

# **Analysis of Communication Patterns During Construction Production Planning**

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Dissertation submitted to the faculty of the Virginia Polytechnic Institute and State  
University in partial fulfillment of the requirements or the degree of

Doctor of Philosophy  
In  
Environmental Design and Planning

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February 24<sup>th</sup>, 2012  
Blacksburg, VA

Keywords: Communication, production planning, project planning, lean construction,  
safety performance

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# **Analysis of Communication Patterns During Construction**

## **Production Planning**

**Somik Ghosh**

### **ABSTRACT**

The construction industry ranks high in the number of occupational incidents due to the complex and interdependent nature of the tasks. However, construction firms using lean construction have reported better safety performance than the rest. The situation reflects the limitation of traditional planning methods used in construction firms focusing on project level planning, at the expense of production level planning. Lean construction involves participants in the formal production planning process to minimize variability in workflow thus reducing probability of incidents. Considering the involvement of various participants in the production planning process, this research study hypothesized that communication levels afforded by participants during formal production planning have a positive impact on safety performance.

The goal of this research study was to understand the role of communication in the formal production planning process and its impact on safety performance. A case study approach was adopted for analyzing two projects, one following formal production planning and another following traditional project planning. Weekly subcontractor coordination meeting was selected as the unit of analysis. Data has been collected using direct observations, open-ended interviews, and examination of archival documents. For this study, the independent variables were categories of communication and dependent variable was recordable incidence rate (safety performance). Communication data was analyzed using Robert Bales' Interaction Process Analysis.

Based on the analyses, the participants involved in formal production planning demonstrated: more sensitivity and higher degree of control by frequently providing suggestions/opinions, more enthusiasm in exchange of commitments, sincerity by declining inquiry for commitments in case of conflict of interest, and greater involvement by engaging in frequent dialogues with others. In addition, participants involved in production planning adopted a proactive approach toward safety performance by ensuring that safety was considered while preparing production plans, thus helping improve awareness. The findings indicated a better safety record by the project following formal production planning in comparison to the other project.

The research study provides a ‘meso’ level understanding of the role of communication among project participants during formal production planning, and indicates that production planning might have a beneficial impact on safety performance.

## ACKNOWLEDGEMENT

I owe my gratitude to all those people who have made this dissertation possible, and because of whom my journey through the last three years has been one that I will cherish forever.

I would like to express my deepest appreciation to my advisor, Dr. Deborah Young-Corbett for her guidance, encouragement, understanding, and patience during my doctoral study at Virginia Tech. She was extremely supportive to provide me the freedom to develop my own research ideas and work with such independence. Without her guidance and generous financial support, it wouldn't have been possible for me to finish my doctoral study. It has been a pleasure to have her as my advisor.

I have been fortunate to have a great committee that underpins the bodies of knowledge pivotal to this dissertation. Dr. Abdelhamid's research background in lean construction was very useful for this research study. I am thankful for his support during the early stages of the development of the research idea. I would also like to thank Prof. Thomas Mills and Dr. Christine Fiori for their valuable inputs and accessibility throughout my doctoral study. I am extremely grateful to Prof. Mills for helping me gain access to field data. Outside of the construction field, Dr. Eileen Van Aken of Industrial and Systems Engineering, offered valuable inputs to refine the methodology of this research study and provided a knowledgebase to compare related issues in lean construction and lean manufacturing.

I am particularly indebted to the organizations and individuals who gave me permission to enter their commercially sensitive world to collect data and ask pertinent questions. As promised you will remain anonymous – but my deepest gratitude to you. I also want to acknowledge the support and cooperation of Dr. Annie Pearce and Dr. Michael Garvin at crucial junctures of my

dissertation. In addition, I am thankful to Dr. Jagdish Khubchandani for critiquing my work and providing thoughtful comments. Many friends have helped me stay sane through these difficult years. Their support and care helped me overcome setbacks and stay focused on my graduate study. I greatly value their friendship and I deeply appreciate their belief in me.

Finally, and most importantly, I would like to thank my wife Suchismita. Her support and encouragement are the bedrock upon which the past ten years of my life have been built. Her tolerance of my occasional frustration proved her unyielding support and devotion for my success. I thank my parents for allowing me to be as ambitious as I wanted. Also, I thank my in-laws for providing me with unending encouragement and support.

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*“In reality, safety is a result, an outcome of actions. Safety is what you get if things are done properly and events go as planned. ... Accidents happen because things occur that prevent the task from proceeding as intended”.* (Prichard 2002)

## **Chapter 1. Introduction**

### **1.1 Introduction**

Improving occupational safety in the construction industry is essential, not only because enlightened clients demand excellent safety performance from contractors/builders, but also due to continuous search for more economic benefit and increased productivity. Thus, improving safety in construction remains a priority for the researchers and the practitioners, which has resulted in a plethora of safety improvement measures. In spite of that, the number of occupational fatalities and injuries in the construction industry is exceedingly high that emphasizes the limitations of the prevalent safety improvement measures. This chapter introduces the concept of formal construction production planning with examples where construction firms have demonstrated better safety performance utilizing that approach. The chapter also presents the research goal, research questions, objectives, research strategy, and concludes with the organization of this document.

### **1.2 Current State of Safety in the Construction Industry**

The construction industry has an unenviable safety record that is reflected by the more severe and frequent incidents taking place in this sector than the incidents of manufacturing sector (BLS 2009a). The number of injuries and illness in the construction industry is extremely high, exceeding 350,000 cases annually as shown in Table 1-1 (BLS 2009b). These figures are

disproportionately high, when compared to other industry sectors, given that construction workers only account for approximately seven percent of the workforce (CPWR 2008). These statistics highlight the importance of improved health and safety in the construction industry.

Apart from the societal cost of occupational incidents, the economic effect can have a sizeable impact on business performance. Incidents have an adverse effect on economic factors of a business, in the form of escalating workers' compensation insurance costs, high cost of medical treatment and resources expended on rehabilitation programs. The economic losses also include indirect costs, such as administrative costs, productivity losses and low morale (Abdelhamid et al. 2003). On average, the death of a construction worker results in losses valued at \$4 million, while a nonfatal injury involving days away from work costs approximately \$42,000. In 2002, the total (direct and indirect) cost of all fatalities and non-fatal injuries was US \$13 billion (CPWR 2008).

Based on statistics alone, safety appears to be improving somewhat in the construction industry (Schafer et al. 2008); yet, the numbers reveal that in the period from 1998 to 2008 the construction industry has accounted for the lives of 12,836 workers, an average of about 1,167 workers per year. A number of safety improvement measures have been offered to reverse this trend in the construction industry. However, Howell et al. (2002) state that safety progress has reached a plateau. The various safety improvement measures have yielded positive results and have reduced incidents (Mitropoulos et al. 2005); however, further improvement in safety is not visible in spite of expending more efforts and resources (Abdelhamid et al. 2003).

**Table 1-1:** Number of injuries, illnesses, and fatalities in construction industry during the period of 1998 - 2008 (BLS 2009b)

Year	Non Fatal Incidence Rate	Average Employment	Total Average Number of Hours Worked	Total Injuries & Illnesses	Total Fatalities	Total Recordable Cases
1998	8.8	5,949,500	11,899,000,000	523,556	1,171	524,727
1999	8.6	6,337,300	12,674,600,000	545,008	1,190	546,198
2000	8.3	6,623,000	13,246,000,000	549,709	1,154	550,863
2001	7.9	unavailable	Unavailable	481,400	1,225	482,625
2002	7.1	unavailable	Unavailable	417,700	1,121	418,821
2003	6.8	6,672,400	13,344,800,000	453,723	1,131	454,854
2004	6.4	6,916,400	13,832,800,000	442,650	1,234	443,884
2005	6.3	7,166,600	14,333,200,000	451,496	1,192	452,688
2006	5.9	7,562,500	15,125,000,000	446,188	1,239	447,427
2007	5.4	7,790,600	15,581,200,000	420,692	1,204	421,896
2008	4.7	7,597,200	15,194,400,000	357,068	975	358,043

### 1.2.1 Limitations of Prevailing Safety Improvement Measures

A comprehensive review of the literature, presented in Chapter two, identified nine major safety improvement measures: (i) personnel selection, (ii) technological intervention, (iii) behavior modification, (iv) poster campaigns, (v) quality circles, (vi) exercise and stress management, (vii) near-miss accident reporting, (viii) safety climate, and (ix) zero injury technique. Almost all of the safety improvement measures listed above are results oriented. A result oriented approach emphasizes on the solution to a particular problem, rather than on prevention (Lareau 2000). Moreover, a majority of the safety improvement measures emphasize training and compliance, as means to prevent unsafe conditions and behaviors. Safety measures based on training,

inspections, motivation, enforcement, and penalties aim at increasing rates of compliance with safety rules thus, escalating the cost of noncompliance.

The present situation reflects a fundamental problem in failing to recognize the dynamic and dependent nature of construction tasks and inadequacy of traditional project planning to focus on process improvement (Howell et al. 2002). Moreover, prevalent measures in construction safety neglect the potentially large effect of work design and team coordination (Mitropoulos et al. 2007). These limitations can be overcome by the application of formal construction production planning, which includes various participants in the planning process (Koskela 1992) and utilizes constraint analyses to ensure that each task is free of any constraints, which can restrain its successful completion (Ballard 2000). In addition, evidence from previous research illustrates that formal production planning helps in making workflow more reliable, which is a successful way to reduce the unexpected events that lead to incidents (Howell et al. 2002).

The following section briefly introduces formal production planning as a part of lean construction and presents evidence of beneficial impact of production planning on construction safety performance.

### **1.3 Formal Production Planning in Construction**

The meaning of the term ‘production’ at its most generic sense is synonymous with ‘making’ (Ballard 2000). A production process can be defined as the methods, or steps, involved in making a product. Lean construction views an entire construction project as a production system; and, brings into practice the concept of minimizing waste. As defined by Koskela et al. (2002), lean construction is a “way to design production systems to minimize waste of materials, time, and effort in order to generate the maximum possible amount of value”. Incidents can be



considered a form of waste on several levels. Losing an experienced worker for any period of time is wasteful. Secondly, incidents can impact the schedule of a project, resulting in waste of time. Finally, often material or work is damaged in the situation of an incident, resulting in material waste and lost effort in rework. Thus, safeguarding construction workers from occupational incidents is an obvious outcome of lean construction ideal of waste minimization.

In lean construction, production planning aims at removing the constraints that prevent making workflow more reliable and reduce unexpected events that lead to incidents. Constraints include lack of resources, poor design coordination, and incomplete pre-requisite work. Production planning pays formal attention to execution, technological implication of different construction techniques, availability of resources, resource capacity, sequencing of work, and integration between different levels of planning. Most importantly, the lean philosophy of “respect for people”, places value on the workers in the system, and various project participants are involved in the process of formal production planning. The term ‘participant’ refers to trade contractors, suppliers, superintendents, project managers, and direct workers. As direct workers are involved, decisions are based on intimate knowledge of working conditions and constructability issues. Lean Construction provides a tool for formal construction production planning called the Last Planner ® System (LPS®) that has been discussed in greater detail in Chapter two.

In utilizing production planning, construction firms are claiming improvement in many areas, especially in safety performance, which is of special interest for this research. The following section provides critical insights on the beneficial impact of production planning on safety performance of construction projects, through review of pertinent case studies.

### *The Case of MT Højgaard*

MT Højgaard was founded in 2001 from the merger of Monberg & Thorsen, and Højgaard & Schultz companies established in the late 1910s. Headquartered in Denmark, it is an international contractor with approximately 5,000 employees, working in all types of construction projects. MT Højgaard has been a key player in the implementation of lean construction. Lean has been an integral part of the company strategy for the Building Division, since the inception of this company. The Building Division stands out among all others in the company as it relates to successful implementation of lean construction principles, evident by application of lean in approximately 40% of the total turnover of the division in 2002 (Thomassen et al. 2003). The projects varied by type, such as housing, offices, and warehouses. The fiscal costs of the projects ranged from two million to 30 million Euros.

The lean construction concepts applied in MT Højgaard at the project level consist of interrelation between methods and tools, based on formal production planning and in-house software for lean planning and pull logistics. Production planning is executed with the help of LPS<sup>1</sup> in the form of weekly work plans prepared with input from foremen, five weeks look-ahead plans, weekly evaluations by percent plan complete (PPC) measurement, and identifying reasons for which tasks are not executed as planned. A systematic and formal effort is taken at the time of the weekly site meeting to ensure that the tasks released by the look-ahead plan are free of constraints. While doing so, the company focuses on seven flows that have to be managed for ensuring that the tasks are free of constraints. According to Thomassen et al. (2003), the seven flows that MT Højgaard tries to control are equivalent to those proposed by Koskela (2000) namely: (i) information, (ii) material, (iii) manpower, (iv) equipment, (v) completion of previous tasks, (vi) accessible building site, and (vii) external conditions. With the above-

mentioned project-specific activities and other companywide initiatives to implement lean construction principles, company data show they have significant improvement in a number of categories. In order to assess the impact of lean construction, projects using lean have been benchmarked with those not using lean. Results demonstrate that projects using lean construction principles and tools rank higher in customer satisfaction, provide higher profit for both MT Højgaard and its trade contractors, and have better recordable incidence rate (RIR) as shown in Table 1-2.

**Table 1-2:** RIR of projects using lean and non-lean at MT Højgaard during 2002 (Thomassen et al. 2003)

Trade		Non- Lean Projects	Lean Projects
Concrete	Number of working hours	296,237	131,188
	Number of Incidents	21	7
	RIR	14.18	10.68
Carpentry	Number of working hours	177,386	126,281
	Number of Incidents	14	5
	RIR	15.78	7.92
Masonry	Number of working hours	106,748	48,135
	Number of Incidents	6	0
	RIR	11.24	0
Total	Number of working hours	580,371	305,604
	Number of Incidents	41	12
	RIR	14.13	7.85

Based on the data of incident rates for in house carpenters, concrete workers, and brick layers collected from lean and non-lean projects, Thomassen et al. (2003) concluded that the incidence

rate of projects using lean is statistically significantly lower than projects not using lean construction principles.

***The Case of Baker Concrete Construction, Inc.***

Baker Concrete Construction, headquartered in Ohio, USA was established in 1968. It is one of the nation's leading concrete construction contractors, offering a full range of concrete construction and related management services from preconstruction through completion. Baker Concrete Construction has been actively implementing lean construction methodology since 2005 in their projects for maximizing value and minimizing waste throughout the construction process. The company applies several lean construction methodology at the project level such as study action team, LPS\ based on pull planning, and six week-look-ahead schedule, weekly work plan, and PPC. For the development and improvement of assignments, morning huddle meetings are employed. Based on a set of targets, the workers give their input on the progress during the morning huddle meetings. Table 1-3 shows the different lean construction methods implemented in the various projects within one of the regional divisions of Baker Concrete Construction. It shows the level of implementation for each of the methods based on an internal scoring system of the company in a scale of 0 to 3 (0 being "not implemented at all" and 3 being "full implementation").

**Table 1-3** : Implementation of lean construction by Baker Concrete Construction in one of their regional divisions

Job Number (Year)	Complete as of November 2010 (Y/N)	Lean Construction Methods									Implementation Score
		Study Action Team	GC used LPS(\	Pull Planning	Weekly Work Plan	Percent Plan Complete	6-Week Look-Ahead	Constraint Log	Workable Backlog	Morning Huddle	
Job # 9540 (2008)	N	3	0	3	3	2	2	3	2	3	2.33
Job # 9126 (2008)	Y	0	2	1	1	0	1	0	0	3	0.89
Job # 9475 (2008)	Y	3	2	2	3	1	2	3	3	3	2.44
Job # 9447 (2008)	Y	3	0	3	2	1	1	2	1	3	1.78
Job # 9476 (2008)	Y	2	0	1	1	0	1	0	0	1	0.67
Job # 9537 (2009)	Y	3	0	3	3	1	1	2	1	3	1.89
Job # 9630 (2009)	Y	3	2	2	3	1	2	3	3	3	2.44
Job # 9660 (2009)	Y	1	1	2	3	1	2	2	1	3	1.78
Job # 9848 (2009)	N	3	3	3	3	1	1	1	1	1	1.89
Job # 9633 (2009)	Y	2	0	1	2	1	2	2	1	3	1.56
Job # 9780 (2010)	Y	1	0	3	3	3	2	3	2	3	2.22
Job # 9868 (2010)	N	2	3	2	3	1	1	2	2	3	2.11
Job # 9908 (2010)	N	0	0	1	2	1	0	3	2	3	1.33

*Degree of implementation: 0 = not at all; 1 = minimal; 2 = partial; 3 = full*

Among others, improvement in safety performance is one of the major benefits realized by Baker Concrete Construction using lean construction methodology. Comparison of Recordable Incidence Rate (RIR) of the projects using lean with those not using lean within the same

regional division visibly shows the beneficial impact of formal production planning and other methodology on safety performance. In the years 2008 and 2009, the RIR of the projects using lean was considerably lower than those projects that did not use lean as shown in Table 1-4.

**Table 1-4:** RIR of projects using lean and non-lean within one of the regional divisions of Baker Concrete Construction during 2008-2009

Year	Commercial/Civil Operations in the Midwest Region						RIR of All Projects of Baker Concrete Construction	Average RIR of Concrete Construction (BLS)
	Projects Using Lean			Projects Not Using Lean				
	Labor-hours	Record-able Incidents	RIR	Labor-hours	Record-able Incidents	RIR		
2008	310,717	5	3.22	281,054	21	14.94	6.93	6.0
2009	404,811	5	2.47	115,642	2	3.46	3.45	6.0

The above instances provide evidence that construction projects utilizing formal production planning have shown better safety performance in comparison to projects utilizing traditional project planning. Production planning process in construction involves inputs from the trade contractors, suppliers, superintendents, project managers as well as direct workers. The collaborative involvement of the various participants indicates an increased level of communication and interaction among them during the process. As a result, it was hypothesized that *communication levels afforded by the participants during formal production planning are the main reasons for arriving at lower incidence rates*. To further investigate the role of communication in production planning process and its impact on safety performance, a set of research questions were formulated and answered through this research study. Description and illustration of how communications among the project participants play a critical role in production planning are presented in Chapter two.

## **1.4 Research Goal**

In context of the discussion above, the broad goal of the research was *to understand the role of communication during formal construction production planning and explore the impact on occupational incidents.*

## **1.5 Research Questions**

Based on the working hypothesis, the broad research goal has been delineated into the following questions:

1. How can communication be assessed among group members in the construction industry?
2. What is unique about the communication in formal production planning, which leads to reduced incidence rate?
3. How can the findings of Research Question 2 be translated to describe communication during formal production planning?

## **1.6 Research Objectives**

The objectives and sub-objectives to answer the aforementioned three research questions are outlined below:

### **Research objective 1**

*Identify the methodology to assess communication among group members in the construction industry.*

- 1.1 Abstract the concepts and underlying theories of communication using literature review.
- 1.2 Explore data collection methods used to capture communication by reviewing prior research.
- 1.3 Adopt a protocol to analyze communication in the construction environment.

### **Research objective 2**

*Analyze and assess communication in the construction environment and its impact on safety performance.*

- 2.1 Assess communication in formal production planning and traditional project planning using case study approach.
- 2.2 Identify parameters for the conceptual framework of communication in formal production planning.
- 2.3 Collect records of safety performance from the projects selected for Research Objective 2.1.

### **Research objective 3**

*Translate the findings from Research Objective 2 to create a conceptual framework depicting communication in formal production planning.*

- 3.1 Develop a conceptual framework of the communication process using concept mapping.
- 3.2 Verify the internal generalizability



## 1.7 Research Strategy

Based on the objectives of this research study, a qualitative research strategy was deemed appropriate. However, within the overarching influence of qualitative research strategy, this research study used multiple methods to accomplish the objectives. An exhaustive literature review, followed by content analysis, was used to abstract the underlying concepts and theories of communication. Having developed an understanding of the concepts of communication, the next objective was to identify data collection method to measure communication among group members. Further, an existing protocol was identified to analyze communication in the construction environment. Comparative analyses of the available protocols based on specific criteria and resources led to the selection of Robert Bales' (1950) Interaction Process Analysis (IPA) as appropriate for this research study.

The research study was designed to elucidate the role of communication among the participants of a construction project during production planning. A multiple case study approach was adopted, where in-depth analyses of the communication among participants in two projects, one following formal production planning and another following project planning were conducted to illustrate the role of communication during each of the planning processes.

Reliability of data collected for the case studies was ensured by triangulating the data sources using the following methods: (i) direct observations, (ii) open-ended interviews, and (iii) examination of archival documents. A graphical method, called concept mapping has been employed to demonstrate the role of communication among the project participants in each of the cases. The other important dimension of this research study is safety performance of the case study projects, which was calculated based on the number of recordable incidents during a period

of six months (out of the total project duration) and total labor-hours expended during that same time period.

From a strategic standpoint, the intention of this research study was to discover the role of communication during construction production planning and then to verify the discovery. For verification purpose, a third case study was conducted on the same project following formal production planning and data were collected using similar methodology as in the first two cases. Figure 1-1 presents an overview of the processes followed in this research study.

