them. This leaves the owner unable to hold the contractor to a minimum level of safety performance expected in the delivery of the work under contract.

*Forces*
- Owners interested in understanding the safety performance of their contractors may be required to intervene if a pattern of non-compliance or poor performance is discovered.
- Tracking a significant number of safety activities and metrics may become overly-burdensome for a contractor, resulting in increased cost to the owner.

*Solution*
Owners add statistic and safety activity reporting requirements to their contractor safety programs. These requirements typically specify what is to be reported and at what frequency.

**Example Items to be reported:**
- Hours worked by contractor/subcontractor(s).
- Incidents, including near misses, first aid, recordable, lost-time, restricted work, and fatalities.
- OSHA Inspections and copies of any violations.
- Accountability actions, including disciplinary actions and corrective actions.
- Tracking of previously identified issues to closure, including the status of lost time injuries and inspection findings.
- Number and/or copies of:
    - **GROUP SAFETY INSPECTIONS**
    - INDEPENDENT CONTRACTOR INSPECTIONS
    - Issued **PERMITTING**
    - Completed **DAILY TASK SAFETY PLANNING**
    - **SITE ORIENTATION TRAINING** or other TASK SPECIFIC TRAINING records.

**Frequency**
Typical requirements specify a monthly submittal of statistics, however weekly, quarterly, and annual reports are also present.

*Examples*

**Monthly submittal with payment request**

*"The general contractor/construction manager shall prepare and submit a project-specific monthly safety report to the Owner's Representative by the 7th of each month (Appendix A). The form should be signed by the contractor project director/manager and contractor superintendent.*

*The monthly safety report shall report current month data, year-to-date data, and project to-date data for the following items:*

> *• Number of cases and rates for OSHA Recordable incidents, lost work incidents, DART incidents, near misses and other incidents, such as first-aid only case, fire, and property damage. Near misses are defined as safety incidents with the potential for serious injury or fatality.*
>
> *• Average daily number of employees and total hours worked by employees.*
>
> *• Project safety activity counts for orientations completed, safety huddles/talks, safety inspections, disciplinary actions, and fire, spill or other emergencies.*
> *• Number of OSHA recordable injuries as they fall into the category of falls, electrical, struck by, or struck against and the number of illnesses. More detail regarding the recordable incidents is also requested in a summary paragraph form.*
>
> *• Number of [OSHA] Citations received on the project broken down by serious, repeat and willful. Near misses are defined as safety incidents with the potential for serious injury or fatality."* (U2)

**Contractor maintained statistics on-site for owner review**

*"Contractors will maintain a monthly list identifying all first aids, near misses, recordable injuries, and total man hours worked. This information shall be provided on company letterhead or via e-mail to the [E3] Construction Safety Representative upon request."* (E3)

*Resulting Context*

The well informed owner can use this reporting of safety statistics and safety activities as the basis for a record audit. In the event of an injury, the owner can ensure it is properly recorded and tracked. For safety activities, the owner can request documentation proving the number of hot work permits or safety orientations performed over that period.

*Rationale*

Reporting safety statistic and activity information to the owner creates an audit path for the owner to ensure the contractor is managing safety as required by the contract and applicable regulation. This "trust but verify" approach maintains the contractor's independence, but allows the owner relatively accurate and easy insight into the contractor's operation.

*Related Patterns*

**INCIDENT REPORTING** – An incident meeting the reporting criteria set by the owner is initially reported to the owner following the INCIDENT REPORTING pattern. This puts the owner on notice that such an incident has occurred and that a detailed incident report should be expected for the reporting period.

**SITE SPECIFIC SAFETY PLAN** – A site specific safety plan should detail how incidents are tracked by the controlling contractor, notifying each subcontractor of the requirement to report specific metrics such as hours, incidents, and safety activities.

**OWNER EVALUATION OF CONTRACTOR**– Compiled statistics may be used by the owner in reviewing contractor safety performance.

PREQUALIFY CONTRACTORS – Compiled statistics may be used by the owner to evaluate future work opportunities for the contractor.

**SAFETY CONCERN REPORTING MECHANISM** – Any reported safety concerns should be filed with the report as a safety activity.

*Related Antipatterns*

**FAILURE TO FOLLOW UP ON A DOCUMENTED NONCONFORMANCE** – If the owner becomes aware of unacceptable levels of safety performance from a contractor or subcontractor but takes no action, they may be subject to liability due to their inaction.

*Disambiguation:*

None

### 5.2.3 DAILY SAFETY COORDINATION

*Also Known As:*
Plan of the Day (POD) Meeting
Pre-Job Meetings

*Problem*
Construction and contractor operations are often complex and may not be properly planned, leading to an increased risk of undesired incidents.

*Context*
A controlling contractor is responsible for coordinating many specific operations in the course of an average project. Owners who require contractors to specifically coordinate work each day may choose to require contractors to follow a specific approach to managing subcontractor's daily operations.

*Forces*
- Owners expect controlling contractors to coordinate all work occurring on a project site.
- Owners must be careful not to **RETAIN CONTROL** of the contractor's operation.
- Owners must be careful to avoid **OWNER ENDORSEMENT AND CONCURRENCE**.

*Solution*
A daily safety coordination meeting is used by many owners to ensure appropriate communication and planning occurs on contractor led projects.

*Examples*
**Flexible owner requirement for communication:**
*"EHS activity briefings shall be held each day prior to the start of work activities. The flexibility exists for each Subcontractor to integrate these requirements into their exiting EHS program format as long as the required information is effectively provided to employees and documentation for these briefings and/or meetings is maintained. This may be accomplished through daily construction meetings, plan of the day (POD) meetings, pre-task activity reviews or other means which prove to be effective in the dissemination of the required information and has been accepted by [G2]. Records for these briefings documenting the meeting content and attendance shall be maintained. All crew members shall acknowledge the information disseminated, by signing the attendance roster.*

*The briefing content shall include at a minimum the following topics:*
*• EHS pre-task planning for the day's work activities*
*• Changes in work practices or environmental conditions*
*• Required equipment/system daily inspections*
*• Previous days incidents, near misses, lessons learned and/or other relevant issues as applicable*
*• Other ongoing activities that may have project EHS implications or may impact [G2] operations*
*• New or modified site-wide procedures or requirements*
*• Review of AHA for new activities and/or revised existing AHAs."* (G2)

**Rigid process for daily safety coordination:**
*"The plan of the day (POD) process is required to maintain daily positive control and to establish a high level of communication between subcontractors prior to the start of construction activities for the day. An acceptable POD form shall be provided by the [G2] Project Manager.*

*The basis of the POD process is in preplanning. First-tier subcontractors and all lower-tier subcontractors shall identify all planned tasks on a POD form. The level of detail must be appropriate to define all tasks that may present a hazard to people, property or environment. The listed task(s) shall include the corresponding AHA(s). If the proposed task does not have a corresponding AHA, then a new AHA will need to be developed and reviewed prior to the work moving forward.*

*All crew members shall acknowledge the POD (daily "tailgate meeting) by signing an attendance roster for the POD/AHA.*

*The completed POD must be submitted to the first-tier Subcontractor for review against conflicting operations, regulatory hold points, required permits and with an acceptable level of detail. The plan must be submitted in a timely fashion (preferably the day before) to ensure that the first-tier subcontractor can perform a quality review of the plan. A representative for each subcontractor performing work that day must have submitted their proposed POD/AHA to the first-tier subcontractor superintendent or designee prior to the start of the meeting for review and work approval. The first-tier subcontractor shall record what subcontractors were in attendance at the POD. Subcontractors that are not present at the POD shall not be authorized to perform work until their POD/AHA is submitted and approved by the first-tier subcontractor.*

*During the POD meeting, each subcontractor must present their POD work activities to the first-tier subcontractor and the other lower tier subcontractor representatives in attendance. Each subcontractor representative must describe the activities for the day by pointing to where the work will be conducted on the visual aid provided, identify the necessary equipment/tools, equipment travel logistics and required permits to perform the work.*

*Upon completion of the initial POD/AHA meeting, each subcontractor is then required to have break-out sessions (daily safety meeting) with each work crew member prior to the start of each work shift, or when an individual arrives at work. The meeting shall include a discussion of the specific POD and corresponding AHA for their work and additional safety topics of interest related to the site.*

*If during the course of the day, additional task(s) need to be performed that are not identified on the POD, then the subcontractor's responsible supervisor shall add this task to the POD, revise the AHA as necessary, receive approval from the first-tier subcontractor superintendent or designee and then brief the affected crew of the work task changes and revised AHA. Affected crew members must initial and date their re-review of the POD/AHA."* (G2)

<u>*Resulting Context*</u>
All project participants will be better informed of the work around them. The work is better coordinated to avoid problems with multiple contractors requiring conflicting resources. By

discussing the results of the activity hazard analysis specific to each planned task, each party is aware of the potential hazards present on the site.

*Rationale*

Communication is a major challenge on all projects and is frequently cited as a cause or contributing factor in accident investigation.

*Related Patterns*

**ACTIVITY HAZARD ANALYSIS** – The predominant method for assessing the tasks necessary to complete the work, the hazards present for the tasks, and the controls to be used to prevent incidents. The AHA forms the basis to plan and communicate upcoming work during the daily safety coordination meeting.

**DAILY TASK SAFETY PLANNING** – The daily plan created from the **ACTIVITY HAZARD ANALYSIS**. Only those tasks to be conducted for the day or shift are included in the plan. This plan is communicated to and signed off by the workers during the daily safety coordination meeting.

TASK SPECIFIC TRAINING – During the daily safety coordination meeting, the necessary training will be reviewed as indicated on the **DAILY TASK SAFETY PLANNING** form. If a worker is not current with the required training, that worker will be withheld from completing the work.

HIGH HAZARD PLANNING PROCEDURE – If a high hazard planning procedure is in place, it will be discussed during the daily safety coordination meeting.

**PERMITTING** – Any required permits necessary to complete the work will be discussed during the daily safety planning meeting.

**GROUP SAFETY INSPECTIONS** – The results of group safety inspections should be discussed with workers before the start of their shift, especially if a corrective action is yet to be completed. Any special instructions needed to complete the work must be communicated to the workers.

INDEPENDENT CONTRACTOR INSPECTIONS – The results of independent contractor inspections should be discussed with workers before the start of their shift, especially if a corrective action is yet to be completed. Any special instructions needed to complete the work must be communicated to the workers.

*Related Antipatterns*

**RETAIN CONTROL** – Owners who require and participate in a daily safety coordination meeting must ensure their actions do not rise to the level of retained control.

**OWNER ENDORSEMENT AND CONCURRENCE –** Owners must not approve or otherwise authorize work discussed during the daily safety coordination meetings. The meetings are led by the contractor for the purpose of coordinating the work and the associated safety requirements.

*Disambiguation*

The **DAILY SAFETY COORDINATION** meeting is a gathering to discuss specific aspects of the upcoming work. Many owners and contractors mistakenly use the terms “Toolbox” or “Tailgate” in these situations. For the purpose of this pattern language, **TOOLBOX TALKS**, or any combination of these terms refer to specific health and safety topics discussed with workers in the field for the general purpose of training and education.

Examples of ambiguous and incorrect use:

*“On a daily basis at the start of each shift, a “tailgate” safety meeting must be conducted to review the daily work permit and health and safety issues associated with the day’s work, or in some cases, prior to a specific high-risk task.”* (E5)

*“Work Zone Tail Gate Safety Meetings* - *“Tailgate” or “toolbox” safety meetings shall be held at the beginning of each work period (normally in the morning before leaving the yard or work staging area) and led by a competent safety professional*.” (U4)

### 5.2.4 SITE ORIENTATION TRAINING

<u>*Also Known As:*</u>
Project On-boarding

<u>*Problem*</u>
If workers are unaware of safety expectations on a site, the particular hazards that may be present, or the procedures for completing the work, they will not be able to conduct work in an appropriate work.

<u>*Context*</u>
Each individual site a worker may visit has specific rules and procedures that apply to that location, that owner, or that scope of work. Without providing a means for making new workers aware of these considerations, an owner is not likely going to receive the expected level of compliance and coordination.

<u>*Forces*</u>
- Most contracts for project delivery assign responsibility for control of the project site to the controlling contractor. Owners need to ensure they do not **RETAIN CONTROL** of the contractors operations, including site orientation.
- Owner's use of the term "orientation" may intend to reflect different types of orientations. This pattern refers specifically to owners who require Contractors to provide site specific orientation training to each Worker who will work on the site. See the D*isambiguation* section below.
- Owners whose unique facility or process hazards fall outside the knowledge and expertise of the contractor are responsible for ensuring contractor can safely conduct their work.

<u>*Solution*</u>
Owners require contractors to develop and deliver a site-specific worker orientation program prior to the start of work.

**Application**
Some owners set out to create different levels of orientation training programs or respective exemptions. These may include:

- Abbreviated - a brief orientation for visitors, vendors, or other individuals who may visit the site but not perform work.

  *"Visitor Protocol: The* SITE SPECIFIC SAFETY PLAN *shall include; visitor Site orientation; to include and not be limited to the; sign in sheet; required PPE to be on Site; and Site accompaniment procedures."* (E4)

- Escorted – Some owners allow for limited to no orientation for individuals who will be continuously escorted. These individuals are typically not allowed to conduct any type of work operation.

*Examples*
*"The general contractor/construction manager is required to develop a project-specific safety orientation for all workers, including subcontractors/trade contractors and other individuals performing work at the site. Orientation training shall address all components identified in the project-specific plan. The orientation must be completed prior to allowing workers to start on-site."* (U2)

*Resulting Context*
Properly oriented workers are able to understand the unique hazards present at a project site. The contractor has shown due diligence by ensuring each worker present on the site has a basic level of safety training before starting work.

*Rationale*
Unfortunately, new workers are at a much higher risk for injury. Requiring an orientation before work can begin is an opportunity to heighten a worker's awareness of their surroundings and potentially reduce or eliminate incidents.

*Related Patterns*
**INCIDENT REPORTING** – The threshold, purpose, and procedure for incident reporting must be communicated to workers at the orientation.

TASK SPECIFIC TRAINING – Some training items are not appropriate for a generic orientation procedure. In these cases, training can be delivered as needed through task specific training.

**SITE SPECIFIC SAFETY PLAN** – A critical function of the site orientation training is to familiarize new workers to the contents of the site specific safety plan.

PRECONSTRUCTION SAFETY MEETING – Any owner specific information that should be included in the worker site orientation should be shared with the controlling contractor no later than the preconstruction safety meeting.

**ESCALATING DISCIPLINARY PROCEDURES** – Disciplinary procedures applicable to all workers on the site must be explained during site orientation.

**STOP WORK AUTHORITY** – The site policy on stop work authority must be explained to all workers on the site.

**PERMITTING** – The purpose and procedure for each required permit must be explained to each worker.

SUBSTANCE ABUSE PREVENTION POLICY – The expectations and procedures of a substance abuse prevention policy must be communicated to workers.

EMERGENCY ACTION PLAN – All workers must be aware of the specific actions they must take for their safety and the safety of others during an emergency.

**GOAL SETTING** – Owners who include a global construction vision or goal must communicate this to workers through the controlling contractor.

**SAFETY CONCERN REPORTING MECHANISM** – Workers and employers must be made aware of the existence of an owner operated safety concern reporting mechanism if one exists.

<u>*Related Antipatterns*</u>
**RETAIN CONTROL** – Owners must not deliver training to workers unless it pertains directly to an owner-specific hazard or procedure.

*"[E3] will be responsible for providing an annual safety orientation training session for all workers before they are allowed to begin work."* (E3)

**REPEATING REGULATION WHICH ALREADY APPLY** – Safety regulations should not be recreated in owner documents or orientation expectations due to the fact that the contractor is already required to comply with the regulations that govern their work. If owners wish to highlight specific regulations, they should simply cite each regulation of interest and audit the contractor's compliance.

**OWNER ENDORSEMENT AND CONCURRENCE** – Owners should not take the responsibility for training contractors or their workers on technical safety topics, unless the information is specific to that owner's operation. Setting an "approved" list of training topics creates a situation where the owner is more involved than they should be.

*"5.1 Subcontractor Worker Safety Orientation*
*[G5] provided Safety Orientation: Each craft worker brought on site to perform "hands-on" work will participate in a safety orientation session. [G5] EH&S or Facilities Division will lead the orientation sessions. Orientation sessions will be held three times a week and will last approximately 30 to 45 minutes. All workers will view a video presentation that will cover the "top fifteen" safety topics (see Appendix A for a list of safety topics), an introduction to the principles of the [G5] LOTO process and procedures, as well as a reminder that [G5] process and procedures may be more rigorous than "industry standard" practices. The orientation will conclude with a brief question and answer session, to provide feedback and to clarify any topics addressed in the presentation."* (G5)

<u>*Disambiguation*</u>
Site specific orientation is sometimes confused between training programs conducted:

1. **By contractors for each new worker prior to their participation on the project site.**

   *"IX. CONTRACTOR'S EMPLOYEE ORIENTATION*
   *Before any work begins, the contractor must conduct a Safety Orientation for their employees. This orientation must be designed to inform and/or instruct their employees in the following:*
   
   *1. Contractor Safety Rules.*

*2. Potential fire, explosion, or toxic release hazards related to their job and the process, and the applicable provisions of the emergency action plan.*
*3. Any unique hazards presented by the work.*
*4. Emergency response plan.*
*5. Incident notification. OSHA recordable injuries and illnesses, accidents, and damage must be reported to their immediate supervisor and [P4]'s Safety Manager.*
*6. Accident investigation. Accident investigation reports must be completed and given to [P4]'s Safety Manager within 24 hours.*
*7. Policy on alcohol, controlled substances and firearms.*
*8. Attendance at safety meetings. How your meetings are conducted and how often they are held should be discussed. Mandatory attendance will be emphasized.*
*9. Designated person-in-charge.*

*Note: [P4] reserves the right to request verification of compliance."* (P4)

2. **By owners for each new contractor prior to work on the project site.**

*"A. TRAINING*
*1. New Contractor Orientation*
*After a new contractor (or subcontractor) is issued a notice to proceed, and before personnel begin work, the contractor management staff shall attend a "New Contractor Orientation Program" provided by the Resident Engineer. This Program will last a maximum of one hour and will include information regarding the following:*
*a. Applicable Federal, State and Local Safety and Health Standards*
*b. Elements of Owner's Construction Safety Plan.*
*c. Reporting and Record keeping procedures for the project.*
*d. Contractor Safety Representative Responsibilities.*
*e. Airport Emergency Procedures.*
*f. Site Security Requirements."* (T1)

3. **By owners and/or contractors prior to the start of a project as part of a kick-off meeting.**

*"2.2 SAFETY ORIENTATION*
*After the project is awarded and prior to the start of work, the Contractor and applicable Company representatives must participate in a Safety Orientation which includes:*
*A review of the Company EHS requirements, site specific safety hazards, abnormal operating conditions, emergency preparedness and response plans, restricted areas, security, potential hazards that may be encountered, evacuation procedures, assembly areas, safety systems and contractor access and parking requirements at the worksite. The Contractor is encouraged to ask questions during the orientation process."* (P3)

This pattern refers specifically to the training program identified in item one, where a contractor provides orientation to a new worker prior to being allowed to work at the site.

Some owners however, especially those owners with their own site safety protocols and specific ancillary hazards such as those found in chemical manufacturing and heavy industry facilities, require a contractor to attend orientation on site-specific hazards of the owner. Examples of this situation are reflected in items two and three above. This related aspect of “site orientation” is addressed in the PRECONSTRUCTION SAFETY MEETING pattern.

### 5.2.5 GROUP SAFETY INSPECTIONS

*Also Known As:*
Safety walk-around

*Problem*
Rapidly changing conditions leave the potential for hazards to arise unnoticed.

*Context*
The conditions on any construction site are rapidly changing due to the evolving nature of construction work

*Forces*
- Many different individuals or companies may be responsible for creating or hold the authority to resolve issues discovered on-site.
- Current OSHA regulations require frequent and regular inspections of the work area.
- Owners want to ensure that any unsafe conditions on the jobsite are corrected as quickly as possible to prevent their own **FAILURE TO FOLLOW UP ON A DOCUMENTED NONCONFORMANCE**.

*Solution*
A regularly scheduled safety inspection with a management level employee of each employer working on-site allows for a critical review of the conditions present on a worksite. The group is empowered to correct deficiencies on the spot. Those issues identified by the group that cannot be immediately corrected are assigned to a responsible party and tracked to closure. The requirements document must assign responsibility for conducting the inspection, subcontractor attendance, reporting results, and tracking corrective actions to the contractor. The owner attends to fully participate in the contractor's process but does not control the inspection.

*Examples*
*"The Subcontractor shall conduct and document regular (at least weekly) EHS inspections of the worksites, materials, equipment, and construction operations. At a minimum, the Subcontractor superintendent/supervisor and the [G2] Project Manager shall be part of this inspection. Coordination with the EHS POC shall be made in advance of these inspections to afford EHS the opportunity to accompany the inspections."* (G2)

*Resulting Context*
Hazards present on the project site that may not be the responsibility of a single entity are identified and corrected before an incident occurs. The contractor maintains a log of issues identified and related corrective actions which can be reviewed by the owner at any time. Issues that occur frequently can be addressed specifically to attempt to manage the problem before it begins, while contractors frequently responsible for unsafe conditions can be actively managed.

*Rationale*
Unsafe conditions corrected proactively will improve the safety performance of the project.

*Related Patterns*

**STATISTIC AND SAFETY ACTIVITY REPORTING** – The findings of group safety inspections can be reported as a safety activity in regular reporting.

**REGULAR EHS MEETINGS** – The findings and closure of findings can be reported at regular EHS meetings to ensure everyone on the site is made aware of the status of issues on the site.

**SAFETY CONCERN REPORTING MECHANISM** – Any reported safety concerns should be thoroughly investigated by the group conducting the regular safety inspection.

**COMPANY SAFETY POLICY** – The company safety policy forms the basis for assessing a contractor's operations.

**SITE SPECIFIC SAFETY PLAN –** The site specific safety plan is the controlling document for safety management on the site. Where issues arise between subcontractors, the site specific safety plan typically controls.

**DESIGNATED ON-SITE SAFETY MANAGER** – The designated on-site safety manager is responsible for conducting the group safety inspection, documenting the findings, and ensuring issues are tracked to resolution.

**FLOW DOWN CONTRACTUAL REQUIREMENTS** – All subcontractors and contractors of each sub-tier are expected to have a representative at the group safety inspection.

*Related Antipatterns*

**RETAIN CONTROL** – While the owner is typically expected to participate in the group safety inspection, the controlling contractor is responsible. The owner must ensure their actions are directed at the controlling contractor and that the controlling contractor maintains the inspection as part of their business process.

**OWNER ENDORSEMENT AND CONCURRENCE** – The owner must also ensure their actions with the group safety walk do not endorse, approve, or stipulate a specific decision on the site. The contractor maintains full responsibility for the overall inspection and control of the worksite while each individual employer is responsible to their employees for safety compliance.

**FAILURE TO FOLLOW UP ON A DOCUMENTED NONCONFORMANCE** – The owner must ensure that any issues discovered during the group safety inspection are documented, directed to the entity responsible, and corrected in a timely manner.

*Disambiguation*

INDEPENDENT CONTRACTOR INSPECTIONS are not **GROUP SAFETY INSPECTIONS** in that each contractor must conduct frequent and regular inspections of their specific job site under the independent contractor inspections. In addition, many regulatory requirements specify inspections which are necessary for compliance and must be completed by each employer's DESIGNATED COMPETENT PERSON. Contractors are responsible to know what inspections are required and to maintain their compliance with these requirements, in addition to the requirement to participate in the **GROUP SAFETY INSPECTIONS**.

**GROUP SAFETY INSPECTIONS** are not **OWNER EVALUATION OF CONTRACTOR**. While the owner may participate as a member of the group formed in the group safety inspection, the process belongs to and is managed by the contractor. The **OWNER EVALUATION OF CONTRACTOR** pattern refers to the owner's process of evaluating the contractor's performance before, during, and after the project.

### 5.2.6 TOOLBOX TALKS

*Also Known As:*
Tailgate Training

*Problem*
Workers may often go long periods without general safety training, especially where it is not required to be completed at a specified frequency as it is with annual asbestos awareness or fall protection training.

*Context*
Smaller safety awareness items often do not get communicated with workers until after an incident has happened. Examples of these could be simple items like lifting safety, distracted driving, and various safety initiatives supported by regulatory agencies.

*Forces*
- Training is rarely provided to workers unless required by regulation or contract.
- The large number of mandated training programs in construction safety may lead to a lack of focus on less common or severe hazards or awareness programs, which still provide benefits to workers.
- Timely delivery of relevant EHS training that reflects conditions on the work site (seasonal, scope of work, etc.) will have a greater impact than generic training delivered at once.

*Solution*
Owners require contractors to deliver regularly occurring toolbox meetings or tailgate trainings. These meetings generally occur weekly and are used to educate the workforce on topics relevant to the current site and keep safety at the forefront of their thoughts.

*Examples*
*"Weekly toolbox talks must be conducted by each Contractor with its employees. A copy of the dated and completed toolbox talk form with attendees' names and the topic(s) discussed must be accessible by the [E3] Construction Safety Representative or Appointed [E3] Representative."* [E3]

*"[SUBCONTRACTOR IS RESPONSIBLE FOR:]*
*Schedule and document weekly "tool box" safety sessions for all employees. Pre-printed forms with different topics are available from various industry sources. The topics selected should be relevant to site conditions or the actual work being conducted."* [G1]

*Resulting Context*
Workers who participate in toolbox talks or tailgate training are likely to have a higher level of safety awareness to relevant topics.