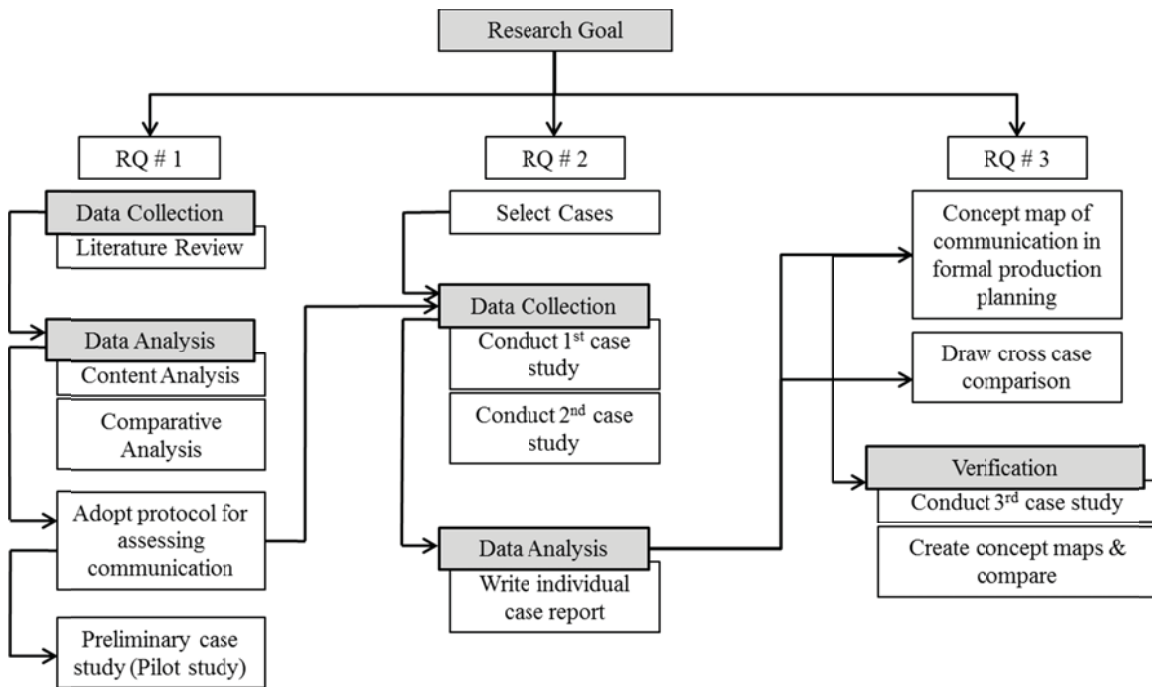


Figure 1-1: Outline of the research process

## 1.8 Document Organization

The document consists of five main parts: (i) literature review, (ii) methodology, (iii) case studies to analyze communication in the construction environment, (iv) verification of the findings, and (v) discussion of the findings and their contributions to the existing body of

knowledge. Chapter two presents a review of the major safety improvement measures, explains the process of formal production planning, and provides a comprehensive review of communication research in the construction environment, as also describes the underlying concepts and theories of communication. Chapter three presents comparative analyses of the methods adopted by other researchers to analyze communication, and outlines the selection process of the protocol used in this research study. In addition, it presents the preliminary case study and the detailed design of the case studies. This is followed by the fourth chapter, which describes and analyzes the two cases considered for this study. It also presents the analysis of the cases with the help of concept maps, description, and verbatim quotes from the observational and interview data. Chapter five presents the internal generalizability of the findings. Finally, Chapter six presents conclusion including summary of research findings, implications of the study, and recommendations for practice and future research.

## **1.9 Definitions**

### **Group**

There are various definitions of the term ‘group’ available in the literature. Bales (1950) defined group as “... number of persons engaged in communication with each other in a single face-to-face meeting or series of meetings”. Cartwright and Zander (1968) summarized characteristics of individuals engaged in communication, which include engaging in frequent interaction, sharing norms concerning matters of common interest, pursuing interdependent goals, and having a collective perception of their identity. In congruence to the definition put forth by Bales, Shaw (1981) defined a group as two or more persons interacting in a manner that each person influences and is influenced by the other persons. A more comprehensive definition of group was

provided by Hare (1982) as collection of individuals who are committed to a set of values that define the overall pattern of activity. The definition provided by Hare, which has been selected for use in this research study, defines group as: “two or more persons who are engaged in face-to-face communication between one another having control over the resources necessary for the task at hand, with sufficient power in the form of authorization and leadership to coordinate the use of resources by the members performing towards the common goal.” Though this definition is loosely applicable to teams, literature suggest “all teams are groups, but all groups are not teams” (Hare 1992). Teams are usually formally organized and highly structured, while groups tend to have limited role differentiation. Considering limitation of role differentiation and decentralized decision making technique, participants involved in construction projects are considered to be groups, for the purposes of this research study.

### **Incident**

The need to define ‘incident’ in context of this research arises due to use of the terms ‘incident’ and ‘accident’ interchangeably in the safety literature. A commonly used distinction between incident and accident is that an accident has a specific outcome, such as injury or death; while an incident has no outcome of this type, but describes conditions that may lead to an accident in slightly different circumstances (Boyle 2003). In the United Kingdom, the Health and Safety Executive (HSE) defines incident and accident as follows (HSE 1997):

- i. Incident includes all undesired circumstances and ‘near misses’ that could cause accidents

- ii. Accident includes any undesired circumstances that give rise to illness or injury, damage to property, plant, products or the environment, production losses or increased liabilities

In the United States, the Occupational Safety and Health Administration (OSHA) does not put forward any distinct differentiation between incident and accident. In the booklet containing the OSHA Form 300 and 300A for recording occupational injuries and illnesses (OSHA 2004), the term “recordable incidents” has been described as those occupational injuries and illnesses that result in death, loss of consciousness, days away from work, restricted work activity or job transfer, or medical treatment beyond first aid. OSHA, in 29 CFR Part 1904 (OSHA 2001a), has outlined detailed criteria for recording occupational injuries and illnesses.

This document defines “ incident” as: *an inclusive term considering accident and incident as part of a single, much larger group of undesired events, which results in occupational injury, illness and death.*

### **Communication**

This research defines communication as: *dynamic sequence of actions between individuals within a group where individuals attach meaning to a situation, interpret what others are meaning, and respond accordingly.*

## **1.10 Chapter Summary**

This chapter presented the current state of safety in the construction industry and identified the limitations in the prevalent measures to improve safety. The inherent nature of these measures to emphasize training and compliance ignore the interdependent nature of construction tasks. Due

to the dynamic and dependent nature of construction tasks, involving the participants and utilizing their expertise is very important. Formal production planning, that stems from lean construction principles value the input of the participants and formally involves them in the planning process. The process of formal production planning was introduced briefly in this chapter. Construction firms utilizing production planning have demonstrated better safety performance than their counter part, two such examples was presented in this chapter. Based on beneficial impact of formal production planning on safety performance, the working hypothesis for this research study was formulated. The chapter presented the research goal, research questions, research objectives, and research strategy. Finally, the chapter concluded with the organization of this document.

## **Chapter 2. Literature Review**

### **2.1 Introduction**

In order to bring any improvement to a system, it is important to know how the system is currently functioning. Similarly, for improving the safety performance of construction industry, it is equally important to know the measures adopted to improve safety in the construction industry. A systematic review of scholarly publications identified the prevalent safety improvement measures; this chapter discusses briefly about each of the measures with their individual strengths and limitations. As a general observation, majority of the safety improvement measures reflect a fundamental problem in failing to recognize the dependent nature of construction tasks. In addition, traditional project planning utilized in construction industry also undermines the importance of team coordination. In contrast, formal construction production planning utilizes the benefits of team coordination and makes workflow more reliable. Evidence exists to show that increase in workflow reliability reduces unexpected events that lead to incidents.

This chapter subsequently describes the process of formal construction production planning and identifies the steps that separate it from the traditional project planning. Detailed discussion has been done on how involvement of the participants during production planning process gives rise to an environment of trust and support among the participants, which ultimately fosters communication among them. The role of communication among the participants during production planning that affects the safety performance has been illustrated through a conceptual model.

Considering the importance of communication among the participants, this chapter further discusses the salient features of the communication in construction environment. The temporal nature of the construction projects added with the usage of vocabularies by the participants specific to respective professional background, give a complex character to the communication in construction settings. Moreover, as group communication in construction context is not a widely researched area, there is lack of defined understanding of general patterns of communications among construction professionals. However, communication among group members has been a topic of sustained investigation since early part of 20<sup>th</sup> century.

This chapter presents a detailed account of the underlying concepts and theories of communication. A chronological advancement of investigations on communication among group members by examining the historical, theoretical, and methodological issues pertaining to this discipline has been provided.

## **2.2 Safety Improvement Measures**

A systematic review of the literature from journal articles and conference proceedings identified nine major prevailing safety improvement measures in the construction industry: (i) personnel selection, (ii) technological intervention, (iii) behavior modification, (iv) poster campaigns, (v) quality circles, (vi) exercise and stress management, (vii) near-miss accident reporting, (viii) safety climate, and (ix) zero injury technique.

### **Personnel Selection**

The concept of accident proneness gave rise to the personnel selection method of accident control. Risk analysts as early as 1920s noticed that a large percentage of any company's accident was caused by a relatively small percentage of employees. This led to the conclusion



that some employees were more accident prone than others. Researchers identified variables that could be used in screening future employees namely personal maladjustment, social maladjustment, impulsivity, cognitive deficits, alcohol use and drug use (Guastello 1993). However, when these were put into effect for personnel selection, the selection technique emerged as the least effective method of improving occupational safety (Guastello 1993). Recent researches also resonate similar findings, which exclude the individual characteristics of construction workers playing a major role in the occupational incidents (Chau et al. 2002).

### **Technological Intervention**

Technological interventions can be mainly categorized into automation (Karwowski et al. 1988) and comprehensive facility redesign (Kjellen 1990). However, the effect of this intervention brings with it human errors that are typical with introduction of any new system (Guastello 1993). For instance, automation interventions have the potential to reduce incidents, but at the same time they give rise to new types of incidents (Chignell et al. 1986). To alleviate the situation, new control techniques emerged in the form of emergency switch operated by workers to stall the operation (Sjostrom 1990), a sensor that detects the presence of workers in the work envelope, or re-engineering the work station altogether eliminating the need of physical presence of workers (Malm and Souminem 1990). Technological intervention has been utilized in construction industry to improve the safety of specific construction operations (Bernold et al. 2001), such as the use of robotics in the pipe laying industry. The benefit can be seen in reduction of accidents and also reduction in cost by not having to adhere to stringent safety regulations (Li and Bernold 2005).

### **Behavior Modification**

A typical behavior modification program of workers consists of basic training regarding safety information and safe behavior, followed by a period of observation and feedback. Feedback may be provided by the supervisors directly or by means of graphical updates displayed at the work place (Guastello 1993). Sulzer-Azaroff and Austin (2000), McAfee and Winn (1989) have reviewed behavior modification programs in great detail and have documented program variations, which incorporate goal setting, providing incentives, and use of mechanical aids for behavior monitoring. The National Safety Council reported that worker behavior was the cause of more than 90% of all injuries and illnesses (Loafman 1996). This justifies the importance of focusing on employee behavior as a critical element in achieving better safety performance.

### **Poster Campaigns**

Saarela et al. (1989) carried out a study on the effects of poster campaigns on safety performance at a ship yard, following the criteria of an effective campaign proposed by Hale and Glendon (1987). Interviewing randomly selected employees from the campaign ships, they concluded that the posters had limited effect on workers. However, there is evidence that safety campaigns can have positive effects on behavior and safety (Kaestner et al. 1967). The value of poster campaigns may not have a direct effect on accident prevention; the most valuable effect is increasing safety awareness among the workers (Saari 1998). To increase awareness, Occupational Safety and Health Administration (OSHA) has made it mandatory for the employers to display poster distributed by the Department of Labor informing employees about the protections of the Occupational Safety and Health Act, 1970 and its amendments.

### **Quality Circles**

A quality circle is a committee of employees who perform similar types of work and meet voluntarily to solve issues related to product quality and productivity (Guastello 1993). In addition to these, quality circle techniques have been successful in preventing incidents also (Saarela 1990). In spite of the notion that temporary organizations such as construction projects are inappropriate for the participative approach of quality circles, the salient features of construction projects actually foster the utilization of quality circles (Rosenfeld et al. 1991). Some of the characteristics of construction projects, which make them ideal for the utilization of quality circles are: short term or temporary employment of construction workers, unique and non-repetitive nature of the projects, and ad-hoc nature of project organization. The task-oriented approach of construction projects greatly benefits from quality circle team approach. The quality circle is also appropriate for creative solutions to urgent problems. Thirdly, the shallow hierarchy of construction project organization and the wide authority of superintendents allow them to implement the suggestions of the quality circle. Based on survey and field experiments, Rosenfeld et al. (1991) concluded that quality circles in construction projects indeed help in improving workers' safety.

### **Exercise and Stress Management**

Exercise programs have proven successful for reducing stress related injuries in physically demanding jobs (Gebhardt and Crump 1990). In a study on exercise programs, Cady et al. (1985) found that such programs had a positive effect in reducing work-related injuries and illnesses among fire fighters. Many of the leading construction companies in the US have developed routine exercise sessions that would benefit construction workers and warm up cold muscles

before they start working. This initiative is a part of the companies' plan to reduce injuries to soft muscle tissues and back injuries among workers (Wolff 2009).

Stress management programs have been successful in reducing stress and improving job attitudes (Ivancevich et al. 1990). However Murphy (1984) pointed to the limitation of the stress management programs, which are not designed to eliminate the sources of stress but only educate workers to cope with the stress.

### **Reporting Near-miss Accidents**

The near-miss reporting program presumes that for every real accident, approximately ten near misses have also occurred. Thus reporting eleven times as many real accidents/incidents provides a greater opportunity to devise more preventive measures (Guastello 1993). A version of this technique, generated by Carter and Menckel (1985), showed an increase in the number of corrective suggestions generated, but without any reduction of the accident rate. In another study by the same researchers, the participants were given training to recognize and interpret critical incidents. The initiative resulted in a reduction of injury severity, but no reduction in the incident frequency rate was noted.

The technique of near-miss accident reporting was devised as a method to generate new incident control ideas and as a means of increasing closeness of safety supervision thus increasing the amount of feedback to workers regarding the safety of operations (Guastello 1993). In a study to explore the quality of incident data of large construction companies in Japan, Gyi et al. (1999) found that these investigations could give detailed information on the nature of unsafe acts associated with different tasks. However, measurement of near miss incidents is difficult due to higher level of occurrences. The construction industry is divided with regard to measurement and

use of the term 'near miss'. One section of the industry uses the term but admits that there is gross under-reporting involved with it, while the other section feels positive about the use of near miss auditing (Gyi et al. 1999).

### **Safety Climate**

Safety climate is a “summary concept describing the safety ethic in an organization or workplace which is reflected in employees’ beliefs about safety and is thought to predict the way employees behave with respect to safety in that workplace” (Williamson et al. 1997). The study conducted by Dedobbeleer and Beland (1991) on construction workers, suggested that the management commitment to safety and workers’ involvement in safety were the two most important factors impacting the safety climate. A separate study on road workers found two separate set of principles for workers and for supervisors both of which included attitudes to safety in the organization, changes in work demands and safety as part of productive work (Niskanen 1994). In order to determine and effectively translate these descriptive measures into an operational measure for safety management, several instruments have been developed. The majority of these instruments are in the form of self-reported questionnaires administered as large scale surveys in an attempt to determine the key factors affecting safety climate. Content analyses of the survey questionnaires used to measure safety climate in the construction industry by Ghosh et al. (2010) revealed that common themes of the questionnaires relate to implication of safety rules and attitude of the management towards worker safety.

### **Zero Injury Technique**

In 1993, the Construction Industry Institute (CII) initiated a research to demonstrate how to achieve zero incidents in construction projects and to convince owners, contractors and managers

about the importance of an effective safety program (CII 1993). Based on interviews with owner/managers, construction managers, construction superintendents, and construction workers, the study generated five high impact techniques that are designed to help owners and contractors achieve zero incidents on their construction projects. The techniques include: (i) pre-project planning for safety, (ii) safety orientation and training, (iii) written safety incentive programs, (iv) alcohol and substance abuse programs, and (v) accident/incident investigations (CII 1993; Hinze and Wilson 2000). Following this study was another one in 1998 by Hinze and Wilson, which validated the importance of the five high impact techniques in safety performance. The five high-impact techniques identified by the CII in 1993 were revisited in another study in 2003, which addressed the importance of using several safety techniques in construction projects (CII 2003). These techniques were categorized into nine groups: (i) management commitment, (ii) staffing for safety, (iii) planning (pre-project and pre-task), (iv) safety education (orientation and specialized training), (v) worker involvement, (vi) evaluation and recognition/reward, (vii) subcontract management, (viii) accident/incident investigations, and (ix) drug and alcohol testing.

### **2.2.1 Limitations of the Prevailing Safety Improvement Measures**

The safety improvement measures discussed in the previous section have contributed to the reduction of incident rates in the construction industry, but they also have limitations (Prichard 2002). Some of the limitations of the prevalent measures to improve safety are:

- i. The current safety improvement approaches do not add monetary value to construction production; they replace one type of unacceptable cost (human sufferings and financial costs) with a more acceptable cost (cost of compliance).

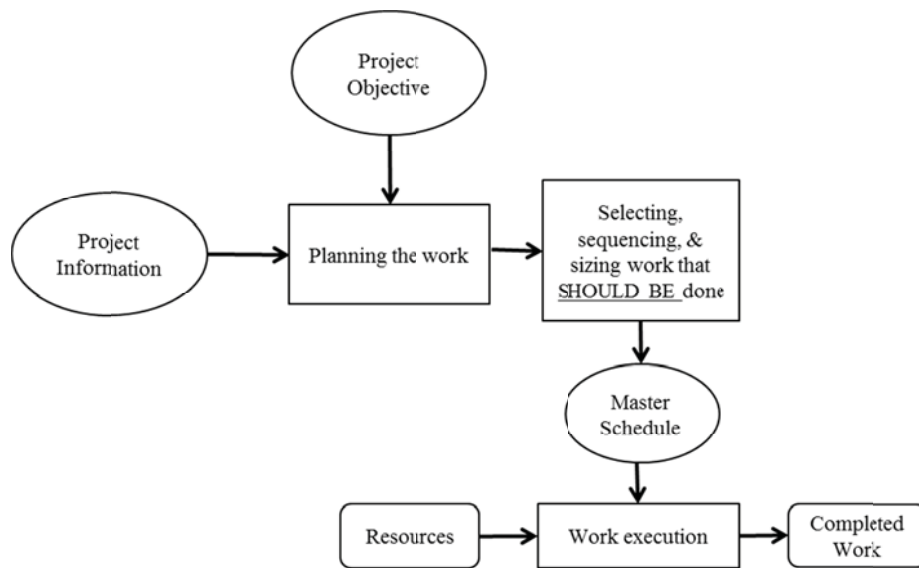
- However, compliance requires significant resources that put safety requirements in conflict with production and cost goals (Mitropoulos et al. 2005).
- ii. Compared to some other industrial sectors, such as nuclear energy, manufacturing, and aircraft production, construction is a less structured and more loosely coupled industry (Rasmussen 1997). The dynamic nature of construction processes and the large number of poorly defined situational hazards limit the effectiveness of the prevalent measure (Mitropoulos et al. 2005).
  - iii. The focus on violations limits the ability to learn from incidents. Incident investigation focuses on violations and liability and tries to assign blame (Mitropoulos et al. 2005).

The prevalent safety measures in the construction industry reflect a fundamental problem in failing to recognize the dynamic and dependent nature of construction tasks (Howell et al. 2002). Moreover, traditional project planning of construction projects also neglect the potentially large effect of work design and team coordination (Mitropoulos et al. 2007). These limitations can be overcome by the application of formal construction production planning, which utilizes the expertise of the different project participants in the planning process (Koskela 1992) and employs a process of constraint analysis to ensure that each task is free of any constraints (Ballard 2000).

### **2.3 Production Planning and Control Process**

Planning is a multi-stage and multi-level process. Some researchers contend that it is a top-down, systematic and sequential process (Emery 1969), while others posit that planning is a multi-directional, incremental and concurrent process (Hayes-Roth and Hayes-Roth 1979). Project

planning follows the systematic and hierarchical model of planning. Traditional project planning in construction utilizes the information about the resources available and the project objectives to define and organize the work to be accomplished (Figure 2-1). The most common approach is to develop a list of tasks and determine the relationships between each task. Work breakdown structure is the tool used to decompose a project into definable tasks. It also acts as a framework for cost estimating and provides guidance for schedule development. Next, quantity takeoff is performed for each task and the productivity of the crew is determined from historical data, from which durations of the tasks are calculated. All this information is integrated into a plan with additional information for responsibility, cost, constructability and availability of resources. Once production begins, management devotes its efforts to control and monitors performance against the planned specifications with corrective actions as needed (Howell 1999).



**Figure 2-1** : Traditional project planning

In current construction practice, project planning has been left to ad-hoc methods and the formal focus has been on project budgets, schedules, and other macro-level specifications of the steps to be followed and the constraints that may be encountered in the execution of the project



(Abdelhamid et al. 2008). The key issue of 'how' to carry out the work receives less or no attention in this approach (Laufer and Tucker 1987). In this model of project planning, everything works fine until a vendor fails to meet the schedule and causes a delay in fabrication or delay in delivery to the project jobsite. This unexpected delay takes away the float in the schedule and puts increasing pressure on everyone in the chain to produce more and fast. This usually makes things worse and directs attention towards getting the work done rather than learning how to work better and safely. Previous research shows that following the traditional project planning method, the amount of work a crew 'actually performs' never matches the work the crew 'should' perform (Ballard and Howell 1994).