*Rationale*

Owners who require ongoing toolbox talks from their contractors are often interested in creating a work force focused on safety culture. This is also an opportunity for the owner to work with their contractors to communicate their safety expectations.

*Related Patterns*

TASK SPECIFIC TRAINING – Some smaller training requirements can be documented in regular or annual toolbox talks if the program is appropriately managed by the contractor.

**SITE SPECIFIC SAFETY PLAN** – If each independent contractor is responsible for conducting and documenting tool box talks, this should be included in the site specific safety plan.

**ACTIVITY HAZARD ANALYSIS** – A job hazard analysis will inform the manager or supervisor of what hazards may be encountered in the upcoming work and may suggest what additional training may be useful to provide to the workforce.

*Related Antipatterns*

**RETAIN CONTROL** – If owners require toolbox talks, they must ensure the material is created or procured by the contractor and not directed, provided, or delivered by the owner. The exception to this antipattern is situations where the *owner's operation* is the hazard to be discussed.

**REPEATING REGULATION WHICH ALREADY APPLY** – Owners need to be cautious that they are not dictating specific training requirements or that specific training programs will meet minimum requirements. In the example below, the owner's intent could be construed to mean that completing these weekly training sessions meets certain requirements.

*"An employee is not to undertake any work that he or she is not properly qualified, trained or equipped to do. In this regard, each employee shall be required to attend safety training or (toolbox/tail-gate) meetings weekly and sign an attendance sheet."* [G3]

*Disambiguation*

**Safety Training vs. Site Safety Coordination**

There is significant confusion with the purpose of the toolbox talk or tailgate training. This pattern reflects the desire of owners and the longstanding practice of contractors to attempt to provide regular continuing education for on-site workers.

A significant number of owners conflate the purpose of toolbox talks and tailgate training with the **DAILY SAFETY COORDINATION** pattern. For example:

*"Safety toolbox / tailgate meetings or similar type meetings must be held at the beginning of each workday, to raise the awareness level of affected personnel."* [E2]

*"SAFETY MEETINGS*

*Daily Tailgate Meetings:*

*Contractor shall conduct and document a daily morning safety meeting with all applicable workers to discuss Work activities, address any safety and health concerns for the Work to be performed,* *review any near miss incidents and how they could have been avoided, and prepare or review the appropriate Job Safety Analysis. Contractor shall provide such documentation to Company upon request."* [P2]

Owners wishing to ensure regular safety training should use this pattern, **TOOLBOX TALKS.**

Owners who want to ensure daily coordination and communication of the tasks to be completed should use **DAILY SAFETY COORDINATION.**

### 5.2.7 REGULAR EHS MEETINGS

*Also Known As:*
Monthly EHS Meeting

*Problem*
Safety communication can be irregular and may lead to break-downs in planning and coordination.

*Context*
Construction work sites are often complex and dynamic environments. The management of safety is dependent on appropriate and regular communication.

*Forces*
- Owners may have many construction projects or sites with varying methods for coordination of safety management.
- Contractors may have different corporate programs and expectations for safety coordination.

*Solution*
Owners require contractors to hold regular health and safety coordination meetings. These meetings allow all participants on the project the opportunity to be involved in the management and coordination of safety.

**Frequency**
While a majority of owners require meetings to be held at least monthly, some leave room in their requirements to change the frequency at their discretion. For example:

*"A monthly construction EHS meeting shall be held for all projects exceeding thirty days… [G2] reserves the right to increase the frequency of these meetings based upon project complexity/risk and/or Subcontractor EHS performance."* [G2]

*"Safety meetings shall be conducted at a frequency appropriate, in light of the safety characteristics of the assignment. Safety meetings shall focus on the quality and not the quantity of daily and weekly safety meetings to ensure all contract employees understand the subjects discussed during this meeting*." [P1]

Other common frequencies include *weekly* and *bi-weekly*. *Quarterly* or *Annual* meetings are typically a different meeting hosted by the owner. See the disambiguation section below for more information.

**Participants**
Participants typically include a management level employee for every subcontractor actively involved in the project at the time. Some owners require representation from a corporate safety manager in addition to site leadership.

*"To insure* (SIC) *a steady flow of safety and health information, a mandatory monthly safety Coordination Meeting will be held, with each Contractor's Safety Representative in attendance."* (T3)

Some owners require the regular EHS meeting to include all active workers involved in the project.

*[Attendance] shall include attendance by all site Subcontractor and lower-tier subcontractor personnel.* [G2]

**Topics**
Topics to be covered include upcoming tasks and their related safety requirements, incidents, the results of their INCIDENT INVESTIGATIONS and lessons learned, and other relevant information.

*"Contractor shall inform workers of factual circumstances resulting in incidents, accidents, and near misses and discuss how to correct and prevent such situations from recurring."* (P2)

**Written Record**
Owners typically require contractors to create a record of each meeting held. This assists owners in their OWNER EVALUATION OF CONTRACTOR.
*"Contractor shall keep a written record of the meetings that includes date, location, names or signatures of attendees, and topics covered."* (P2)

<u>*Examples*</u>
*"Communication between the Company, inspection team, and the Company representatives is a critical element in managing safety. Scheduling regular meetings to communicate safety issues is imperative to success."* [E2]

*"A monthly construction EHS meeting shall be held for all projects exceeding thirty days and shall include attendance by all site Subcontractor and lower-tier subcontractor personnel. [G2] reserves the right to increase the frequency of these meetings based upon project complexity/risk and/or Subcontractor EHS performance. Supervisors, foremen or other designated personnel shall conduct these meetings. Meetings can be held for the entire project or smaller breakout meetings can be held for each subcontractor and/or craft. A record of each meeting, documenting the meeting content and attendance shall be maintained.*

*At a minimum, monthly EHS meetings shall include:*

- *EHS, health, and job-related issues/concerns related to the particular operation*
- *Summary of relevant lessons learned from [G2] and/or other Subcontractor projects as applicable*
- *As applicable, accident investigations conducted since the last meeting, to discuss if the cause of the unsafe acts or conditions were properly identified and corrected*
- *EHS inspection findings since the last meeting*
- *Ad hoc EHS or special emphasis training*
- *Other relevant EHS subject matter as determined by the Subcontractor or [G2]."* [G2]

*Resulting Context*
After owners require regular EHS meetings, communication and coordination of safety on project sites should improve. The materials produced in the meeting minutes provide excellent audit material for an owner to trust but verify the contractor's safety program performance.

*Rationale*
Improved communication on construction sites allows each party to improve their actions toward safety at the jobsite.

*Related Patterns*
**INCIDENT REPORTING** – All reported incidents should be discussed and tracked in the regular EHS meeting.

**STATISTIC AND SAFETY ACTIVITY REPORTING**– Reported statistics and safety activities should be discussed in the regular EHS meeting.

**GROUP SAFETY INSPECTIONS** – Any findings from the regular group safety inspections should be discussed in the regular EHS meeting. These findings should be tracked to closure to ensure that corrective actions are appropriately completed and maintained.

INDEPENDENT CONTRACTOR INSPECTIONS – Any findings from the independent contractor safety inspections should be discussed in the regular EHS meeting. These findings should be tracked to closure to ensure that corrective actions are appropriately completed and maintained.

**SAFETY CONCERN REPORTING MECHANISM** – A safety reporting mechanism allows workers to voice their concerns to the project management. All reports received through such a mechanism should be discussed during a regularly scheduled project wide EHS meeting. A specific example of this language is:

*"Each contractor and/or project shall establish a safety suggestion box so employees may anonymously submit suggestions for site safety improvements. The safety suggestions will be addressed in the scheduled safety meetings with action items listed within the meeting notes, by the contractor/subcontractor safety representative. The contractor shall submit a copy of all employees' safety suggestions and solutions by the contractor to [G3] monthly.*" [G3]

**TOOLBOX TALKS** – Completed toolbox talks can be discussed as part of the **STATISTIC AND SAFETY ACTIVITY REPORTING** pattern. Contractors can discuss upcoming work to determine what if any site-wide toolbox talks should be included.

**SITE SPECIFIC SAFETY PLAN** – The site specific safety plan is where the controlling contractor communicates the regular EHS meeting requirement to the subcontractors as well as to the owner.

PRECONSTRUCTION SAFETY MEETING – Scheduling the regular EHS meeting should take place during the pre-construction safety meeting.

**DESIGNATED ON-SITE SAFETY MANAGER** – The meeting is typically chaired by the on-site safety manager for the contractor. This individual ensures the meeting is attended as required, necessary topics are discussed, and appropriate meeting minutes are kept.

**FLOW DOWN CONTRACTUAL REQUIREMENTS** – Each active subcontractor is typically required to have a representative present.

OWNER CONSTRUCTION SAFETY COMMITTEE – Owner's own construction safety committees can both review minutes from the regular EHS meeting and attend the meeting in person.

*Related Antipatterns*

**RETAIN CONTROL** – The owner must clearly indicate who owns the regular EHS meeting. In cases where the meeting is limited to a single project, the contractor is typically responsible for delivering the meeting. In other cases where an owner convenes multiple contractors across different projects, the owner may control the meeting.

THE ABSENT OWNER – The owner who does not attend regular EHS meetings sends a clear message to the contractors involved in the project that they do not prioritize safety as a business deliverable.

**FAILURE TO FOLLOW UP ON A DOCUMENTED NONCONFORMANCE** – Owners who are made aware of issues with contractor safety compliance must respond in a reasonable way to ensure the issues are corrected in a suitable manner.

*Disambiguation*

This pattern focuses on the contractor's management of project health and safety for a single project or a small group of connected projects.

A related meeting that some owners hold is an annual "all contractors" meeting with the owner's construction safety committee. This practice is included in OWNER CONSTRUCTION SAFETY COMMITTEE.

### 5.2.8 SAFETY CONCERN REPORTING MECHANISM

*Also Known As:*
Construction Safety Tipline, Safety Suggestion Box.

*Problem*
Conditions on construction sites are always changing and owners and contractor leadership are often not the first to discover hazards or concerns.

*Context*
As projects evolve and hazards change, owners and contractor management need to be aware of developing hazards. Often, there are many layers of management that a reported concern may have to travel though, delaying action. In some cases, workers may feel reporting of concerns may be frowned upon. Workers and the public may feel powerless to change conditions or actions on a site, so they take no proactive steps that may otherwise prevent an incident.

*Forces*
- Owners or contractors notified of hazards or concerns must take reasonable steps to correct any potential issues in a timely manner or they may face additional liability.
- The potential for abuse may discourage some contractors from fully adopting the policy.
- The reporting mechanism should clearly exclude emergency situations unless the owner or contractor intends to coordinate emergency response.

*Solution*
Owners have shown several novel approaches to establishing a safety concern reporting mechanism. The most common is a simple system in which a worker can elevate a concern through their existing line management. Other samples reflected the need for the contractor to elevate concerns that fall out of their control directly to the owner. Finally, several owners have established contact methods whereby any person, whether worker, contractor, owner staff, or the general public could submit safety concerns directly to the owner.

*Examples*
Several examples are included below, each reflecting the different approaches to the reporting mechanism discussed above:

**Worker Concern Reporting to Employer**
*"Each employee is responsible for learning and abiding by those rules and regulations that are applicable to their work and for reporting observed, or anticipated hazards to their immediate supervisor. If the hazard is not corrected, the affected employee will refuse to perform this work and will report the conditions to the Contractors Designated Safety Representative."* [E1]

*"If a Worker has a safety concern, or refuses work the Worker reasonably believes is unsafe, the Worker shall immediately contact their People Leader before proceeding with the work. All refusals of unsafe work shall be investigated and addressed with the Worker before the work proceeds. If unsafe work conditions, activities or hazards are identified during the investigation,*

*corrective measures shall be implemented to resolve such conditions, activities or hazards before the work proceeds."* [E5]

**Contractor Concern Reporting to Owner**
*"Notification of Hazards: Each Contractor shall notify the [E1] Project Manager in writing of the existence of any hazardous conditions, property, or equipment at the work site which are not under the Contractor's control. It is the Contractor's responsibility to take all necessary precautions against injury until corrected by the responsible party."* [E1]

**Any Individual Concern Reporting to Owner**
*"All personnel shall be informed of the [U2] Construction Safety Tipline as an avenue to anonymously report non-emergency safety related issues. The number for the Tipline is [PHONE] or [PHONE] or text messages can be sent to [CODE]. Issues will be followed up by the [U2] EHS department during normal business hours."*[U2]

*Resulting Context*
After implementing this pattern, owners are more likely to be made aware of potentially hazardous situations or conditions before they lead to an incident.

*Rationale*
A more informed owner or contractor is likely able to be more proactive in the correction of hazardous situations or conditions, leading to reduced disruption to operations and fewer safety incidents.

*Related Patterns*
**DAILY SAFETY COORDINATION** – Reported concerns should be addressed in the daily coordination of work if they are not fully abated immediately.

**SITE ORIENTATION TRAINING** – Workers must be made aware of the safety concern reporting mechanism specific to the project via participation in a site orientation training program.

**REGULAR EHS MEETINGS** – All reported concerns should be discussed and tracked during the project specific regular EHS meetings.

INCIDENT INVESTIGATION – Reported safety concerns may rise to such a level that an incident investigation is required.

**GROUP SAFETY INSPECTIONS** – All reported concerns should be discussed, evaluated, and tracked to closure during the group safety inspections.

INDEPENDENT CONTRACTOR INSPECTIONS – Contractors should be made aware of the reported concern for evaluation of their own workspaces.

**STOP WORK AUTHORITY** – Any individual who reports a condition should be empowered to stop work of the concern rises to the level of imminent danger or conditions immediately dangerous to life and health.

**GOAL SETTING** – Owners must communicate their intent to deliver the work in a safe manner and support that message by their actions. One action available to owners is a public facing safety concern reporting mechanism that allows anyone to provide information.

*Related Antipatterns*

**FAILURE TO FOLLOW UP ON A DOCUMENTED NONCONFORMANCE** – If the owner is notified by the contractor that an owner-based condition outside of the control of the contractor is present, the owner must ensure responsive and/or corrective actions are taken.

*Disambiguation*

**INCIDENT REPORTING** vs. **SAFETY CONCERN REPORTING MECHANISM**

The safety concern reporting mechanism is intended to be an outlet where workers can choose to anonymously report concerns they feel need to be addressed, as opposed to incident reporting, where workers are compelled to report any injury, no matter how insignificant, to their direct supervisor.

## 5.3 Site Safety Planning Patterns of Construction Safety

*Table 5-3. Site Safety Planning Patterns of Construction Safety Summary*

| Number | Name | Description |
|---|---|---|
| 5.3.1 | COMPANY SAFETY POLICY | The contractor must submit a manual that details the company's approach to compliance with OSHA and other safety requirements |
| 5.3.2 | SITE SPECIFIC SAFETY PLAN | The contractor must create a site specific plan for the management of safety which considers all local issues and interfaces. |
| 5.3.3 | ACTIVITY HAZARD ANALYSIS | The contractor must evaluate each task to be conducted during their scope of work, their potential hazards, and what mitigating actions must be taken. |
| 5.3.4 | DAILY TASK SAFETY PLANNING | The hazard analysis for each activity to be performed that day is used to create a task specific planning tool. |
| 5.3.5 | PERMITTING | Various types of permits are required by both owners and contractors to manage contractor safety. |

### 5.3.1 COMPANY SAFETY POLICY

*Also Known As:*
Global Safety Plan, Company Safety Manual/Procedure

*Problem*
Owners hire contractors to deliver their scope of work in a manner that is compliant with all applicable rules and regulations, and the owner should not direct the means, methods, or manner of work.

*Context*
Contractors bring a wide range of safety knowledge to a given project. Owners must have several methods of assessing the contractor's capability to deliver the work in a safe and complaint manner.

*Forces*

- Owners must not prescribe means and methods or otherwise **RETAIN CONTROL** of a contractor's operation, but need a way to ensure contractor has developed procedures.
- Owners who wish to audit contractor performance via **OWNER EVALUATION OF CONTRACTOR** need to understand *how* the contractor intends to deliver their scope of work.
- Unqualified contractors who do not have established safety procedures increase the risk of an incident occurring on the project, ultimately impacting the owner's interests.

*Solution*
Owners require contractors bidding for or otherwise seeking work to submit their company safety policy to the owner for review.

*Examples*

*"In addition to the site-specific plans, all Contractors shall have and adhere to their own core health and safety plans, which must contain rules and procedures that apply to and mitigate the perceived hazards associated with the Contractors specialty. In the event that these or any other applicable Company safety and health requirements conflict with federal, state, local regulatory requirements and/or the Contractors/Subcontractors own safety requirements, the procedures/rules/regulations which are most protective of human life and Company property shall prevail."* [E2]

*"The Contractor shall develop, furnish to all employees, and prominently display at the worksite and maintain for the duration of the Contract, a signed safety program that will effectively incorporate and implement, as a minimum, all required safety provisions."* [G4]

*Resulting Context*
By requiring contractors to submit their internal plans and procedures for safety compliance, the owner can avoid dictating means and methods to the contractor. Instead of instructing the contractor when a practice is non-compliant with regulatory requirements, the owner can simply

ask if they are following their own internal safety procedures. If a true violation has been observed, they are either not in compliance with their own procedures, or their own procedures are insufficient and show they do not understand all applicable rules and regulations.

*Rationale*
Contractors are hired for their expertise, which includes the safety requirements applicable to their work. The owner uses this submitted information to complete their due diligence review of the contractor's capabilities, and can use it to hold the contractor to *their* standards, instead of those of the owner. Contractors not able to comply with regulatory requirements can be dealt with through contract terms instead of safety regulation terms, which is an easier path for the owner to take.

*Related Patterns*
**SITE SPECIFIC SAFETY PLAN** – The site specific safety plan refers to the company safety policy for *how* safety is managed by each employer.

PRECONSTRUCTION SAFETY MEETING – Company safety policies are submitted to the owner no later than the preconstruction safety meeting. If the owner has concerns or reservations about a company safety policy, this is the last point for an owner to ask for clarifying or correcting revisions.

**ACTIVITY HAZARD ANALYSIS** – The completed activity hazard analysis often refers to the company safety policy for specific detail on how the company manages compliance with a given safety regulation.

PREQUALIFY CONTRACTORS – When owners seek to prequalify contractors, the company safety policy is one of the preferred documents for review. Owners are typically able to quickly determine whether the contractor understands the hazards and is capable of managing their impact on their work or not.

**DESIGNATED ON-SITE SAFETY MANAGER** – The contractor's designated on-site safety manager similarly uses each submitted company safety policy to critique and correct subcontractor safety performance.

**FLOW DOWN CONTRACTUAL REQUIREMENTS** – The company safety policy requirement extends down to all tiers of subcontractors.

**OWNER EVALUATION OF CONTRACTOR** – The owner uses the company safety policy to evaluate the contractor before, during, and after the work. By holding the contractor responsible for complying with the plans they submitted, the owner avoids dictating means and methods to the contractor.

*Related Antipatterns*
**RETAIN CONTROL** – Owners must be sure to hold the contractors to adherence to their own safety policy to avoid dictating means and methods, and ultimately retaining control of their contractors.

**REPEATING REGULATION WHICH ALREADY APPLY** – Owners must require contractors to comply with all applicable regulations, including safety regulation such as OSHA regulations. Any owner-specific requirements a contractor must address can be included in the site-specific safety plan.

*Disambiguation*

**COMPANY SAFETY POLICY** vs. **SITE SPECIFIC SAFETY PLAN**

Owners require contactors to submit their company safety policy to understand how each company conducts their safety procedures in the field, as opposed to the site specific safety plan, which instead focuses on the unique conditions, procedures, and hazards that may be found at a specific job site. The owner will use both of these plans; the company safety manual to avoid REPEATING REGULATION WHICH ALREADY APPLY and the site specific safety plan to ensure that the contactor has adequately addressed site specific concerns.

### 5.3.2 SITE SPECIFIC SAFETY PLAN

*Also Known As:*
Project Safety Plan

*Problem*
Owners hire contractors to deliver their scope of work in a manner that is compliant with all applicable rules and regulations, and the owner should not direct the means, methods, or manner of work.

*Context*
Contractors bring a wide range of safety knowledge to a given project. Owners must have several methods of assessing the contractor's capability to deliver the work in a safe and complaint manner.

*Forces*
- Owners must not prescribe means and methods or otherwise **RETAIN CONTROL** of a contractors operation, but need a way to ensure contractor has developed procedures.
- Owners who wish to audit contractor performance via **OWNER EVALUATION OF CONTRACTOR** need to understand *how* the contractor intends to deliver their scope of work.
- Unqualified contractors who do not have established safety procedures increase the risk of an incident occurring on the project, ultimately impacting the owner's interests.

*Solution*
Owners require contractors bidding for or otherwise seeking work to submit their company safety policy to the owner for review.

*Examples*

*"In addition to the site-specific plans, all Contractors shall have and adhere to their own core health and safety plans, which must contain rules and procedures that apply to and mitigate the perceived hazards associated with the Contractors specialty. In the event that these or any other applicable Company safety and health requirements conflict with federal, state, local regulatory requirements and/or the Contractors/Subcontractors own safety requirements, the procedures/rules/regulations which are most protective of human life and Company property shall prevail."* [E2]

*"The Contractor shall develop, furnish to all employees, and prominently display at the worksite and maintain for the duration of the Contract, a signed safety program that will effectively incorporate and implement, as a minimum, all required safety provisions."* [G4]

*Resulting Context*
By requiring contractors to submit their internal plans and procedures for safety compliance, the owner can avoid dictating means and methods to the contractor. Instead of instructing the contractor when a practice is non-compliant with regulatory requirements, the owner can simply

ask if they are following their own internal safety procedures. If a true violation has been observed, they are either not in compliance with their own procedures, or their own procedures are insufficient and show they do not understand all applicable rules and regulations.

*Rationale*

Contractors are hired for their expertise, which includes the safety requirements applicable to their work. The owner uses this submitted information to complete their due diligence review of the contractor's capabilities, and can use it to hold the contractor to *their* standards, instead of those of the owner. Contractors not able to comply with regulatory requirements can be dealt with through contract terms instead of safety regulation terms, which is an easier path for the owner to take.

*Related Patterns*

PRECONSTRUCTION SAFETY MEETING – The contractor must submit their site specific safety plan no later than the preconstruction safety meeting. At this meeting, the owner and contractor should verify that they both understand and agree to the site specific management approach to safety.

**ACTIVITY HAZARD ANALYSIS** – The requirement for each contractor to submit their activity hazard analysis must be clearly defined and discussed in the site specific safety plan.

**DESIGNATED ON-SITE SAFETY MANAGER** – The contractor's designated on-site safety manager is responsible for seeing that the processes defined in the site specific safety plan are operated, conducted, or otherwise carried out as agreed.

**FLOW DOWN CONTRACTUAL REQUIREMENTS** – Each subcontractor is responsible for complying with the site specific safety plan and/or creating and enforcing their own site specific safety plan.

**OWNER EVALUATION OF CONTRACTOR** – The quality of the submitted site specific safety plan can be used in all phases of owner evaluation of the contractor. The owner is also able to evaluate the contractor based on the level of compliance with their own written plan.

*Related Antipatterns*

**RETAIN CONTROL** – The owner must ensure that the submitted site specific safety plan is created, managed, and enforced by the contractor. While the owner may review the plan, it is entirely owned by the contractor.

**REPEATING REGULATION WHICH ALREADY APPLY** – The owner must be careful not to repeat the regulations of OSHA or other regulatory entities to avoid instructing the contractor.

**OWNER ENDORSEMENT AND CONCURRENCE** – Owners should receive and evaluate the site specific safety plan of their contractors, but not "sign off" or approve of the plan.

*Disambiguation*

**COMPANY SAFETY POLICY** vs. **SITE SPECIFIC SAFETY PLAN**

Owners require contactors to submit their company safety policy to understand how each company conducts their safety procedures in the field, as opposed to the site specific safety plan, which instead focuses on the unique conditions, procedures, and hazards that may be found at a specific job site. The owner will use both of these plans; the company safety manual to avoid REPEATING REGULATION WHICH ALREADY APPLY and the site specific safety plan to ensure that the contactor has adequately addressed site specific concerns.

### 5.3.3 ACTIVITY HAZARD ANALYSIS

*<u>Also Known As</u>*
Job Safety Analysis, Job Hazard Analysis, Safety Task Assessment, JHA, JSA

*<u>Problem</u>*
Prior to the start of a project, a risk assessment of the probability and severity of incidents on a project must be conducted. Any task above a specified level of risk must be thoroughly evaluated for all associated hazards and the mitigating actions which must be conducted.

*<u>Context</u>*
Each task to be conducted on a project carries risk.

*<u>Forces</u>*
- Owners need to ensure their contractors understand the steps, risks, and mitigation necessary to complete a task safely
- Owners must also avoid **RETAIN CONTROL** of the contractors operations.

*<u>Solution</u>*
Owners require contractors to create assessments of the tasks necessary to complete their scope of work, the hazards present in completing that scope of work, and the mitigating steps to be taken to reduce those hazards to an acceptable level of risk. This process is commonly referred to as an Activity Hazard Analysis (AHA).

*<u>Examples</u>*
Owners must consider a number of factors in requiring contractors to complete Activity Hazard Analyses:

**Changes**
Where the planned task, conditions, or other circumstances change, the workers are instructed to stop work and reassess the steps, hazards, and mitigating steps prior to continuing the work.