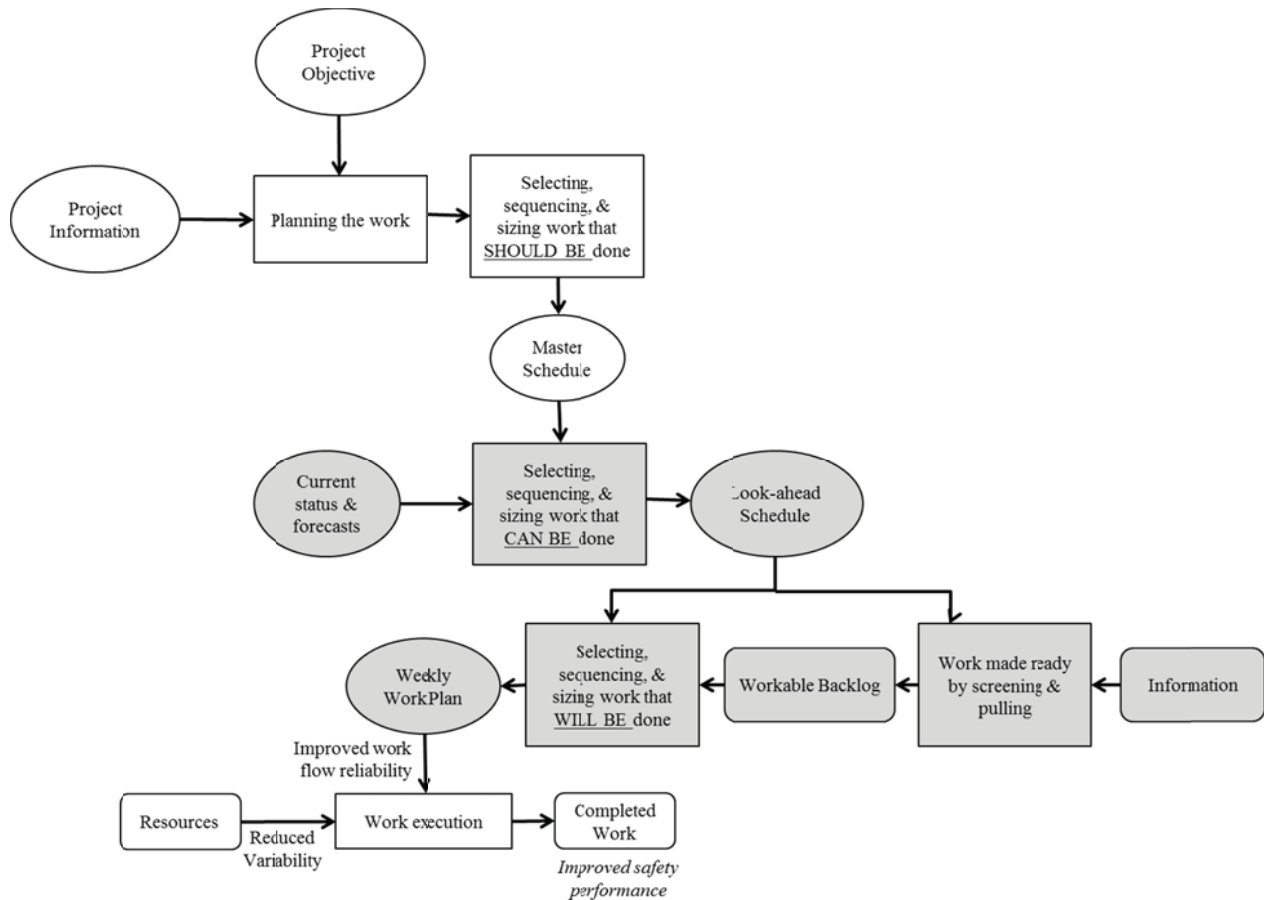
To reduce the variability of workflow, scholars suggested a shift from the sequential nature of traditional project planning to a planning model where design of product and process are considered concurrently (Howell 1999). Additionally, in order for the execution of the project to proceed in a reliable fashion, Abdelhamid et al. (2008) suggested that planning has to follow a formal process to identify detailed specification of the tasks and the constraints that may cause incompleteness of the tasks. This process of planning by exposing workflow issues at the task level utilizing inputs from participants and thus enabling better performance at the system level is termed as formal production planning. Using a decentralized decision making process, production planning defines the criteria for success and produce strategies for achieving them (Howell 1999).

In a generic sense, the term 'production' is synonymous with 'making' (Ballard 2000).

Production process includes the methods or steps involved in making a product. In construction, production processes include site preparation, construction of the facilities, finishing and delivering the end products. Formal production planning aims at removing the constraints of the

normal flow of work and pays formal attention to execution and integration between different levels of planning. Similar with the project planning approach, the master schedule outlines the ‘should do’ tasks in production planning, as well. The master schedule is prepared based on the quantity takeoff and crew productivity, and inputs from the different participants, i.e. subcontractors, suppliers, superintendents and project manager. Incorporating the inputs of the participants in preparing the master schedule helps in avoiding resource shortage, thus removing some constraints at the very beginning. As illustrated in Figure 2-2 below, the next step is to parse the master schedule into a look-ahead plan for a shorter window of time. This process again involves inputs from the different participants. The subcontractors and suppliers agree to those tasks they think can be done. These tasks form the list of ‘can do’ tasks. The set of ‘can do’ tasks are further analyzed to identify the constraints for the completion of the same. Constraint analyses of the tasks are performed to make the tasks ready for the workers of different trades (Mohammed 2005). Koskela (2000) identified seven categories of pre-requisite information that should be considered while performing the constraint analysis of each task. The seven categories include: (i) information about the project, (ii) materials, (iii) workers, (iv) equipment, (v) place to work, (vi) pre-requisite work, and (vii) environmental conditions. Only tasks those are free from constraints can pass through this process as assignments to be completed. The subcontractors’ superintendents and foremen should commit to these assignments, which form the weekly production plan. These are the tasks that have been committed to, and are identified as ‘will do’ tasks. The work selected in the weekly production plan is then completed during the week. While finalizing the weekly work plan, the right sequence and right amount of work has to be selected. As the direct workers are involved in the preparation of weekly plans, decisions are based on the intimate knowledge of working conditions and constructability issues. The direct workers “can

be expected to make commitments (will) to doing what ‘should’ be done, only to the extent that it ‘can’ be done” (Ballard and Howell 1994).



**Figure 2-2:** Formal production planning process

At the completion of each day, the variance is measured by comparing the work completed with work that was promised to be completed. The variance of work promised and work actually executed in the field is measured by using percent plan complete (PPC) (Ballard and Howell 1994). To measure progress, PPC for each day is measured and in turn the weekly rolled PPC is calculated (Mohammed 2005). Following this, the reasons for incompleteness of tasks are identified and categorized to find out the major causes of delay. A complete data analysis is performed, and the result of the analysis is used in the next constraint analysis for preparing

weekly plan through a feedback loop. The model of the formal production planning in Figure 2-2 is based on the Last Planner ® System (LPS®) and has been adopted from Ballard (2000), Ballard and Howell (1994).

### **2.3.1 Formal Production Planning as Part of Lean Construction**

Taiichi Ohno of Toyota developed lean production as a design and production management system in the 1950s. The main aim of lean production is to shorten the cycle time to get products to market by minimizing waste (Mohammed 2005). According to Ohno, this production philosophy should provide custom products to the customers, deliver instantly with minimum inventory, and produce with zero wastes (Howell and Ballard 1998). Since then, Lean principles have been applied successfully around the world in the automobile industry. Manufacturers such as Toyota have striven to achieve production with zero or minimal waste. Lean principles are being increasingly utilized in various industrial sectors with success, especially when used in repetitive or continuous production environment (Howell 1999). Lean philosophies have also been adapted and adopted in construction industry (Abdelhamid 2003). Guided by the research efforts to adapt concepts of lean production to fit construction industry, a number of companies have embarked on a lean conversion path (Mohammed 2005).

Lean Construction views the entire project in production system terms and brings into practice the concept of “value generation” instead of “activity management” (Howell and Ballard 1998). The movement towards a unified theory of production in construction, was initiated by Koskela (1992), where he put forth the Transformation-Flow-Value (TFV) theory of production. The TFV theory of production encompasses the attributes of various production paradigms and considers transformation, flow and value generation as complementary rather than competing

theories of production. Specifically, craft production embodied the transformation view, while mass and lean production embodied the flow view and the value generation of production process was inspired by the transformation and flow paradigms (Abdelhamid 2004).

Considering the theoretical background of lean construction, it is defined by Koskela et al. (2002) as a “way to design production systems to minimize waste of materials, time, and effort in order to generate the maximum possible amount of value”.

Within lean construction paradigm, Last Planner ® System (LPS®) is the tool to perform formal production planning that defines the criteria for successful completion of a project and produce strategies to achieve those criteria (Howell 1999). As discussed earlier, a formal process is followed to identify detailed specification of the steps to be followed and the constraints to be removed in order for the execution of the project to proceed in a reliable fashion (Abdelhamid et al. 2008). Production control, in this context ensures that the events conform to plan (Howell 1999). LPS moves away from the hierarchical decision making process of traditional project planning and employs decentralized decision making. This is achieved by involving direct workers in the weekly planning process, whose efforts result in production and are positioned best to affect the building process (Koskela 1992). Additionally, inclusion of the direct workers provide them the authority to say ‘no’ to an assignment which fails to meet agreed criteria for success.

#### **2.4 Communication in Production Planning**

The production theory in construction based on the Transformation-Flow-Value model provides a powerful platform to coordinate action and increase communication among multiple trades which is undermined by the traditional project planning process (Abdelhamid et al. 2008).

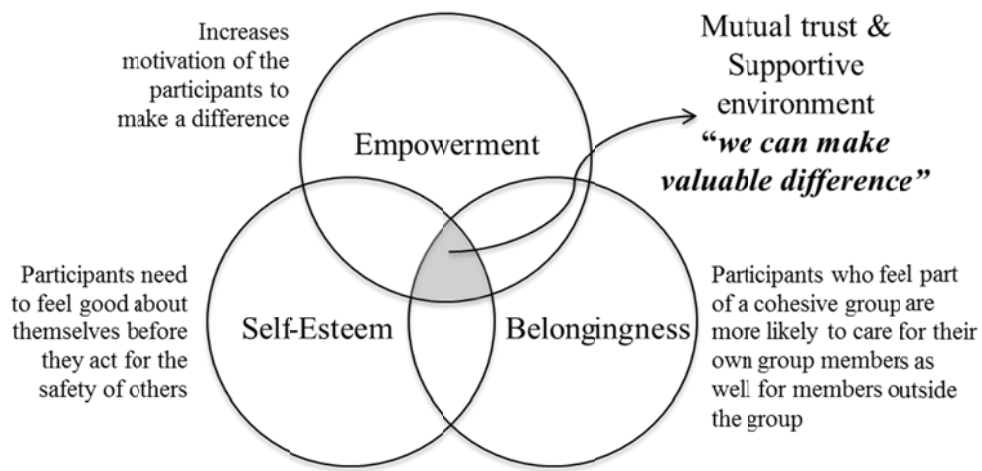
Construction is a collaborative social act that relies on effective communication between project participants (Gorse and Emmitt 2007). People working in the construction projects are temporarily brought together and interact on an individual and group level (Bryman et al. 1987). One way to coordinate action among these various individuals and crews, who work together on a temporal basis, is to increase participants' involvement (Ballard 2000).

#### **2.4.1 Involvement of Project Participants**

In lean settings, where continuous effort is made to reduce wastes, participants such as superintendent, project manager, subcontractors, vendors, and direct workers have the ability and authority to make decisions (Fullerton and Wempe 2009). This reflects the increased involvement of the participants in decision-making process and a shift from the 'control' approach to 'commitment' oriented approach towards work force management (Walton 1985). Within the commitment approach, emphasis is put on continuous improvement as well as higher expectation of performance from the participants. The emphasis on continuous improvement is supported by active involvement of participants, which lead to heightened importance of group achievement and expanded scope for individual contribution. An imperative aspect of this commitment approach is assuring that participants be heard on issues of production methods, mutual problem solving and planning, thus facilitating worker consultation (Walton 1985; Koskela 1992).

Participants' involvement leads to empowerment of participants along with enhanced self-esteem and increased sense of belongingness to the group (Geller 1994; Argyle 2007). This fosters a sense of cohesiveness among the participants, and they are likely to actively care not only for their own group members but for those external to the group as well. Koskela (1992) indicated

that empowerment of participants play vital role for rapid response to problems. The tripartite perspective of empowerment, self-esteem, and belongingness give rise to a feeling of making valuable contribution as a group as shown in Figure 2-3. Participants' involvement and resulting increase in communication also establish a base level of trust, which allows workers within a system to shift their attention toward improvement at the system level instead of simply defending their limited interests (Howell and Ballard 1998).



**Figure 2-3** : Effect of participant involvement

### 2.4.2 Supportive Environment

A supportive work environment, promoted by participants' involvement, points toward higher degree of trust and support within the work group. This also improves the confidence that participants have in working relationships with co-workers, and their general morale (Mohamed 2002). According to Goldberg et al. (1991) having a supportive work environment demonstrates participants' concern for safety and encourages closer ties between them. For this reason, trust in co-worker has been widely included in safety climate studies (Goldberg et al. 1991).

Trust is the human attitude that arises in conditions of reliability. Production planning is about building reliability (Howell 1999). Participants are not likely to trust one another very long, if the system does not demonstrate reliability. It is one thing to focus on the worker facing a hazard and another to require the worker who completed the previous work to assure such hazards are not left open before allowing the next crew to commence work (Howell et al. 2002). Making workflow more reliable by implementing production planning is an obvious way to reduce unexpected events, with evidences that more reliable planning reduce incidents (Howell et al. 2002).

From the preceding discussion, it is evident that production planning in construction projects promotes participants' involvement in the decision making process and indicate commitment oriented approach towards work force management. Due to the involvement of the participants in the issues of production methods and mutual problem solving, production planning provides the opportunity of improved coordination and collaboration thus fostering enhanced communication and interaction among the participants.

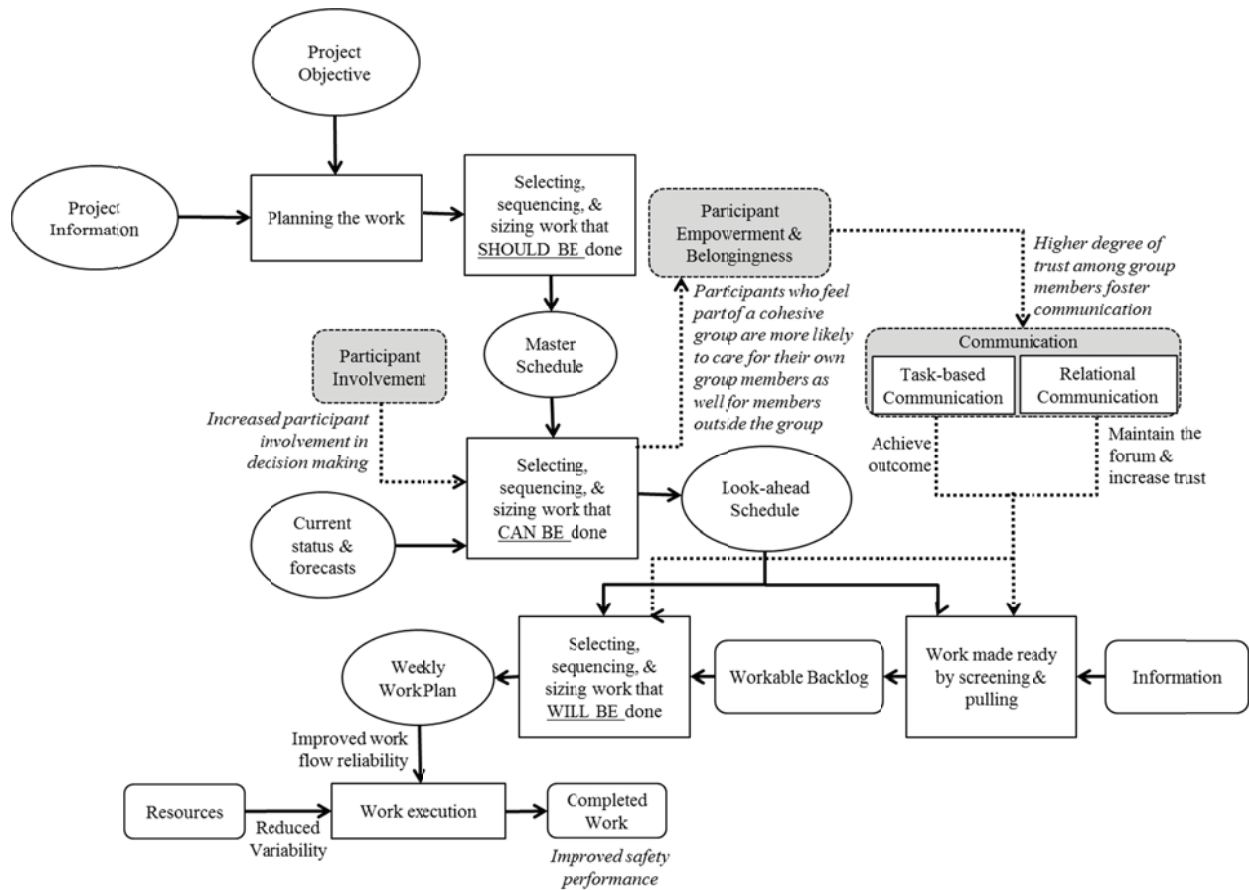
### **2.4.3 Purpose of Communication**

Communications among the group members directly influence the decision-making process. Decision-making in this regard involves gathering, processing, integrating, and exchanging information in support of task-based decision. In essence, this is an ongoing process in which demand on particular individuals can vary according to momentary task demand. Within the decision-making process, the group members communicate relevant information and assess the information by applying individual expertise (Cannon-Bowers et al. 1993). Effective decision making require the application of various classes of expertise by individual group members and



often is beyond the capability of a single individual. Additionally in an operational environment such as construction, decision making is embedded in a larger goal (Orasanu 1990). The goal of the different participants is to accomplish a task, rather than simply to make decision.

In reference to the production planning process illustrated in Figure 2-2, it is evident that lot of coordinated group work take place in this process, which is facilitated by communication among the various participants. Communications among group members can be separated into two dimensions: (i) task-based communication and (ii) relational communication (Bales 1950, 1970; McLeod and Kettner-Polley 2004). To achieve goals and discuss issues, groups share task-based information, opinions, and suggestions. And by showing support, establishing values, and resolving differences through communication that has social and emotional content, relationships are formed and maintained. Sperber and Wilson (1986) suggested that when people communicate they intend to alter the cognitive environment of the persons whom they are addressing. As a result, it is expected that the receiver's thought process and possible actions will be altered. Failure to exchange task-based information and ask questions will decrease a person's ability to use the other's knowledge and thus considerably hinders effective coordination (Gorse and Emmitt 2007). Based on the discussion so far, the model shown in Figure 2-4 depicts the role of communication during the formal production planning process.



**Figure 2-4:** Role of communication among participants during formal production planning

## 2.5 Communication in Construction Environment

Communication can be seen as a metaphorical ‘conduit’ (Axley 1984), which facilitates the participants of a project in realizing the objectives of the project. Successful communication skill is of utmost importance to achieve key management competencies such as decision-making, problem-solving and coordination (Emmitt and Gorse 2007). Considering the dynamic social system of the construction projects with uncertainty and interdependence of tasks, involvement of many participants in order to successfully deliver project objectives is common. In contrast to communication being a “simple transfer of information to another party” (Cheng et al. 2001), Emmitt and Gorse (2007) contended that communication performs much more complex tasks

than simple exchange of information among different participants. Communication also includes the participants' opportunity to ask questions to achieve common understanding about the project. To engage in meaningful communication, scholars claim that there is a need to build on the information; overcoming the complex and temporal constraints that construction projects place on the participants is fundamental to successful communication (Goczol and Scoubeau 2003). According to Brownell et al. (1997), appropriate communication helps to build a common understanding about the project among the participants to a large extent and vice versa. Development of common understanding facilitates communication, while lack of common understanding can lead to confusion. The temporal nature of the construction projects also plays a major role in deciding the characteristics of communications among the project participants.

### **Characteristics of Groups in Construction Environment**

Emmit and Gorse (2007) stated that the participants involved in a construction project could be considered as single organization. However it should be recognized that the organization is temporary in nature and only last for the duration of the project (Hill 1995). Thus, in effect the participants of a construction project form a loosely coupled group of interdependent individuals or subgroups, who contribute towards the completion of the project. On completion of the project, specifically on completion of a particular participant's work package, the relationship of the individual and the project comes to an end. This means the groups and network within the construction projects are temporary and the projects demand different set of participants each time (Emmitt and Gorse 2007). Even if the same organizations are involved, there are more chances that the same individuals are not repeatedly working together. Nevertheless, communication remains as critical to support professional relations among the participants of any construction project.

Due to the sequential nature of construction projects, the different organizations or trades that are involved in the projects are dominant at different stages in the project. This provides chance for short-term involvement, which reduces opportunities for the participants to establish firm and permanent communication network among themselves. Thus in spite of the interdependence of the tasks, many of the participants do not meet other participants during their period of involvement in the project. Relationships among the participants form, evolve and disband throughout the life cycle of the project (Dainty et al. 2006). The fluid nature of construction groups forces the participants who join later to take additional initiative to socialize with other participants (Anderson et al. 1999). Previous literatures on group communication and socialization processes found that new groups present a bidirectional process of social influence. In such situations both the existing participants and the new members have the opportunity for changing other's ideas and opinions through communication (Anderson et al. 1999). Wallace (1987) found that as groups developed, the importance of individual professional roles would be recognized. Throughout the life cycle of construction projects, as the tasks change from feasibility study to designing and then move into construction phase, the involvement and influence of the participants also change constantly (Emmitt and Gorse 2007). It is the responsibility of the project managers or superintendents to try and guide this dynamic process. As the project develops and the specific demand of the project changes the participants with the most relevant skills become more influential and powerful. Those with relevant skills emerge as the most dominant participant for a particular period of the project, during which they are central to the information processing and decision-making because of their expertise. Construction projects are transient in nature and are new ventures for the group of participants appointed to deliver the projects; regardless of the expertise and experience of the participants they are often

faced with unfamiliar and unpredictable situations. However, very few groups have the opportunity to develop long-term relationships and the norms of those groups are distinctly influenced by previous relationships and experience of that relationship. Although construction projects are unique and the participants disband upon completion of the project, the groups that are able to maintain relationship use that relationship in future projects (Emmitt and Gorse 2007).