*"If, while working, it is discovered that the controls addressed in the AHA will not/do not provide adequate protection then the task at hand shall be stopped and not be conducted until the hazards have been re-assessed, the AHA updated, and adequate controls implemented. In these instances, the subcontractor may utilize field changes (i.e., red line, pen/ink changes) as needed to reflect changing conditions associated with the activity. All affected contractor personnel involved in the work being performed shall review each AHA and subsequent updates/changes. The updated AHA shall be made available for review to the [G2] Project Manager and EHS POC."* (G2)

**Audits**
Owners requiring Activity Hazard Analysis may choose to periodically conduct field audits of the written documentation created as part of the contractor's operations under the **OWNER EVALUATION OF CONTRACTOR** pattern.

**Performance approach with minimal direction:**
*"The JSA is a documented process that focuses on the relationship between the worker, the task, the tools, and the work environment and requires that supervisors actively involve all members of the work crew in its development. Once hazards have been identified, steps can be taken to eliminate or reduce the hazards to an acceptable level. All JSA's (or equivalent) shall be maintained at the project location for the duration of the work and made available for review by Contractors, subcontractors and Company personnel."* (E2)

*"For Work that is potentially hazardous in nature, such as work from heights, scaffold use, trenching operations, steel erection, electrical, crane operations, the general contractor/construction manager shall review and approve each JHA before permitting the work to begin. The JHA shall be a comprehensive evaluation of the work activity broken down into basic job steps, hazards identified for each step and contain hazard controls measures for each hazard identified. The general contractor/construction manager shall keep all JHAs in a bound notebook in an easily accessible location for the length of the Project. JHA's shall be updated as necessary as the Work progresses throughout the project and conditions change. JHA's must be reviewed with applicable employees prior to the start of work at each occurrence and when updates are made and this training shall be documented."* (U2)

**Expanded requirements:**
*"For each separately definable construction activity (e.g., excavations, foundations, structural steel, roofing, electrical, mechanical, etc.) the subcontractor shall develop an activity hazard analysis (AHA) prior to commencement of the associated work/definable feature. A definable work activity is a task which is separate and distinct from other tasks, has separate control requirements. A definable work activity may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Within each definable work activity there may be other sub-phases of work which warrant separate AHAs. It will be the responsibility of the Subcontractor to determine the best break-down of separately definable activities and the subsequent work steps in order to produce clear, concise, and effective, AHAs. The Subcontractor AHAs shall be kept at the worksite and available for review by [G2].*

*[G2] recommends using a graded approach in the development of AHAs; however, the Subcontractor AHAs shall be developed in sufficient detail to preclude confusion and misunderstanding and shall be commensurate with the size, complexity and risk level of the construction project. When used appropriately, the graded approach will incorporate the level of rigor for implementing the work planning and control attributes based on the importance/significance of the activity in relation to the associated hazards and consequences.*

*The analyses shall contain and/or meet the following elements as applicable to the activity:*
*• Identification of the definable work activity*
*• Identification of the job steps for each work activity*
*• Identification of the foreseeable hazards for each step/activity and the planned protective measures to include appropriate protective devices and/or equipment as needed*
*• Identification of competent persons required for workplace inspections of the construction activity, where required by OSHA standards*

*• Identification of Emergency Response Action relative information (e.g., gas shutoff valve location, etc.)*
*• Identification of project-required hold-points or other logistical requirements*
*• Address additional hazards revealed by supplemental site information (e.g., site characterization data, as-built drawings)*
*• Provide drawings and/or other documentation of protective measures for which applicable Occupational Safety and Health Administration (OSHA) standards require preparation by a Professional Engineer or other qualified professional*
*• Review and approval of the AHA by the Subcontractor's Management*
*• Made available for review to the [G2] Project Manager and [G2] EHS prior to the start of work activities*
*• Places for signatures of the involved workers to signify that they have been briefed on and understand the requirements of the AHA, and acknowledge their intended compliance with the AHA. Attach additional signature pages as needed.*

*The completed AHA shall be made available for review to the [G2] Project Manager/designee and EHS POC."* (G2)

<u>*Resulting Context*</u>
The work to be completed by a subcontractor is thoroughly reviewed by completing the Activity Hazard Analysis. For each day on the job, a daily version of this planning tool pulls the specific tasks from the "global" list of topics created in the AHA.

<u>*Rationale*</u>
Risks must be identified and managed to deliver the project in a safe manner. The activity hazard analysis is a formal and standardized method to achieve appropriate planning and control.

<u>*Related Patterns*</u>
**DAILY SAFETY COORDINATION** – The daily safety coordination meeting is informed by the DAILY TASK SAFETY PLANNING process, which is informed by the higher level activity hazard analysis.

TASK SPECIFIC TRAINING – The activity hazard analysis should indicate if additional task specific training is necessary.

INCIDENT INVESTIGATION – Incident investigations typically include a review of records of all pre-planning documents produced prior to the incident, including the activity hazard analysis.

**DAILY TASK SAFETY PLANNING** – The activity hazard analysis is the master list of all activities to be conducted by an employer, while the daily task safety planning process involves documenting selected activities *to be completed that shift*. This allows the pertinent information to make its way to a worker in the field in a timely manner so the information is fresh in their mind.

**FLOW DOWN CONTRACTUAL REQUIREMENTS** – Each contractor is responsible for conducting an activity hazard analysis for each unique work activity required to deliver their scope of work.

*Related Antipatterns*

**RETAIN CONTROL** – The owner must be careful to not unnecessarily involve themselves in the creation, acceptance, and application of the activity hazard analysis.

*"All subcontractors shall prepare a written Job Hazard Analysis (JHA) for each type of construction task or activity in the subcontract and submit it for review by [G5]. This submittal must be approved by the [G5] Project Team."* (E5)

*Disambiguation*

The **ACTIVITY HAZARD ANALYSIS** is generally created prior to the start of a project by each subcontractor for their entire scope of work. Many owners also require contractors to practice **DAILY TASK SAFETY PLANNING** and/or **DAILY SAFETY COORDINATION** for each individual task to be completed for that given shift, day, or phase of work. In this way, the activity hazard analysis serves as a global list of all tasks, all hazards, and all mitigating steps while the daily focus of just the tasks to be completed each day is addressed though these other patterns.

### 5.3.4 DAILY TASK SAFETY PLANNING

*Also Known As:*
Pre-Task Plan, Plan of the Day

*Problem*
Workers may not be aware of the hazards of their work and the work of others around them and the steps they need to follow to ensure their safety.

*Context*
The constant evolution of construction work means that hazards are always changing. Without a standard process of notifying workers of the task, associated hazards, and mitigating actions workers may be unaware of the safety expectations for their work.

*Forces*
- Workers are not likely to read a complex hazard assessment such as a project-wide **ACTIVITY HAZARD ANALYSIS** on a regular basis.
- Coordination between subcontractors requires a plan specific to the day's tasks.
- The owner can use written daily task safety plans in auditing and incident investigation.

*Solution*
Owners require contractors to plan the day's work with task safety plans. These plans are generated from a global list of tasks developed in the project **ACTIVITY HAZARD ANALYSIS** and are further used during the **DAILY SAFETY COORDINATION** meeting to communicate to workers and between subcontractors.

*Examples*
*"The plan of the day (POD) process is required to maintain daily positive control and to establish a high level of communication between subcontractors prior to the start of construction activities for the day. An acceptable POD form shall be provided by the [G2] Project Manager.*

*The basis of the POD process is in preplanning. First-tier subcontractors and all lower-tier subcontractors shall identify all planned tasks on a POD form. The level of detail must be appropriate to define all tasks that may present a hazard to people, property or environment. The listed task(s) shall include the corresponding AHA(s). If the proposed task does not have a corresponding AHA, then a new AHA will need to be developed and reviewed prior to the work moving forward."* (G2)

*Resulting Context*
With a daily task safety plan requirement in place, the contractor will have a specific written plan for each day of work. This task specific focus ensures that workers and contractors are individually and collectively coordinated.

*Rationale*

Communication of risks and hazards is one of the most effective way to manage construction safety. This process creates a written and auditable procedure that is easy for contractors to adopt and modify to suit their needs.

*Related Patterns*

**DAILY SAFETY COORDINATION** – The daily task safety planning process is the creation of the written plan to be covered in the communication phase detailed in the daily safety coordination pattern.

TASK SPECIFIC TRAINING – The daily task safety plan should review what task specific training was found to be necessary in the ACTIVITY HAZARD ANALYSIS and check to make sure each worker involved in the task has the proper current training.

INCIDENT INVESTIGATION – Incident investigations should always review the written daily task safety plan as part of a post-incident review.

**ACTIVITY HAZARD ANALYSIS** – The activity hazard analysis forms the basis for the daily task safety plan. The AHA should be written in such a way that the field supervisory personnel can simply copy the appropriate AHA section into the daily report.

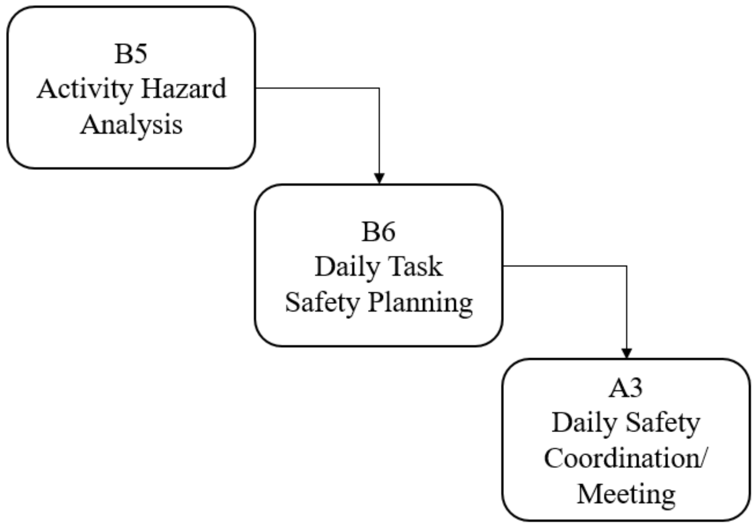
**OWNER EVALUATION OF CONTRACTOR** – The owner can use the written daily task safety plans to evaluate the performance of the contractor through all phases of the work, but most importantly while the contractor is actively working on site.

*Related Antipatterns*

**OWNER ENDORSEMENT AND CONCURRENCE** – The owner should not approve or "sign off" on daily task safety plans *unless* the plan reflects hazards under control of the owner.

*Disambiguation*

**DAILY TASK SAFETY PLANNING** involves a written plan created from the comprehensive **ACTIVITY HAZARD ANALYSIS** created before the beginning of the project. This written plan is specific only to the tasks to be completed within the day's scope of work. The **DAILY SAFETY COORDINATION** pattern on the other hand is the daily meeting where a representative from each contractor or crew meets to discuss each crew's work plan for the following day and then the information on the written **DAILY TASK SAFETY PLANNING** is shared with each participating worker.


B5
Activity Hazard
Analysis
B6
Daily Task
Safety Planning
A3
Daily Safety
Coordination/
Meeting

### 5.3.5 PERMITTING

*Also Known As:*
Work Control

*Problem*
Construction work is a potentially hazardous endeavor and certain activities

*Context*
Certain work activities have more significant risk or complexity and therefore require a more in-depth control process.

*Forces*

- Regulatory and/or insurance requirements dictate that several types of permits are used in the construction industry.
- Some regulations require occurrence specific documentation or determination.
- Work that has an inherently higher risk deserves a higher level of process control.

*Solution*
Owners require contractors to either comply with existing permit systems of the owner or develop and maintain their own system of permitting to control the process of hazardous work. In other instances, regulatory permits must be acquired prior to the start of a project or task.

*Examples*
Three general levels of permitting exist:

**Regulatory Permits**
These permits are required to be submitted to and/or approved by a regulatory body. Examples of these permits include demolition permits, National Pollutant Discharges Elimination System (NPDES) Storm Water Construction Permit, and asbestos removal.

*"Contractor must review and comply with all applicable environmental permits and conditions, laws, regulations, and [P3] requirements prior to the start and during work. Contractor will be provided copies of [P3]-obtained environmental permits, and Contractor will provide [P3] with copies of environmental permits it obtained."* (P3)

**OSHA Compliance Permits**
These permits are either specifically required per OSHA regulation (hot work, permit required confined space) or current best practice involves the use of an employer generated permit system. Other examples include:

- Excavation
- Scaffold
- Cranes (Assembly, Critical Lift)
- Aerial Lifts
- Radiation
- Energized Electrical Work

- Penetration of Building Surfaces

*"Energized Electrical Work Permit (EEWP)*
*The subcontractor shall ensure that a permit has been completed with the [G2] required concurrences and approvals before work may be initiated on hazardous energized systems. The permit being submitted shall be task specific. Blanket, general, or open-ended permits are prohibited and will not be processed. After a permit has been approved, subsequent changes in the scope of work or associated hazards requires cessation of work and a timely reassessment of this permit. If necessary, additional controls will be established and a new permit issued."* (G2)

**Work Process Control Permits**
A third type of permit used by owners is a more general work control measure, intended to provide the owner with information about where and when work is in progress within their property:

*"General Work Permits are commonly issued to serve as a written authorization to perform work in designated areas that do not involve Hot Work. Each permit will give a general description of the work to be performed, where and when the work is to take place, special precautions, required personal protective equipment, and emergency information."* (E2)

*"Safe Work Permit ([P1 SAFETY PROCEDURE])*
*Prior to performing work, contractors must obtain permission from the equipment owner or [P1] Host by way of the issuance of a safe work permit per [SAFETY PROCEDURE]. As part of the issuance of a safe work permit it is mandatory that the equipment owner and contract worker(s) verify the job by completing a FIELD REVIEW."* (P1)

In hospitals, specific infection control requirements often also mandate the use of an "above ceiling permit" or similar control:

*"Above Ceiling Permit*
*Contractors working at [H4] must obtain an above ceiling permit from the Program Manager and the Fire Marshal in the Engineering Department prior to accessing any ceiling in the hospital. If using containment or HEPA filtration for above ceiling work, contractors must ensure that containment units are flush with ceiling."* (H4)

<u>*Resulting Context*</u>
Work completed under a permit system is subject to a higher level of care, consistent with the graded approach to managing risk. These specific activities requiring a permit are planned, coordinated, and executed within the confines of the permit procedure itself, and greater control is achieved. In many cases, the completed permit itself also serves to memorialize the extra steps and care that went into planning and delivering the work. This allows for both auditing of the process and proof to third parties in the event of a regulatory inspection or unplanned incident.

<u>*Rationale*</u>
Permitting allows for the coordination that is sometimes required by work activities that are or may be high risk. By setting the expectation that the task is more highly scrutinized, extra care is spent by those involved to conform to the expectations of the process.

*Related Patterns*
**DAILY SAFETY COORDINATION -** The daily safety coordination meeting must address any required permits necessary to complete the work.

**SITE ORIENTATION TRAINING** – The site orientation training must explain to the workers the purpose and function of any permit systems in use on the site.

INDEPENDENT CONTRACTOR INSPECTIONS – Permitting requirements are among the items independent contractor inspections should regularly evaluate, especially including those permits that are employer, task, or crew specific. Examples of these include excavations, hot work, and fall protection.

**COMPANY SAFETY POLICY** – The company safety policy must address how each company manages regulatory requirements related to permit systems.

**DAILY TASK SAFETY PLANNING** – In some examples, owners refer to the written daily task safety plan as a general work permit. Others include necessary permit requirements to be satisfied prior to the start of the day's task in the written plan.

*Related Antipatterns*
**RETAIN CONTROL** – The owner should ensure that the process of controlling these high hazard practices remains the responsibility of the contractor. The owner should be involved in the process, but only as an auditor.

**REPEATING REGULATION WHICH ALREADY APPLY** – The tendency for an owner to stipulate what permits the contractor must create and comply with potentially leaves the owner susceptible to a claim that the

**OWNER ENDORSEMENT AND CONCURRENCE** – Owners should not approve or "sign off on" permits created by the contractor, *unless* the permits are specific to owner controlled hazards, are existing facility permitting procedures, or are required by regulation.

*Disambiguation*
None

## 5.4 Contractual Control Patterns of Construction Safety

*Table 5-4. Contractual Control Patterns of Construction Safety Summary*

| Number | Name | Description |
|---|---|---|
| 5.4.1 | DESIGNATED ON-SITE SAFETY MANAGER | The owner should require the contractor to designate an on-site safety manager who is responsible for the contractor's safety management. |
| 5.4.2 | STOP WORK AUTHORITY | Stop work authority must be clearly delineated and communicated to all who participate in the construction process. |
| 5.4.3 | FLOW DOWN CONTRACTUAL REQUIREMENTS | The owner should develop an expectation that requirements apply to all contractors, subcontractors, and lower tier contractors, suppliers, and vendors. |
| 5.4.4 | ESCALATING DISCIPLINARY PROCEDURES | The owner should create or require the contractor to create a system where contractor and/or worker non-conformance is progressively disciplined |
| 5.4.5 | OWNER REQUIREMENTS DO NOT RELIEVE CONTRACTOR | The owner must make clear to the contractor that the existence of construction safety requirements and owner oversight does not relieve the contractor of their responsibility for safety. |

### 5.4.1 DESIGNATED ON-SITE SAFETY MANAGER

*Also Known As:*
Designated Site Safety Manager, Dedicated Site Safety Manager

*Problem*
The management of safety requirements requires significant man power.

*Context*
Contractors need to have designated staff on-site to manage safety. Depending on the size, complexity, and risk of a given project, these individuals may be foremen, superintendents, or full time safety professionals.

*Forces*
- Safety management is a time and skill intensive process which may require specialized staff
- Requiring additional dedicated personnel adds cost to projects.
- Projects vary widely in size, scope, complexity, and ultimately, risk.

*Solution*
Owners develop a flexible system which specifies what staff must be on-site to manage project safety.

A number of factors determine how this requirement is applied:

**Multiple-tier System**
The most frequent arrangement for the requirement of on-site safety personnel is a multi-tier system. Under this system, the terms "*designated* contractor safety manager" and "*dedicated* contractor safety manager" define the separate roles as:

*"'Dedicated Safety Representative' is a person assigned to a worksite whose sole responsibility on that job is to ensure compliance with safety requirements in connection with performance of the Work. The safety representative shall be qualified to perform the Work by education (e.g., OSHA (defined below) 40-hour course, higher education in related field), certification (e.g., CSP, CIH), or experience. This person shall have current certified first-aid/CPR training.*

*"Designated Safety Representative" is a person assigned to a worksite that is responsible for safety, but may also have more than one role in connection with performance of the Work. This person shall have current certified first-aid/CPR training."* (P2)

**Flow Down:**
An important factor in this pattern is the **FLOW DOWN CONTRACTUAL REQUIREMENTS** of this position. Most subcontractors are required to have a *designated* site safety contact who is responsible for the safety of a given subcontractor's crew. For example:

*"Subcontractor Site Safety Representative*

*Each Subcontractor, under the direction of a contractor, is responsible for the safety and health of their employees as well as other workers; the protection of equipment, materials and structures; and protection of the general public and environment.*

*Each Subcontractor will designate an on-site Safety Representative to act as the safety liaison with the contractor and [G4] Safety consultant, and maintain safe working practices and conditions. The Subcontractor's Site Safety Representative is responsible for ensuring that their personnel comply with the [G4] Safety Program Requirements as well as all applicable federal, state and local regulations. Each Subcontractor's Site Safety Representative is required to have the attended an OSHA 10-Hour training program within the past three years. The name and qualifications for each subcontractor on-site safety representative must be listed in the Project Safety Plan."* (G4)

**Dedicated Safety Manager Trigger**

Some owners require a dedicated safety manager for the controlling contractor only in the event of a large scale or high risk project, while others require a dedicated safety manager at a given threshold for any contractor (controlling or subcontractor) for any factor. Some of these factors include:

- Total project or scope of work cost
  *"Projects costing more than 15 million and/or more than 30 project CONTRACTOR/ SUBCONTRACTOR employees:*
  *The CONTRACTOR Project Safety Representative must be onsite at all times for Contracts that either exceed 15 million dollars or at times when the project's combined workforce (including SUBCONTRACTORs) is greater than 30 workers. This Project Safety Representative's primary responsibility is to ensure that all JOB SITE employees comply with the Owner Controlled Insurance Program: Safety Program Requirements as well as all applicable federal, state, and local regulations. This Representative shall be knowledgeable of all applicable safety and health codes, statutes, and ordinances as well as best safety practices recognized by the construction industry for this project. The Representative shall be able to demonstrate knowledge and ability to ensure SUBCONTRACTOR compliance with these regulations. This designated CONTRACTOR Project Safety Representative shall not be the project manager, project engineer or superintendent. This Project Safety Representative shall arrange a monthly site safety inspection that includes the SC and [G4] RE/RI. This Project Safety Representative must have attended an OSHA 30 hour Construction Industry Outreach Training Program within the past three years. A resume outlining experience and training must be submitted to [G4] Resident Engineer within 30 days of receiving Notice to Proceed and/or before construction begins on the JOB SITE.* (G4)

- Number of on-site workers
  *"Contractors with 25 or more employees on a single shift (including all subcontractors) will establish a fulltime position of a Contractor Safety Manager to perform safety inspections and training services. In addition, for every additional 100-job site employees added, an additional Safety Management Representative shall be required. In the event that the Contractor has less than 25 employees, the Contractor shall appoint an on-site person who, along with other concurrent duties, shall serve as the Contractor's Safety Representative." (E3)*

- Risk of project or scope of work
  *"Each project is analyzed to determine the appropriate level of safety representation which is required to provide adequate field presence. The following factors shall be considered when making this decision:*
    - *Scope, complexity, and length of the Work*
    - *The geographical location of the Work*
    - *The number of crews and how they are spread out*
    - *The risks/hazards associated with the Work.*
    - *The type and nature of work activities being performed"* (E5)

- Owner's discretion
  *At the [T5]'s discretion the requirements for Contractor safety personnel can be reviewed and action taken to decrease or increase the number of individuals.* (T5)

<u>*Examples*</u>
*"Contractor's Designated or Dedicated Safety Representative shall perform frequent safety inspections of operations, facilities, and equipment used in the performance of the Work and participate in joint inspections and audits with [Owner] upon request. Contractor shall immediately address any unsafe condition, equipment, or action identified during an inspection.*

*Contractor shall have a Designated Safety Representative at the worksite at all times to ensure that appropriate safety practices are being followed. In addition to Duty to Intervene requirements, the Designated Safety Representative shall specifically have authority to stop and correct Work that presents a serious hazard or violation. [Owner] reserves the right, at its sole discretion, to require Contractor to provide one or more Dedicated Safety Representatives onsite throughout performance of the Work. Contractor shall provide the qualifications of the proposed safety representative to [Owner] for review and approval upon request."* (P2)

<u>*Resulting Context*</u>
By following this requirement an owner can ensure the contractor has a knowledgeable management representative present to support the safety duties of the work.

<u>*Rationale*</u>
A professional on-site safety representative working for the contractor can effectively operate a safety program for the project site and provide an interface to the owner's safety representative.

<u>*Related Patterns*</u>
**INCIDENT REPORTING** – The designated on-site safety manager is both the person often receiving the initial report of an incident and the individual responsible for notifying the owner's representative and filing a written report of the incident.

**STATISTIC AND SAFETY ACTIVITY REPORTING** – The statistic and safety activity report is a primary work product of the designated on-site safety manager.

**DAILY SAFETY COORDINATION** – The daily safety coordination meeting is typically chaired by both the site superintendent and the designated on-site safety manager.

**SITE ORIENTATION TRAINING** – The site orientation training is typically delivered by the on-site safety manager.

**GROUP SAFETY INSPECTIONS** – Group safety inspections are often led, documented, and tracked by the on-site safety manager.

**SAFETY CONCERN REPORTING MECHANISM** - The on-site safety manager is responsible for

INCIDENT INVESTIGATION – Incident investigations are typically conducted and documented by the on-site safety manager.

**SITE SPECIFIC SAFETY PLAN** – While the on-site safety manager may not ultimately be the individual who was responsible for creating the site-specific safety plan, they are responsible for operating the plan as conceived, including the enforcement of safety requirements.

PRECONSTRUCTION SAFETY MEETING - The on-site safety manager is typically an attendee of this meeting. In cases where the on-site safety manager is not present, they must be designated at this point at a minimum.

**ACTIVITY HAZARD ANALYSIS** – The on-site safety manager is responsible for evaluating each subcontractor's activity hazard analysis and ensuring each subcontractor is at least compliant with the regulatory requirements and their submitted activity hazard analysis. They may not be responsible for the means and methods of the subcontractor.

**DAILY TASK SAFETY PLANNING** – The controlling contractors designated on-site safety manager is responsible for reviewing the safety plan of each subcontractor.

**PERMITTING** – Site wide permits may need to be authorized, reviewed, or audited by the on-site safety manager.

HIGH HAZARD PLANNING PROCEDURE – The on-site safety manager should participate in any high hazard planning procedure.

**ESCALATING DISCIPLINARY PROCEDURES** – The on-site safety manager is often responsible for administering and tracking disciplinary actions.

*Related Antipatterns*

**RETAIN CONTROL** –

*"[E3] reserves the right to remove and/or request a replacement for any Contractor Safety Manager and/or Safety Representative or other Contractor employee due to his or her noncompliance with the items listed above. This shall be done at the direction of the Appointed [E3] Representative responsible for the Contractor's work project, and at no additional cost to [E3]."* (E3)

*Disambiguation*
A **DESIGNATED ON-SITE SAFETY MANAGER** differs from a DEFINED COMPETENT PERSON in that the on-site safety manager is the single representative of the controlling contractor responsible for coordination of safety efforts on site. The DEFINED COMPETENT PERSON on the other hand is only responsible for a narrow area of expertise, such as fall protection or excavation safety. There are often multiple competent persons on-site representing multiple employers at any given time.

### 5.4.2 STOP WORK AUTHORITY

*Name*
Stop Work Authority

*Also Known As:*
Duty to Intervene

*Problem*
Many dangerous situations can arise during construction through changing conditions, unknown hazards, or willful behavior.

*Context*
As issues are detected, a worker must have a mechanism to share knowledge or be informed of new knowledge by anyone who may possess it. Without clear direction on who has the power to stop work if an imminently dangerous activity is observed, individuals may feel unable to prevent an incident.

*Forces*

- OSHA regulations and construction liability law are based on privity between an employer and an employee.
- Many incidents can be prevented if people are empowered to intervene when conditions are unsafe.
- Stopping work on a jobsite can have considerable cost, including equitable claims for extension.

*Solution*
Owners include the right or duty to stop unsafe work in their construction safety requirements, making it acceptable for any worker or individual to intervene when warranted to keep workers and the public safe.

*Examples*
*"DUTY TO INTERVENE (STOP WORK)*
*No worker is expected to work in an unsafe environment or to perform an unsafe act, and no worker shall be penalized for refusing to do so. Anyone who observes an unsafe action or condition in the workplace has an obligation to intervene by taking one or all of the following actions to correct the condition or situation:*

- *Communicating concerns and asking questions;*
- *Notifying appropriate supervisors; and*
- *Shutting down the job, if necessary*

*Contractor shall ensure that all of its employees, subcontractors, agents, and representatives performing any portion of the Work are informed of these "stop work" requirements."* (P2)

*"If unanticipated/unsafe conditions are identified or non-compliant practices are observed during construction activities, workers shall be instructed stop the work immediately and notify their*

*supervisor and health & safety officer of this action. All workers at [G2] sites have the authority to stop work. Work may not proceed until the circumstances are investigated and deficiencies corrected."* (G2)

*"Any employee that observes an imminent-danger situation is responsible for stopping the work and reporting it to the subcontractor representative at the work site."* (G5)

*Resulting Context*
All workers are able to intervene, but it must be for a serious issue that is likely to present harm to a worker. The controlling contractor is responsible for the timely resolution of the problem and the appropriate communication to affected parties.

*Rationale*
No one on the worksite should feel powerless to stop an unsafe act or condition that rises to the level of imminent danger. This includes the owner.

*Related Patterns*
**INCIDENT REPORTING –** In the event a stop work order is issued, it should be reported to management in the same manner as a work site incident.

**SITE ORIENTATION TRAINING –** Workers must be informed of the expectation surrounding the authority and use of stop work orders.

**SITE SPECIFIC SAFETY PLAN –** The site specific safety plan must detail the site rules and procedures for stop work authority.

*Related Antipatterns*
**RETAIN CONTROL** – The owner must ensure the contract documents allow for any party to declare a stop work situation. In addition, the owner must also direct their communication after a stop work order has been issued and the scene made safe to a management level employee. The owner should avoid providing corrective actions and instead simply explain their observations and ask the contractor to correct the situation as they see fit. If the contractor does not address the situation to the satisfaction of the owner, other avenues of control provided in the direct contract may be used.

*Disambiguation*
None

### 5.4.3 FLOW DOWN CONTRACTUAL REQUIREMENTS

*Also Known As:*

*Problem*

Construction safety requirements may need to apply to each contractor, even where owners do not have a direct contract with subcontractors, lower tier subcontractors, suppliers, and other entities involved in a project.

*Context*

Many employers work on an average construction project, and many of the owner requirements need to be completed by each employer in addition to the controlling contractor. Without specifying what owner requirements apply to all lower tier contractors, owners may receive incomplete safety program participation from lower tier entities.

*Forces*

- Owners may not hold a direct contract with subcontractors, lower tier subcontractors, suppliers, and other entities involved in a project.
- With limited exception, controlling contractors must apply requirements to lower tier entities to ensure their compliance.

*Solution*

Owners require controlling contractors to “flow down” certain requirements to apply to all lower tier subcontractors while the controlling contractor retains responsibility for other requirements.

*Examples*

*“Each contractor has responsibility for the safety of their personnel and shall be responsible for compliance with all [M4] standards, applicable laws, applicable codes, and accredited consensus standards applicable to their scope of work. The General or Prime Contractor assumes the entire responsibility under the contract and the Subcontractor assumes responsibility with respect to their portion of the work. With respect to subcontracted work, the General and Prime Contractors, and any Subcontractor(s), shall be deemed to have joint responsibility. Where joint responsibility exists, both the Prime and General Contractor and their Subcontractor(s), regardless of tier, shall be considered subject to the enforcement provisions of all applicable laws, codes, standards and the requirements contained herein.”* (M4)

*Resulting Context*

The controlling contractor maintains overall control of the project and site, and with that, an overall responsibility for the coordination of safety. Subcontractors are still required to fulfill all of the obligations as an employer to their employees. Owners can specify any requirements they expect controlling contractors to hold subcontractors accountable for that may be in addition to regulatory required actions.

*Rationale*

While each employer is responsible for the safety of their employees, a controlling contractor is responsible for the coordination of all subcontractors and lower tier participants. The owner, who does not hold a contract directly with these lower tier participants, may still exert their desired level of influence through the use of flow down requirements.

*Related Patterns*

**INCIDENT REPORTING** – All workers on a site, regardless or tier or direct reporting line, must reporting incidents to the controlling contractor's management.

**STATISTIC AND SAFETY ACTIVITY REPORTING** – While the controlling contractor is usually the only entity required to submit statistic and safety activity reports to the owner, all subcontractor and lower tier entities must have their effort reported to the owner by the controlling contractor.

**DAILY SAFETY COORDINATION** – Each subcontractor and lower tier entity must participate in the controlling contractor's daily safety coordination meeting process.

**GROUP SAFETY INSPECTIONS** – All contractors are required to have a management level representative present for the group safety inspection.

INDEPENDENT CONTRACTOR INSPECTIONS – All tiers of contractors are responsible for conducting their own frequent and regular inspections of the jobsite, including any specific inspections required for the completion of their scope of work.

**REGULAR EHS MEETINGS** – All tiers of contractors are responsible for ensuring a company representative attends all regularly occurring EHS meetings.

**ACTIVITY HAZARD ANALYSIS** – The owner requires that all contractors and lower tier participants conduct and submit an activity hazard analysis prior to the commencement of work activities on site.

**DAILY TASK SAFETY PLANNING** – Each subcontractor and lower tier entity must participate in the daily task safety planning process for each crew to be coordinated.

DEFINED COMPETENT PERSONS – Each subcontractor and lower tier entity must define their competent persons for the controlling contractor to ensure proper lines of communication are clearly demarcated.

PREQUALIFY CONTRACTORS – The controlling contractor should similarly prequalify each subcontractor and lower tier entity to a similar standard of the owner if they are not already prequalified by the owner.

**STOP WORK AUTHORITY** – All workers and contractors should have stop work authority, including for the work of other contractors.

**ESCALATING DISCIPLINARY PROCEDURES** – Each subcontractor and lower tier entity must comply with the same project wide discipline procedures established by the controlling contractor or owner.

**OWNER REQUIREMENTS DO NOT RELIEVE CONTRACTOR** – Each contractor must acknowledge they understand the owner specific requirements present at a specific job site. Each contractor must understand that they remain responsible for the oversight and delivery of safety for their employees.

*Related Antipatterns*

**RETAIN CONTROL** – Owners must ensure their flow down requirements are not written in a way that give them control over the subcontractor’s operations, but instead make the subcontractors comply to the same requirements of the higher-tier contractors where necessary.

*Disambiguation*

None

### 5.4.4 ESCALATING DISCIPLINARY PROCEDURES

*Also Known As:*

*Problem*
Without consequences for non-compliance with safety rules and procedures, workers will have no incentive to comply.

*Context*
The owner must ensure that the contractor will use a progressive disciplinary process to guarantee that bad actors and those willfully disobeying appropriate workplace safety requirements are removed from the workplace.

*Forces*
- Repeat offenders endanger themselves and those around them and are a significantly higher risk to the project.
- The owner does not have a direct relationship with each worker.
- The owner must be careful not to **RETAIN CONTROL** of personnel management.

*Solution*
Owners create minimum expectations for contractors to follow in a basic disciplinary program. Escalating discipline policies typically take one of three forms:

1. Contractor led
   Typically, the contractor is asked to create or supply their existing discipline program to the owner. If the owner is satisfied that the contractors discipline program is sufficient, they may simply audit the discipline process as the project progresses.

2. Owner led
   In some cases, the owner seeks to create consistency in discipline across their enterprise. In this case, the owner knowingly takes on additional responsibility. Many instances of this approach include discipline for worker violations in addition to broad contractor violations.

3. Owner and Contractor hybrid
   A third approach includes a combination of the first two. The contractor is responsible for creating and enforcing their discipline program, while the owner reserves the right to intervene through existing contract mechanisms, such as breach of contract.

Factors considered by owners in the creation of escalating discipline requirements typically include:

**Severity of Violation**
Each violation of a safety procedure has its own potential severity. In most cases, several levels of violation severity are identified. For example:

*"Violations are defined as:*

*"General Violations" are considered to be those infractions that may not cause serious injury or illness to an individual but are still violations of written safety policies and procedures. Examples include housekeeping, unregulated ACM incidents, property damage, mushroomed tools, etc. "General Violations" do not necessarily require a written warning unless they become classified as "Repeat Violations."*

*"Serious Violations" are those violations that if left uncorrected could cause serious injury or illness to an individual. Examples include employees exposed to fall or impalement hazards or serious bodily harm.*

*"Imminent Danger" are violations/situations that will most likely cause permanent disability or death to an individual. Examples can include falls, electrical, or trenching hazards and unsafe equipment.*

*"Repeat Violations" are situations that arise as a result of a previously identified infraction not being abated in the time frame required or numerous violations of the same classification. "Repeat Violations" can also be defined as a situation where one supervisor has multiple employees working under their direction who are in violation of a written Federal, State, project, or company policy."* (T5)

**Escalation**
Contractors or workers who show a repeat or willful pattern of violations present a greater risk to the project. To address this, most owners require some escalation pattern for recurring violations, with increasing consequences at each step. For example:

*First offense – verbal warning with written record of the offence. Notice to subcontract employee's supervisor*

*Second offense – written warning. Subcontract employee and supervisor attend mandatory meeting with the subcontractor Superintendent, [G5] Project Manager, [G5] Construction Manager, and [G5] Construction Safety Engineer to determine corrective action. A copy of the written warning is sent to the office of the subcontract employee with a statement that if another violation occurs the worker will be removed from the project and consideration will be given to terminating the contract.*

*Third offense – the worker is removed from the project. Consideration is given to terminating the contract.*

*Multiple violations among employees of the same subcontractor – consideration will be given to removing the subcontractor Supervisor from the project and in terminating the subcontractor's contract."* (G5)

<u>*Examples*</u>
**Contractor Led:**
*"[E2] is committed to providing a safe and healthful work environment for all employees, visitors and vendors that remains free from recognized hazards. To help achieve this goal, Contractors*

*are expected to develop and implement a disciplinary action program for their employees that must be included in the Contractor's Health and Safety Program."* (E2)

**Owner Led (with separate discipline procedures for contractors and employees):**
*CONTRACTOR Compliance Policy*
*Each CONTRACTOR/SUBCONTRACTORS must comply with [G4] Construction Safety Requirements. CONTRACTOR/SUBCONTRACTORS will be subject to the following actions if non-compliance is noted by the [G4] safety consultant or the RE/RI. The [G4] SC and/or RE/RI will explain the [G4] policy and their discipline policy for contractors. Should a requirement not be followed a notice of "non-compliance" will be sent to the offending contractor. It is the responsibility of the notified contractor to correct the noted issue.*

> *• 1st violation—a copy of the verbal/written warning will be given to the CONTRACTOR/SUBCONTRACTOR for non-compliance with [G4] policies/requirements*
>
> *• 2nd violation—verbal/written warning given on the same issue will be given to the CONTRACTOR/SUBCONTRACTOR for non-compliance with [G4] Construction Safety Requirements. The Contractor must review the relevant sections of this document and the site safety plan, and submit a plan to bring the violation into compliance including any training to be completed. A copy of the written warning will be included in the monthly Project Safety reports.*
>
> *• 3rd Violation or noncompliance of the same issue will result in the [G4] classifying the CONTRACTOR/SUBCONTRACTOR as "non-responsible" for any future [G4] Projects for the next three years.*

*EMPLOYEE Compliance Policy*
*Each CONTRACTOR will advise employees and SUBCONTRACTORS that unsafe acts or conditions will not be tolerated and that violators will be subject to the following [G4] actions if an unsafe act or condition is noted.by the [G4] SC or RE/RI:*

> *• 1st violation—verbal/written warning will be given to the employee and to the CONTRACTOR/SUBCONTRACTOR. [G4] SC or RE/RI will explain the violation and the [G4] discipline policy. A copy of the written warning will be included in the monthly Safety reports.*
>
> *• 2nd violation—verbal/written warning given to the employee, the CONTRACTOR/SUBCONTRACTOR. The warning will be discussed by the SC or RE/RI with the CONTRACTOR/SUBCONTRACTOR. Employee must re-attend the [G4]/Veolia orientation for retraining. A copy of the written warning will be included in the monthly Safety reports.*
>
> *• 3rd Violation or one willful disregard to safety guidelines by an employee will result in a written notice of termination from the [G4] JOB SITEs for one year.*

*An unresolved unsafe condition or behavior will require a meeting with the OWNER (RE/RI and RM) and SC. Should any CONTRACTOR/ SUBCONTRACTOR or vendor allow such non-compliance and/or unsafe practices, the OWNER will stop the work until the issue is resolved.*
*In the event of imminent danger work shall be stopped immediately.*
*The appeal process for a 3rd violation will follow the procedure in the GENERAL CONDITIONS of the contract (see sections on DISPUTES and REMEDIES).* (G4)

**Owner and Contractor hybrid:**
*"An accountability plan shall be developed, communicated, and implemented for the project. This plan shall include disciplinary procedures to be utilized for noncompliance with safety requirements. Violations may result in work stoppage and progressive enforcement action pursuant to the terms of the contactor's contract with [U2]. If violations are severe or repetitive, the general contractor/construction manager or subcontractor/trade contractor may be prohibited from working at [U2] in the future."* (U2)

*Resulting Context*
Creating and sharing a predetermined disciplinary program clearly establishes the consequences for non-compliance with applicable safety procedures. Whether the owner prefers to run the program, require the contractor to create their own, or share some of the responsibility is a matter of preference and fit for each owner to determine.

*Rationale*
Owners must have a pre-agreed to course of action available to them for instances of non-compliance with regulatory safety requirements or general safety practices that does not rise to the level of **RETAIN CONTROL**.

*Related Patterns*
**SITE ORIENTATION TRAINING** – Contract employees must be made aware of the disciplinary program in effect for the project to ensure it effectively impacts their behavior.

**COMPANY SAFETY POLICY** – The contractor's disciplinary policy is often included as a component of their company safety policy. The owner should ensure the disciplinary policy in place is clearly communicated, especially in cases where an owner-specific policy may vary from the company procedure.

**SITE SPECIFIC SAFETY PLAN** – the Site specific safety plan should clearly communicate the discipline policy in effect.

SUBSTANCE ABUSE PREVENTION POLICY – Violations of the substance abuse policy subject the individual to the disciplinary policy.

**DESIGNATED ON-SITE SAFETY MANAGER** – The designated on-site safety manager is often responsible for controlling the disciplinary program.

**FLOW DOWN CONTRACTUAL REQUIREMENTS** – All workers of all tiers are subject to the disciplinary policy.

*Related Antipatterns*

**RETAIN CONTROL** – Owners must give consideration to their actions in this process to ensure they do not unintentionally retain control. The right to remove workers from a contractor's crew, to enforce personnel corrective actions, or to retrain violating employees could each support a conclusion that the owner has retained control.

**FAILURE TO FOLLOW UP ON A DOCUMENTED NONCONFORMANCE** – If an owner is made aware of a severe violation, they must act in a reasonable manner to ensure the hazard is corrected by the contractor. Proof that the owner was aware of the issue and did nothing may increase their risk of liability in future fact-finding scenarios.

*Disambiguation*

None

### 5.4.5 OWNER REQUIREMENTS DO NOT RELIEVE CONTRACTOR

*Also Known As:*

*Problem*

Owners publishing safety requirements may unintentionally take on additional responsibility for safety performance of the contractor.

*Context*

As employers, each contractor is the primary entity responsible for the safety of their employees. Owners must ensure their contracts and documents addressing safety management make clear that the contractor remains responsible for the safety of their workers.

*Forces*

- The general rule of owner non-liability holds the owner to little or no responsibility for safety of contractor employees.
- Owners who publish safety requirements may unintentionally take on additional responsibility.

*Solution*

Owners must clearly state in contract documents, safety requirements, and other communications that the contractor retains the full responsibility for the safety of their employees.

**Independence**

Contractors may vary in the degree to which they are truly independent. In instances where a contractor is not truly independent, owners must recognize the extent to which they may be responsible for a worker's safety. Contractors can be divided a number of ways based on the manner in which they conduct their work. A typical independent contractor who maintains their responsibility for the safety of their employees may be described as:

*Independent Contractor – Hired to perform a specific job task with a defined scope of work. They are expected to work independent of [P1] supervision and accomplish the job without direct supervision from [P1]. Specific characteristics of an independent contractor include, but not limited to:*

1. *Contractor obtains all licenses or registrations required to perform work;*
2. *Contractor has furnished all tools or equipment necessary to perform work;*
3. *Contractor has the right to hire and fire employees as contractor sees necessary to perform work ([P1] cannot tell them who to hire or how to use staff internally to perform work); and*
4. *Contractor represents self to the public as an independent business.* (P1)

The following cases for example would require additional scrutiny and control by the owner:

*Guided Contractor – Receiving daily guidance by [P1] contractor host/Equipment Owner regarding safety and health issues associated with [P1] operations and facilities. A guided contractor would include but not be limited to contractors that are brought on-site in an emergency manner.*

*Supervised Contractor – "leased" or "temporary" employees which are supervised on a day-to-day basis by [P1].* (P1)

Similarly, when the owner hires one or more contractors, but functions as an internal construction manager or general contractor, the owner retains the responsibility of a controlling contractor. For example:

*"When an internal [M4] Division, Department, Section, or Group hires a Prime Contractor or is acting in the role of the General Contractor/Contractor, they shall be responsible for performing all required functions of the General Contractor and shall make provisions to satisfy the base requirement of a dedicated on-site Safety Representative as specified in Section 1.6 Safety Representation."*(M4)

<u>*Examples*</u>
*"The contractor is responsible for the safety of its employees, and the [U2] is committed to helping the Contractor meet its goals of a safe, healthy and productive work site. The [U2] provides this document to help contractors provide a safe environment for their employees and everyone else who visits the project site. The applicability of this document is for all construction projects administered through [U2]. The contractor nevertheless remains solely responsible for the safety of all persons and property, and must take whatever steps may be necessary or appropriate to assure that safety. The contractor is solely responsible for the development and implementation of their own safety program. This document provides contractors with [U2]'s specific requirements for incorporation into their safety programs implemented pursuant to their contracts for work to be performed at [U2]. This document is not designed to address every possible environmental, safety, or health issue. No specific requirements given herein are intended to limit, replace or supersede applicable provisions of federal, state, and municipal safety laws. The requirements in this document apply to all new construction, renovation, alteration, and demolition projects conducted by general contractors/construction managers, subcontractor/trade contractors and their respective employees.*

*The contractor shall comply with applicable provisions of federal, state, and municipal safety laws and building codes. This document outlines contractual requirements as well as suggests the roles and responsibilities various parties have for construction safety, identifies key facility resources, outlines minimum safe work requirements, and provides guidelines for responding to potential emergencies. This document, however, does not relieve any contractor of its obligations to (1) control the means and methods by which it and its employees, subcontractor/trade contractors and agents perform work or services at [U2]; (2) independently ascertain what health and safety practices are appropriate and necessary for the performance of such Work; and (3) develop, implement and enforce a comprehensive health and safety program appropriate for the Work or services performed that complies with all rules, regulations and industry standards, including permits, governing the contractor and the Project.*

*In various places, this document requires contractors to develop and administer plans for safety, fire prevention and other environmental, health and safety issues on a Project. The [U2] shall have the right, but not the obligation, to review and comment on any such plan and any amendments to it. The contractor shall carefully consider all [U2] comments on the Plan, but the* *contractor bears final responsibility for scope, detail, implementation, enforcement and administration of all such plans. Neither any comments offered by [U2] nor the failure of [U2] to offer any comments shall in any way reduce the contractor's responsibility for safety.*

*The provisions set forth in this document are intended to either be in addition to or clarify the requirements of the contract documents. This document shall never be interpreted as lessening or superseding any requirement set forth in the contract documents. Additional site-specific safety requirements may be mandated under the contract "Special Conditions"* (U2)

The owner's program is supplemental to the regulatory requirements:
*"The Project Safety Requirements are a supplementary document to all governmental rules, codes and regulations, and does not negate, abrogate, alter or otherwise change any provisions of these rules, codes and/or regulations, and is intended to supplement and enforce the individual program of each trade Contractor and to coordinate the overall safety effort. It is understood that the ultimate responsibility for providing a safe place to work rests with each individual trade Contractor."* (E1)

The contractor is not relieved of any responsibility:
*"These rules in no way relieve any Contractor or its employees from the applicable Occupational Safety and Health Standards (OSHA) and regulations or rulings made by government authorities or agents. Additionally, these rules do not release Contractors from the responsibilities and conditions contained in the contract documents. Contractors are responsible for compliance with all federal, state, and local authority safety regulations, which are applicable to the project."* (E3)

Contractor is responsible for "all applicable requirements":
*"Each Contractor is responsible for ensuring compliance with 'all applicable requirements' that govern their work at [G2] facilities, including any consensus standards incorporated therein by reference."* (G2)

*Resulting Context*

By including language similar to the examples above, the owner provides clear notice to the contractor that while the owner has a safety requirement and specific safety language, the ultimate responsibility for safety still rests with them. In cases where the owner is working with employees who are not truly independent contractors, care should be taken to make safety management decisions on a case specific basis.

*Rationale*

Owners seeking to improve the safety performance of their contractors will often create construction safety requirements. It is critical that the owner only does so with a clear understanding of the potential impact control may have on their liability, and a clear plan to limit increases to their liability. One of the most important methods for this is to clearly explain in contract language that the owner is not responsible for the management of worker safety.

*Related Patterns*

**COMPANY SAFETY POLICY** – Each employer is responsible for the management of the safety of their employees. This includes supplying all applicable instruction and coordination of safety activities.

**SITE SPECIFIC SAFETY PLAN** – Contractors are similarly responsible for coordinating safety at each work location. A controlling contractor may choose to write a single site safety plan and require each subcontractor to adopt it or may require each employer to develop their own.

**ESCALATING DISCIPLINARY PROCEDURES** – The contractor is ultimately responsible for enforcing strict discipline on the worksite. If the contractor does not meet this requirement, the owner may choose a course of action provided in the contract documents to relieve the contractor of their responsibilities.

*Related Antipatterns*

**RETAIN CONTROL** – The owner must ensure their involvement on a work site, including their published documents and their actual actions, do not take responsibility for the contractor's control and management of safety considerations on the site.

*Disambiguation*

None

## 5.5 Owner Presence Patterns of Construction Safety Management

*Table 5-5. Owner Presence Patterns of Construction Safety Management Summary*

| Number | Name | Description |
|---|---|---|
| 5.5.1 | GOAL SETTING | The owner's clear statement of interest in the safety performance of their contractors has been shown to improve the contractor's safety performance |
| 5.5.2 | OWNER REVIEW OF SUBMITTED SAFETY PLANS | The owner must reserve the right to review plans submitted to comply with these requirements, but must ensure that the responsibility for them remains with the contractor |
| 5.5.3 | OWNER EVALUATION OF CONTRACTOR | The owner develops a process to evaluate the contractor before, during, and after the completion of their work |

### 5.5.1 GOAL SETTING

*Also Known As:*
Vision Statement, Value Statement, Safety Expectations

*Problem*
New contractors and their employees may not be familiar with the importance the owner places on safety culture and performance.

*Context*
The owner is in a unique position to impact the safety performance of contractors on their properties. One if the most important things for an owner to do is to make clear their interest and focus on contractor safety.

*Forces*
- The owner has "purse string authority" and can set the expectations for safety on a project.
- Contractors control safety and may have different mindset on safety from the owner.

*Solution*
Owners include some form of goal setting language in the safety requirements for contractors to orient them to the expectations of the owner.