### **Characteristics of Communication Among Construction Professionals**

Language used by the participants plays a major role for effective communication in construction projects. The construction industry's fragmented structure and its technical nature have led to the creation of both formal and informal vocabularies developed around the professionals and processes (Dainty et al. 2006). Professionals in the construction industry utilize specialized languages using vocabularies specific to their respective professional background (Gameson 1992) which enable them to communicate specific facts and ideas to fellow professionals (Emmitt and Gorse 2003). The various participants coming from different professional backgrounds make use of varied vocabularies, which are perceived as jargon by others (Emmitt and Gorse 2007). As a result, use of some of the vocabularies may lead to confusion if not supported with sufficient background information and explanation. Moreover construction industry has an increasing migration of construction professionals from different ethnic backgrounds speaking different dialects, which makes communication among the participants all the more complex. The complexity is increased manifold by the market forces that compel the participants to compete for the same businesses while collaborate on projects. According to Emmitt and Gorse (2007) these are some of the reasons that characterize the communication

processes among the various participants of construction projects to be less open and intermittent.

Loosemore (1996) found that lack of open communication among participants during problem solving phase had adverse effects on the ability of the participants. Loosemore (1996, 2000) also found out that during times of uncertainty and crisis, communication among the participants deteriorate and relationships break down. In a comparative analysis of two construction projects where the participants were involved in quality circles to identify specific causes of failure, Hall (2001) noticed that poor communication among participants resulted in failure of inter-organizational relations. In another study conducted by Emmitt and Gorse (2003), effective communication among participants were found to have major effect on construction project outcomes. They found that management and design team communication are subject to task-based communication norms, but could be affected by presence of relational communication.

Previous studies posit that communication among participants of construction projects are essential to develop and maintain relationships as also to accomplish project objectives (Keyton 1999). For the success of any construction project, communication among the participants play a critical role to establish and maintain the inter-organizational relationships necessary to accomplish the project goals. According to Emmitt and Gorse (1998) the nature of relationship established through communication affect the participants' understanding and hence the ability to use information to facilitate decision-making and coordination. The collective effort necessary to complete a construction project successfully can be achieved only through effective relational and task oriented communication (Emmitt and Gorse 2007). Gudykunst (1986) stated that in a construction environment, task-based and relational communications among the participants are interdependent and the context in which those occur are interrelated.

### **Communication to Achieve Project Objectives**

Achieving project objectives demand all participants to collaborate, share, collate and integrate significant amounts of information and knowledge (Oxman 1995). While addressing contentious issues, problem solving, conflict resolution and building relationships, face-to-face communication plays a crucial role (Abadi 2005). As mentioned previously, communication in any group has two dimensions: task-based and relational (Bales 1950, 1970; McLeod and Kettner-Polley 2004). Task-based communications are those that determine and define project goals, whereas relational communications help to build and maintain personal relationships among group members. Findings of a pilot study conducted by Higgin and Jessop (1965) revealed that the professionals interact during meetings to build and maintain the relationships necessary to accomplish tasks. Keeping in mind the benefits of face-to-face meetings, these are used as the preferred format of meeting by the participants of construction projects. The communication traits and practices followed by the participants were also found to be important for problem solving, especially during construction phase (Higgin and Jessop 1965).

Occasionally problems occurring during the construction phase require the involvement of design and management professionals to resolve them. As problems develop, key members of the design team and the contracting organization need to use effective communication to coordinate the available information and hence allow decisions to be taken to achieve the project objectives (Hugill 1998).

Interpersonal relationships among the project participants develop based on their own behavioral traits as also on others' behavior towards them. Even during limited period of communication, signals are being sent that influence the behavior of the participants (Lesch 1994). Relational communication signals of this type help in the development of implicit contracts among the

participants. It helps to understand the other participants' perceptions and recognize mutual expectations. As relationships develop, implicit contracts are formed that enable strong cohesion among the group members (Lesch 1994).

**Summary of Previous Investigations on Communication in Construction Environment**

To investigate communication in any setting, it is important to adequately define the attributes of communication that are to be researched. One of the basis on which prominent distinctions are made between different types of communication is 'level' (Emmitt and Gorse 2007). According to Gorse (2002), differentiation between levels within the context of construction environment can be made in terms of operations and actions from the micro-level (individual) to the meso-level (group) and then to the macro-level (project). The processes and participants involved in each of the levels are discussed below in Table 2-1.

**Table 2-1:** Levels of communication

<b>Type of Communication</b>	<b>Process</b>	<b>Participants involved</b>
Intrapersonal communication (Gorse 2002)	Participants interpret or react to messages stimulating conscious and subconscious processes in their mind	Only one participant is involved. It is the thought process of the single participant when he/she is alone or when interacting with others
Group communication (Price 1996)	Participants within the group interpret messages in different ways	Involves more than two participants but limited to a single group of participants
Multi-group communication (Gorse 2002)	Participants belonging to different groups and subgroups respond to messages depending on the groups' motivation and norms	Targets a number of groups or subgroups
Mass communication (Gorse 2002)	Individuals and group participants receiving message through mass media may attach different meanings to it depending on their	Groups can be targeted to whom a particular message will be sent



Type of Communication	Process	Participants involved
culture and norms		

Few of the doctoral studies that have looked into aspects of communication in construction environment, the researchers have identified interpersonal communication as mainstay for the successful completion of the construction projects. Some of the studies focused on discrete aspects of the construction projects, such as communication during the feasibility stage (Gameson 1992) where as Emmitt (1997) have investigated communication between specific participants. Kreiner (1976), Pietroforte (1992), Loosemore (1996), Hugill (2001), and Gorse (2002) collected data on distinct events from the construction jobsites. On the other hand, Abadi (2005) and den Otter (2005) focused their investigations on technological tools that facilitate communication. The afore-mentioned studies were conducted in different geographic location around the world and thus differ based on cultural, legal and contractual obligations among the participants. From the findings, it is clear that the communication among the participants play instrumental roles to resolve professional differences and sometimes to circumvent formal communication routes dictated by formal construction contracts. In all the studies face-to-face communication emerged as the most preferred method for resolving problems and contentious issues. However, very limited information exists on the behavior and practices of the professionals during face-to-face meetings.

Kreiner (1976) studied the communication among the participants of Danish construction sites, focusing on progress meetings. Based on works of Goffman (1974), he described the site meetings as formal events where participants engage in communication among themselves

following a fixed agenda. Kreiner's (1976) observation of the site meetings revealed that those exhibit stable relationships and relatively uneventful debate with minimal exchange of information. Some participants even did not actively contribute to the proceedings and merely attended the site meetings to fulfill their contractual obligations. Although Kreiner (1976) did not rate the site meetings highly as events to exchange communication and information, he found that the co-presence of a group of participants allowed for the misunderstandings and ambiguity to be resolved and agreement reached. The site meetings provided a platform to the project participants for coordination and problem solving.

Using a longitudinal study approach Pietroforte (1992) examined the flow of both formal and informal information during the different phases of construction projects: design, procurement, construction and commissioning. The researcher shadowed and observed the communication of one of the major subcontractors in the specific project (the cladding contractor). Pietroforte's (1992) work identified a number of differences in the organizational structures of the general contractor and the subcontractor. This showed that construction contracts are only able to allocate responsibilities among different participants and not direct the organizational arrangement of the participating organizations. The organizational arrangements are specific to the situation and the organizations engaged in the project. On a similar note Loosemore (1996) suggested that social adjustment, behavioral instability, and power struggles are some of the main factors that affected the resolution of unplanned events, instead of contractual obligations.

Loosemore (1996, 2000) investigated the patterns of communication and social structures that develop in response to situations of crisis in the construction phase of the project. The participants observed in the studies included clients, estates department representatives, project managers, architects, client's quantity surveyors, contractors' project managers and contractors'

quantity surveyors. Data of communication following the situation of crisis was collected through participants' reports and data analysis was performed using social network analysis. Loosemore (1996) identified patterns in the communication and interaction of the participants and suggested a need for communication networks to overcome crisis. Construction crisis was also found to result in conflict that undermined collective responsibility and reduced the effectiveness of the communication network. The study also found the recurrent occurrence of latent tension throughout the construction phase that developed due to the conflict. In addition, the crisis had a detrimental effect on communication and interaction among the participants. Interestingly, it was also found that the same crisis could present opportunities for increased communication and cohesion among the participants. This could result in increasing cohesion and strengthening mutual trust within the group members. Lee (1997) and Cline (1994) also identified other benefits from conflict. They observed that disagreement could be productive at times, helping to expose alternative views and increasing collaboration. Loosemore's (1996) findings reiterated that cohesion following a crisis could be used to resolve problems. However, no specifics of the nature of conflict were reported by Loosemore.

Hugill's (2001) work on team meeting looked into the methodological aspect of studying meeting using conversation analysis. Conversation analysis had been particularly useful for examining short episodes of group behavior, but posed a problem in analyzing multiple meetings due to the amount of time involved in the method. In this regard, Potter and Wetherell (1987) differentiated discourse analysis and conversation analysis on methodological grounds (Potter and Wetherell 1987). While discourse analysis is a broad term covering all forms of communication, conversation analysis is restricted to verbatim transcripts of communication among the participants. Conversation analysis is considered to take a more naturalistic approach

focusing on the nuances of different types of gestures such as blaming, excuses and greetings, etc. The method may be considered a part of ethnomethodology, which is concerned with the study of people in everyday life. Due to the amount of detail extracted in ethnomethodological studies, those are often limited to short episodes. Due to the adoption of such detailed and intricate method Hugill's (2001) report was restricted to the analysis of one hour of the meetings discussion. Such observations provide insight into human communication and behavior, but to uncover trends and practices that affect the project many meetings need to be researched and the data collated. The study argued that patterns of behavior may be identified and such behavior may be linked to successful or unsuccessful communication. However as group communication in construction context is not a widely researched area (Emmitt and Gorse 2007), scholars still do not have a defined understanding of general patterns of communication among construction professionals.

Due to scant research conducted in the field of group communication in the construction environment, it was critical to establish the underlying concepts of group communication, as they are currently understood. This task required investigation into the roots of the discipline of group communication based on the thought, theory, and understanding throughout recorded history. This has been accomplished by a comprehensive literature review. Based on the review of scholarly articles and books published from 1930 to 2011 on communication, group communication, and social interaction, the underlying concepts of group communication are discussed in detail below.

## **2.6 Underlying Concepts of Group Communication**

From its earliest stage of inception, the discipline of group communication is currently more than half a century old. In this fairly long time, the discipline has attained much maturity by virtue of different conceptual underpinning and methodological practices. The following sections provide the chronological advancement of investigations on communication among group members by examining the historical, theoretical, and methodological issues pertaining to this discipline. The origin of this emergent discipline can be traced back to the pedagogical investigations of early 1940s, which also acted as precursors of social psychology and sociology (Gouran 1999). In the decade to follow (1950s), investigations pertaining to social sciences gained importance among the scholars, and 1960s observed a developing focus on communication within groups.

Continuing with the focus on group communication, in 1970s the scholars explored the development of group communication, and the relation of messages exchanged among the group members with the outcomes of the groups. Following the exploration phase, much of the scholarly activities were guided towards development of theories of communication among group members. During 1980s, theories of group communication were developed and research agendas were designed to examine the theories. The theories generated were refined in 1990s, as well new theories were formulated and tested with an emphasis on the study of natural groups. The refinements of the theories were continued in the 21st century with continued investigation on the implications of these theories.

### **2.6.1 Origin of Investigation on Group Communication**

As a topic of research interest, investigations on group communication can be traced back more than 60 years. Investigators in the late 1930s and 1940s focused on topics such as the effects of group discussion on college students' social attitudes (Robinson 1941), association of discussion

among group members on the divergence in judgment (Simpson 1939), and gender differences on group discussion (Timmons 1941). Johnson (1943) developed an instrument to measure reflective thinking ability, which was a substantial contribution to the discipline of group communication. The instrument was based on Johnson's earlier work on communication pedagogy (Johnson 1939).

Early investigation on group communication was pedagogical in nature and related largely with group forum as a pedagogical tool for improving public life (Lyman 1915). During the 1920s, group forum was considered as instrument of democracy as evident in the works of Sheffield (1922) and Baird (1928); similar views can be found in the works of the scholar at a much later time in 1950s in which public meetings were thought as means for people to arrive at decisions collectively. Group communication was considered as a cooperative activity aimed at solving mutually shared problems (Lewin et al. 1939; Lippitt and White 1943). With the progress of time the concentration of the scholars moved from generic investigations on group communication to focused investigations such as methods to minimize influence of disruptive behaviors of group members on the group outcome (McBurney and Hance 1939).

The pedagogical interest into groups could be observed in Sociology and Social Psychology also, as evidenced from the works of Lewin (1943, 1945, 1951). Lewin (1945) started the movement to study groups scientifically based on group dynamics, modeled in part on theories of Physics. The concept of group dynamics was reflective of Systems Perspective, which considered entities to be composed of interlinked elements, and any alteration in the property of one element would predictably alter the properties of other linked elements (Mabry 1999). Within the realm of group communication, Systems Perspective showed evidence that changes in particular characteristics of groups (for example, leadership style) are systematically related to changes in other

characteristics (for example, group members' satisfaction and motivation) (Wilson 1998). The investigation of Lewin et al. (1939) on leadership style also complemented the earlier scholarly activities where group communication was considered a tool of democracy. The significance of Lewin's work was that it showed possible use of scientific approach towards group analyses. Lewin's works on Systems Perspective later culminated to the development of the Field Theory (Lewin 1951), which was the foundation of majority of the research conducted on small groups in Social Psychology during 1940s and 1950s.

Cattell (1948, 1951a, 1951b) developed a comprehensive theory of group processes in respect to basic dimensions of personality of the group members, referred to as Syntality. It represents the combined characteristics of the group members that affect the functioning of the group. Cattell (1948) posited that the amount of collective energy a group devoted for the completion of any task was equivalent to the energy left after the amount spent for the maintenance of the group. Cattell's theory focused on the social dimensions of the group processes as well as the means (for example coordination) by which the group members attempted to achieve group goals.

The aforementioned developments in Sociology, Social Psychology and related disciplines along with research questions that challenged the educators of group discussion and authors of instructional materials, paved the stage for sustained research activities among the communication scholars that began to appear in the 1950s.

### **2.6.2 Emergence of Investigation on Group Communication**

In the beginning of 1950s, study by Brandenburg (1950) questioned the legitimacy of group communication as a suitable discipline of study and compared it with a mere instrument to influence social judgments. Gunderson (1950) also joined the league of those who did not

consider group communication as a discipline worthy of investigation, and stated that group dynamics only presented false hopes to unwary group members to improve their abilities to solve problems.

Despite the criticism, scholars such as Harnack (1951, 1955), Black (1955), Wischmeier (1955), and Grissinger (1955) continued their investigations on group communication. Harnack (1951) conducted a study on the cooperation and competition among small group members and concluded that groups having cooperative members performed better than groups with competitive members. In a follow up study, Harnack (1955) demonstrated that cooperation among the group members increased when the members were trained to generate and appreciate group goals. Other scholars such as Black (1955) looked at the causes of breakdown of group discussion, and Crowell et al. (1955) looked in to the self-concepts of communication skills and performance in small group discussion. Other scholars such as Barnlund (1955) and Wischmeier (1955) focused on the effect of leadership on the decision-making process within the groups. Wischmeier (1955) compared the effectiveness of group-centered and leader-centered approaches on group decisions.

A significant improvement in the group communication research during the 1950s was the development of methodological procedures and instruments to measure outcomes of group discussion. Bales (1950) came up with the significant study on methodology to analyze communication process among group members. It provided a means for coding both the task-based and relational content of communication occurring during group meetings. Bales' (1950) work also provided reinforcement to the view that groups constitute systems and they exhibit system like regularities in respect to stages of development and communication. Mathews and Bendig (1955) created an index of group members' agreement on decision alternatives, and



Dickens (1955) came up with a formula to assess the characteristics of participation (spread vs. evenness) among group members during discussion process. As time progressed, the focus of the researchers shifted to the effect of personal characteristics of group members on the outcome of group discussion, such as motives, aggression, and need for achievement (Scheidel et al. 1958; Utterback and Fotheringham 1958).

Keltner (1957) continued the work started by Harnack (1951) on cooperation among group members and introduced the term “groupthink”. Keltner used the term to refer to a form of cooperative thinking among the members of a group. Later, Brillhart (1960) used group-thinking as a constructive form of discussion activity in a case study of two groups and concluded that the group characterized by high level of collaborative thinking performed better than the other group. Studies by Bane (1958) and Crowell (1958) reinstated the positive effect of cooperative thinking on group communication.

The scholars came to the understanding that the processes of group communication was not always erratic and followed some degree of regularity; with appropriate understanding acquired through scientific study group communication could even be predictable. This realization was established by Lewin’s (1951) Field Theory based on Systems Perspective. Majority of the studies carried on during 1950s contributed to the notion that characteristics and members had significant impact on the performance of the groups. However, investigating discussion methods alone was not sufficient to ensure the proper functioning of task-oriented groups. Thus, the focus of the scholarly activities shifted to investigations of group communication.

### **2.6.3 Investigation with Focus on Communication**

Since the beginning of 1960s, the scholars started to focus on group communication from both functional and developmental perspectives. Functional perspective refers to the manner in which messages help in the completion of tasks and thus affect the outcome of the group; developmental perspective refers to the manner how messages reflect the influence of prior communication as also impact the subsequent communication. The functional perspective suggested that decision-making or problem-solving groups should follow the sequence of Dewey's (1910) method of reflective thinking or an adapted version of it while performing tasks. Phillips (1966) suggested five distinct steps to be followed by members of group: (i) define the problem; (ii) analyze the problem; (iii) propose possible solutions; (iv) test solutions against criteria; and (v) select one final solution. Among multitude of studies, a notable few by Pyron and Sharp (1963), Pyron (1964), and Sharp and Milliken (1964) focused on the reflective thinking capability of group members and its relation to the group outcome. The group members exhibiting reflective thinking identified by Dewey (1910) not only contributed towards better outcome of the groups, but also enjoyed more influence over the group in comparison to other group members (Pyron and Sharp 1963; Pyron 1964).

While some scholars were investigating group members' reflective thinking ability and its effect on the outcome, other group of scholars became less concerned about the outcome and more focused on the dynamics of group communication. The attention towards investigating communication sequence was consistent with Lewin's (1951) Systems Perspective, which stated investigating the microscopic detail of communication sequence was the key to understanding the broader aspect of the outcome of any group. The developmental perspective of group communication gained impetus from the works of Scheidel and Crowell (1964, 1966) in which

they attempted to determine the predictability of communication sequences and found out that discussion does not follow a linear fashion, in complete contrast to what Bales and Strodtbeck (1951) stated in their earlier study. The findings of Scheidel and Crowell (1964, 1966) created interest among other researchers to investigate how communication in groups develop and evolve and also impact the relationships among the group members. Berg (1967) performed descriptive analyses of themes in task-oriented group communication and concluded that to some extent they reflect the emerging culture of the groups. Geier (1967) investigated the characteristics of the messages exchanged among the group members and how it relates to the emergence of leadership in groups. In another study, Gouran (1969) attempted to differentiate consensus from non-consensus groups in terms of attributes of discussion content. The study concluded that the extent to which discussion content exhibit particular attributes was dependent on the content of discussion. The different stages of group development were identified by Tuckman (1965) in his study on therapeutic groups. Tuckman's (1965) investigation also focused on the predictability of communication among group members based on Information Theory and Mathematical Theory of communication, both grounded in the Systems Perspective.

Commonality among the studies conducted during 1960s was the development of coding schemes focused on content of communication (Scheidel and Crowell 1964, 1966; Gouran 1969). However the coding schemes were study-specific and lacked general applicability. Moreover, majority of the coding schemes, except a few were not firmly grounded in any specific theories. It was not until later in 1970s and 1980s that more reliable and valid coding schemes emerged based on strong theoretical grounding.

#### **2.6.4 Further Exploration of Group Communication**

Following the investigations with an emphasis on messages for the study of group communication during 1960s, the scholars investigated more diverse topics pertaining to group communication during the 1970s. Despite the diversification of the topics and issues of investigation, majority of the studies conducted during 1970s were grounded in Systems Perspective. Scholars during 1970s also investigated methods for improving performance of groups, but not necessarily in respect to addressing social and political issues (Fisher 1974; Tubbs 1978). Janis (1972) focused on decision-making in groups and discussed different variables that affect or are affected by the manner in which group members interact. He focused his investigations on number of variables such as leadership, cohesiveness, and other roles the group members enact as well as influence of external constraints. Janis (1972) based his work on real-life group communication and thus established the value of case studies of natural groups as a methodology to investigate group communication processes. During the 1970s, researchers also looked into the relation of group communication and leadership. However, the studies varied considerably with regard to the issues addressed. Borman et al. (1978) for instance looked at responses of the male group members to dominance demonstrated by female members, where as Sargent and Miller (1971) attempted to determine the various aspects of communicative behavior that distinguish various styles of leaderships. Other studies focused on the types of behaviors that could predict leadership emergence (Schultz 1974, 1978).

A major concern for the studies published during early 1970s was threat to validity of the studies. Bochner (1974) identified issues with the adopted methodologies that constituted threat to validity, such as diversity of the group tasks and lack of reliability of the coding schemes used. This forced the researchers to consider designing the studies more precisely, especially in regards

to analyses of group communication and the interpretation of pertinent data. Along with increased emphasis on the validity of the studies, there was another radical methodological change noticed during this period. While majority of the earlier researchers conducted quantitative and laboratory investigations to study the effect of one variable on another during group communication, a departure from this tradition was noticed. Scholars started to focus on case studies of natural groups to explain phenomenon such as group development (Chesebro et al. 1973; Gouran 1976). Also emerging were more sophisticated, elaborate and generally applicable coding schemes for classifying group communication (Ellis and Fisher 1975; Mabry 1975).

With changes in methodological approaches, the scholars felt need for robust theories on group communication. In response, Gouran (1973) developed a meta-theoretical perspective demonstrating possible connections among contexts of group communication, functions of communication behavior, and group outcomes. This was the foundation of the Functional Theory perspective of groups developed later on. Fisher and Hawes (1971) developed a grounded model of communication sequences in groups that showed the level of predictability one can expect in various types of group communication, especially in task-oriented groups. In spite of the sporadic development of theories, the overall lack of theories of group communication during 1970s made it complicated for the scholars to synthesize and integrate the disparate knowledge. The scholarly works in the decade to follow addressed the need for theories of group communication, and developed a plethora of theories about group communication.

### **2.6.5 Development of Theories about Group Communication**

The 1980s saw sustained interest in the study of group communication, which were either exploratory in nature or based on the theories of cognate disciplines. The measurement of characteristics of communication among group members received much attention by various researchers during the 1980s that gave rise to a number of coding schemes (Poole 1981; Seibold et al. 1981; Hirokawa 1982, 1983; Poole 1983; Putnam 1983). These coding schemes exhibited better theoretical grounding, especially in regard to Functional Theory, Developmental Theory, and Structuration Theory. Two other theories namely Symbolic Convergence Theory and Socio-Egocentric Theory also came into existence during the 1980s. The theories that emerged during this period underwent multiple refinements and became formal in structure. The aforementioned theories exerted a long lasting influence on the scholarly activities related to communication among group members into the late 1990s.

Functional Theory had its origin in research that took place during 1960 – 1970, and received considerable impetus in a study by Hirokawa (1980). Functional Theory explained how communication affect group outcomes, especially the quality of decisions and effectiveness of solutions to problems. Hirokawa (1980) identified communication-based reasons for differences in the performance of effective and ineffective decision-making groups. The basic features of the Functional Theory were subsequently articulated in greater detail by Gouran and Hirokawa (1983), Gouran (1985) and Hirokawa and Scheerhorn (1986).

Similar to the Functional Theory, the Developmental Theory had its origin during the same time frame. Developmental Theory was concerned with how group communication unfolds and shapes itself over time. The theory came into existence partly as a continuation of interests

among early scholars on developmental stages of group communication. Researchers investigating the development of group communication were mainly divided into two groups; one group of researchers were of the opinion that communication in groups unfolded in some kind of identifiable linear progression (Bales and Strodtbeck 1951; Tuckman 1965; Fisher 1970), while the other group of researchers posited that group communication progresses was linear as well as multiple sequence model (Scheidel and Crowell 1966; Poole 1981).

Structuration Theory developed by Giddens (1976) is appropriate for the study of communication in groups and has some commonality with the Developmental Theory. It offers a progressive view of communication in which underlying “structures” affect the “surface behavior” of group members, which in turn results in alterations of structures. Structures in this context is defined as combinations of rules and resources that group members have available to them, and surface behavior refers to their communication behaviors.

Symbolic Convergence Theory emerged from the earlier work of Bormann and received formal articulation during middle of 1980s (Bormann 1985, 1986). The theory was developed to explain the influence of communication in groups. A number of case studies of natural groups conducted during the 1980s were grounded in the Symbolic Convergence Theory, such as Cragan and Shields (1981), Koester (1982), Ford (1989), and Kroll (1983).

Hewes (1986) developed the Socio-Egocentric Model of Group Decision-Making. The model predicts group decisions on the basis of pre-discussion preferences of group members. In other words, the model posits that what a group member says at any given moment is partially, if not completely, determined by an immediately preceding comment.

The aforementioned theories provided the foundation for much of the investigations on group communication during the 1990s and beyond. The theories were frequently revised and refined in the years to come to make them more formal and robust.

### **2.6.6 Sustained Investigation on Group Communication**

During the 1990s there was not only substantive attention to the emergent theories of group communication, but also the scholars showed growing interest on group communication in the form of both stability and diversification. The scholars showed stability in continued efforts to develop and refine the theories, which emerged during the 1980s, and also to expand the research base related to them. Diversification in the research interest was evidenced in topics researched during 1990s that had not been investigated previously, or at least not in any depth. One of the significant changes was the reduction in the amount of investigation on group decision-making and problem solving (Gouran 1999). Other changes included more naturalistic modes of inquiry and the use of case studies of natural groups (Gouran 1999). In contrast to the investigation of group communication in the artificial and controlled environment of laboratories, in 1990s the researchers sought to case studies of natural groups even for understanding topics of traditional interest such as relationship between communication and group decision-making (Ball 1994a, 1994b). Methodologies used within case studies included participant observation by the researchers, interviewing of group members, members' self-reports collected via questionnaires, and content analysis (Gouran 1999). In general, these studies had a strong influence of ethnographic research strategy.

Various studies looked into the measurement of group communication based on the Functional and Structuration Theories (Poole and DeSanctis 1992; Poole et al. 1993; Salazar et al. 1994).



Developmental Theory coming out of the primary focus on phase development expanded its scope and became the generic label for a family of theories and models concerned with patterns of communication. Poole and Baldwin (1996) characterized these patterns as phase, critical events, continuous and social construction models. Both Symbolic Convergence Theory and Socio-Egocentric Theory underwent revisions. Symbolic Convergence Theory was enriched by continued case studies, for instance the application of the theory to corporate strategic planning (Cragan and Shields 1992).

The Bona Fide Groups emerged as the new theoretical perspective in the 1990s. Originated by Putnam and Stohl (1990) and encouraged by Frey (1994), the new theoretical perspective sets group within larger organizational, institutional, and social contexts. Bona Fide Group perspective also considers ways in which multiple roles and group boundaries influence the behavior of group members. This perspective continued to evolve throughout the 1990s in the works of Putnam (1994), Putnam and Stohl (1994, 1996), and was a major stimulus to the significantly increased attention to natural groups (Sunwolf and Seibold 1998). Another emergent theoretical perspective related to the Bona Fide Group Perspective was the Naturalistic Paradigm.

The 1990s marked a period when previously emergent theories received continued attention and underwent considerable refinement and modifications. The new visions of Bona Fide Group Perspective and Naturalistic Paradigm emerged in this period and influenced the topics of group communication investigated as also the methods used in the investigations. Methodologically use of case studies became more prolific with studies based on natural groups and use of qualitative research methods.

### **2.6.7 Contemporary Issues in the Research on Group Communication**

Research directions that emerged in the 1970s, and reached their peak in the 1980s and 1990s, continued into the 21<sup>st</sup> century. At the same time, important developments in the 1990s infused renewed energy in the study of group communication. Towards the end of 1990s scholars investigating group communication began to establish connections with scholars who study groups in other disciplines, such as psychology and information system (Wittenbaum et al. 2006), and this was evident in the research trends of the 21<sup>st</sup> century. On a broader aspect, the investigations on group communication during the 21<sup>st</sup> century fall into four main areas: (i) performance; (ii) participation; (iii) bona fide groups; and (iv) technology.

Scholars have shown sustained interest in deciphering how communication impacts performance on group decision-making and problem solving tasks. Majority of investigations related to performance are based on the Functional Perspective, where the quality of the group's output is considered a function of the inputs (Wittenbaum et al. 2004). Some of the scholars attached themselves to the traditional line of investigations, such as group polarization (Henningsen and Henningsen 2004) and groupthink (Henningsen et al. 2006). The recent studies in this area examine processes that are relatively new to the investigation of group communication such as: (i) information sharing; (ii) remembering; and (iii) resource sharing. Since middle of 1990s, a number of studies have focused on information processing among group members. Much of this work was inspired by psychological research on information sharing in decision-making groups, replicated and extended by scholars across many fields (Wittenbaum et al. 2004). In a study conducted by Stasser and Titus (2003), they found that unshared information was less likely to appear in group discussion and impact group decisions compared to shared information, much to the contrast of prevailing understanding. This collective information sharing among group

members has significant decisional implication and is referred as the hidden profile, where part of information is shared among group members and other parts are not shared. However group members cannot detect the optimal solution until a thorough pooling of the unshared information (Schultz-Hardt et al. 2006). Van Swol et al. (2003) in their study concerning hidden profile stated that information exchange and group decisions suffer when members emphasize shared information through repetition. On the other hand, being able to compare the decision alternatives on common dimension improves members' performance on a hidden profile task (Reimer et al. 2007). On a separate note, Wittenbaum et al. (2004) posited that members might hold competitive goals, motivating them to withhold unshared information from other members. Unlike information sharing, scholars in diverse disciplines such as psychology, economics and environmental science could not link resource sharing with group communication, till Pavitt et al. (2005) and Pavitt et al. (2006) were ultimately successful. The studies showed that groups with a higher replenishment rate performed better and contributed more maintenance and procedural comments during group discussion compared to groups with a lower replenishment rate.

There are three theoretical issues that drive participation research from a communication perspective. Firstly there is a concern with the nature of participation (Wilson 2002); secondly to explain the co-occurrence of different types of contributions (Jackson and Poole 2003); and thirdly to explain the influence of exogenous factors on participation (Hirokawa et al. 1996).

The Bona Fide Groups Perspective (Putnam and Stohl 1990) which emerged in the 1990s provided the platform that allowed for comparisons of communicative behavior across contexts. Within the perspective there are two main assumptions (Frey 2003): (i) group boundaries are permeable and fluid; and (ii) features of group processes, as well as outcomes, affect and are

affected by a group's working environment. Methodologically, according to the Bona Fide Perspective there is no one "correct" set of methods and analyses (Stohl and Putnam 2003). Thus, different types of methods such as participant observations, textual analyses, and field and laboratory experiments are used. Investigations based on the Bona Fide Perspective have examined groups in a wide variety of natural settings. Two such examples are Kramer's (2005) examination of a fund raising group, and SunWolf and Leet's (2004) study of adolescent and child peer groups.

With the advancement of communication technologies group members no longer need to be co-present in space and time for group proceedings. The advent of technology has opened up a new area of investigation for group communication researchers. Few studies reviewed by Baltes et al. (2002) have compared the differences in process and performance between groups using technology mediated communication and face-to-face communication. These two groups often differ in member anonymity, familiarity with the technology, degree of synchronous communication, and relational communication (Bonito et al. 2009).

The 21<sup>st</sup> century has so far witnessed sustained investigation on group communication based on the theoretical perspectives that emerged in the earlier decade. While refinement of the theories were not so common in this period, an obvious inclination towards a unified perspective for comparisons of communicative behavior across contexts was seen in the Bona Fide Group Perspective. Another important aspect was the increasing interest of the scholars in the implications of technology on group communication.

## **2.7 Chapter Summary**

This chapter presented a wide array of literature review on the prevalent safety improvement measures in the construction industry, followed by a detailed description of formal production planning establishing the significant role of communication among the participants in a construction project. Based on existing studies, it is evident that the field of group communication and interaction in construction environment has received very little attention from researchers despite group communication being a fundamental aspect of construction. The lack of existing research in this area has prompted the author to investigate this area in further detail. Moreover this has acted as a motivation for the present research study in which communication among the participants were envisioned to have a beneficial impact on safety performance of construction projects. To explore the role of communication during formal production planning, it was necessary to develop comprehensive understanding of the underlying theories and concepts of communication among group members. This was accomplished by the systematic literature review. Though the review cannot be claimed exhaustive, it captured the chronological advancement of investigations on communication among group members by examining the contextual, theoretical, and methodological issues, as presented in this chapter.

## **Chapter 3. Research Methodology**

### **3.1 Introduction**

This chapter presents the methodological approaches adopted for accomplishing the objectives of this research study. The objective to identify the protocol for analyzing communication for this research study involved two steps. The first step was to explore the data collection methods used by other investigators, followed by selection of a protocol appropriate for this study. A preliminary case study was conducted to test the efficacy of the selected protocol for analyzing communication among the participants in construction industry environment. Moreover, based on the findings of the preliminary case study, this chapter reports on the different types of site-based meetings and selects the one used as the unit of analysis for the case studies in this research. Finally, the chapter illustrates the design of the case studies with detailed discussion on case selection, variables of interest and data collection methods.

### **3.2 Exploring Data Collection Methods Used to Capture Communication**

A desire to understand communication in a natural context with real life variables and dynamics needs methods that capture communication. A vast majority of the research on analysis of communication among group members focus on observations of external factors, such as the sending and receiving of verbal messages, facial expressions, emotions and body language, or reactions to these messages (Gorse and Emmitt 2005). However, understanding and capturing the dynamics of communication among group members is extremely cumbersome. The literature on methods for collecting data of communication among group members is dominated by four main approaches: (i) video and audio recording (Hugill 1999), (ii) retrospective account and reflection

(Loosemore 1998; Gorse 2002), (iii) multiple level observation (Bales and Cohen 1979), and (iv) direct observation (Bales 1950).

### **Video and Audio Recording**

Audio recording is a common method of collecting data for group communication analysis. Gameson's (1992) study of communication characteristics associated with construction professionals was based on data collected from audio tape recordings of interviews. However, using audio and video recorders to record real communication may face resistances due to apprehension of the participants. Hugill (1999) used audiotape to collect communication data from site meetings and indicated the difficulties related to gaining access to sensitive business environments. Even when allowed to observe meetings and audio record the meetings' communication, occasionally the researcher was asked to turn off the recorder.

### **Retrospective Account and Reflection**

Self-reports of the participant's feelings or beliefs can be used to produce retrospective accounts and reconstructions of actions and events. While data from retrospective accounts may be abbreviated and distorted, they provide a source of data that are otherwise almost unobtainable (Clark 1991). Previous research has referred to diaries used in construction to gain reflections and accounts of events. Some emphasis should be placed on the personnel that record the reflections, and the time gap between the actual occurrence of the event and recording of the event. In the study conducted by Emmitt (1997) the diary was completed by the researcher who consistently recorded events immediately following the observation, whereas, in some cases diaries were completed by the participants (Loosemore 1998). Unless controlled, time periods between the event and participant's recording of the event will vary, as will the accounts, which

could reduce the reliability of the data. Collecting information after the event can help reduce the problems caused by a researcher observing sensitive negotiations. However, Loosemore (1998) found that participants tend to remember and recount periods of heightened emotion rather than recall all of the mundane detail of events. In addition, retrospective accounts of unpleasant events for the participants are subject to recall bias that threatens the validity of the data (Breslau et al. 2008).

### **Multiple Level Observations**

This method requires the participants to observe others and reflect on their own feelings. Those participants who engage in the discussion are asked to consider their actions with the actions of others in relation to a specific situation that involves a group communication. In small groups each individual provides data on his/ her behavior and other members' behaviors. To add a third dimension, independent observers also provide data. Simple multiple level observation techniques, such as that suggested by Fryer et al. (2004), allow researchers and participants to pick a specific issue, event or period within the group context and use multiple perceptions to investigate it. There are standard multiple level observation systems, which have the benefit of being consistent in whatever context the research is being conducted (Blake and Moulton 1964). Though these systems provide the opportunity to explore individual and group perception in detail, some multiple level observations methods are complex (Poole 1999) and time consuming (Gorse and Emmitt 2005).

### **Direct Observation**

Direct observation involves observing or recording the proceedings of the group communication in its natural environment by the researcher. This technique minimizes the problem of researcher



reactance, which is a cardinal feature of the fabricated or "artificial" laboratory experimental environment. Moreover, a naturalistic direct observation is well suited for the multidisciplinary construction groups. It provides an opportunity for the researcher to analyze combination of a range of individual characteristics more validly from the perspective of a non-reactive group member. Previous literature shows evidence of established observation, coding, and processing methodologies used to examine group communication in construction and various other fields. Standardized and established observation, coding, and processing methodologies are available and have been appraised (Bales 1950; Gorse and Emmitt 2007).

### **3.2.1 Selecting Data Collection Method**

Selecting an appropriate method for data collection was of paramount importance for this research study. In order to do so, it was necessary to acknowledge the strengths and limitations of the methods available for data collection. It was critical to ensure that the selected method effectively captures communication data in order to answer the research questions. There were limited incentives for the participants who agreed to take part in this research study. Thus, it was really important not to interfere with the natural flow of business for the participants and to minimize the consumption of participants' time.

The strengths and limitations of the aforementioned data collection methods were compared based on five criteria, which were significant in context of this research study: (i) reliability of data collected, (ii) possibility of data loss between the actual event and recording, (iii) resistance from participants, (iv) simplicity to use, and (v) time required for execution of the method. Comparison shown in Table 3-1 clearly indicates that video and audio recording is the most effective method of data collection for capturing communication among group members.

However, resistance from the participants for video and audio recording led to direct observation as the preferred method of data collection for this research study.

**Table 3-1:** Comparison of data collection methods

<b>Criteria for Selection</b>	<b>Video and Audio Recording</b>	<b>Retrospective Account and Reflection</b>	<b>Multiple Level Observation</b>	<b>Direct Observation</b>
<b>Reliability of data</b>	Accurate account of the event	Account can be abbreviated or distorted	Data collected from multiple sources increase reliability	Data is rich, but difficult to capture every communication act
<b>Possibility of data loss</b>	Can be repeatedly reviewed to capture the nuances of communication	Participants do not always recall all of the detail of events	Captures both real time and reflective data	Sometimes difficult to capture all of the simultaneous communication acts
<b>Resistance from participants</b>	Participants are highly resistant	Moderate resistance from the participant	Intense involvement of the participants lead to high resistance	Less resistance than video and audio recording lead to high resistance
<b>Simplicity to use</b>	Very easy to use; requires little or no training	Researcher has to keep an account to fill in the missing information	Method is complex and elaborate	Laborious and requires training and experience
<b>Time required for execution</b>	Time consuming process	Time consuming process	The longer time taken to complete makes it often impractical	Time consuming; does not demand time commitment from participants

While selecting direct observation, as the data collection method for this research study, two vital factors were considered. First, the method of data collection should be suited to the research, and second, compromising the interests of the participants was minimized as much as possible. The sensitivity of the business environment forced to negotiate the method of recording

communication. This meant that some degree of compromise on method was needed. For instance, video and audio recordings provide rich sources of data, but the participants of this research were reluctant to let such method be used. Using direct observation reduced the richness of the data collected, but could not be avoided. The communication of the participants (that means the participants of the construction project during the site-based meetings) was noted down verbatim. To make sure none of the communication acts get unnoticed, two observers collected data in real time and in tandem.

### **3.3 Identification of Protocol to Analyze Communication**

There is perpetual debate in communication, management, psychology, and sociology disciplines between the use of qualitative and quantitative methodology for analyzing communication. As a methodological approach to all research studies, O’Keefe (2004) argued that conducting research consists of making claims and subsequently supporting the claims with evidence. Therefore, collecting intricate data or attempting to capture all of the nuances of communication among group members can sometimes become complex. The speed of communication and the various sociological, psychological and environmental factors that influence communication further complicate the process of analyzing communication data.

Majority of the previous research studies have used content analysis to observe, record, measure, and analyze group communication. This research study used communication analysis as the tool for collecting data and analyzing it. Communication analysis approach was selected for this research study due to its several benefits. First, communication analysis considers the sequential nature of communication (Bateman and Gottman 1997; Keyton 1999). Sequential analysis takes into account what precedes and succeeds a particular piece of communication and how one piece

has an impact on the whole communication process. In contrast to other approaches that assume communication data or participants to be independent, communication analysis focuses on the dependence (Bateman and Gottman 1997). Communication analysis independently considers the communication behavior. Lastly, communication analysis also considers natural communication thereby providing a foundation for analyzing communication among group members during formal meetings (Beck 2008).

Robert Bales first conceptualized a group as a social system and made a clear distinction between task-based and relational communications (or socio-emotional communications). The early work of Bales provided a system for categorizing various types of communications (Bales 1950) and established the theory of phase movement during the group communication (Bales 1953). By adopting external observation for data collection Bales' (1950) Interaction Process Analysis (IPA) provides a detailed protocol for observing and coding group members' communication at a 'meso' level, so that the group members' communication can be recorded, isolated, and interpreted. IPA has been used extensively to examine group communication in various fields. This includes Bales' (1950, 1970) profiles of social and student groups, Cline's (1994) study of disagreement and agreement, Bell's (2001) observations of multidiscipline child protection teams and Fahy's (2006) comparison of face-to-face and online groups. In construction industry a small number of researchers have successfully applied Bales' IPA, namely Wallace (1987), Gameson (Gameson 1992), Bellamy et al. (2005) and Gorse and Emmitt (2007).

### 3.3.1 Interaction Process Analysis

There are a number of research methods used for analyzing communication among group members, yet Bales' IPA remains a robust method with a very distinct concentration on task-based and relational components of communication. Bales (1950) argued that IPA is appropriate for groups involved in planning. Also, IPA is an established method that is "well accepted as a sound method for identifying the communicative functions of group problem-solving and decision-making interaction" (Keyton 2003). Although other methods claim to offer features that collect additional data, the longevity of IPA has resulted in accumulation of a considerable body of information over the period of past few decades (Armstrong and Priola 2001; Fahy 2006). For the purpose of this research, Bales' IPA was used as the protocol to analyze communication. The primary reasons for selecting IPA for this research were as follows:

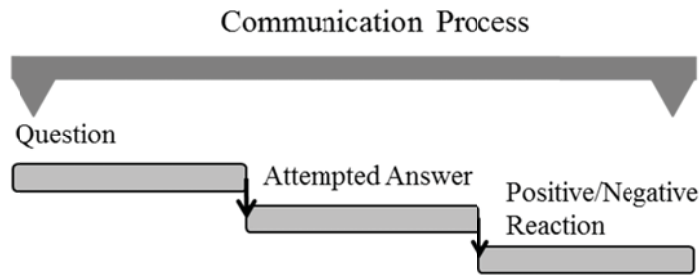
- i. Observers cannot observe abstract concepts. Therefore, all aspects of communication should be translated into observable phenomena. Bales has done that in IPA using operational definitions for each of the conceptual variables (Clark 1991)
- ii. It has low-level constructs and simple definitions of observable phenomenon that can be explicitly tied to the data (Gorse and Emmitt 2005)
- iii. IPA is simple to use and easily repeatable. Simple observations provide robust data. On the contrary, complex systems tend to be less consistent and reliable (Gorse and Emmitt 2005)

The coding scheme of IPA has shown considerable longevity in communication research and is still being used in variety of contexts. A major reason is that the categories are "constructed only

as they have a socially defined and culturally shared meaning for the participants” (Trujillo 1986).