*Examples*
*"[E3]'s goal is to achieve an accident-free work environment. Any Contractor performing work for [E3] is expected to maintain safety as the highest priority. [E3] considers no phase of the construction or maintenance process more important than preserving the well-being of all employees and clients of the company. The realization of this goal depends heavily upon the active participation and cooperation of Contractors' project managers, foremen, supervisors, employees, and the coordination of their efforts with [E3] in implementing some basic program components."* (E3)

*"Vision Statement:*
*Everyone takes personal ownership and is proactive to ensure a value-added work atmosphere where we all are injury free and protective of the environment. Every individual in the plant has the following rights and obligations with regard to Safety, Health and the Environment:*

*V. RESPONSIBILITY*
*Rights*
- *Training applicable to job*
- *Tools and equipment to safely perform task*
- *Individual involvement and participation*
- *Personal responsibility for safety of self, coworkers and others in the facility*
- *Safe and healthy work conditions*
- *Resources for continuous improvement*
- *Safety information*
- *Open communication*

- *Time to do a task safety*
- *Authority to suspend operations if viewed to be unsafe*

*Obligations*

- *Understand and comply with procedures, seek clarification as appropriate*
- *Safe use /operation of tools and equipment*
- *Individual involvement and participation*
- *Intervene on unsafe conditions / practices*
- *Report of near misses and injuries*
- *Understand and support EHS policy*
- *Identify opportunities to improve policies and procedures*
- *Safe handling of materials*
- *Act on behalf of [P1] to protect the community, our customers and the environment.”* (P1)

*Resulting Context*

By showing the project team members that the owner is interested and invested in the safety performance of the project, all parties start from a common point.

*Rationale*

Research has repeatedly shown that the single most impactful action an owner can take is to make clear their interest in safety and the welfare of the workers involved. By clearly setting safety related goals at the outset of the project, the owner is indicating the importance they set on worker wellbeing.

*Related Patterns*

**SITE ORIENTATION TRAINING** – The site orientation training is an excellent opportunity to impress upon the workers that the owner is both interested and involved in their safety. The owner may choose to share their goals for construction safety at a PRECONSTRUCTION SAFETY MEETING and ask the contractor to share this information in each orientation.

**SAFETY CONCERN REPORTING MECHANISM** – The safety concern reporting mechanism is an excellent tool for the owner to show the workers that they take their observations and concerns seriously.

**OWNER EVALUATION OF CONTRACTOR** – The owner should set clear goals for the performance of any contractor working for them, and reward good performance in the evaluation phase.

OWNER CONSTRUCTION SAFETY COMMITTEE – The owner’s construction safety committee should be responsible for setting the corporate goals and vision, as well as evaluating the owner’s performance after the fact.

OWNER SUPPORTED SAFETY INCENTIVE PROGRAM – An owner supported incentive program may only be effective if it is tied to forward looking incentives and not backward-looking safety metrics.

OWNER SAFETY POLICY SIGNED BY EXECUTIVE – The statement from top leadership of the owner signifies the clear importance and intent from the owner's executives and sets the tone of the owner's goals.

*Related Antipatterns*
**RETAIN CONTROL** – The owner must ensure that to achieve their goals they do not substitute their management of safety for that of their independent contractor.

**OWNER ENDORSEMENT AND CONCURRENCE** – The owner must communicate their goals in a way that does not approve, sign on to, or authorize the contractors work.

*Disambiguation*
None

### 5.5.2 OWNER REVIEW OF SUBMITTED SAFETY PLANS

<u>*Name*</u>
Owner Review of Submitted Safety Plans

<u>*Also Known As:*</u>
Owner Review of Safety Documentation

<u>*Problem*</u>
Owners must conduct their due diligence in reviewing the management of safety by contractors in a way that does not overstep their role in the process.

<u>*Context*</u>
Owners have long reviewed safety plans submitted by contractors, but many take a dangerous step into approving or otherwise endorsing a plan as sufficient for use on a project.

<u>*Forces*</u>

- Owners must ensure their actions do not **RETAIN CONTROL** of the contractor's operations.
- The owner may treat the review of safety plans as a risk management activity, choosing to become involved in requesting improvement or clarification on a case by case basis.
- Contractors are ultimately responsible for producing, disseminating, and enforcing applicable safety plans.

<u>*Solution*</u>
Owners provide for their ability to review and comment on submitted safety plans, but clearly state that the owner's actions do not relieve the contractor of their express responsibility for their safety management of their employees and the project.

<u>*Examples*</u>
*"In various places, this document requires contractors to develop and administer plans for safety, fire prevention and other environmental, health and safety issues on a Project. The [U2] shall have the right, but not the obligation, to review and comment on any such plan and any amendments to it. The contractor shall carefully consider all [U2] comments on the Plan, but the contractor bears final responsibility for scope, detail, implementation, enforcement and administration of all such plans. Neither any comments offered by [U2] nor the failure of [U2] to offer any comments shall in any way reduce the contractor's responsibility for safety."* (U2)

<u>*Resulting Context*</u>
By creating the "right but not the obligation" for an owner review of contractor safety plans and assessments, the owner can assure itself the contractor is meeting the expectations for safety management. In cases where the contractor clearly demonstrates that their programs are insufficient to cover the hazards of the work, the owner can intervene, up to and including contract termination.

*Rationale*

The owner in this situation is conducting a risk assessment of the contractor, not purely reviewing plans for compliance with applicable safety regulation. While compliance is important, it is ultimately the contractor's responsibility. The owner may use their discretion on which plans to request improvement from the contractor.

*Related Patterns*

**COMPANY SAFETY POLICY** – The owner may choose to review a contractor's corporate safety procedure to ensure the company has sufficient plans in both breadth and detail.

**SITE SPECIFIC SAFETY PLAN** – The owner may also choose to review site specific safety plans to ensure the contractor has addressed any hazards known to the owner and to understand the level of planning and control the contractor has put into the project.

**ACTIVITY HAZARD ANALYSIS** – Owners may choose to review the activity hazard analyses conducted prior to the start of the project to satisfy the question of whether the contractor has sufficiently evaluated their scope of work and the associated hazards and mitigating steps.

**DAILY TASK SAFETY PLANNING** – During the project, the owner may choose to audit the day to day task safety plans to ensure the contractor is adequately planning the work of each subcontractor every day.

**FLOW DOWN CONTRACTUAL REQUIREMENTS** – Each contractor and sub-contractor should be subject to owner plan review.

**OWNER REQUIREMENTS DO NOT RELIEVE CONTRACTOR** – Contractors must understand that the owners due diligence efforts do not relieve them of the responsibility to manage safety on the project.

**OWNER EVALUATION OF CONTRACTOR** – The owner should continuously evaluate the contractor through all phases of the project.

*Related Antipatterns*

**RETAIN CONTROL** – Owners must ensure they are not dictating means and methods to contractors or in any other way specifying safety performance to the contractor in a way that compromises the contractor's oversight of the work.

**OWNER ENDORSEMENT AND CONCURRENCE** – Owners must also ensure they do not accept responsibility for the contents of a plan by approving, accepting, endorsing, certifying, or validating the submission. Owners may acknowledge receipt or submission of the plan, and if necessary, ask for clarification or further development of the plan.

*Disambiguation*

None

### 5.5.3 OWNER EVALUATION OF CONTRACTOR

*Name*
Owner Evaluation of Contractor

*Also Known As:*
Contractor Safety Audit

*Problem*
If owners are not aware of the safety performance of their contractors, they are likely to miss potential issues to their contracting process and assume a greater risk of an impact to their operation.

*Context*
Contractor safety management is likely to span a wide range of performance. The owner must understand how contractors are performing and work to improve or limit the underperforming entities from work.

*Forces*

- Owners must evaluate the contractors they hire to ensure they are capable of delivering their scope of work.
- Owners need the safety management efforts they expend to mean something to the contractors.

*Solution*
Owners must proactively evaluate the performance of their contractors in terms of safety management performance to ensure they are meeting their requirements and do not constitute an unacceptable risk.

**Three Phases**
*Prior to work*
The owner may choose to use a PREQUALIFY CONTRACTORS process to evaluate contractors prior to work. This is also an appropriate period for the **OWNER REVIEW OF SUBMITTED SAFETY PLANS.**

*During work*
While the contractor is on-site and actively delivering the scope of work, the owner should evaluate the contractor's ongoing safety activities. Examples of documentation available for audit include but are not limited to:

- Reviewing submitted **INCIDENT REPORTING**
- Requesting back up documentation for reported **STATISTIC AND SAFETY ACTIVITY REPORTING**.
- Attending **DAILY SAFETY COORDINATION** meetings.
- Revisiting the findings of **GROUP SAFETY INSPECTIONS** and INDEPENDENT CONTRACTOR INSPECTIONS to ensure corrective actions have been taken and remain effective.

- Reviewing completed **DAILY TASK SAFETY PLANNING** forms.
- Reviewing completed **PERMITTING** documentation.
- Reviewing any **ESCALATING DISCIPLINARY PROCEDURES** taken by the contractor.

*Post job completion*
Following the completion of a project, some owners also conduct a post-work evaluation. This is especially useful for two-way communication between the contractor and the owner to acknowledge achievements and learn from areas of potential improvement discovered during the project.

*"At the end of every project, a [P4] representative should complete a Contractor Evaluation Form. In the case of full time contractors, the form should be completed every quarter by representatives of the maintenance department and project engineering.*

*The evaluation form rates the contractor's performance in the areas of safety, work quality, personnel and equipment. The evaluation will be discussed with the contractor in order to improve performance on the next job. The evaluations will be used by the purchasing department to rate contractors for inclusion or exclusion to [P4]'s approved contractors list."* (P4)

<u>*Example Language*</u>
**Solution using an internal process:**

*"Contractor and its subcontractors shall be evaluated by Company on their performance and Work practices, including but not limited to compliance with federal, state, and local health and safety requirements as well as the requirements of this Manual. To verify compliance, Contractor may be subject to detailed safety audits, including site visits, attendance at Contractor's safety meetings, and inspection of equipment, any time during the term of the working relationship with Company.*

*Contractor shall cooperate fully with Company's audits and inspections.*

*Company shall document Contractor's safe and at-risk safety performance.*

*The evaluation results may be used in the decision process for awarding future Work.*

*If Contractor's overall safety performance evaluation is unsatisfactory and Contractor is unwilling to demonstrate prompt and satisfactory improvement, Company may remove Contractor from the Work, as more particularly set forth in the agreement between Contractor and Company.*

*Serious, willful, or repeated violations of safety requirements by Contractor may be deemed a material breach of Contractor's agreement and reason for contract termination.*

*If a safety violation is observed by Company, Company shall discuss the violation with Contractor's representative on the job at the time of discovery. Contractor shall promptly implement corrective actions and establish measures to prevent a recurrence.*

*If in Company's sole discretion, the Work presents a condition that is unsafe or harmful to people, property, or the environment, Company shall have the right to suspend the Work, in whole or in part, until the condition is corrected or terminate the Work."* (P2)

**Solution using third party vendor:**

*"The Contractor Safety Assessment Program provides a quantitative measure of job site conditions and compliance with [E1] policy and requirements. The assessment form can be viewed by going to the [E1] Contractor Information web page at [WEBSITE]. At this site a link to the form is provided within the section entitled Forms and Permits. A copy of the Observation/Action Item Form which listed identified defects, will be left with the Contractor's Project Supervisor at the conclusion of every assessment. Discrepancies will be followed up with a certified letter to the Contractor's Ranking Designated Safety Representative."* (E1)

*Resulting Context*

The **OWNER EVALUATION OF CONTRACTOR** process is the primary day to day activity of an OWNER ON-SITE SAFETY MANAGER or in cases where the owner does not employ a full time safety professional, the owner's project manager. It ensures the owner is aware of the practice the contractor is using to manage contractor safety and allows for audit and oversight of the quality of the contractor's safety management without **RETAIN CONTROL** of the process.

*Rationale*

Research has shown that engaged owners are able to produce a better level of safety performance from their contractors. By following this evaluation pattern, based on the "trust but verify" model of oversight, the owner is able to ensure the contractor is actually performing these safety activities at a high level without becoming part of the process, and accepting a resulting increase in liability.

*Related Patterns*

**INCIDENT REPORTING** – All submitted incident reports will be used to evaluate the performance of the contractor.

**STATISTIC AND SAFETY ACTIVITY REPORTING** – Owners should use submitted statistics, especially including OSHA categories such as recordable and lost time incidents, along with hours worked to calculate OSHA incident rates.

**DAILY SAFETY COORDINATION** – The daily safety coordination meeting or process is an excellent situation to observe the contractors control and management of safety.

**GROUP SAFETY INSPECTIONS** - The group safety inspection is an excellent situation to observe the contractors control and management of safety.

INDEPENDENT CONTRACTOR INSPECTIONS – The owner may choose to evaluate each contractor and subcontractor based on the quality and thoroughness of each inspection conducted, especially on a regular basis as the work is conducted.

**DAILY TASK SAFETY PLANNING** – Completed written daily task safety plans are an excellent document to audit in the field to ensure contractors are completing the planning process in a complete and thoughtful manner.

**PERMITTING** – Completed permits are another potential audit point the owner may choose to use to evaluate the contractor's performance.

PREQUALIFY CONTRACTORS – Should an owner choose to prequalify contractors, a rigorous and transparent evaluation process allows the owner to make appropriate decisions.

OWNER ON-SITE SAFETY MANAGER – The owner's on-site safety manager is the primary point of evaluation of the contractor, especially as work progresses in active construction.

OWNER CONSTRUCTION SAFETY COMMITTEE – The owner's construction safety committee may also be a primary evaluation point for contractors, especially in the prequalification and post-work stages.

*Related Antipatterns*
**RETAIN CONTROL** – The owner must ensure that their evaluation of the contractor does not become direct enough to constitute control over the contractor's operations.

**FAILURE TO FOLLOW UP ON A DOCUMENTED NONCONFORMANCE** – Should an evaluation of a contractor indicate significant compliance issues, the owner must take proactive steps to document their efforts to have the contractor correct these problems.

NEGLIGENT CONTRACTOR SELECTION – While there may be limited avenues for actual liability to the owner for negligent retaining of a contractor, the owner should attempt to remove the unqualified, incapable, and those unwilling to follow regulatory or owner procedures from their jobsites.

*Disambiguation*
**GROUP SAFETY INSPECTIONS** vs. **OWNER EVALUATION OF CONTRACTOR**
The group safety inspection is a regularly occurring inspection of the jobsite conducted by a representative of each employer on the jobsite, where the owner evaluation of the contractor occurs before, during, and after the project to assess the performance of the contractor from the owner's perspective.

PREQUALIFY CONTRACTORS vs. **OWNER EVALUATION OF CONTRACTOR**
Prequalifying contractors involves gathering as much probative information on the contractor's ability to complete a job in a safe manner as possible. This information should include the owner's evaluation of the contractor from previous interactions as often as possible.

# 6 DISCUSSION

This chapter will summarize and discuss the findings in Chapters 4 and 5 as well as highlight specific answers to each of the four original subquestions identified at the outset of this work. An appraisal of the limitations and strengths of this research will highlight the unique qualities of this work and how this may impact the application of these findings. Finally, the contribution of this work and the resulting implications will be addressed.

## 6.1 Research Summary

This research adopted a pragmatic philosophical worldview and a transformative mixed-methods approach to knowledge generation, allowing the researcher to combine a variety of methods and procedures to produce new and interesting information. The literature frequently ties owner impact and success to contractor safety performance metrics such as recordable incident rates, and in doing so, fails to capture a realistic assessment of the owner's choices and experience. This research used grounded theory and pattern language to generate an accurate representation of the range of owner practices in contractor safety management. A primary finding of this work is the misalignment between the existing literature and current owner practices. Owners always face tradeoffs when implementing practices, and these conflicting forces have also been documented for each of the practices identified. Finally, the problematic practices of owners have been highlighted to identify those practices owners may engage in that do not align with their given management approach.

Thirty-six positive practices were identified across four major categories, including communication, site safety planning, contractual control, and owner involvement. Further, eleven potentially negative practices were also identified that often led to owners unknowingly and needlessly taking responsibility, and by extension, shouldering liability for their contractors. Finally, the forces that an owner must consider when balancing competing priorities were identified to help understand the often conflicting priorities that shape owner behavior.

What this research has done, instead of proffering to have solved the issue of owner's challenges with engagement, is provide a rationale for each practice, document the tradeoffs to be considered, and show how each of these potential management practices impacts other related practices. This research has also, for the first time, explored the practices and behaviors that owners fall into that create unexpected problems and challenges. Collectively, these insights can inform owners, researchers, contractors, and other participants in the construction process of how they can realize the benefits available to all when safety performance improves, risks are reduced, and unforeseen costs and project impacts are limited.

## 6.2 Summary of Findings by Subquestion

Four subquestions presented at the outset of this research helped to refine the purpose and shape the scope of the study. Each is reviewed below with specific answers and insights gained through the work.

### 6.2.1 Subquestion 1: What are the Current Practices of Owners?

The first subquestion directing this study was: *What are the current practices of owners as they relate to management of the safety of independent contractors?* Several different steps in the research aimed to answer this question. A review of the current published safety requirement manuals identified the most common practices in use by owners today, as shown in *Table 4-3. Owner Practices by Percent Usage and Overall Rank*, which is reproduced below.

*Table 4-3. Owner Practices by Percent Usage and Overall Rank*

| Practice | Owner Score | Owner Rank |
|---|---|---|
| Immediate Reporting of Accidents | 98 | 1 |
| Permitting | 81 | 2 |
| Required Site Orientation Training | 81 | 2 |
| Set Construction Safety Goals | 77 | 4 |
| Emergency Planning | 77 | 4 |
| Activity Hazard Analysis | 74 | 6 |
| Flow Down Requirements | 67 | 7 |
| Task Specific Training | 65 | 8 |
| Project-Specific Safety Plan | 61 | 9 |
| Substance Abuse Program | 61 | 9 |
| Stop Work Authority | 60 | 11 |
| Escalating Discipline | 60 | 11 |
| Pre-Construction Safety Meeting | 58 | 13 |
| Document Does not Relieve Contractor | 58 | 13 |
| Owner Evaluation of Contractor (Audits) | 58 | 13 |
| Independent Contractor Inspections | 51 | 16 |
| Company Safety Program | 48 | 17 |
| Designated Safety Manager | 47 | 18 |
| Regular EHS Meetings | 47 | 18 |
| Toolbox Talks | 47 | 18 |
| Maintain Contractor Safety Statistics | 42 | 21 |
| Safety Concern Reporting | 40 | 22 |
| Owner Construction Safety Manager | 40 | 22 |
| Safety Inspections (Site) | 37 | 24 |
| Daily Task Safety Planning | 35 | 25 |
| Provide Emergency Contact to Owner | 33 | 26 |
| Manual/policy signed by executive | 33 | 26 |
| Defined Competent Persons | 32 | 28 |
| Owner Concurrence | 30 | 29 |
| Daily Safety Coordination Meeting | 28 | 30 |
| Injury and Illness Prevention Plan | 23 | 31 |
| Job Safety Board | 23 | 31 |
| Prequalify Contractors | 21 | 33 |
| Contractor Sign-Off on Requirements | 21 | 33 |
| Required Safety Management Program | 19 | 35 |
| High Hazard Planning Procedure | 16 | 36 |
| High Hazard Plan to Owner | 14 | 37 |
| 10-Hour Training | 14 | 37 |
| Owner Construction Safety Committee | 12 | 39 |
| Implementing Safety Incentive Programs | 12 | 39 |
| Controlled Insurance Programs | 9 | 41 |

Owners tended to use requirements that forced contractors to plan work in advance. Examples include permitting, emergency planning, activity hazard analysis, and site safety planning. Training for the workers was also frequently addressed, evidenced by site orientation and task specific training requirements. Owners also required the prompt reporting of incidents occurring on project sites.

These current owner practices varied within each individual sector and across different sectors. This variation appears to stem from the organic development of each individual owner's contractor safety program. Interview participants identified the tendency of owners to implement new requirements in piecemeal fashion, as they responded to problems and issues related to contractor safety performance.

Owners are also informed by case law and existing legal guidance. An owner paying close attention to legal precedent and the current limited obligation to become involved may be likely to shy away from many of these practices, while an owner informed largely by the safety professional and the academic body of knowledge may take an entirely different path, fully engaging in safety management with their contractors. Specific characteristics of the owner may also impact their involvement. Governmental owners who enjoy the benefit of legal immunity in many cases for example, face a different level of liability than private sector owners, and tend to be more engaged. Other owners face additional regualtions that do not apply to others as broadly. One example is owners who must comply with process safety management (PSM) requirements in energy production and manufacturing enviroments or airports, which are seperately regulated by the Federal Aviation Administration (FAA).

This variation is to be expected due to the local characteristics of each owner, but is so significant that it appears to be nearly random. *Figure 4-1* illustrates this variation with each owner's use of safety requirements plotted by major category. While this variation can be useful in order for owners to control exactly what they need to with their independent contractors, it can make entry into the market difficult, time consuming, and expensive for new contractors.

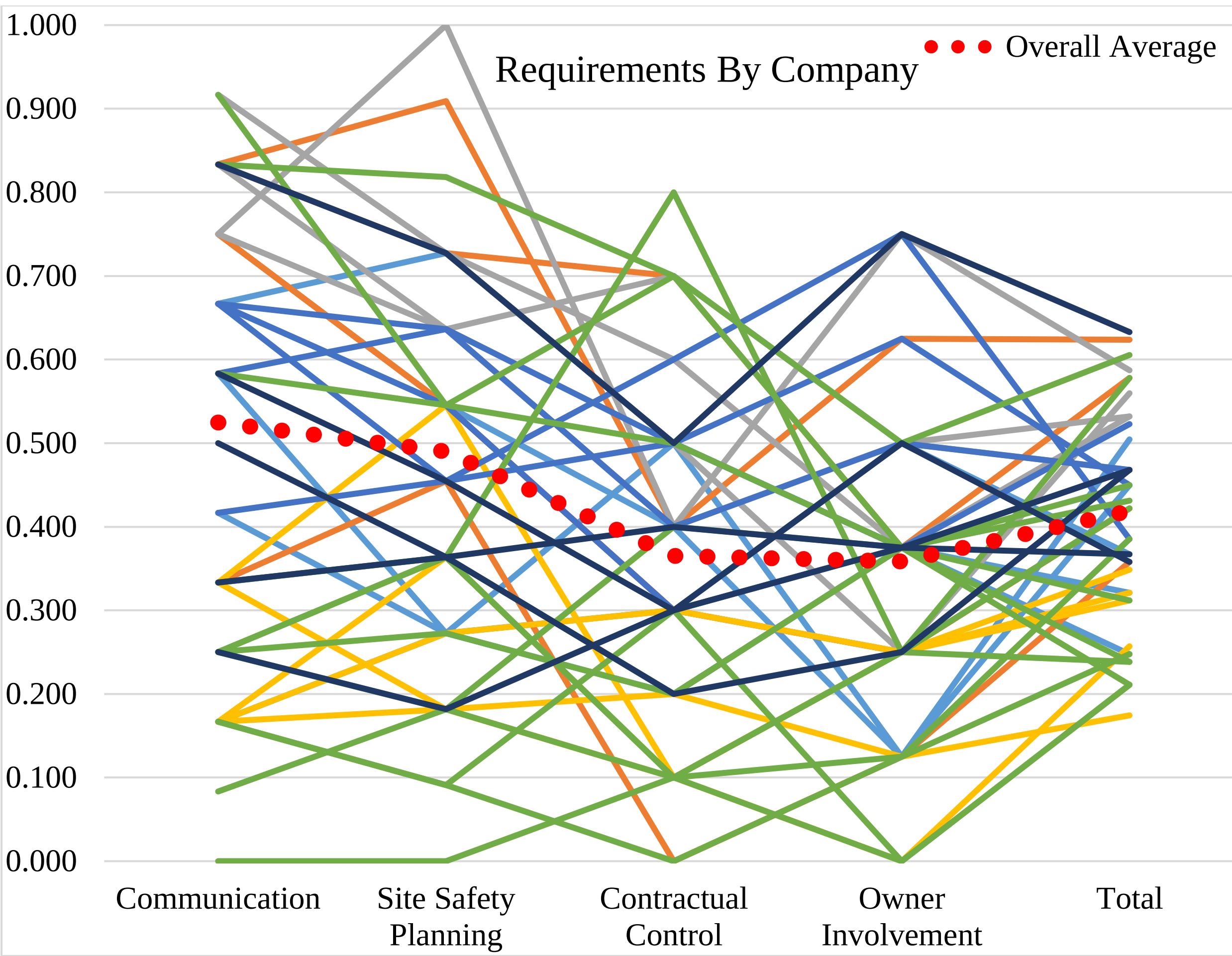



*Figure 4-1. Requirements Used by Major Category for Every Owner Evaluated*

Another interesting trend occurred when evaluating the difference in requirement usage by owners within the same industry sectors, as illustrated by *Figure 4-2* and *Figure 4-3*. The variation did not appear to decrease when considering owners from a single sector.

While the variation between different sectors and within each individual sector is not necessarily a bad thing, it does show the management practices across each industry to be highly variable. This is likely due to the fact that most owners have create their requirements programs in response to prior events, and each evolved organically. The intent of this research is to provide a resource for owners looking to develop their own approach to managing contractor safety. By creating the pattern language, an owner can evaluate the practices other owners have found to be helpful and make more informed decisions on their own practices.

### 6.2.2 Subquestion 2: What are the recommended practices for owners?

The second subquestion built upon the first in that the question shifted from what is current to what is best. Subquestion two asked w*hat are the recommended practices for contractor safety management for owners?* The academic literature is a good place to attempt to determine the best source of information for owners looking to shape their practices for managing contractors' safety. *Table 4-4. Ranking of Practices Based on Frequency of Academic Recommendation,* reproduced below, ranked the frequency of the practices discussed in eleven academic publications that recommended owner practices.

*Table 4-4. Ranking of Practices Based on Frequency of Academic Recommendation*.

*Table 4-4. Ranking of Practices Based on Frequency of Academic Recommendation*

| Practice | Academic Score | Academic Rank |
|---|---|---|
| Owner Evaluation of Contractor (Audits) | 91 | 1 |
| Designated Safety Manager | 91 | 1 |
| Task Specific Training | 82 | 3 |
| Safety Inspections (Site) | 82 | 3 |
| Maintain Contractor Safety Statistics | 82 | 3 |
| Set Construction Safety Goals | 73 | 6 |
| Owner Construction Safety Manager | 73 | 6 |
| Prequalify Contractors | 73 | 6 |
| Implementing Safety Incentive Programs | 73 | 6 |
| Immediate Reporting of Accidents | 64 | 10 |
| Project-Specific Safety Plan | 64 | 10 |
| Regular EHS Meetings | 64 | 10 |
| Activity Hazard Analysis | 55 | 13 |
| Pre-Construction Safety Meeting | 55 | 13 |
| Flow Down Requirements | 45 | 15 |
| Emergency Planning | 45 | 15 |
| Independent Contractor Inspections | 45 | 15 |
| Owner Construction Safety Committee | 45 | 15 |
| Permitting | 36 | 19 |
| Required Site Orientation Training | 36 | 19 |
| Substance Abuse Program | 36 | 19 |
| Escalating Discipline | 36 | 19 |
| High Hazard Planning Procedure | 36 | 19 |
| Document Does not Relieve Contractor | 27 | 24 |
| Company Safety Program | 27 | 24 |
| Daily Task Safety Planning | 27 | 24 |
| Owner Concurrence | 27 | 24 |
| Stop Work Authority | 18 | 28 |
| Toolbox Talks | 18 | 28 |
| Defined Competent Persons | 18 | 28 |
| 10-Hour Training | 18 | 28 |
| Safety Concern Reporting | 9 | 32 |
| Daily Safety Coordination Meeting | 9 | 32 |
| Manual/policy signed by executive | 9 | 32 |
| Required Safety Management Program | 9 | 32 |
| High Hazard Plan to Owner | 9 | 32 |
| Provide Emergency Contact to Owner | 0 | 37 |
| Contractor Sign-Off on Requirements | 0 | 37 |
| Injury and Illness Prevention Plan | 0 | 37 |
| Job Safety Board | 0 | 37 |
| Controlled Insurance Programs | 0 | 37 |

The practices, from the academic perspective, did not align with the actual practices of owners reflected in this work as discussed in *Section 6.2.1*. This difference was illustrated by *Table 4-6. Difference in Rank between Academic Recommendation and Owner Practice,* reproduced below. It seems that owners and academics concentrate on entirely different practices. This may be due to different focuses; owners are largely interested in practical management practices that help them to improve the contractors focus on safety and compliance, while academics focus on the practices that lead to lower incidence rates and other statistical indicators of exemplary safety performance. Both of these perspectives are important to consider.

*Table 4-6. Difference in Rank between Academic Recommendation and Owner Practice*

| Variance | Practice | Academic Rank | Owner Rank |
|---|---|---|---|
| -33 | Implementing Safety Incentive Programs | 6 | 39 |
| -27 | Prequalify Contractors | 6 | 33 |
| -24 | Owner Construction Safety Committee | 15 | 39 |
| -21 | Safety Inspections (Site) | 3 | 24 |
| -18 | Maintain Contractor Safety Statistics | 3 | 21 |
| -17 | Designated Safety Manager | 1 | 18 |
| -17 | High Hazard Planning Procedure | 19 | 36 |
| -16 | Owner Construction Safety Manager | 6 | 22 |
| -12 | Owner Evaluation of Contractor (Audits) | 1 | 13 |
| -9 | 10-Hour Training | 28 | 37 |
| -8 | Regular EHS Meetings | 10 | 18 |
| -5 | Task Specific Training | 3 | 8 |
| -5 | Owner Concurrence | 24 | 29 |
| -5 | High Hazard Plan to Owner | 32 | 37 |
| -4 | Controlled Insurance Programs | 37 | 41 |
| -3 | Required Safety Management Program | 32 | 35 |
| -1 | Independent Contractor Inspections | 15 | 16 |
| -1 | Daily Task Safety Planning | 24 | 25 |
| 0 | Pre-Construction Safety Meeting | 13 | 13 |
| 0 | Defined Competent Persons | 28 | 28 |
| 1 | Project-Specific Safety Plan | 10 | 9 |
| 2 | Set Construction Safety Goals | 6 | 4 |
| 2 | Daily Safety Coordination Meeting | 32 | 30 |
| 4 | Contractor Sign-Off on Requirements | 37 | 33 |
| 6 | Manual/policy signed by executive | 32 | 26 |
| 6 | Injury and Illness Prevention Plan | 37 | 31 |
| 6 | Job Safety Board | 37 | 31 |
| 7 | Activity Hazard Analysis | 13 | 6 |
| 7 | Company Safety Program | 24 | 17 |
| 8 | Flow Down Requirements | 15 | 7 |
| 8 | Escalating Discipline | 19 | 11 |
| 9 | Immediate Reporting of Accidents | 10 | 1 |
| 10 | Substance Abuse Program | 19 | 9 |
| 10 | Toolbox Talks | 28 | 18 |
| 10 | Safety Concern Reporting | 32 | 22 |
| 11 | Emergency Planning | 15 | 4 |
| 11 | Document Does not Relieve Contractor | 24 | 13 |
| 11 | Provide Emergency Contact to Owner | 37 | 26 |
| 17 | Permitting | 19 | 2 |
| 17 | Required Site Orientation Training | 19 | 2 |
| 17 | Stop Work Authority | 28 | 11 |

A third data source (to join the owner's practices and the academic recommendations) was added to the scope of this study to attempt to define the practices available to owners. *Table 4-7* illustrates the preferences and values of safety representatives gleaned through a survey completed as a part of this work. Safety professionals tended to focus on practices more like owners than academics. However, when comparing the safety professionals and owners, there was still less alignment than would be expected between these two, especially considering that many of these safety professionals are responsible for creating or enforcing owner policies. This may point to a different focus of the safety professional, who is much more interested in the 'how' of construction safety. They favored practices, such as high hazard planning procedures, notification to the owner, pre-construction safety meetings, stop work authority, and prequalifying contractors at significantly higher rates than did the owners.

*Table 4-7. Safety Professional Preferences and Values*

| Practice | Safety Professional Raw Score | Safety Professional Score | Safety Professional Rank |
|---|---|---|---|
| Permitting | 4.75 | 95 | 1 |
| Task Specific Training | 4.56 | 91 | 2 |
| Flow Down Requirements | 4.54 | 91 | 3 |
| Stop Work Authority | 4.52 | 90 | 4 |
| High Hazard Planning Procedure | 4.51 | 90 | 5 |
| Immediate Reporting of Accidents | 4.43 | 89 | 6 |
| Pre-Construction Safety Meeting | 4.41 | 88 | 7 |
| Document Does not Relieve Contractor | 4.38 | 88 | 8 |
| Prequalify Contractors | 4.36 | 87 | 9 |
| High Hazard Plan to Owner | 4.36 | 87 | 9 |
| Independent Contractor Inspections | 4.31 | 86 | 11 |
| Contractor Sign-Off on Requirements | 4.26 | 85 | 12 |
| Activity Hazard Analysis | 4.24 | 85 | 13 |
| Provide Emergency Contact to Owner | 4.19 | 84 | 14 |
| Owner Evaluation of Contractor (Audits) | 4.19 | 84 | 14 |
| Required Site Orientation Training | 4.16 | 83 | 16 |
| Project-Specific Safety Plan | 4.16 | 83 | 16 |
| Designated Safety Manager | 4.16 | 83 | 16 |
| Daily Task Safety Planning | 4.15 | 83 | 19 |
| Safety Concern Reporting | 4.11 | 82 | 20 |
| Substance Abuse Program | 4.11 | 82 | 20 |
| Required Safety Management Program | 4.11 | 82 | 20 |
| Safety Inspections (Site) | 4.06 | 81 | 23 |
| Company Safety Program | 4.03 | 81 | 24 |
| Owner Construction Safety Manager | 4.02 | 80 | 25 |
| Daily Safety Coordination Meeting | 3.97 | 79 | 26 |
| Set Construction Safety Goals | 3.97 | 79 | 26 |
| Emergency Planning | 3.95 | 79 | 28 |
| Owner Concurrence | 3.92 | 78 | 29 |
| Defined Competent Persons | 3.9 | 78 | 30 |
| Escalating Discipline | 3.82 | 76 | 31 |
| Regular EHS Meetings | 3.8 | 76 | 32 |
| Manual/policy signed by executive | 3.69 | 74 | 33 |
| Toolbox Talks | 3.68 | 74 | 34 |
| Controlled Insurance Programs | 3.68 | 74 | 34 |
| Injury and Illness Prevention Plan | 3.65 | 73 | 36 |
| Maintain Contractor Safety Statistics | 3.64 | 73 | 37 |
| Owner Construction Safety Committee | 3.34 | 67 | 38 |
| Job Safety Board | 3.29 | 66 | 39 |
| 10-Hour Training | 3.26 | 65 | 40 |
| Implementing Safety Incentive Programs | 2.91 | 58 | 41 |

Finally, with all three of these data sources identified, the final overall rank of practices was created and is reproduced below in *Table 4-8. Overall Rank of Practices*. This table considers the priorities of each perspective that influences how owners should interact and produces a new ranking of practices. These practices represent the best available information to owners on what practices are best to implement to influence construction safety.

As discussed in *Section 4.1.3.2*, each owner must carefully consider their objectives, preferences, and needs when selecting the practices they will or will not employ in furtherance of managing contractor safety. Business constraints, low level risk, resource limitations, and questions about owner expertise are all examples of reasons why owners may choose to be *less* involved, even though this decision may negatively impact safety performance. Ultimately, owners must make decisions about when, where, and how to be involved that are consistent with their ability to perform these expanded roles in construction safety.

A complete chart showing all of the columns in one view is provided in *Appendix F: Complete Pattern Analysis Chart.*

*Table 4-8. Overall Rank of Practices*

| Practice | Overall Rank | Academic Rank | Owner Rank | Safety Pro Rank |
|---|---|---|---|---|
| Immediate Reporting of Accidents | 1 | 10 | 1 | 6 |
| Task Specific Training | 2 | 3 | 8 | 2 |
| Owner Evaluation of Contractor (Audits) | 3 | 1 | 13 | 14 |
| Set Construction Safety Goals | 4 | 6 | 4 | 26 |
| Designated Safety Manager | 5 | 1 | 18 | 16 |
| Activity Hazard Analysis | 6 | 13 | 6 | 13 |
| Permitting | 7 | 19 | 2 | 1 |
| Project-Specific Safety Plan | 8 | 10 | 9 | 16 |
| Flow Down Requirements | 9 | 15 | 7 | 3 |
| Pre-Construction Safety Meeting | 10 | 13 | 13 | 7 |
| Emergency Planning | 10 | 15 | 4 | 28 |
| Safety Inspections (Site) | 12 | 3 | 24 | 23 |
| Required Site Orientation Training | 12 | 19 | 2 | 16 |
| Maintain Contractor Safety Statistics | 14 | 3 | 21 | 37 |
| Owner Construction Safety Manager | 15 | 6 | 22 | 25 |
| Regular EHS Meetings | 16 | 10 | 18 | 32 |
| Independent Contractor Inspections | 17 | 15 | 16 | 11 |
| Prequalify Contractors | 18 | 6 | 33 | 9 |
| Substance Abuse Program | 19 | 19 | 9 | 20 |
| Document Does not Relieve Contractor | 20 | 24 | 13 | 8 |
| Escalating Discipline | 21 | 19 | 11 | 31 |
| Stop Work Authority | 22 | 28 | 11 | 4 |
| Company Safety Program | 23 | 24 | 17 | 24 |
| Daily Task Safety Planning | 24 | 24 | 25 | 19 |
| Implementing Safety Incentive Programs | 25 | 6 | 39 | 41 |
| High Hazard Planning Procedure | 26 | 19 | 36 | 5 |
| Toolbox Talks | 27 | 28 | 18 | 34 |
| Owner Concurrence | 28 | 24 | 29 | 29 |
| Safety Concern Reporting | 29 | 32 | 22 | 20 |
| Defined Competent Persons | 30 | 28 | 28 | 30 |
| Owner Construction Safety Committee | 31 | 15 | 39 | 38 |
| Provide Emergency Contact to Owner | 32 | 37 | 26 | 14 |
| Manual/policy signed by executive | 33 | 32 | 26 | 33 |
| Daily Safety Coordination Meeting | 33 | 32 | 30 | 26 |
| Required Safety Management Program | 35 | 32 | 35 | 20 |
| High Hazard Plan to Owner | 35 | 32 | 37 | 9 |
| Contractor Sign-Off on Requirements | 37 | 37 | 33 | 12 |
| 10-Hour Training | 38 | 28 | 37 | 40 |
| Injury and Illness Prevention Plan | 39 | 37 | 31 | 36 |
| Job Safety Board | 40 | 37 | 31 | 39 |
| Controlled Insurance Programs | 41 | 37 | 41 | 34 |

### 6.2.3 Subquestion 3: What should owners not do?

The third subquestion was *what management practices, actions, roles, and structures should owners avoid?* These principles are captured in this work as antipatterns. It is overly simplistic to refer to these ideas simply as "problematic practices"; the bad practice comes from owners who behave in a way that does not consider their actions' impact and potential for unintended consequences.

The principle antipattern is **RETAIN CONTROL**, where the owner captures the contractor's ability to independently direct the work. Many of the remaining antipatterns in some way reflect the general idea that if the owner wishes to avoid taking on additional liability for the contractor's work, they must allow the contractor to control their own operation. This does not, however, preclude the owner from participating in the process of managing the safety performance on a project. In fact, these antipatterns simply highlight the missteps owners can make when attempting to act in a manner consistent with their moral and ethical obligations.

Owners must consider the impact of their actions when contemplating construction safety management and make informed decisions. In many cases evaluated as part of this research, owners were simply unaware of the impact their actions had on their relative level of control, and consequently, their liability. Owners who evaluate their process along with their capabilities, relative risk, and risk tolerance before making informed decisions about how to manage contractor safety are in the best position to understand their role and create sustainable improvement in the performance of their contractors.

There are situations where an owner is wise to limit the role they will play in contractor safety. An example is a project with relatively straightforward work and few unusual risks, or a project where the owner has neither the expertise nor the resources to effectively participate in the project's management. These situations may leave the owner only a few practices to cover, such as incident reporting and goal setting.

Other situations create scenarios where the owner is much more involved and is wise to intentionally retain significant control of a contractor's operation. These configurations are common in instances where the owner's enterprise is a highly sophisticated operation, and where the owner has the expertise and resources to manage both construction broadly and construction safety specifically. The court in *Funk v. GM,* for example, found that GM's "internal divisions drew up the building plans, wrote the contractual specifications, and acted as architectural supervisor." Other functions GM retained control of were identified as evidence of their duty to proactively manage safety, which they failed to do, resulting in their responsibility for coordination of the safety of the contractor.

Owners may also have an inherently riskier operation that they still control and which must interface with independent contractors. Examples would include operations where the owner's existing business process is inherently dangerous, such as chemical manufacturing or energy production. In these cases, the hazards under control of the owner are often far greater and far more complicated than the construction activities necessary for the contractor. In these cases, the owner must exert a stronger level of control to ensure that the owner's processes do not negatively impact the independent contractors.

Ultimately, owners must evaluate the characteristics of their enterprise and make informed decisions regarding involvement in contractor safety. Most of the negative consequences and questionable practices identified during this research are directly associated with owners who attempt to act in a morally and ethically responsible way but do not understand the impact of these actions.

### 6.2.4 Subquestion 4: What are the forces affecting these decisions?

Owners are bounded by finite resources, expertise, risk tolerance, and other characteristics that guide and direct their behavior, as illustrated in the previous three sections. The final subquestion was *what are the conflicting forces owners must consider behind each management practice or action?*

There are an infinite number of competing and conflicting forces that owners must balance in every facet of their operation. Those impacting the management of contractors are similarly varied. Forces identified in this study were summarized into eight main forces and presented to the focus group. *Table 4-14. Initial Force Ratings* shows these eight forces and each of the six focus group participants' opinion of the "value" each force held. These forces are sorted from most to least important.

*Table 4-14. Initial Force Ratings*

| | **1** | **2** | **3** | **4** | **5** | **6** | **Average** |
|---|---|---|---|---|---|---|---|
| **Force** | Value | Value | Value | Value | Value | Value | Value |
| Satisfying Regulatory Req. | 5 | 4 | 5 | 5 | 5 | 5 | 4.8 |
| Contractor Safety Performance | 5 | 5 | 5 | 5 | 5 | 3 | 4.7 |
| Safety Culture | 5 | 4 | 5 | 5 | 5 | 3 | 4.5 |
| Owner Risk/Liability | 3 | 4 | 5 | 5 | 5 | 5 | 4.5 |
| Contractor Relationship | 5 | 4 | 4 | 5 | 4 | 4 | 4.3 |
| Project Delay | 4 | 4 | 5 | 5 | 4 | 4 | 4.3 |
| Public Image/Perception | 4 | 3 | 5 | 5 | 4 | 4 | 4.2 |
| Cost Impact | 3 | 3 | 5 | 2 | 4 | 2 | 3.2 |

These forces were later used in part to calculate the utility of each practice presented to the focus group. The cumulative ranking of each force, across each of the 21 reviewed practices, is presented in *Table 4-16. Total Calculated Force Ratings for All Twenty-One Patterns*. The relative position of each force did not vary significantly from the initial rating to the rating conducted within the practices, indicating relative stability on this topic from the focus group participants.

*Table 4-16. Total Calculated Force Ratings for All Twenty-One Patterns*

| | **1** | **2** | **3** | **4** | **5** | **6** | **Average** |
|---|---|---|---|---|---|---|---|
| **Force** | Score | Score | Score | Score | Score | Score | Score |
| Contractor Safety Performance | 405 | 385 | 385 | 435 | 420 | 237 | 208.2 |
| Safety Culture | 420 | 328 | 390 | 450 | 425 | 252 | 207.9 |
| Satisfying Regulatory Req. | 355 | 288 | 365 | 430 | 375 | 405 | 203.8 |
| Owner Liability | 207 | 328 | 375 | 240 | 350 | 415 | 176.3 |
| Contractor Relationship | 375 | 308 | 248 | 420 | 272 | 276 | 174.5 |
| Public Image/Perception | 316 | 222 | 315 | 390 | 328 | 292 | 171.3 |
| Project Delay | 236 | 264 | 355 | 220 | 292 | 300 | 153.5 |
| Cost Impact | 177 | 192 | 375 | 108 | 260 | 138 | 115.1 |

Of interest, the force ratings compiled from the focus group show the traditional deliverables of construction management, cost and schedule, to be the last two rated forces among the eight summarized forces. This may more closely reflect a value judgement on behalf of the focus group participants instead of a true reflection on the importance of that factor affecting owner decisions. Many of the practitioners may feel a moral obligation to promote other forces over cost and schedule, but these are significant forces that significantly impact owner decision making.

Other specific tradeoffs that owners must navigate were identified in the course of the literature review, the requirement manual coding, and the successive participant interviews. A selected number of these tradeoffs are discussed below.

*Contractor Safety Performance vs. Liability*

One of the most important tradeoffs an owner must consider between forces is the risk related to contractor safety performance versus owner liability, as illustrated in the discussion of bad owner practices in *Section 6.2.3*. If the owner has no construction safety requirements or program at all, they likely have a higher risk of a construction incidents. The advantage, however, is they likely would have lower exposure to liability for an incident due to the general rule of owner non-liability and lack of retained control. Conversely, if the owner has such a highly involved and mature construction safety program that they have completely reduced or eliminated the risk of a construction incident, they have exercised more control and may be exposed to more liability in the event that an incident still occurs. The owner should balance these two extremes and find a point where their level of engagement eliminates unnecessary and catastrophic risk, but does not rise to the level of shifting liability typically borne by the contractor to the owner.

*Figure 6-1. Selecting Engagement to Minimize Risk and Liability* illustrates the conceptual balance between risk and liability as a driving factor for determining owner engagement. In this conceptual diagram, the owner's involvement is represented by the green line. The risk an owner is subjected to through a contractor's operation is indicated by the red line, while the owner's liability for the contractor and their operation is represented in blue. Both the red and blue lines have a minimum level of residual risk and liability, respectively, where further changes to an owner's operation have little to no impact. The location where the red risk line and the blue liability line cross represents the minimum of the combined risk and liability an owner faces. Consequently, the gray dotted line corresponds to the point on the green engagement line where an owner should place their level of involvement.

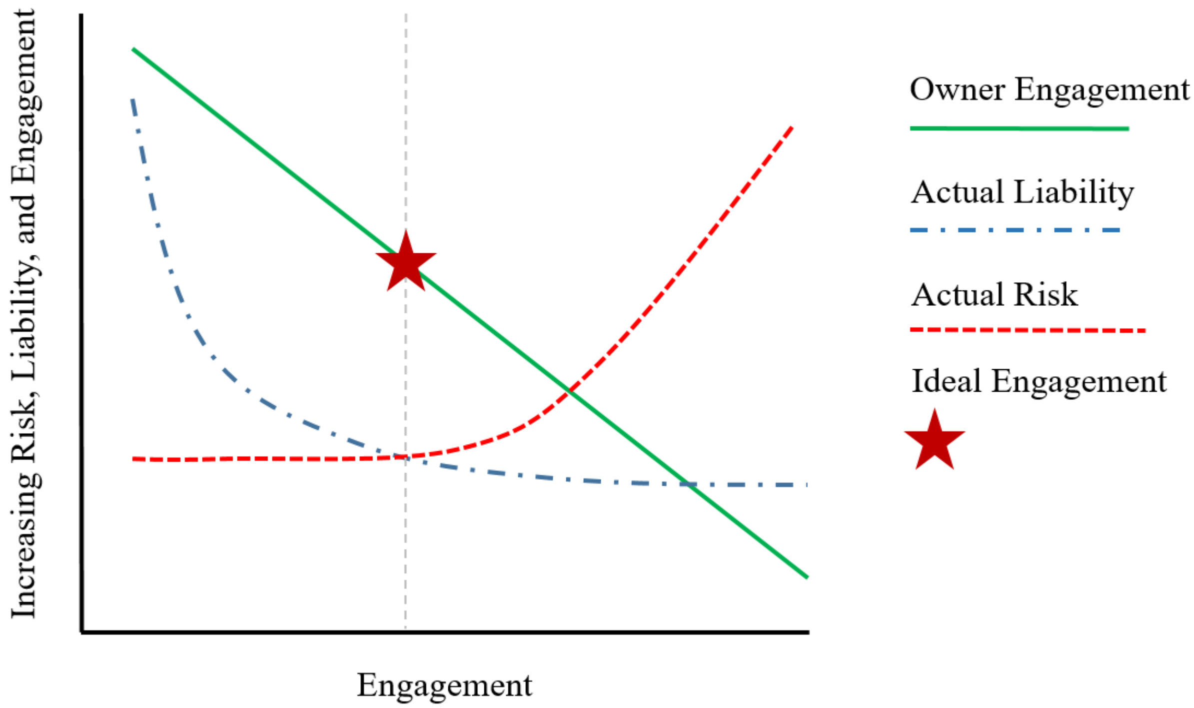



*Figure 6-1. Selecting Engagement to Minimize Risk and Liability*

The owner should also consider the initial configuration of risk and liability. Some projects or owner operations are inherently riskier than others. For example, overhauling a large power generation plant will be more dangerous than constructing of a single story commercial storefront. In this situation, the level of risk will dictate that the owner is more involved in the power plant project than they necessarily would be in the commercial project. *Figure 6-2. Differences in Initial Risk on Engagement* illustrates these two scenarios. The complex project is reflected on the left under "high risk," while the simple project would more closely resemble the low risk scenario on the right. Note the differences in theoretical ideal engagement while the potential liability arc remains the same.

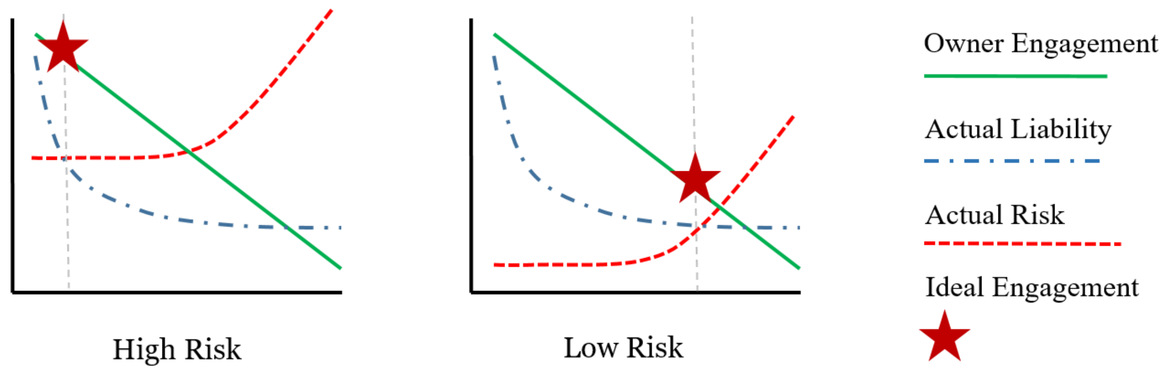



*Figure 6-2. Differences in Initial Risk on Engagement*

The same consideration is true for the potential liability an owner may face. This is illustrated in *Figure 6-3. Differences in Initial Liability on Engagement*. The government owner programs evaluated as part of this work were consistently more engaged and demanding. Part of this difference is likely the initial configuration of the government's potential liability. Because most governmental entities operate with a level of governmental immunity, these owners are likely to be consistently less worried about the added liability that comes with extra engagement.