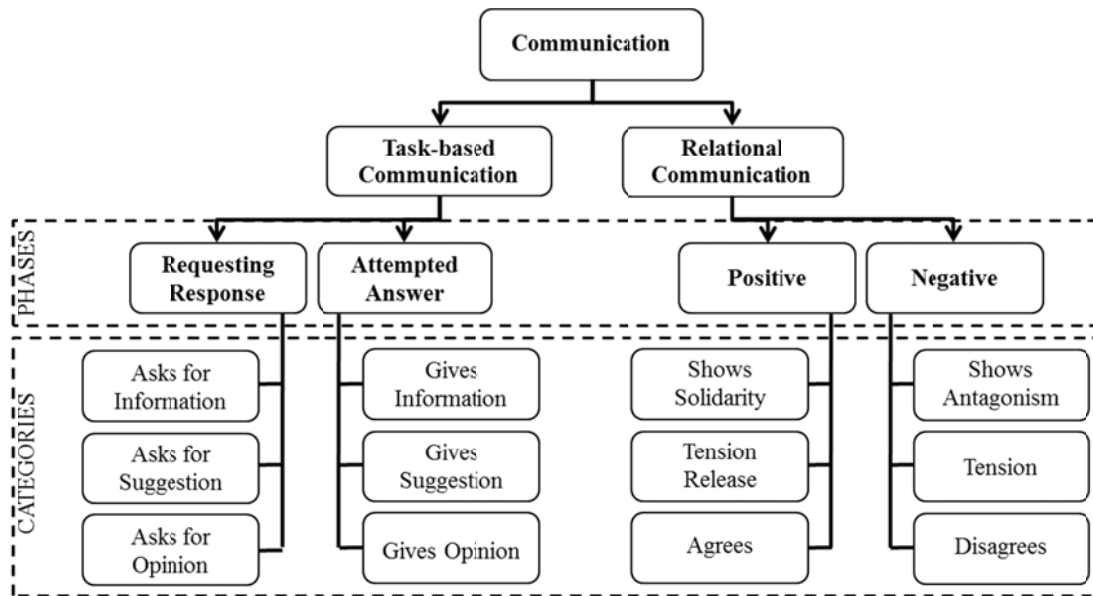
### Coding Scheme

Any communication process can be conceptualized by three phases: it consists of requesting responses (questions), followed by attempted answers, followed by either positive or negative reactions (Bales 1950) as shown in Figure 3-1.



**Figure 3-1:** Phases of communication

Each of the above mentioned phases could be divided into multiple categories. As a part of IPA, Bales (1950) divided each phase into three categories for a total of twelve categories as shown below in Figure 3-20. Another way of describing the inter-relationships of the categories is in regard to the phases: question and attempted answer as constituting an area of ‘task’ based communication, while the other phases: positive and negative reaction constituting an area of ‘relational’ communication.

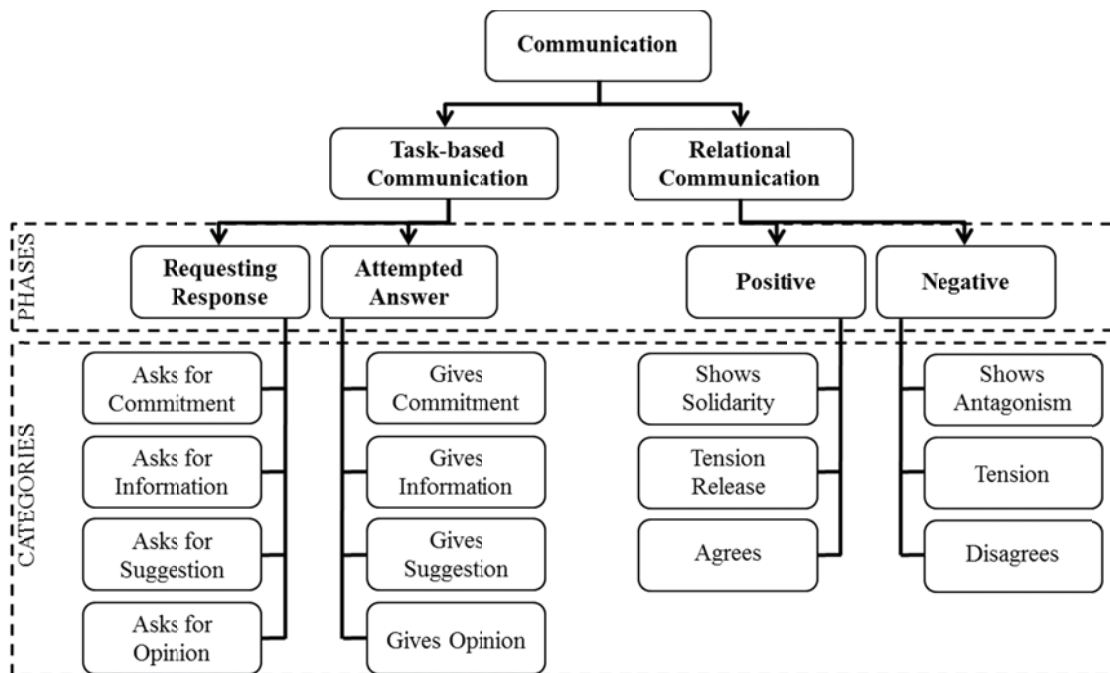


**Figure 3-2** : The phases and categories of communication according to Bales’ (1950) IPA

To the list of task-based communication categories identified by Bales (1950), two more categories were added for the purpose of this research study: ‘asks for commitment’ and ‘gives commitment’. Site-based meetings among the participants in construction projects are not only utilized to coordinate actions, but also to formally reduce uncertainty and organize workflow. Coordination in complex settings, such as construction projects is a matter of participants making commitment and following through. According to Macomber and Howell (2001), construction project is comparable to a complex “web of commitments”. The purpose of making commitment is to complete the project as intended. Thus instead of making promises that are conditional and often unreliable, commitments are achievable and specific. Commitment can be compared with promises made to one participant by another based on “timely declaration of completion for work that releases work to others for the sake of completing the project to the desired work sequence” (Macomber and Howell 2001). In order to distinguish between an ordinary promise and a commitment, Macomber (2004) has identified the following attributes of commitment.

- i. The participants involved in the commitment should have a clear understanding of the scope of work.
- ii. The participant making commitment should be competent to fulfill the commitment. Time required for fulfillment of the commitment should be estimated and resources should be allocated accordingly.
- iii. The participant making the commitment should be sincere and should not have any conflict of interest.
- iv. Regardless of what the future holds, the participant should be obligated to fulfill the commitment. In situation where commitment cannot be fulfilled the participant should take responsibility of the consequences.

Based on the inclusion of two new categories, the modified list of categories of communication comprising of 14 categories used for this research study is shown in Figure 3-3.



**Figure 3-3** : Modified list of categories of communication



Bales provided a detailed description of each category as a guideline for the observer to classify each communication under a particular category. The current operational definitions were more important and critical in deciding where to classify a given act than the more detailed empirical definitions provided by Bales (1950) for each category. Moreover, the categories constitute a system in a way that as a whole they will constitute a context within which each component category gained its principle meaning by its particular position in the context (Bales 1976). Bales (1950) has provided detailed description of each of the categories; this research adapted Bales' description to construct the operational definitions of each of the categories as shown below in a tabular format. Table 3-2 served as a rubric and provided guidance for coding communication data for this research study.

**Table 3-2 : Categories for coding communication**

Phases		Categories	Operational Definitions
Positive Relational Communication		Shows solidarity (1)	Any act that shows support, raises others' status, gives help, encourages others, uses positive social gesture
		Shows tension release (2)	Any act that reduces anxiety that the member or group may be experiencing and attempt to remove tension. Also act of expressing enthusiasm, enjoyment, satisfaction
		Agrees (3)	Any act that shows acceptance and compliance of what another member has to say
Task based Communication	Attempted Answer	Gives suggestion (4)	Any act that provides direction or resolution and attempt to control direction of how to perform the task
		Gives opinion (5)	Any act that offers view, provides insight or reasoning that is relevant to the task
		Gives information (6)	Any act that reports factual observations or experience related to the task
		Gives commitment (7)	Any act that shows mutually determined obligation to perform a task

Phases		Categories	Operational Definitions
Requesting Response	Asks for commitment (8)	Any act that requests to arrive at a mutually determined obligation to perform a task	
	Asks for information (9)	Any act that requests factual observations or experience related to the task	
	Asks for opinion (10)	Any act that requests view, insight or reasoning that is relevant to the task	
	Asks for suggestion (11)	Any act that requests direction or resolution of how to perform the task	
Negative Relational Communication	Disagrees (12)	Any act that shows disagreement to what another member has to say	
	Shows tension (13)	Any act that shows concern, apprehension, dissatisfaction or frustration	
	Shows antagonism (14)	Any act that suppresses another member and shows rejection of what the other member has said. Also acts expressing aggression and anger	

*Note: Numbers in the parentheses are used while coding the transcript to refer to the categories*

### **Coding of Communication Data**

The categorization is used to quantify qualitative and observational data generated during communication. However as Burke (1974) posited, there can be many different unit of analysis that can be recorded. The two basic units of analysis are:

- i. Participation - Refers to the contributors, who took part in the communication process being observed (Stephen and Mishler 1952).
- ii. Act - Refers to the communication act which defines and classifies communication into discrete act of verbal communication (Bales 1950).

Observation of overt external factors of communication and identifying who makes the act and to whom it is directed has been termed as “surface meaning” of communication by Heinicke and Bales (1953). Surface meaning only identifies the obvious acts of communication and does not

attempt in depth analyses of communication. This research study attempted comprehensive and in-depth analyses of communication.

Coding systems are used by researchers to categorize similar communication under a common group. A good coding schema acts as a lens through which the researcher can view the events (Bakeman and Gottman 1997). Observers can take two stances while attempting to code information: (i) observer-privileged meaning, or (ii) subject-privileged meaning. The observer-privileged meanings are the external observer's perceptions of the communication, while subject-privileged meaning are the perception of the group members regarding the same incident. In IPA and in this research study, the observer-privileged meanings of the data are considered.

Moreover, Poole et al. (1999) posit that when using Bales' IPA, the observer(s) takes the position of a receiver rather than being blind to the group communication. They argue that such approaches allow biases to creep in when attributing meaning. To negate the biases, two coders were used to code the observational data and inter-coder reliability was computed.

In IPA, coding is not solely based on the words, but also on the understanding of words when used in the context of communication sequences supported by reactions and emotional expressions of the group members (Bales 1950). Recognizing discrete communication acts within the larger communication sequence was of essence for coding the group communication data. Discrete observation that failed to recognize how a gesture or communication was used could have been misleading. Bales emphasized the importance of the coders' ability to understand language to identify the real meaning of the words. For example, coding a sarcastic statement as an act of praise would be incorrect leading to reduced reliability (Emmitt and Gorse 2007). Coders working from transcripts only (e.g. those who were not present at the meetings) could possibly assign wrong category to an act based on the literal meaning. To prevent this

error, the observers were used as the coders for this research. To the observer of real communication, assigning categories was considerably easier and simplistic as they could gauge the reactions and expressions of members of the meeting group.

For this research, each thought unit during communication was coded by its function. A thought unit can be defined as “sequence of a few words conveying a single thought” (Weldon et al. 1991). Using IPA, 14 codes were used to label function of each thought unit under two large umbrella phases: task-based and relational communication. Task functions are goal oriented and include thought units that ask for and provide information, ask for and offer suggestion, ask for and give opinion, ask for and give commitment. Relational functions have a positive or negative aspect and include thought units such as agree, disagree, release tension, show tension, show solidarity and show antagonism. Once all the thought units were assigned an IPA code, the researcher had a blue print of the communication, which could be analyzed using analyses techniques discussed subsequently.

### *Analyses*

IPA has often been used to simply identify frequencies and ratio of thought units (Emmitt and Gorse 2007). This research study decided to exploit the full scope of communication analysis. It is important in communication analysis to look at communication acts sequentially in order to obtain comprehensive understanding of the communication process. Analyses of IPA codes were used to identify individual communication sequence for further qualitative analysis. Also IPA codes were examined in each of the projects to determine how they created meeting activities and illustrated the differences between the two sets of meetings. Additionally, this research study also investigated the interacts and 3-interacts, and how they were used similarly or differently

across the two projects selected for case study. An interact is a set of two continuous communication acts (Coutright et al. 1989), and 3-interact is a sequence of three continuous communication acts (Beck 2008). The frequency of interacts and 3-interacts illustrated the use of different communication categories in continuum. Additionally, for the set of two continuous communication acts, the research study investigated whether same or different group members were involved with both the acts. This provided an opportunity to compare the prevalence of monologue with dialogue during the site-based meetings of the two projects.

### **3.4 Preliminary Case Study**

The following sections describe the preliminary case study, which was conducted to explore the various site-based meetings typically taking place in a construction project, and select the meeting type to be used as unit of analysis for the case studies. The preliminary case study also provided the opportunity to test the efficacy of Bales' IPA for analyzing communication among the participants in construction industry environment. The protocol was used in two different meetings during the preliminary case study and simple frequency of task-based and relational communications were computed.

#### **3.4.1 Overview of the Project**

The project selected for the preliminary case study was a 42,190 square foot, US \$ 23 million state-of-the-art research facility at Virginia Polytechnic Institute and State University with highly specialized research laboratories that support multi-disciplinary research. Half of the area of each floor (total of three stories) houses the different laboratories whereas the remaining half being office spaces. The exterior envelope is of dolomite ('hokie' stone) and storefront glazing. At the time of the site visits during July 2010, hokie stone and curtain-wall components installation

were going on in the exterior envelope, while Mechanical, Electrical, and Plumbing (MEP) tasks in all the floors and interior finishes were going on in tandem. During the site visits, on an average seven different trades were working daily within the project site. The whole project was subcontracted while the General Contractor (GC) was acting as construction manager at risk. The project started in April 2009 and was completed by November 2010.

### **3.4.2 Types of Meeting**

In construction industry, various participants negotiate in a variety of ways and for vivid reasons, from signing the contract until the end of the respective project. Projects in construction industry are often times very complicated, individual trades are extremely specialized and thus, there are higher probabilities of misunderstanding and confusion (Dainty et al. 2006). With the increasing complexity of the projects formal lines of communication frequently become imperative. Meetings are a convenient means for facilitating communication in construction industry projects as in projects of other industries. Majority of these meetings are formally scheduled, while on some occasions meetings are arranged out of the normal schedule to deal with any critical situation. The project manager of the GC in regard to this particular project said:

*“We always have the Owner-Architect-Contractor (OAC) meeting scheduled twice each month. The architect ..... is out of DC (Washington D.C.). So to reduce the time spent during travelling, the OAC meetings are scheduled after every two weeks. .... Sometime we need to meet out of the regular schedule if there is some really critical issue. In this project there has been only one such meeting...you know if there is something really critical, we call for an OAC meeting in between...otherwise we stick to the regular bi-weekly schedule.”*

The central concern of the different types of meetings is to inform the participants regarding the progress of the project, to discuss problems related to the project, and to propose and identify solutions for the problems. Time is very important for all the professionals who are involved in the construction project. Thus, creating an agenda for every meeting is of paramount significance to a project. Agendas for some meetings can be somewhat standardized, though the details of a particular agenda can differ depending on which phase the project is in and the magnitude of the project. The details of formal meetings are captured in meeting minutes and other type of logs so that participants can receive clarification when needed after the conclusion of a meeting.

Discussed below are the different types of meetings that took place in the preliminary case study project. Table 3-3 summarizes the different types of meetings along with their duration, frequency of occurrence, participants and agendas. Information about the meetings held in the project site during construction phase (site-based meetings) was collected by observation. Open ended interviews with the project manager of the GC, the superintendent, and the subcontractors provided the information about the meetings held before construction started (off site meeting).

Brief discussion about each of the different types of site-based meetings follows Table 3-3.

**Table 3-3:** Meeting types observed in the preliminary case study

Types of Meeting		Time	Frequency	Duration	Participants	Agenda
Off Site Meetings	Pre-bid meeting	Before the bid documents are sent out	Once for the project		GC, owner and all the interested subcontractor	Provides owner or GC the opportunity to review and explain project requirements to all bidders at one time, as well as answer any initial questions
	Post-bid meeting	After the subcontractors submit their proposals	Once for the project		Top 3/4 subcontractors (based on the submitted bid) for each trade and the GC	Detailed review of the bid package, bidders' proposal, prices, work plan, exceptions, and alternates
	Kick off meeting	2 weeks before the project started	Once for the project	One hour	Project manager, superintendent of GC, owner/project manager of subcontractors	Project goal, and general scope of work, project communication, coordination issues during construction, site access, deliveries and storages, changes in work, etc.
Site-based Meetings	Pre-installation meeting	1/2 weeks prior to the start of work by any subcontractor	As many number of subcontractors	One – One and half hour	Project manager, superintendent, and scheduler of the GC, foreman, owner of the subcontractor (if the company is small sized) or the project manager of the subcontracting company	Detailed discussion of work plan, site logistics, sequencing of interdependent tasks, deliveries of materials, quality control and any imminent hazard
	Site orientation meeting	Before any crew starts working in the project site	As many number of subcontractors	45 minutes – One hour	Superintendent of the GC, the foreman and crew members of individual subcontractor	Getting acquainted with the project
	OAC meeting	Regularly during construction	Bi-weekly	30 - 45 minutes	Owner representative, representative of the user	Safety issue updates, site updates, schedule/milestone,



Types of Meeting	Time	Frequency	Duration	Participants	Agenda
	phase			group, architect, project manager, superintendent, commissioning agent/testing agent (if necessary)	commissioning schedule, inspection status
Safety meeting	Regularly during construction phase	Weekly (at the end of day)	45 minutes	Superintendent of the GC, the foreman and crew members of individual subcontractor	Basic safety issues
Subcontractor coordination meeting	Regularly during construction phase	Daily (in the morning)	30 minutes	GC's project manager (PM), superintendent, supervisor to the PM, and the foremen of the different trades	Coordination among trades, safety, delivery of materials, testing of various works, quality assurance/quality control, submittals, as built drawings, as well as O&M manuals

### **OAC Meeting**

Throughout the course of this project, the owner, the architect and the general contractor (OAC) met bi-weekly on site during OAC meetings to report on the construction tasks, track submittal status, update budget and schedule, and to resolve field conflicts and drawing discrepancies. As the name signifies, the participants of this type of meeting were the owner (or owner's representative), the architect, and the GC. The OAC meeting observed during the preliminary case study (held on July 14<sup>th</sup>, 2010) was attended by the owner representative, representative of the user group, architect, personnel from the GC (project manager, superintendent, supervisor to the project manager), and representative from the commissioning agent (n=7). All together there were eight individuals (seven participants and one observer) in that particular meeting which took place in a trailer (set aside for meetings only) beside the GC's trailer.

The GC's project manager led the meeting. The agenda for the meeting was set ahead of time and was circulated at the beginning of the meeting. The agenda included safety issue updates, site updates, schedule/milestone discussion, discussion about open request for information (RFI) and potential cost items, LEED review update, commissioning schedule, inspection status and miscellaneous action items. The GC's project manager updated the participants on the project's safety performance since the last OAC, and provided updates to the construction schedule. The meeting lasted for thirty-three minutes and was formal in nature. Other than the mentioned list of participants for this particular OAC meeting, the user and technical groups were copied on meeting minutes and had representation at the OAC meeting as needed to assist in resolution of field issues.

### *Subcontractor Coordination Meeting*

Coordination among the subcontractors is one of the major responsibilities of the construction project team. The subcontractor coordination meeting for the preliminary case study project was scheduled daily at 8:00 am in the morning. The participants of these meetings included the GC's project manager (PM), superintendent, supervisor to the PM, and the foremen of the different trades (n=10). During these coordination meetings, according to the project manager the participants discussed on various issues including but not limited to coordination among trades, safety, delivery of materials, testing of various works, quality assurance/quality control, submittals, as-built-drawings, as well as operations and maintenance (O&M) of the facility.

*“We meet with the subcontractor foremen every day in the morning and briefly go over what they will be doing that particular day.... any issues about the day's work. We go over which trade will be working in which part of the building on that day. If one trade needs some more time to finish the work before the next trade follows...we will say...ok you have till 10:00 am in that area to get the work done...then you are out of it.”*

The coordination meetings that the researcher observed during the preliminary case study started with a briefing on the weather forecast for the day by the project manager. This was followed by a discussion on any concerns in the day's tasks that could be affected by inclement weather. Due to the prediction of rain, the project manager warned the participants:

*“Mortar (for the hokie stone) is not going to dry so fast.”*

The researcher noticed that current problems were verbalized in the coordination meeting, which provided an opportunity to discuss and solve any anticipated problems. Unlike the OAC meeting, this meeting was less rigid in nature with the participants frequently breaking up into small groups (3-4 people) to discuss issues pertaining to their scope of work. There was a marked difference in the mode of communication among the participants as opposed to the communication that occurred in the OAC meeting. Jokes and banter were used by the participants during the meeting. Though full of lighthearted comments and banter, there were written agendas for each of these coordination meetings. Without a written agenda, no organization can exist, as there will be little or no clarification or accountability of existing problems to complete the meeting.

When asked to explain the importance of subcontractor coordination meeting, one of the participants (foreman) made an important point:

*“If you are in the field running around, catching all these guys (the other foremen) is impossible...you might run into a guy and tell him (or her) something, but you know, he (or she) does not have any pad, he (or she) does not write it down... so it's not documented...here (in the coordination meeting) everybody has his (or her) notepad to write it down...everybody knows where everybody is at...and it changes daily...so daily meeting is good.”*

The coordination meetings act as a shared situation awareness mechanism for different trades. Coordination through these meetings is one of the most effective ways to manage dependencies among different trades and resources. Moreover, the meetings help in developing work familiarity by the exchange of information about equipment, materials, work environment, and

workers. It has been found in literature that communication among different members creates a common understanding about the tasks and facilitates coordination (Emmitt and Gorse 2003). Information such as sequencing and delivery of materials that changed on a daily basis was communicated among members during the coordination meetings that kept all the participants informed about the status of the project.

When asked if they discussed about safety specifically in the coordination meetings, one of the foremen mentioned that other than any imminent safety issues which was anticipated in that day's work, basic safety issues were discussed only during the weekly safety meeting.

### **Safety Meeting**

The safety initiatives in this project included pre-task planning during the subcontractor coordination meetings. Concerns of the subcontractors regarding safety related to scope of work were addressed and resolved in the coordination meetings. In addition to the coordination meetings, every subcontractor had to attend a weekly safety meeting (which lasted about forty-five minutes) wherein the superintendent of the GC went over basic safety issues. Talking about the importance of these meetings on the safety awareness of the workers, one foreman mentioned:

*“Safety is just pounded in our head repeatedly...if you don't know the safety rules by now, you are not going to make it.”*

### **Site Orientation Meeting**

Workers of this project site had to go through a site orientation meeting on their first day at the job. The foreman of each trade along with all the crewmembers had to attend the site orientation meeting before they started working in the project. The site orientation meeting observed on July 18<sup>th</sup>, 2010 was attended by the superintendent of the GC and the foreman of the flooring subcontractor along with eight workers. This meeting was more of an informational session. The superintendent of the GC was leading the session and started off by showing a presentation (prepared in Microsoft Power Point) that lasted for 45 minutes. The presentation consisted of overall information about the project, the site logistics, description of the safety plan with evacuation plan, safety norms the subcontractor had to follow while in the project site, description of various equipment that were being used in the project (by the other subcontractor), and related measures of safe handling. When asked, the project manager of the GC said the site orientation meeting provided a general overview to the workers about the project and the rules and regulation followed in the project site before they actually start working. However, detailed discussion with individual subcontractor regarding specific issues in their scope of work for the project was discussed in pre-installation meeting.

### **Pre-installation Meeting**

Unlike the site orientation meeting, the pre-installation meeting involved detailed discussion between individual subcontractor and the GC. According to the project manager of the GC, the pre-installation meetings were generally scheduled one or two weeks prior to the start of work by

that particular subcontractor on the jobsite. For trades that required a lot of coordination such as mechanical, plumbing, and electrical, the pre-installation meetings were scheduled much earlier.

The participants in a typical pre-installation meeting were the foremen of the subcontractors, the owner of the subcontracting firm (if the company is small sized), or the project manager of the subcontracting company, the project manager, superintendent, and scheduler of the GC. Planning about coordination and safety was an essential function of the pre-installation meeting. The participants discussed about the work plan of the specific subcontractor and assessed whether the work plan synchronized with the master schedule of the GC. Among other issues of concern were site logistics, sequencing of interdependent tasks, delivery of materials, quality control and any imminent hazards related to scope of work. Identifying hazards required a common understanding of the techniques that would be employed to complete the tasks and thus the foreman of the subcontractor was an integral part of this meeting along with higher-level project officials.

### **3.4.3 Usability of the Protocol**

Communication data were collected during the subcontractor coordination meeting and the OAC meeting was analyzed using IPA codes. Due to the small size of the group (n=10 and n=7 respectively) only one observer collected verbatim notes of communication among the participants during the meetings. Subsequently, transcripts were prepared for the notes collected from the meetings. Two coders equipped with knowledge about the operational definitions of IPA categories coded the transcripts using the categories of communication shown in Table 3-4. The smallest part of the communication process that was coded and analyzed was a ‘unit of thought’ as described in earlier section. Excerpts of the coded transcript generated during the

subcontractor coordination meeting are presented below. The numbers in the parentheses represent the categories of communication as per Table 3-2.

*[2-0] We are not going to be here (in the meeting) a long time (6). We have a lot of stuff going on (6). Weather forecast for this week is pretty much the same as always (6). The humidity is up and which should help the water dry not so fast (6). Life is good (2).*

*[2-7] Okay...talking about drywall real quick. Where are you guys at the soffits (9)?*

*[7-2] 100% complete (6).*

*[2-7] 100% complete and ready for paint (9)?*

*[7-2] Correct (3).*

*[2-7] Except for the wood that's coming up (5).*

*[7-2] For the large curtain wall (6)?*

*[2-7] No, no, no (12)...for the lights that has to go in (6).*

*[7-2] Correct...the lights (3).*

*[2-7] But still you have got everything you could do at this point (5).*

*[7-2] Yeah (3).*

*[2-7] That's what we are pressing for (1). Is there any part of the drywall you need help with (6)?*

*[7-2] The south curtain wall is the last place I have to install drywall (6).*

*[2-7] 2nd floor south (9)? Just right over here (6) (referring to the drawing).*

*[3-7] What's your problem there (9)?*



[7-3] That's the last of my framing and last of my hanging (6). So I cannot get out of there (11). The glass is in the way (6).

[2-5] Okay...did you check these rooms (9)? Are you in good shape for these rooms for sealants (9)?

[5-2] The only thing that is left is the 3rd floor RO room (6). That's the last room (6).

[2-5] Yeah (3). How long do you need to finish that (8)?

[5-2] That will be soon ready to paint (7). We are going to finish all small rooms in the 3rd floor and 2nd floor that anything to do with terrazzo (7). Then we will be dropping down to the first floor and dropping grid in the open office (6).

[2-5] Perfect (1).

[2-0] Good deal (1). We have a real mess with these lab equipment stuff (13).

[2-9] I need to send you a copy of this email (5). This is from the terrazzo guy (6). Anyway that's for terrazzo...the power requirements (6). Basically I am thinking it is going to be the easiest to put a power source every floor (5). You know out of that electric room if we can (5).

[9-2] Yes (3). The thing is it would have been easier if I have the breakers (6). If I don't have the breakers, I will have to order them...you know what I mean (4).

#### **3.4.4 Inter-coder Reliability**

The Chi-square ( $\chi^2$ ) test is the standard method of demonstrating consistency among coders using the Bales' (1950) IPA method. To check the reliability between the coders, Bales recommended the use of the Chi-square test at the 0.5 probability level (not  $p = 0.05$ ), or above,

to demonstrate that the system being used is common to the coders, although not exact. Although Bales is critical of other tests used to check inter-coder reliability, including the use of correlation coefficient, Norusis (2000) noted that Chi-square is not a good measure of association. Norusis (2000) suggested the use of Cohen's kappa ( $\kappa$ ) to measure the degree of agreement between the different coders as a more definitive test. It is generally thought to be a more robust measure than simple percent agreement calculation since Cohen's kappa takes into account the agreement occurring by chance. For this research study, Cohen's kappa was used to check the inter-coder reliability.

### **Percentage Agreement Calculation**

Simple percentage agreement of the coders was calculated for the two meetings. Percentage agreement measures included occurrence reliability, the ratio of the number of occasions both coders agreed that same category occurred to the sum of those occasions and the occasions on which they disagreed. The agreement between the coders while coding the communication of the subcontractor coordination meeting was 87.42% and that of the OAC meeting was 85.26%. In general, a percentage agreement of more than 80% is considered acceptable.

### **Chi-square Calculation**

The inter-coder agreement between the two coders developed from the data of the subcontractor coordination meeting was  $\chi^2 = 9.161$  (df = 10). The probability of a  $\chi^2$  value with ten degrees of freedom greater than 9.161 is approximately 0.517, which is above the acceptance level of 0.50 (Bales 1950).

The calculated  $\chi^2$  value of the inter-coder agreement for the OAC meeting was 6.559 (df = 9). The probability of a  $\chi^2$  value with nine degrees of freedom greater than 6.559 is approximately 0.68, which is above the acceptance level of 0.50 (Bales 1950).

**Cohen’s Kappa Calculation**

Cohen’s kappa ( $\kappa$ ) is a statistical test for probability of co-occurrence of scores from two coders, in comparison to the random probability of co-occurrence by chance. Fleiss (1981) suggested the following ranges for interpretation of kappa: 0.40 and below represents poor agreement beyond chance, 0.40 - 0.75 represents fair to good agreement, 0.75 and above represents excellent agreement. The two coders showed excellent agreement for the subcontractor coordination meeting with a  $\kappa$  value of 0.849. Limited data for the OAC meeting did not permit the computation of  $\kappa$  value for this study.

**3.4.5 Analysis**

For the purpose of the preliminary case study, simple frequencies of the thought units and ratios were computed. Table 3-4 and Table 3-5 show the IPA categories of data collected during the subcontractor coordination meeting and OAC meeting respectively.

**Table 3-4:** Communication categories for subcontractor coordination meeting

Categories	Units of Thought	
	Frequency	Percentage
Shows solidarity (1)	9	5.66
Shows tension release (2)	8	5.03
Agrees (3)	14	8.81

Categories	Units of Thought	
	Frequency	Percentage
Gives suggestion (4)	12	7.55
Gives opinion (5)	40	25.16
Gives information (6)	32	20.13
Gives commitment (7)	8	5.03
Asks for commitment (8)	5	3.14
Asks for information (9)	14	8.81
Asks for opinion (10)	2	1.26
Asks for suggestion (11)	0	0
Disagrees (12)	2	1.26
Shows tension (13)	13	8.18
Shows antagonism (14)	0	0
Total Unit of Thoughts	159	100

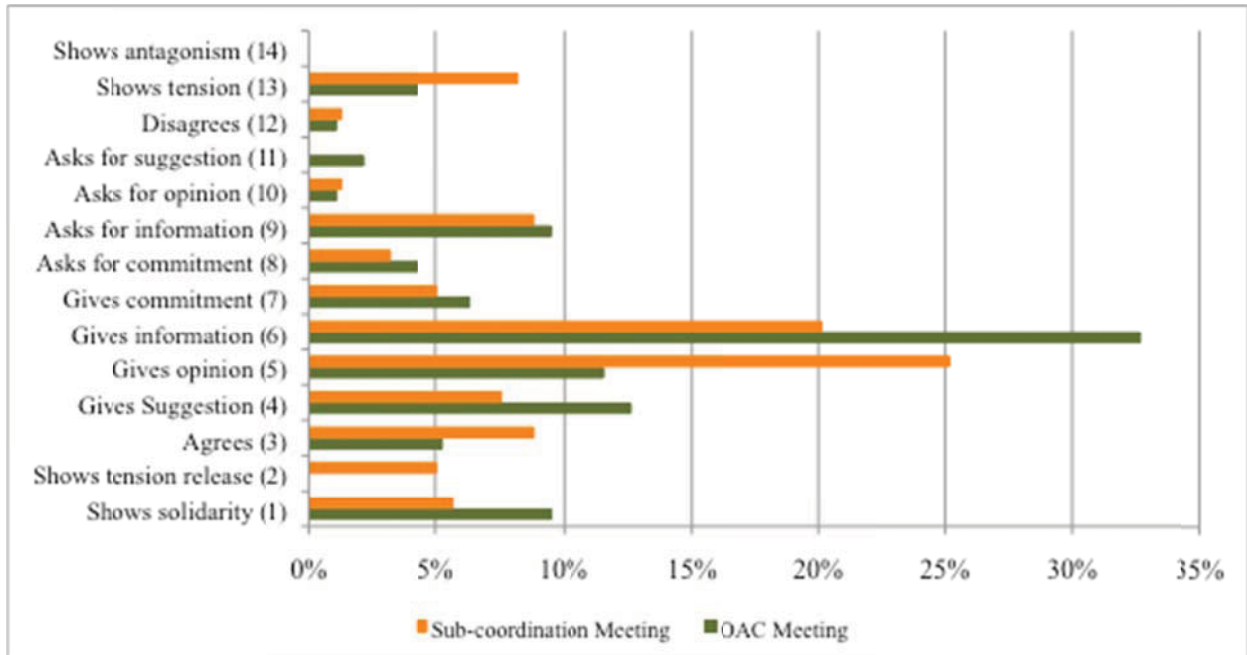
**Table 3-5:** Communication categories for OAC meeting

Categories	Units of Thought	
	Frequency	Percentage
Shows solidarity (1)	9	9.47
Shows tension release (2)	0	0
Agrees (3)	5	5.26
Gives suggestion (4)	12	12.63
Gives opinion (5)	11	11.58
Gives information (6)	31	32.63
Gives commitment (7)	6	6.32
Asks for commitment (8)	4	4.21

Categories	Units of Thought	
	Frequency	Percentage
Asks for information (9)	9	9.47
Asks for opinion (10)	1	1.05
Asks for suggestion (11)	2	2.11
Disagrees (12)	1	1.05
Shows tension (13)	4	4.21
Shows antagonism (14)	0	0
Total Units of Thought	95	100

Following the individual coding of the two meetings, the frequencies of each of the communication categories were compared across the two meetings. As the total numbers of observations in the two meetings were different, percentages of each communication categories have been compared as shown in Figure 3-4. Briefly analyzing the graph, it is apparent that in the sub-coordination meeting the participants expressed their opinion more frequently in comparison to that of the OAC meeting. The OAC meeting was more about disseminating information in the form of updates. However, in the sub-coordination meeting, the participants were expressing their concerns or trying to coordinate with the other trades. The project manager and the superintendent of the GC were facilitating the whole process. Naturally, there was a lot of information exchange followed by possible solutions for solving imminent problems. This was evident in the higher percentage of communication categories such as ‘gives suggestion’ and ‘gives opinion’. The sense of belongingness to the project group along with a common

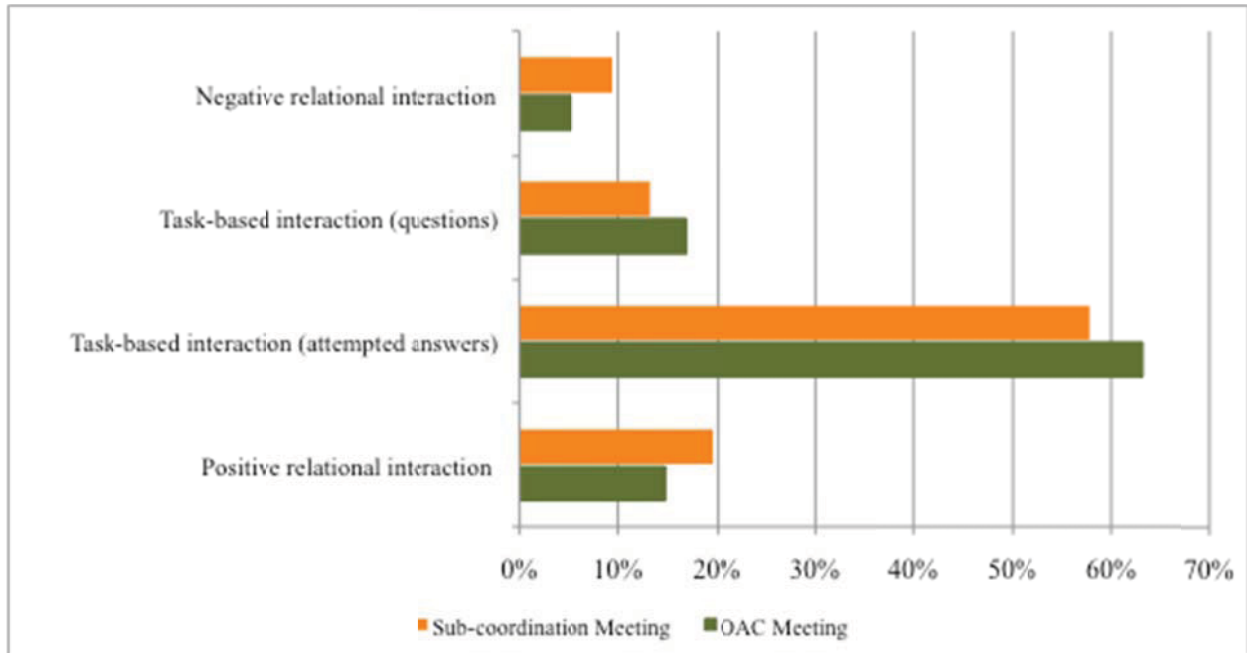
understanding of the project among the participants of the meeting was manifested by the higher percentage of categories such as ‘shows tension release’, ‘agrees’, and ‘shows solidarity’.



**Figure 3-4:** Comparison of communication categories of subcontractor coordination meeting and OAC meeting

The two meetings were also examined in terms of task-based and relational communication as presented in Figure 3-5 below. In both the meetings, positive relational communication (categories 1-3) was higher than negative relational communication (categories 12-14). The amount of relational communication (categories 1-3 and 12-14) was much lower compared to task-based communication (categories 4-11). In both the meetings, the task-based communication accounted for in excess of 70% of the communication. Another noticeable trend was that the categories ‘gives suggestion’, ‘gives opinion’, ‘gives information’ and ‘gives commitment’ were more frequent than ‘asks for information’, ‘asks for opinion’, ‘asks for suggestion’, and ‘asks for commitment’. Higher positive relational communication in

comparison to the negative relational communication in both the meetings indicated a sense of cohesiveness among the participants.



**Figure 3-5:** Comparison of communication phases of subcontractor coordination meeting and OAC meeting

### 3.5 Research Design to Analyze Communication in Construction Environment

Analysis of social communication among group members is a complex and intricate process, especially in the construction environment. Methodologically, this could be approached by means of more than one flexible research design. Ethnographic design and case study design have been discussed in the following section as two possible methodologies for analyzing communication among group members; a case study design approach was adopted for this research study.

### **Ethnographic Design**

Interpretive and ethnographic observation could be used to gather vital insights into specific episodes of the communication process (Gorse and Emmitt 2007). Ethnographic studies provide description and interpretation of the culture and social structure of a group (Robson 2002). It is a technique of inquiry by which observers become an accepted member of the group they are studying, and use viewpoints of their subjects in order to understand the intrinsic structure and functioning of the group. Thus, the central feature of this research design is that people are studied for a prolonged duration of time in their own natural environment, and data are collected primarily through observation and interviews during extended time in the field. The main purpose of this approach is to produce “thick description” which allows others to understand the culture from a native perspective (Robson 2002). Ethnographic research design can possibly be restrictive due to the longer time periods taken to collect data that sometimes extend over years. Some approaches seeking to reduce the timeframe for data collection in ethnographic design has faced strong contention. Scholars argued this could probably minimize the richness of data and fail to develop an intimate understanding of the group (Robson 2002).

### **Case Study Design**

“Case study is a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life” (Yin 1994). Case study design is an approach rather than a method, concerned with research in a broader sense and predominantly relying on collection of evidence about contemporary event. According to Yin (1994), a case study design should be considered when the focus of the study is to answer “how” and “why” questions, in situations where an investigator cannot manipulate the behavior of those involved



in the study, and in conditions where an investigator wants to cover contextual conditions due to the relevance to the phenomenon under study.

This research study is unique because of the contemporary events, no control over behavior (here: the participants of the construction projects), and form of research questions (how).

Therefore, a multiple-case study design, which was a hybrid exploratory-explanatory approach, was employed for this research study. The objective of exploration was to gain insights into the role of communication among the participants in construction projects during formal production planning and traditional project planning. In addition, the intent was to explain how communication among participants of the projects using production planning improves safety performance in comparison to projects using traditional project planning.

### **3.5.1 Case Selection**

Two cases were selected in this research study. The case selection process ensured that the cases were diametrically opposite in nature (one project following formal production planning (utilizing LPS®) and another utilizing traditional project planning) so that the process of interest was transparently observable. No attempt was made to generate a representative sample of the cases, since the aim of this exploratory research study was to produce analytical rather than statistical generalizations (Yin 1994). Based on the role of construction project features on safety performance (Manu et al. 2010), the following project features were used as criteria to select projects for this research study (Table 3-6).

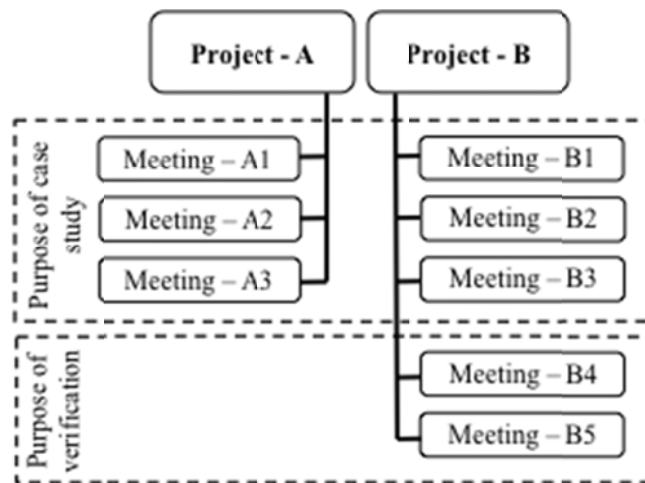
**Table 3-6** : Criteria for selection of projects for case study

<b>Project Features</b>	<b>Impact on Safety Performance</b>
Type of project	Although existing literatures do not show any influence of project type (defined according to end use such as healthcare, bank, hotel, shopping mall, retail store, etc.) on incident causation, yet it might have latent influence on other project features
Subcontracting	Literatures reveal that subcontracting inherently introduces fragmentation of the work force that could impede safety management on site
Delivery method	Existing literatures show that different delivery methods have varying influence on incident causation in construction projects
Construction height	The height of construction has a profound impact on incident causation in construction site. Safety management in a one-story building is different from that of a multi storied building

Two projects were selected for the case studies (henceforth referred to as Project A and Project B in this document) that had the same aforementioned features (Table 3-6). The reason for selecting projects with similar features was to negate any varying effect of those features on the outcome of this research study. Both the projects were healthcare facilities located in the Mid Atlantic Region. The delivery method of Project A was Construction Management at risk (CM), while that of Project B was General Contracting (GC). In both the projects, all the trade works were bid competitively by the CM/GC and awarded to subcontractors. None of the works in any of the projects were self-performed by the CM/GC. As Manu et al. (2010) stated that construction height has a profound impact on safety performance of projects, this feature was given special consideration while selecting the projects. Both Project A and Project B were more than five stories high.