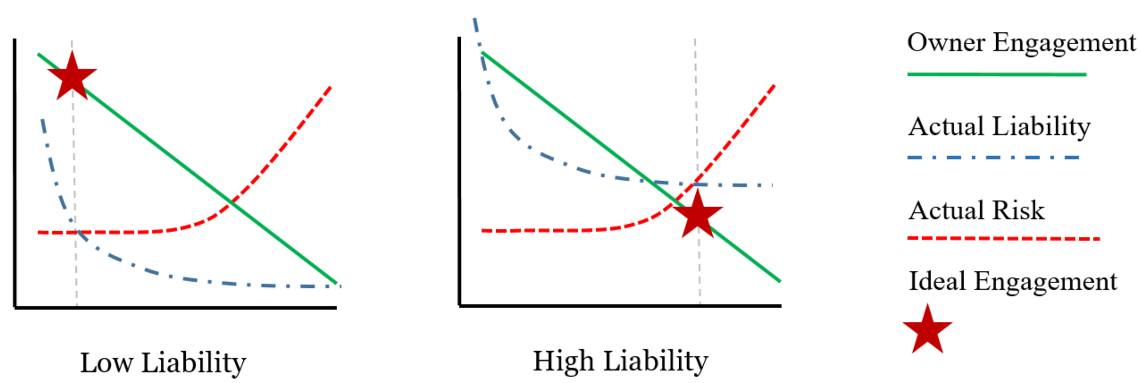



*Figure 6-3. Differences in Initial Liability on Engagement*

*Requirements vs. Cost and Time*

The number of requirements used by an owner has an influence on both the cost of their project and the time demands placed on owner staff and contractor staff. Research has already shown that owner's construction safety programs reduce safety incident rates and, ultimately, owner's cost. (Huang, 2006; Liu, 2017). There is, of course, an opportunity cost the owner and contractors must pay before any of these savings are realized. Logically speaking, if an owner has more practices they require a contractor to comply with, the cost of compliance is passed onto the owner in the form of overhead and management cost. Owners need to be cognizant of this tradeoff as they create their contractor safety programs. Interestingly, there is often a point where the increased effort (in the form of specific cost) actually creates a safer and more efficient work place, eventually reducing overall cost. While the owner is not likely to see these savings in a direct dollar amount, the reduced cost of construction should ultimately make contractors more competitive with these savings, in part, flowing to the owner.

The time necessary for the contractor to comply with owner requirements that exceed their regular business practices will also be a burden owners need to consider. The contractor's staff (that may otherwise be working on project documentation, quality control, scheduling and project controls and so on) will have to divert their progress to comply with safety directives. This is a burden the contractor must be aware of that adds to the cost of these requirements. Similarly, the owner must dedicate time to auditing the contractor and fulfilling other responsibilities that are explicitly and implicitly required by choosing to become engaged in contractor safety management.

Each owner is under a unique set of constraints. These may take many forms, but are often realized as issues with the eight forces identified above.

## 6.3 Limitations and Strengths

The grounded theory method allows for researcher involvement in a way that many other research methods restrict. This is both a limitation and a strength of this method. In the sense that this is a limitation, the researcher brings to the table experience in the area of contractor safety management. With this experience comes preconceived notions and an idea for how things should be done. To overcome this limitation, a number of data solicitation and collection strategies were utilized. Data triangulation was a consistent imperative and helped to shape the number of methods incorporated into this research. Peer debriefing and member checking were also included in the method to ensure that multiple voices informed, shaped, and confirmed the findings. The researcher having a significant amount of expertise and experience in this domain is also a major advantage of this research project as well. The researcher's resume is included in *Appendix G: Researcher Resume*. It is important to point out that the researcher is not an attorney and the guidance produced in this research is not to be construed as legal information, guidance, or direction.

Another limitation that this study brings is the treatment of owners in aggregate. While it has been mentioned in prior sections of this work, the owners included in this study are not representative of all owners who are buyers of construction services. Some owners, such as residential homeowners or unsophisticated commercial property owners, may not purchase major construction services more than a handful of times. The experience and practices for these owners are not reflected by the research presented here. Similarly, some owners are so complex that they control the contractor's operation and integrate their management processes into the contractor's operation. This type of owner is likely to have adopted all of the practices considered in this work and more due to their accepted role as a controlling entity in that scenario.

## 6.4 Contribution

Prior research described the evolving role of the owner in contractor safety management, from the early 1980s, assessing the impact in cost and performance, to more recently, advocating for ever-increasing levels of owner involvement. This perspective of complete owner engagement delivers on the moral and ethical driver for construction safety, but does not deliver a workable industry standard. Academia, industry, and owners need clear and consistent guidance focused on assessing each owner and project on a case by case basis. The implications this work places on theory, practice, and future research are discussed below.

The construction industry as a whole will benefit from the pattern language. As owners adopt the requirements-based approach to managing contractor safety described in the pattern language, their expectations from contractors will become more unified. Contractors will enjoy the reduced expectation to create a unique safety program for each project they wish to pursue. As rules become more consistent, workers will receive clear and stable safety procedures to follow from job to job, and this will help workers improve their actual safety behavior. As the safety efforts of the workers improve, injuries and their related costs will drop.

The pattern language approach to capturing and sharing knowledge has been applied to diverse domains, including architecture, software engineering, apparel design, teaching, and many others. This work is the first to apply the pattern language to the complex nature of construction safety management by clients and owners. This language is an evolving and growing set of patterns that can be adopted in whole or in part to suit a wide range of owners and industries. Future work can expand on the scope of this research using the framework developed here. For example, the pattern language could be adapted to project design, project management, quality, cost, schedule, or many other areas of interest in the field of construction management.

The idea of anti-patterns developed by Brown et al (1998) has also allowed this work to look at those practices owners knowingly or unknowingly adopt that actually add risk, rather than reduce it. A major contribution of this work is exploring this idea, and reporting these “problematic” practices in a comprehensive manner for the first time. By combining these antipatterns with the patterns developed from current practices in the literature, owners have a more complete view of the state of the art approach to independent contractor safety management.

Users of this pattern language will be able to quickly create a legal document holding contractors responsible for executing projects with a clear focus on construction safety practices. The owner, with these requirements established in the contract, can simply audit to ensure the contractors are protecting their workers, which will in turn reduce cost and limit liability. By using this “trust but verify” approach to managing contractors, traditional concerns of owners (based on inadvertently retaining control or interfering with a contract) are minimized, allowing every project participant to benefit from the owner’s involvement.

## 6.5 Implications

This work touches every construction project, every participant, and every person who enjoys the product of this industry. Controlling safety risks is not only a moral and ethical imperative, when done correctly it reduces costs and negative impacts and allows both owners and contractors to maximize their return on investment and profit respectively. Additional specific implications of this work are discussed below.

### 6.5.1 Implications for Practice

This is the first scholarly work that rejects the “more practices are better” approach, instead focusing on finding the right practices for each owner. An underlying assumption here is that these practices discussed in prior works are all able to improve performance. What determines the right practices for each owner is based largely on both their preferences and characteristics. Preferences that determine an owner’s involvement include their risk tolerance, their perceived value toward social responsibility, and relative aversion to conflict and litigation. Characteristics that may push an owner to one side of the engagement scale or the other include the size and complexity of their projects, the relative risk of the construction and owner-led operations, initial liability configuration, and the sophistication of owner when it comes to delivery of construction projects. Each situation remains fact-intensive and deserves careful consideration and action. The work practices, identified in this research as patterns, allow owners to understand the recommended practices of the industry and allow each to make a careful assessment of their best course of action.

It is not simply “be involved or don’t be involved;” each owner must carefully consider their characteristics and preferences and craft a management approach that is consistent with these qualities. Once a management approach is clearly articulated, owners must continually seek to behave in a manner that is consistent with this philosophy. Multiple correct paths are open to owners. An owner who has limited expertise and resources may rightfully allow the contractor the autonomy necessary to complete the work in their own way. Conversely, owners who have unique experience and expertise, who control unusual or extreme hazards, or closely guard their public image and reputation are all in a position to work with contractors to achieve exemplary levels of safety performance. This issue is one that has no single correct answer. Owners who understand the implication of their actions will make decisions that more appropriately fit their needs.

This work also allows owners to understand the interrelated nature of these practices. In many cases, if an owner decides to implement a requirement to impact the safety performance of their contractors, there are other ancillary patterns that support the execution of this pattern. If the owner does not also include these related patterns as requirements, contractors are left to manage the owner-implemented practices on their own. This may not be a bad thing, but it will introduce variability in the practices of the contractors and, in some cases, may not result in the outcome the owner originally intended.

Finally, this work shows that even the most conscientious owner is capable of taking actions that jeopardize their goodwill. The antipatterns identified and developed by this research show that owners must continue to walk a fine line when managing contractor safety and are wise to review these problematic practices and make decisions and conduct their operations with these lessons learned in mind.

### 6.5.2 Implications for Theory and Future Research

The existing approach to owner involvement in construction safety essentially states that owners are free to participate in safety or not, at their discretion. While this is legally true, significant research has shown that the owner is capable of improving safety performance of their contractors and that this improvement ultimately benefits owners in the form of reduced cost, delay, and publicity related to construction incidents. At this point, a formal theory of the owner's role needs to be developed to move the applied knowledge on this topic toward more complex and quantifiable understanding.

One facet the current approach fails to consider in owner engagement is the potential for negative outcomes from the owner's involvement. This is a major issue because of the fact that the entire focus of the owner is to balance risk and liability in managing contractor safety. Many decisions impact this tradeoff and they have yet to be fully explored in the literature. Owners starting with an inherent initial configuration of risk and liability that fail to consider where they fall on the spectrum are operating with inefficient knowledge and guidance and may actually harm their interests. This was illustrated in the discussion above in *Section 6.2.4*. In some cases, high levels of risk present in the owner's operation may dictate that the owner chooses to retain *more* control of the operation of the contractor than the average owner; likewise, lower levels of risk may push the owner to allow the contractor a greater degree of freedom in their management of contractor safety. The current scope of this work did not address this variable, and, as a result, the construction safety pattern language does not speak to owners who have differing levels of initial risk (beyond the general awareness that these different starting conditions necessitate a careful assessment of the owner's actions). The same can be said regarding the initial liability curve illustrated in *Section 6.2.4*. Owners who have a reduced initial liability associated with their work, (governmental entities, for example), are significantly likely to be more involved. Other owners have obligations beyond typical tort law standards due to hazardous or high profile hazards and operations. On the other hand, some owners contract for services at arm's length, bringing in third party developers or other managing entities in build-operate-transfer type arrangements. Each of the owners on the spectrum of risk and liability described above have applications to the pattern language, and significant work remains to assist these owners with their decision making process.

Another area the existing approach fails to investigate is the interplay between these practices. Many prior works recommend dozens of practices, but fail to consider the impact these practices may have upon each other or the conflicting (and often competing) reasons one practice may take precedence over others. Future theories of owner involvement in contactor safety must consider the limited resources of owners and account for how these practices interact with one another, in situations both supporting and interfering with the owner's objective. Future research is needed to take the network of connected practices and apply a more quantitative treatment to the impact from one practice to the next. The interplay between these practices needs to be more fully understood before more complex analysis can be undertaken. Ultimately a predictive tool or software that helps an owner decide what level of engagement minimizes their risk and liability could be developed with this information, expanding on this work and on the work of Liu (2017).

This work shows that many measurements of owners' contractor safety practices, often tied to recordable incident ratings or the number of lost time incidents, fail to consider true impact. These measures, while important, are incomplete in their ability to show the true value to owners and to the industry. Future work should expand the way in which both owners and researchers assess the performance of contractors relative to the owner's interaction. This would parallel the trend in the industry to move from lagging indicators of safety performance to predictive or leading performance indicators.

## 6.6 Conclusion

This research employed a new approach to determine the owner's role in construction safety, specifically seeking to understand the range of practices and the reasons for them. Existing research and owner practices were found to be misaligned, indicating that these two populations approach the same problem with differing perspectives and priorities. By combining several of these different perspectives, this research has attempted to balance competing interests and present a new understanding of what owner practices provide the greatest impact. Equally important to identifying which of the practices an owner should implement, the problematic practices and actions owners may unknowingly engage in have been added to the conversation. The points of conflict for patterns and antipatterns have been captured as forces, and help both owners and researchers to better understand the intricacies and complexity behind decision making.

So, how should an owner interact with contractors when it comes to construction safety? Unfortunately, the answer is still “it depends.” The fact that it depends, however, points to the need for owners to assess their operation and to make informed decisions about how to approach safety. The pattern language established by this research allows owners to understand the major practices that are in use in the industry, to understand how these practices impact each other, and to weigh the benefits and risks of each. By clarifying and presenting this information, it is the hope of the researcher that more owners are empowered to take a stand and implement a management approach that meets their needs. Owners are, after all, going to pay for it either way.

# APPENDICIES

# Appendix A: Example of Horizontal Coding Chart

| Alias | Type | Incident Reporting | Statistic and safety activity reporting | Daily safety coordination/meeting | Site-orientation training | Task-specific training | Group safety inspections | Independent contractor inspections | Toolbox/Tailgate Talks | Regular/Monthly EHS Meetings | Provide emergency contract to Owner | Safety reporting mechanism | Job safety board | Company safety policy | Site-specific safety policy | Injury and Illness Prevention Plan | Pre-construction safety meeting | Activity Hazard Analysis (AHA or JHA) | Daily Task safety planning (TSP) | Permitting | Defined competent persons | High hazard planning procedure | Substance abuse policy/program | Emergency Action Plan | Prequalify contractors | Designated on-site safety manager | Stop work authority | Flow down requirements | Escalating disciplinary procedures | OCIP/CCIP | OSHA 10-Hour for ALL workers | Contractor must sign off on requirements | Document does not relieve contractor | Require safety management system | Goal Setting (zero harm, no injuries) | High Hazard procedure notification to owner | Owner Review of Safety Plans | Owner Evaluation of Contractor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | A11 | A12 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | B10 | B11 | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | D1 | D2 | D3 | D4 |
| | | 42 | 18 | 12 | 35 | 28 | 16 | 22 | 20 | 20 | 14 | 17 | 10 | 17 | 25 | 8 | 20 | 27 | 12 | 34 | 12 | 6 | 24 | 32 | 9 | 20 | 26 | 29 | 26 | 4 | 6 | 9 | 25 | 8 | 33 | 6 | 13 | 25 |
| | | 0.98 | 0.42 | 0.28 | 0.81 | 0.65 | 0.37 | 0.51 | 0.47 | 0.47 | 0.33 | 0.40 | 0.23 | 0.48 | 0.61 | 0.23 | 0.58 | 0.74 | 0.35 | 0.81 | 0.32 | 0.16 | 0.61 | 0.77 | 0.21 | 0.47 | 0.60 | 0.67 | 0.60 | 0.09 | 0.14 | 0.21 | 0.58 | 0.19 | 0.77 | 0.14 | 0.30 | 0.58 |
| P1 | Petrochemical | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| P2 | Petrochemical | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| P3 | Petrochemical | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| P4 | Petrochemical | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| P5 | Petrochemical | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 |
| E1 | Energy | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| E2 | Energy | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| E3 | Energy | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| E4 | Energy | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| E5 | Energy | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 |
| G1 | Government | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 |
| G2 | Government | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| G3 | Government | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| G4 | Government | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| G5 | Government | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |
| H1 | Healthcare | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| H2 | Healthcare | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| H3 | Healthcare | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| H4 | Healthcare | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| H5 | Healthcare | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| T1 | Transportation | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| T2 | Transportation | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 |
| T3 | Transportation | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| T4 | Transportation | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| T5 | Transportation | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| U1 | University | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| U2 | University | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| U3 | University | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| U4 | University | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| U5 | University | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |
| U6 | University | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| U7 | University | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| U8 | University | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| U9 | University | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| U10 | University | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| U11 | University | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| U12 | University | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| U13 | University | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| M1 | Manufacturing | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| M2 | Manufacturing | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| M3 | Manufacturing | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| M4 | Manufacturing | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |

*Figure 7-1. Sample Horizontal Coding Chart*

## Appendix B: Example of Vertical Coding

A1 – Incident Reporting

Why does the owner want to be notified 8-Hrs in advance of OSHA? Added Potential for liability?

with all pertinent information. (Reference Accident/Incident reporting format contained herein)
7. Reporting a work related fatality immediately to the [G1] Safety Director; Project Officer; Local authorities; OSHA within eight (8) hours; and [CITY BUILDING AUTHORITY] (B.E.S.T. Squad).

Accidents Involving Injury and/or Property Damage
The contractor's competent Site Supervisor/Job Foreman or a competent person must:

Immediate Notification

1. Send for appropriate medical personnel and/or public rescue service.
2. Notify the Director of Safety and/or the [G1] Safety Officer immediately of any accident/incident.

Interim Steps

3. Remove and/or keep back all non-essential personnel.
4. Protect against further damage where possible.
5. Where the possibility of fire, explosion, or electrical injury exists, take additional measures as necessary to protect against any further injury.

M a Restriction
Photo Restriction
Preserve Scene

6. Make no comments to the media, general public, or all others. Refer all inquiries to the [G1] Project Officer.
7. No on-site photographs are to be taken except on approval of the Project Officer.
8. Within immediate area of accident scene, nothing is to be disturbed nor removed after proper evacuation of injured employee. Investigating personnel must be able to inspect the undisturbed scene. Incident Invest.
9. Prepare the [G1] Job Site Incident Report and within 24 hours of an incident for presentation to the [G1] Project Officer.

Will GC's push back? what information?

10. Provide necessary information to the injured worker's employer in order to prepare and submit Form C-2 to the [G1] within 24 hours of the incident.

The [G1] Project Officer Must
1. Report all accident and incidents as per guidelines outlined herein not defined
2. Notify the Director of Safety and/or the [G1] Safety Officer immediately of any accident/incident.

Owner-led Investigation?
P: Reporting Incident
P: Filing Initial Report
P: Comp Investigation
what purpose?

Initiate a full investigation and ensure that a Jobsite Incident Report is completed within 24 hours of the accident. The [G1]'s Insurance is to be notified within 24 hours and an Employer's Report of Work-Related Accident/Occupational Disease (C-2) Exhibit is to be completed and submitted A copy of the Jobsite Incident Report is to be faxed to the IG's office within 24 hours of any accident or injury. CIP?
4. The Jobsite Incident Report shall be completed using the guidelines established in the section entitled: Jobsite Incident Report Format, included herein.
5. Review and sign all accident reports. Ensure that the reports are complete and that the action indicated to prevent a recurrence is adequate and effective.

what role for owner? why?

Fat/Cat - Outdated
Distinguish btw Reportable and Recordable

Fatal Accident Reporting
In the event an employee of a contractor or subcontractor is involved in a construction accident leading to death, or should three or more workers be hospitalized as a result of the same accident, the Occupational Safety & Health Administration is to be notified within 8 hours of accident by calling the local OSHA number or OSHA Hot line at 1-800-321-OSHA.

Not owners Responsibility
what do owners want to know?

*Figure 7-2. Vertical Coding Chart Sample 1*

A1 – Incident Reporting

Why does the owner want to be notified 8-Hrs in advance of OSHA? Added Potential for liability?

with all pertinent information. (Reference Accident/Incident reporting format contained herein)
7. Reporting a work related fatality immediately to the [G1] Safety Director; Project Officer; Local authorities; OSHA within eight (8) hours; and [CITY BUILDING AUTHORITY] (B.E.S.T. Squad).

Accidents Involving Injury and/or Property Damage
The contractor's competent Site Supervisor/Job Foreman or a competent person must:

Immediate Notification

1. Send for appropriate medical personnel and/or public rescue service.
2. Notify the Director of Safety and/or the [G1] Safety Officer immediately of any accident/incident.

Interim Steps

3. Remove and/or keep back all non-essential personnel.
4. Protect against further damage where possible.
5. Where the possibility of fire, explosion, or electrical injury exists, take additional measures as necessary to protect against any further injury.

M a Restriction
Photo Restriction
Preserve Scene

6. Make no comments to the media, general public, or all others. Refer all inquiries to the [G1] Project Officer.
7. No on-site photographs are to be taken except on approval of the Project Officer.
8. Within immediate area of accident scene, nothing is to be disturbed nor removed after proper evacuation of injured employee. Investigating personnel must be able to inspect the undisturbed scene.

Incident Invest.

9. Prepare the [G1] Job Site Incident Report and within 24 hours of an incident for presentation to the [G1] Project Officer.

Will GCs push back? what information?

10. Provide necessary information to the injured worker's employer in order to prepare and submit Form C-2 to the [G1] within 24 hours of the incident.

The [G1] Project Officer Must
1. Report all accident and incidents as per guidelines outlined herein not defined
2. Notify the Director of Safety and/or the [G1] Safety Officer immediately of any accident/incident.

Owner-led Investigation?
P: Reporting Incident
P: Filing Initial Report
P: Comp Investigation
what purpose?

3. Initiate a full investigation and ensure that a Jobsite Incident Report is completed within 24 hours of the accident. The [G1]'s Insurance is to be notified within 24 hours and an Employer's Report of Work-Related Accident/Occupational Disease (C-2) Exhibit is to be completed and submitted A copy of the Jobsite Incident Report is to be faxed to the IG's office within 24 hours of any accident or injury.

CIP?

4. The Jobsite Incident Report shall be completed using the guidelines established in the section entitled: Jobsite Incident Report Format, included herein.
5. Review and sign all accident reports. Ensure that the reports are complete and that the action indicated to prevent a recurrence is adequate and effective.

↳ what role for owner? why?

Fat/Cat - Outdated
Distinguish btw Reportable and Recordable

Fatal Accident Reporting
In the event an employee of a contractor or subcontractor is involved in a construction accident leading to death, or should three or more workers be hospitalized as a result of the same accident, the Occupational Safety & Health Administration is to be notified within 8 hours of accident by calling the local OSHA number or OSHA Hot line at 1-800-321-OSHA.

↳ Not owners Responsibility

what do owners want to know?

*Figure 7-3. Vertical Coding Chart Sample 2*

## Appendix C: IRB Approval for Interviews

MICHIGAN STATE
UNIVERSITY

# Initial IRB Application Determination *Exempt*

February 3, 2017

To: Mohamed El-Gafy
114 Human Ecology

Re: **IRB# x17-148e** Category: Exempt 2
**Approval Date:** February 3, 2017

Title: The Owner's Role in Construction Safety Management: A Pattern Language

The Institutional Review Board has completed their review of your project. I am pleased to advise you that your **project has been deemed** as **exempt** in accordance with federal regulations.

The IRB has found that your research project meets the criteria for exempt status and the criteria for the protection of human subjects in exempt research. **Under our exempt policy the Principal Investigator assumes the responsibilities for the protection of human subjects** in this project as outlined in the assurance letter and exempt educational material. The IRB office has received your signed assurance for exempt research. A copy of this signed agreement is appended for your information and records.

**Renewals**: Exempt protocols do not need to be renewed. If the project is completed, please submit an *Application for Permanent Closure*.

**Revisions**: Exempt protocols do not require revisions. However, if changes are made to a protocol that may no longer meet the exempt criteria, a new initial application will be required.

**Problems**: If issues should arise during the conduct of the research, such as unanticipated problems, adverse events, or any problem that may increase the risk to the human subjects and change the category of review, notify the IRB office promptly. Any complaints from participants regarding the risk and benefits of the project must be reported to the IRB.

**Follow-up**: If your exempt project is not completed and closed after three years, the IRB office will contact you regarding the status of the project and to verify that no changes have occurred that may affect exempt status.

Please use the IRB number listed above on any forms submitted which relate to this project, or on any correspondence with the IRB office.

If we can be of further assistance, please contact us at 517-355-2180 or via email at IRB@msu.edu. Thank you for your cooperation.

c: Zachary Hansmann

Office of Regulatory Affairs
Human Research Protection Programs

Biomedical & Health Institutional Review Board (BIRB)

Community Research Institutional Review Board (CRIRB)

Social Science Behavioral/Education Institutional Review Board (SIRB)

Olds Hall
408 West Circle Drive, #207
East Lansing, MI 48824
(517) 355-2180
Fax: (517) 432-4503
Email: irb@msu.edu
www.hrpp.msu.edu



*Figure 7-4. IRB Approval Memo for Interviews*

# Appendix D: Semi-Structured Interview Questionnaire

**Informed Consent Semi-Structured Interview on Construction Safety Management**

**1. EXPLANATION OF THE RESEARCH and WHAT YOU WILL DO:**
You are being asked to participate in a research study seeking to understand the Owner's Role in Construction Safety Management.

- To participate in this phase of the research, you only need answer the questions to the best of your ability and share the best practices and lessons learned you have developed in your professional experience.
- You must be at least 18 years old to participate in this research.

**2. YOUR RIGHTS TO PARTICIPATE, SAY NO, OR WITHDRAW:**

- Participation in this research project is completely voluntary. You have the right to say no. You may change your mind at any time and withdraw. You may choose not to answer specific questions or to stop participating at any time.

**3. CONTACT INFORMATION FOR QUESTIONS AND CONCERNS:**
If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury, please contact the lead researcher:


Dr. Mohamed El-Gafy
552 W. Circle Drive, Room 102
East Lansing, MI 48824
elgafy@msu.edu
(517)432-6512


**4. DOCUMENTATION OF INFORMED CONSENT.**
You indicate your voluntary agreement to participate by beginning this interview.

*Table 0-1. Participant Identification and Recruitment*

| Assessment Rubric for Participant Selection |
|---|
| **Role, Achievement, or Experience** |
| Attorney, contract administrator, risk manager, regulator, safety professional, or academic |
| Experience representing owners who manage the safety operations of contractors |
| Participant in the construction delivery process at any level, including contractor's safety managers |
| Member of a domain specific industry association (ABA, ASSE, COAA, CII, ASCE, RIMS, etc) |
| Previous participant as an expert in similar studies |

*Table 0-2. Assessment Rubric for Participant Qualification*

| Assessment Rubric for Participant Selection | | | |
|---|---|---|---|
| **Achievement or Experience** | **Points (each)** | **Answer** | **Points** |
| Professional Registration (CSP, PE, ARM, etc.) | 3 | | |
| Year of professional experience | 1 | | |
| Conference presentation | 0.5 | | |
| Member of a committee | 1 | | |
| Chair of a committee | 3 | | |
| Peer-reviewed journal article | 2 | | |
| Faculty member at an accredited university | 3 | | |
| Writer/editor of a book on contractor safety | 4 | | |
| Writer of a book chapter on contractor safety | 2 | | |
| Relevant advanced degrees: | | | |
| BS | 4 | | |
| MS | 2 | | |
| PhD | 4 | | |
| JD | 3 | | |
| Minimum for selection | | 2 categories | 6 points |
| Score | | | |

**Demographics**

1. Please describe your experience related to contractor safety management.

**Iba and Yoder Questions** *(these 3 questions are repeated until responses are exhausted):*

2. What are the key management techniques Owner's should apply when trying to improve the safety performance of independent contractors that you feel are worth sharing?
3. What happens when these key techniques are not done or done improperly (Digging)?
4. When does this problem occur (Context)?

5. Have you ever seen any owner practices create problems for an owner?

**Targeted Experience**

6. What entity do you feel is responsible for safety on a project?
7. Are you familiar with the general rule of owner non-liability?
8. Are you familiar with existing best practices identified by the safety industry and academic community?
9. What do you feel is the ideal approach for an owner to take regarding contractor safety management?
    a. What other approaches have you seen?
10. Have you ever worked with an owner or been involved in a project where the owner was highly engaged with the contractors regarding their safety?
    b. What worked?
    c. What didn't work?
11. Have you ever seen an owner become involved in the management of contractor safety that ultimately created problems for the owner?

**Practices**

12. What owner specific requirements (exceeding OSHA) have you seen in use? (ie, 6'fall protection requirement for all trades)
    a. What would you recommend?
    b. What would you not recommend?
13. What owner specific requirements would you not recommend?

**Expanding This Work and Participating in Future Work**

14. Would you be willing to receive and comment on a draft version of the findings from this phase of the research or participate in future phases?
15. Do you know anyone else who may have expertise on this topic?

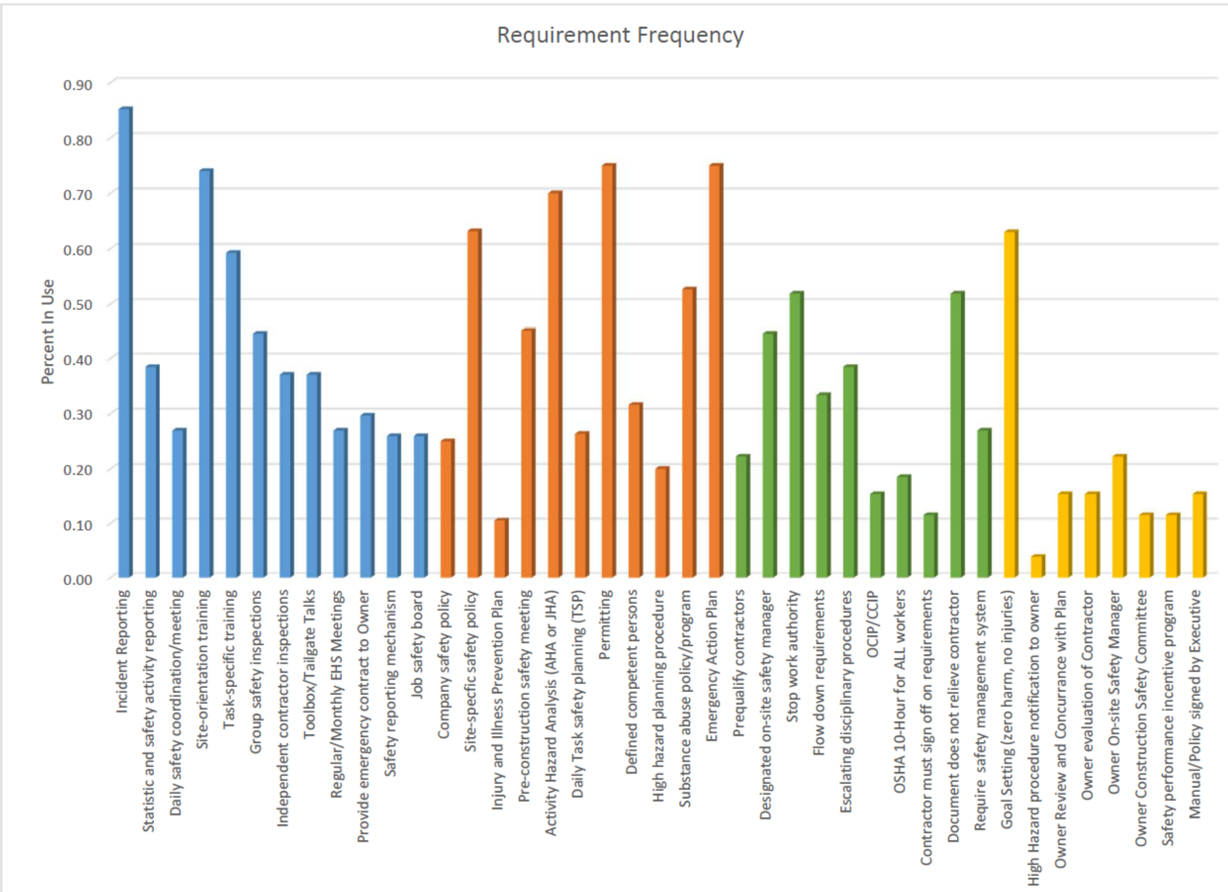



*Figure 7-5. Owner Requirements for Construction Safety Management*

1. What are your thoughts on Owners requiring the following practices:
    a. Injury and Illness Prevention Plan (I2P2)
    b. High hazard planning procedure
    c. Contractor Controlled Insurance Programs (CCIP)
    d. OSHA 10-Hour training for all workers
    e. Contractor sign-off on requirements manual contents
    f. High hazard procedure notification to owner
    g. Owner review and concurrence with the plan
    h. Owner evaluation of contractor
    i. Owner construction safety committee
    j. Safety performance incentive plan
    k. Owner manual signed by chief executive

## Appendix E: IRB Approval for Online Survey

MICHIGAN STATE
UNIVERSITY

**Initial IRB Application Determination *Exempt***

February 13, 2017

To: Mohamed El-Gafy
114 Human Ecology

Re: **IRB# x17-216e** Category: Exempt 2
**Approval Date:** February 13, 2017

Title: Owner Safety Representative Preference and Value Survey

The Institutional Review Board has completed their review of your project. I am pleased to advise you that **your project has been deemed as exempt** in accordance with federal regulations.

The IRB has found that your research project meets the criteria for exempt status and the criteria for the protection of human subjects in exempt research. **Under our exempt policy the Principal Investigator assumes the responsibilities for the protection of human subjects** in this project as outlined in the assurance letter and exempt educational material. The IRB office has received your signed assurance for exempt research. A copy of this signed agreement is appended for your information and records.

**Renewals**: Exempt protocols do not need to be renewed. If the project is completed, please submit an *Application for Permanent Closure*.

**Revisions**: Exempt protocols do not require revisions. However, if changes are made to a protocol that may no longer meet the exempt criteria, a new initial application will be required.

**Problems**: If issues should arise during the conduct of the research, such as unanticipated problems, adverse events, or any problem that may increase the risk to the human subjects and change the category of review, notify the IRB office promptly. Any complaints from participants regarding the risk and benefits of the project must be reported to the IRB.

**Follow-up**: If your exempt project is not completed and closed after three years, the IRB office will contact you regarding the status of the project and to verify that no changes have occurred that may affect exempt status.

Please use the IRB number listed above on any forms submitted which relate to this project, or on any correspondence with the IRB office.

If we can be of further assistance, please contact us at 517-355-2180 or via email at IRB@msu.edu. Thank you for your cooperation.

c: Zachary Hansmann

Office of Regulatory Affairs
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Biomedical & Health Institutional Review Board (BIRB)

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408 West Circle Drive, #207
East Lansing, MI 48824
(517) 355-2180
Fax: (517) 432-4503
Email: irb@msu.edu
www.hrpp.msu.edu



*Figure 7-6. IRB Approval Memo for Online Survey*

# Appendix F: Complete Pattern Analysis Chart

| Variance | Safety Pros and Academics | Safety Pros and Owners | Academic and Owners | Practice | Overall Rank | Score SUM | Rank SUM | Academic Score | Academic Rank | Owner Score | Owner Rank | Safety Professional Raw Score | Safety Professional Score | Safety Professional Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | -4 | 5 | 9 | Immediate Reporting of Accidents | 1 | 251 | 17 | 64 | 10 | 98 | 1 | 4.43 | 89 | 6 |
| 12 | -1 | -6 | -5 | Task Specific Training | 2 | 238 | 13 | 82 | 3 | 65 | 8 | 4.56 | 91 | 2 |
| 26 | 13 | 1 | -12 | Owner Evaluation of Contractor (Audits) | 3 | 233 | 28 | 91 | 1 | 58 | 13 | 4.19 | 84 | 14 |
| 44 | 20 | 22 | 2 | Set Construction Safety Goals | 4 | 229 | 36 | 73 | 6 | 77 | 4 | 3.97 | 79 | 26 |
| 34 | 15 | -2 | -17 | Designated Safety Manager | 5 | 221 | 35 | 91 | 1 | 47 | 18 | 4.16 | 83 | 16 |
| 14 | 0 | 7 | 7 | Activity Hazard Analysis | 6 | 214 | 32 | 55 | 13 | 74 | 6 | 4.24 | 85 | 13 |
| 36 | -18 | -1 | 17 | Permitting | 7 | 212 | 22 | 36 | 19 | 81 | 2 | 4.75 | 95 | 1 |
| 14 | 6 | 7 | 1 | Project-Specific Safety Plan | 8 | 208 | 35 | 64 | 10 | 61 | 9 | 4.16 | 83 | 16 |
| 24 | -12 | -4 | 8 | Flow Down Requirements | 9 | 203 | 25 | 45 | 15 | 67 | 7 | 4.54 | 91 | 3 |
| 12 | -6 | -6 | 0 | Pre-Construction Safety Meeting | 10 | 201 | 33 | 55 | 13 | 58 | 13 | 4.41 | 88 | 7 |
| 48 | 13 | 24 | 11 | Emergency Planning | 10 | 201 | 47 | 45 | 15 | 77 | 4 | 3.95 | 79 | 28 |
| 34 | -3 | 14 | 17 | Required Site Orientation Training | 12 | 200 | 37 | 36 | 19 | 81 | 2 | 4.16 | 83 | 16 |
| 42 | 20 | -1 | -21 | Safety Inspections (Site) | 12 | 200 | 50 | 82 | 3 | 37 | 24 | 4.06 | 81 | 23 |
| 68 | 34 | 16 | -18 | Maintain Contractor Safety Statistics | 14 | 197 | 61 | 82 | 3 | 42 | 21 | 3.64 | 73 | 37 |
| 38 | 19 | 3 | -16 | Owner Construction Safety Manager | 15 | 193 | 53 | 73 | 6 | 40 | 22 | 4.02 | 80 | 25 |
| 44 | 22 | 14 | -8 | Regular EHS Meetings | 16 | 187 | 60 | 64 | 10 | 47 | 18 | 3.8 | 76 | 32 |
| 10 | -4 | -5 | -1 | Independent Contractor Inspections | 17 | 182 | 42 | 45 | 15 | 51 | 16 | 4.31 | 86 | 11 |
| 54 | 3 | -24 | -27 | Prequalify Contractors | 18 | 181 | 48 | 73 | 6 | 21 | 33 | 4.36 | 87 | 9 |
| 22 | 1 | 11 | 10 | Substance Abuse Program | 19 | 179 | 48 | 36 | 19 | 61 | 9 | 4.11 | 82 | 20 |
| 32 | -16 | -5 | 11 | Document Does not Relieve Contractor | 20 | 173 | 45 | 27 | 24 | 58 | 13 | 4.38 | 88 | 8 |
| 40 | 12 | 20 | 8 | Escalating Discipline | 21 | 172 | 61 | 36 | 19 | 60 | 11 | 3.82 | 76 | 31 |
| 48 | -24 | -7 | 17 | Stop Work Authority | 22 | 168 | 43 | 18 | 28 | 60 | 11 | 4.52 | 90 | 4 |
| 14 | 0 | 7 | 7 | Company Safety Program | 23 | 156 | 65 | 27 | 24 | 48 | 17 | 4.03 | 81 | 24 |
| 12 | -5 | -6 | -1 | Daily Task Safety Planning | 24 | 145 | 68 | 27 | 24 | 35 | 25 | 4.15 | 83 | 19 |
| 70 | 35 | 2 | -33 | Implementing Safety Incentive Programs | 25 | 143 | 86 | 73 | 6 | 12 | 39 | 2.91 | 58 | 41 |
| 62 | -14 | -31 | -17 | High Hazard Planning Procedure | 26 | 142 | 60 | 36 | 19 | 16 | 36 | 4.51 | 90 | 5 |
| 32 | 6 | 16 | 10 | Toolbox Talks | 27 | 139 | 80 | 18 | 28 | 47 | 18 | 3.68 | 74 | 34 |
| 10 | 5 | 0 | -5 | Owner Concurrence | 28 | 135 | 82 | 27 | 24 | 30 | 29 | 3.92 | 78 | 29 |
| 24 | -12 | -2 | 10 | Safety Concern Reporting | 29 | 131 | 74 | 9 | 32 | 40 | 22 | 4.11 | 82 | 20 |
| 4 | 2 | 2 | 0 | Defined Competent Persons | 30 | 128 | 86 | 18 | 28 | 32 | 28 | 3.9 | 78 | 30 |
| 48 | 23 | -1 | -24 | Owner Construction Safety Committee | 31 | 124 | 92 | 45 | 15 | 12 | 39 | 3.34 | 67 | 38 |
| 46 | -23 | -12 | 11 | Provide Emergency Contact to Owner | 32 | 117 | 77 | 0 | 37 | 33 | 26 | 4.19 | 84 | 14 |
| 12 | -6 | -4 | 2 | Daily Safety Coordination Meeting | 33 | 116 | 88 | 9 | 32 | 28 | 30 | 3.97 | 79 | 26 |
| 14 | 1 | 7 | 6 | Manual/policy signed by executive | 33 | 116 | 91 | 9 | 32 | 33 | 26 | 3.69 | 74 | 33 |
| 30 | -12 | -15 | -3 | Required Safety Management Program | 35 | 110 | 87 | 9 | 32 | 19 | 35 | 4.11 | 82 | 20 |
| 56 | -23 | -28 | -5 | High Hazard Plan to Owner | 35 | 110 | 78 | 9 | 32 | 14 | 37 | 4.36 | 87 | 9 |
| 50 | -25 | -21 | 4 | Contractor Sign-Off on Requirements | 37 | 106 | 82 | 0 | 37 | 21 | 33 | 4.26 | 85 | 12 |
| 24 | 12 | 3 | -9 | 10-Hour Training | 38 | 97 | 105 | 18 | 28 | 14 | 37 | 3.26 | 65 | 40 |
| 12 | -1 | 5 | 6 | Injury and Illness Prevention Plan | 39 | 96 | 104 | 0 | 37 | 23 | 31 | 3.65 | 73 | 36 |
| 16 | 2 | 8 | 6 | Job Safety Board | 40 | 89 | 107 | 0 | 37 | 23 | 31 | 3.29 | 66 | 39 |
| 14 | -3 | -7 | -4 | Controlled Insurance Programs | 41 | 83 | 112 | 0 | 37 | 9 | 41 | 3.68 | 74 | 34 |

*Figure 7-7. Complete Pattern Analysis Chart*

## Appendix G: Researcher Resume

# Zachary D. Hansmann, M.S., CSP, CHMM, ARM

Construction safety expert with specialty experience in risk management and owner-contractor engagement

hansmann@msu.edu
(517)980-3670


## WORK EXPERIENCE:

**Adjunct Faculty – Construction Management** — *Michigan State University*
August 2019 – Present — School of Planning Design and Construction
E. Lansing, MI 48824

- Teaching graduate and undergraduate students in the Construction Management program at SPDC
- Courses taught include:
    - CMP 401 – Construction Safety Management
    - CMP 311 – Construction Project Scheduling

**Contractor Safety Manager** — *Michigan State University*
February 2018 – Present — Office of Environmental Health and Safety
E. Lansing, MI 48824

- Responsible for creation and implementation of university-wide construction safety oversight prog.
- Act as principal owner liaison with contractors to facilitate construction safety
- Lead EHS staff subject matter experts' participation in university project review and design
- Support owners' project managers through onsite walkthroughs and compliance audits
- Track real time contractor safety performance through data collection
- Support identifying and providing solutions for construction and environmental hazards.

**Principal** — *The Hansmann Group*
September 2016 – Present — E. Lansing, MI 48824

- Work with owners to evaluate their risk and liability to determine appropriate involvement in safety management
- Assist contractors in improving safety performance to meet the needs of their employees and business objectives
- Speak at local, state, and national industry conferences to raise awareness of safety management challenges
- Develop manuals, guidelines, procedures, and other program documents for owners and contractors

**Construction Safety Manager** — *Michigan State University*
September 2013 – March 2019 — Facility for Rare Isotope Beams (FRIB)
E. Lansing, MI 48824

- Oversee construction safety for the 730-million dollar US Department of Energy funded nuclear physics project
- Present construction safety performance to external auditors and reviewers from federal funding agency
- Develop and operate a behavior based leading indicator program to evaluate construction manager performance

**Environmental Coordinator** *Michigan State University*
September 2007 – February 2014 Office of Environmental Health and Safety
E. Lansing, MI 48824

- Created and enforced the university's environmental policies relating to asbestos, lead, PCBs, and mold
- Coordinated asbestos and lead management activities for 22.8 million square feet of university owned facilities
- Managed hazardous material project design on all minor (>$250,000) and major ($1,000,000+) projects
- Created annual prequalification process for asbestos abatement contractors seeking on-campus contracts
- Established inspection procedures and recordkeeping systems to meet federal regulatory compliance requirements

**Industrial Hygienist** *Fibertec Industrial Hygiene Services*
May 2006 – September 2007 Industrial Hygiene Division
Holt, MI 48842

- Provided on-site air monitoring, regulatory compliance oversight, and project management for remediation projects
- Performed asbestos inspections, industrial hygiene investigations, and physical assessments for various clients
- Conducted lead risk assessments and inspections following EPA/HUD and MDHHS guidelines

**Biological Safety Aide** *Michigan State University*
May 2004 – May 2006 Office of Radiation, Chemical, and Biological Safety
E. Lansing, MI 48824

- Assist in compliance operations, including laboratory inspections, recordkeeping, and respirator fit tests
- Conducted annual autoclave inspections for research facilities throughout the Michigan State University campus

## EDUCATION:

**Doctor of Philosophy (Ph.D.) Candidate** *School of Planning, Design, and Construction*
*Planning, Design, and Construction* Michigan State University
Dissertation Area: The Owner's Role in Contractor Safety Management East Lansing, MI 48824
2015 – Present

**Master of Science (M.S.)** *School of Planning, Design, and Construction*
*Construction Management* Michigan State University
2011 – 2015 East Lansing, MI 48824

**Bachelor of Science (B.S.)** *College of Natural Science*
*Human Biology* Michigan State University
2002 – 2006 East Lansing, MI 48824

## CERTIFICATIONS:

**Certified Safety Professional (CSP)** — *Board of Certified Safety Professionals*
No. 24406 — Champaign, IL 61821

**Certified Hazardous Materials Manager (CHMM)** — *Institute of Hazardous Materials Management*
No. 16265 — Rockville, MD 20852

**Associate in Risk Management (ARM)** — *The Institutes*
No. 900096843 — Malvern, PA 19355

**Authorized Construction Industry Outreach Trainer (OSHA 500)** — *Great Lakes OSHA Education Center*
No. C0062186 — Cincinnati, OH 45267

**Associate Constructor** — *American Institute of Constructors*
No. 11819 — Alexandria, VA 22314

## PROFESSIONAL AFFILIATIONS:

**American Society of Safety Professionals (ASSP)** — Mid-Michigan Chapter
Professional Member, No. 10048127
Construction Practice Specialty Member

**Michigan Safety Conference**
Executive Secretary/Treasurer (2019-2020)
Board of Directors (2017-Present)
Arrangements Committee Chair (2016 - Present)
Construction Division Member (2015 - Present)

**Michigan Association of Hazardous Materials Professionals (MI-AHMP)**

## OTHER EXPERIENCE and VOLUNTEER WORK:

- Former *Asbestos Project Designer, Building Inspector, and Contractor/Supervisor* (No. A35562, MI LARA)
- Former *Lead Inspector, Risk Assessor, and Elevated Blood Lead (EBL) Investigator* (No. P-03413, MI DHHS)
- Michigan State University Alpine Ski Team, President (‘05-‘06), VP (‘04-‘05), Faculty Advisor (‘07-Present)
- Medical Photographer, Michigan State University College of Human Medicine (2003 - 2006)

## CONFERENCE PRESENTATIONS:

**“Leading Indicators:  Industry Trends and Predicting Tomorrow”**

| | |
|---|---|
| *Michigan Safety Conference* | Novi, Michigan |
| Construction Division | April 2017 |
| | |
| *Construction Association of Michigan* | Oakland, Michigan |
| Safety Leadership Conference | December 2017 |

**“The Owner’s Role in Construction Safety: Risk, Responsibility, and Reward”**

| | |
|---|---|
| *Alliance of Hazardous Materials Professionals* | Washington, D.C. |
| National Conference | August 2016 |
| | |
| *American Society of Safety Engineers, Mid-Michigan Chapter* | Midland, Michigan |
| Safety Leadership Series | August 2016 |
| | |
| *Michigan Safety Conference* | Grand Rapids, Michigan |
| Construction Division | April 2016 |
| | |
| *Construction Association of Michigan* | Livonia, Michigan |
| Safety Leadership Conference | December 2015 |

**“Understanding the Owner's Role in Construction Safety”**

| | |
|---|---|
| *Indiana Safety and Health Conference and Expo* | Indianapolis, Indiana |
| Construction and Maintenance Division | February 26, 2020 (Expected) |

## OCCUPATIONAL TRAINING (Selected):

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|---|---|
| **Occupational Safety & Health Standards for the Construction Industry (OSHA 510)** | *Great Lakes Regional OTI Education Center*<br>Ypsilanti, MI 48197 |
| **OSHA Construction Industry Outreach Trainer Refresher (OSHA 502)**<br>No. 21-0105310 | *Great Lakes Safety Training Center*<br>Midland, MI 48642 |
| **Intermediate Incident Command Systems for Expanding Incidents (FEMA ICS 300)** | *Michigan State Police*<br>Lansing, MI 48910 |

## ACADEMIC COURSEWORK:

**Doctor of Philosophy (Ph.D.), Planning, Design, and Construction:**

- Organizational Behavior for Human Resources and Labor Relations (HRLR 813)
- Organizational Development and Change (HRLR 816)
- Human Resources Practices and Decisions (HRLR 820)
- Independent Study in Human Resources and Labor Relations for PhD (HRLR 990)
- Organizational Research Methods (MGT 906)
- Integrated Approach to Sustainable Planning, Design, and Construction (PDC 901)
- Advanced Research Methods in Planning Design and Construction (PDC 992)
- Doctoral Dissertation Research (PDC 999)

**Master of Science (M.S.), Construction Management:**

- Advanced Project Scheduling (CMP 811)
- Advanced Cost Estimating and Analysis (CMP 815)
- Construction Project Management and Information Systems (CMP 817)
- Contracts and Legal Issues in Construction (CMP 822)
- Occupational Health and Safety in Public Health (HM 858)
- Environmental Toxicology (EVSP 594)
- Construction Management Research Seminar (CMP 892)
- Economics of Environmental Resources (AEC 829)
- Structural Systems (CMP 322)
- Statics and Strengths of Materials (CMP 222)
- Construction Surveying (CMP 315)
- Commercial Construction (CMP 210)
- Watershed Concepts (ESA 452)
- Building and Implementing Watershed Management Plans (ACR 841)
- Watershed Assessment and Tools (CSUS 842)
- Construction Management Independent Study (CMP 890)

# REFERENCES

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