### 3.5.2 Unit of Analysis

Based on the findings of the preliminary case study, subcontractor coordination meeting was selected as the unit of analysis for the two case studies. The subcontractor coordination meeting has a stable group membership consisting of the project manager, superintendent of the GC/CM and the different subcontractors. These meetings are integral part of both traditional project planning and formal production planning as they help in coordinating and managing dependencies among different trades and resources. Moreover being site-based meetings, these provide opportunity to collect unadulterated and rich data from the project jobsite. Subcontractor coordination meetings of Projects A and B were used to collect data of communication among the participants. The flowchart in Figure 3-6 shows the schedule of the subcontractor coordination meetings from Projects A and B used for the purpose of data collection for this research study.



**Figure 3-6 :** Schedule of subcontractor coordination meetings used for collecting communication data for this research study

For the projects under consideration, subcontractor coordination meetings were held once every week. The attendees of subcontractor coordination meetings for Project A included the project

manager and other field personnel of the CM, and the representatives of the subcontractors. On behalf of the subcontractors, their project managers or lead foremen were present in the meetings. For Project B, the superintendent and the field personnel of the GC and the lead foremen of all the subcontractors attended the meetings. It was mandatory for the foremen to attend the subcontractor coordination meetings in case of Project B. These meetings primarily focused on coordination among different trades, project planning and control. Other topics discussed in the meetings included safety issues related to work, coordinating delivery of materials, testing of various works, and quality assurance/ quality control.

### **3.5.3 Independent Variable**

Communication among group members can be separated into two phases: relational communication and task based communication (Bales 1950, 1970; Menckel and Carter 1985; McLeod and Kettner-Polley 2004). These two variables were considered as independent variables for this research study. To achieve goals and to discuss issues related to the projects, group members share task-based commitment, information, opinions, and suggestions. On the other hand relationships are formed and maintained by showing support, establishing values, and resolving differences through communication that has social and emotional content.

In order to better understand task and relational phases of communication, and their subsequent influence on the relational foundation, the data collected from the subcontractor coordination meetings were coded using IPA's code, discussed in previous sections.

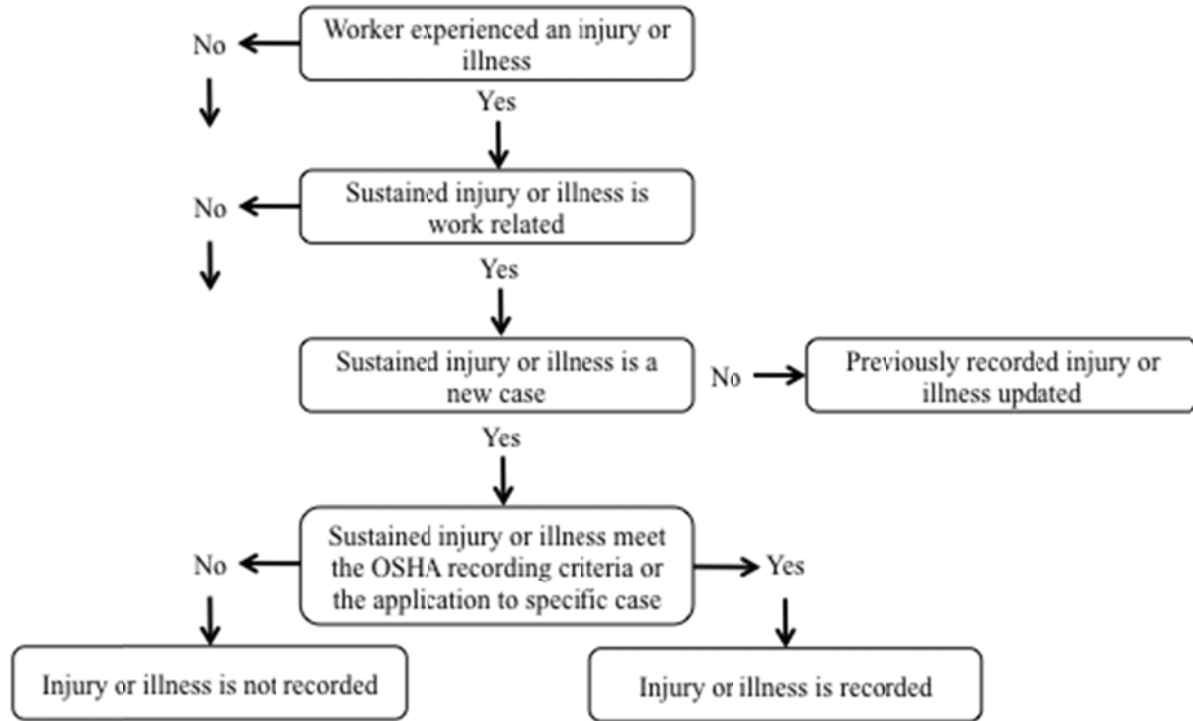
### **3.5.4 Dependent Variable**

In this research study, Recordable Incidence Rate (RIR) was considered as the dependent variable. RIR is defined as the number of recordable incidents occurring among a given number of fulltime workers over a given period of time. According to OSHA (2001c) guidelines, recordable incidents include work related injuries and illnesses that result 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.

#### **Criteria for Identifying Recordable Incidents**

The first step to classify an incident as recordable case is to examine whether it has resulted in death, injury, or illness. The next step is to verify whether the incident is work related. Work relatedness of an incident is established when the injury or illness occurs or any preexisting condition is aggravated from an event or exposure in the work environment. OSHA (2001b) defines work environment as “the establishment and other locations where one or more employees are working or are present as a condition of their employment. The work environment includes not only physical locations, but also the equipment or materials used by the employee during the course of his/ her work.” While injuries are caused by instantaneous events in the work environment, incidents resulting from anything other than instantaneous events are considered illness. This also includes acute illness that results from exposures of relatively shorter duration. The third step to be verified in order to consider the injury or illness as a recordable incident is to check if medical treatment beyond first aid is required. According to OSHA (2001c) medical treatment includes managing and caring for a patient for the sole purpose

of combating illness or injury. OSHA (2001d) has provided a decision tree for recording occupational injuries and illnesses as shown in **Figure 3-7**.



**Figure 3-7:** Decision tree for recording occupational injuries and illnesses (OSHA 2001c)

**Computing Recordable Incidence Rate**

Recordable incidence rate (RIR) can be computed using the following formula as put forth in the guidelines of OSHA (2004):

$$RIR = (\text{Total Number of Incidents} \times 200,000) / \text{Cumulative Labor Hours}$$

200,000 in the above formula is the standard base for calculating incidence rates and represents the number of hours 100 employees working 40 hours per week, 50 weeks per year would work.

### **3.5.5 Data Collection**

A hallmark of case study research is the use of multiple data sources, a strategy which also enhances data credibility (Yin 1994). Collecting data from multiple sources or triangulation of data sources means comparing and cross-checking consistency of the information derived by different means, such as comparing observational data with interview data or comparing the perspectives of different people about the same events or processes. It refers to validating information obtained from interview by examining archival documents or any written evidences that can substantiate the data collected from interviews. However, Patton (1990) posited that triangulation of data sources in qualitative methods may not always converge. In such a situation, variation in the data from different sources signifies different aspect of the same thing. In any case, triangulation of data sources greatly improves evaluation results.

In this research study, direct observation, open-ended interviews with the participants of the subcontractor coordination meetings, and examining subcontractor coordination meeting documentations were used as the methods for data collection. Prior to initiating data collection, the researcher successfully obtained approval from Virginia Tech Institutional Review Board (VT-IRB Project No. 10-749) providing justification for the study, identifying the recruitment and consent processes, and a depiction of how the data would be used.

The project manager of Project A and superintendent of Project B were contacted by the researcher, inviting them to participate in this research study. The researcher made initial visits to the project jobsites to provide background information about this research study, and to appraise the project manager/superintendent about the requirements for data collection. Subsequently, the

project manager/superintendent of both the projects transmitted the information to other participants who would be active participants of the subcontractor coordination meetings.

### **Direct Observation**

After obtaining consent of the participants, the observers started collecting communication data during the subcontractor coordination meetings. Each of the meetings continued for 90 to 120 minutes. The observers collected data from three meetings of each project (total n=6) (Figure 3-6). The data collection spanned over a period of one month for each project. Collection of observational data from Project A started in October 2010 and continued till the end of November 2010; while that of Project B started in November 2010 and concluded in the middle of December 2010. As use of audio or video recording was not allowed, two observers collected verbatim written notes of the communication during the meetings. Use of two observers ensured that none of the communication acts went unrecorded.

All the subcontractor coordination meetings were held in the jobsite trailer of the CM/GC. The observers used to arrive at the location of the meetings at least 30 minutes prior to commencement of the meetings to record the communication of the participants. This provided an opportunity to observe additional communication among the participants apart from the official time of the meetings. Prior to commencement of the meetings, the observers placed themselves in two vantage positions to enhance visibility of the participants and to ensure adequate capturing of communication among the participants. Once the meetings started, verbatim notes of the communication were taken. Instead of recording or using the real name of the participants the observers referred to the participants as numbers such as 1, 2, 3, etc. To protect the identity of the participants their names and the names of their companies have been



kept confidential in this document. At the conclusion of the meetings, the observers used to exchange notes, which were then transcribed into one final transcript. For Project A, three subcontractor coordination meetings produced 46 pages of transcripts (Appendix A-C), while for Project B, 57 pages of transcripts (Appendix D-H) were prepared from the observed data.

### **Open-ended Interview**

The participants of the open-ended interview were a convenience sample (n=12) from projects-A and B (two individual participants, and a focus group consisting of four participants from each project). Interviews were conducted at the jobsite trailers following the completion of the subcontractor coordination meetings. Each interview was noted verbatim and field notes were taken. Interviewees were asked to be candid about their responses and guiding follow-up questions were asked. Interviews were conducted using standardized open-ended format with carefully worded questions (Appendix I). This format was preferred over other interview formats for this research study since it minimized variations among the questions asked, maintained focus during the interview so that time was used efficiently, established priorities for the interview, simplified the analysis and comparison of the interviewees' responses, and assisted in maximizing the reliability of the data collected.

### **Examination of Archival Documents**

Two different types of archival documents were collected and examined in this research study. First, the minutes of the subcontractor coordination meetings were collected from both the projects. For Project A, the minutes of the subcontractor coordination meetings were collected for the period of October to November 2010. In case of Project B, the same data was collected

for the period of November 2010 to December 2010. The meeting minutes were prepared by representatives of the CM/GC who attended the subcontractor coordination meetings and were a formal documentation of the discussion and decisions made during the meetings. These were rich sources of data about the outcome of each meeting and helped in complementing the data gathered by direct observation and open-ended interview. A great deal of information was found in those documents about the responsibilities of the various subcontractors and also that of the CM/GC. Without knowledge of those discussion it would have been impossible to understand the nature of the communication between the participants of the subcontractor coordination meetings.

Second, the safety performance data from both the projects were collected to compute the RIR. To calculate the RIR of each project for a period of six months, two sets of data were required: (i) the number of incidents, which had occurred in that project during a period of six months, and (ii) the number of labor-hours expended in the project during the same six months. For Project A, the aforementioned data were collected for the period of August 2010 to January 2011; while for Project B it was for the period September 2010 to February 2011. The basic data of the incidents from the two projects were next scrutinized based on the OSHA criteria to select the ones that were recordable incidents. Following this, the RIR for both the projects were calculated separately using the number of recordable incidents and the labor-hours expended.

### **3.6 Chapter Summary**

This chapter presented the methodologies adopted in this research study. Bales' (1950) IPA was selected and then modified to analyze communication among the participants in construction environment. The sequential analyses of IPA take into account the impact of any individual act

on the whole communication process. The chapter also presented the coding scheme used in this research study along with the operational definition of each of the codes. To test the usability of Bales' (1950) IPA for analyzing communication data, a preliminary case study was conducted. This provided the required training for collecting communication data from site-based meetings and coding the transcripts using the coding scheme.

Due to the focus of this research study on contemporary events where the researcher could not manipulate the behavior of the participants, a multiple-case study approach was deemed appropriate. Subcontractor coordination meeting was selected as the unit of analyses for the main case studies based on the comparison of different types of meetings presented in this chapter. Having decided to follow a case study design, two projects were selected which were healthcare facilities. The chapter discussed the design of the case studies in detail. The three methods to collect data on independent variables were direct observation, open-ended interviews, and examination of archival documents. Collecting data from three sources would help in triangulating and increase reliability of the data collected. Examination of safety records of the two projects provided data to compute the RIR of the projects. The RIR computed for the two projects would provide a measure of the safety performance of the projects. Based on the case study design discussed in this chapter, the case studies on Project A and B were conducted which are discussed at length in Chapter four.

# **Chapter 4. Analyses of Communication in Construction**

## **Environment**

### **4.1 Introduction**

This chapter presents two case studies of construction projects, both in the United States, that were undertaken for the purpose of exploring communication among the participants during construction planning. The case studies were conducted between August 2010 and March 2011. Data collection for each of the case studies consumed six months, which included multiple site visits to collect observational data, interviews with project participants and examination of archival documents. Each case study starts with an overview of the project followed by description of the planning process adopted. Next, general descriptions of the observational data are presented as foundation of subsequent analyses. The data analyses has been presented in detail to explore the patterns of communication among the project participants in each of the cases, which are illustrated graphically by means of concept maps. In addition, descriptions of the safety and health programs implemented in the projects are also illustrated with computation of incidence rates.

### **4.2 Case Study 1**

#### **4.2.1 Overview of Project A**

Project A was a 438,000 square foot, US \$ 125 million health care facility in the Mid Atlantic region. The project included a 154-bed hospital (capable of providing comprehensive surgical procedures and intensive care, advanced cardiac care, and maternity center) with medical offices

and garage. It was a six storied freestanding building added to an existing health care facility campus.

The owner launched Project A as a Design-Bid-Build project and hired an Architectural/Engineering (A/E) firm to handle the architectural design; mechanical, electrical, and plumbing (MEP) design; and the structural design. A different firm was hired to prepare the civil and site-work drawings. The Construction Manager (CM) was hired by the owner on a cost plus fee agreement once the construction documents were substantially completed. The CM firm selected subcontractors for all trades, based on competitive bidding. Construction started in November 2008 and was scheduled to be completed by June 2011. Data for the case study was collected during the period of August 2010 to January 2011. At the time of data collection, all the foundation and structural works were complete for project and construction tasks in the ‘skin’ of the building were ongoing. The envelope was comprised of brick veneer, glass curtain wall, and metal fascia. MEP tasks in all the floors and interior finishes were going on in tandem. In the exterior, site lighting was underway and landscaping and paving subcontractors were preparing to start work.

#### **4.2.2 Description of the Planning Process**

The planning process utilized in Project A to organize and accomplish the tasks resembled that of traditional project planning (Figure 4-1). Following the hiring of the CM by the owner, the CM received the construction documents in packages: site-work package, structural steel package, exterior skin package, interior fit out package, and similar others. Based on the A/E drawings, the project manager of the CM categorized the project into definable tasks with the help of work breakdown structure (WBS). The WBS was a framework for cost estimating and

provided guidance for schedule development. Following the breakdown of tasks, they were sequenced according to the interrelationships using network diagram. Next the project manager and his planning team performed quantity takeoff for each task and the productivity of the crew was determined from historical data, based on which durations of the tasks were calculated. All this information was integrated into a master schedule with additional information for responsibility, cost, constructability and availability of resources. The master schedule prepared by the project manager was segregated into multiple components: site-work, structural steel, and exterior skin of the building.

A scheduling consultant was hired by the CM to prepare the schedule for the interior fit out package. The project manager provided input to the consultant regarding the overall sequencing for the project. Once the consultant prepared the schedule, it was reviewed and revised multiple times to make sure it merged with the rest of the schedule prepared by the project manager of the CM. After the schedule was finalized, it was issued to the subcontractors along with the drawings, specifications, scope of work, and they had to follow the schedule to accomplish the tasks. When asked about the possibility of incorporating subcontractors' input in preparing the schedule, the project manager commented:

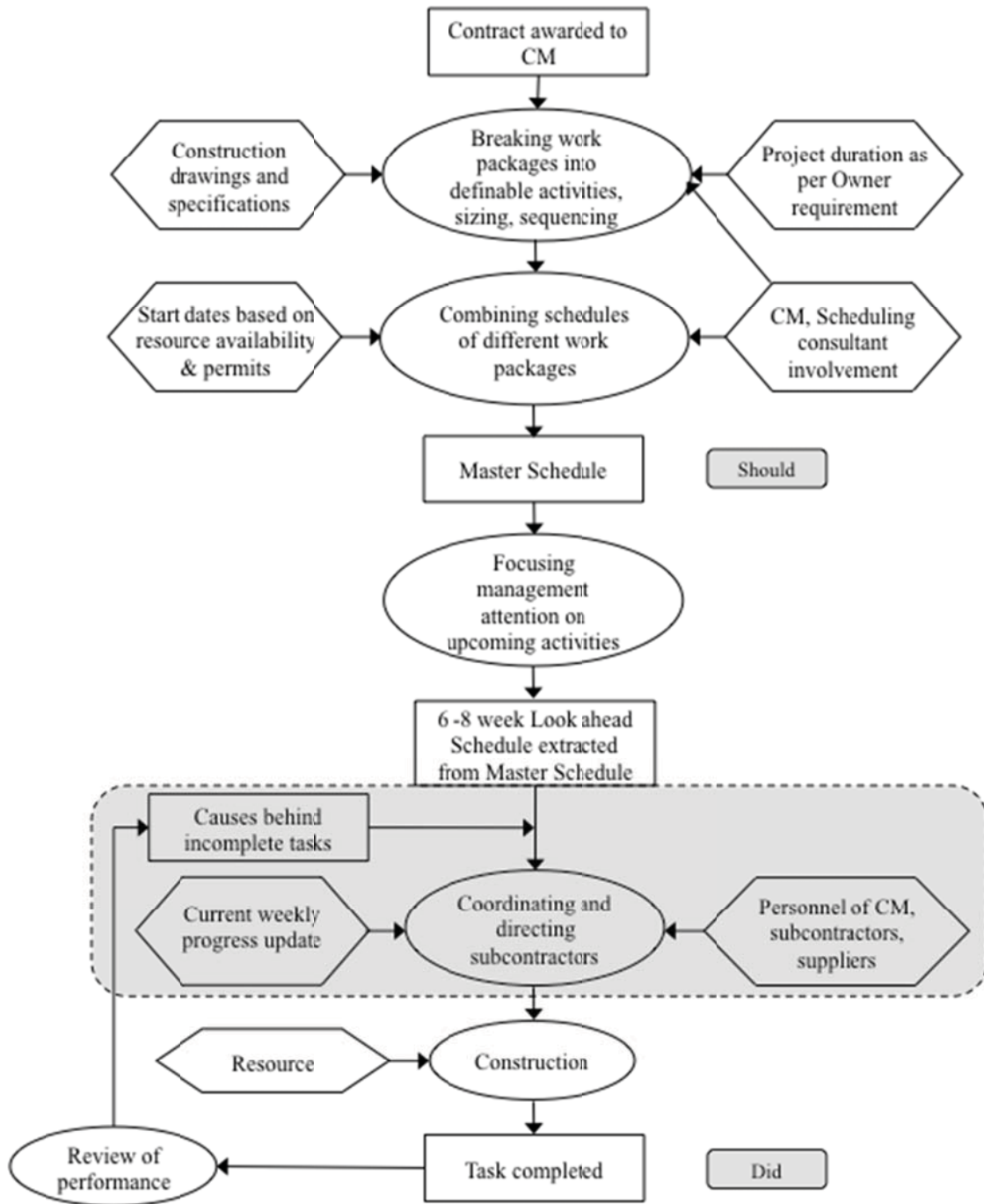
*“The subcontractors were bidding the job. So, they had to have a schedule before they bid the job. So, they knew where the dates were. We will never bid a job to a subcontractor and then give them a schedule afterwards. Then they will say...oh I need six weeks for this one area. While you only need four, you see what I mean. The job will take forever. A 12 month job will take 18 months if we do that way.”*

Once production began, the CM devoted their efforts to control and monitoring of the performance of the subcontractors against the master schedule. The subcontractors were not always able to meet the dates outlined in the schedule in spite of the push from the CM, and the project manager of the CM mentioned:

*“Now we are in the middle of the project, some dates we are meeting, and some dates we are not. Usually we are yelling at people that may not meet the dates.”*

In the control phase, they focused on variance between the work planned and work accomplished, and made corrective actions to reduce the variance. An important aspect of the control and monitoring mechanism was the weekly subcontractor coordination meetings conducted by the CM. These were meetings attended by the subcontractors working in the job site to discuss comprehensively about schedule, coordination issues, imminent safety problems, and quality issues related to Project A.

For the purpose of this research study, data of communication among the project participants were collected from three subcontractor coordination meetings, which are referred as Meetings A1, A2, and A3 in this document. As previously mentioned, the subcontractor coordination meetings took place once every week.



*Note: This study focused on the highlighted segment of the process*

**Figure 4-1:** Process of project planning for Project A



### **4.2.3 Descriptive Summary of Communication Data**

This section presents the analyses of the communication data collected from Meetings A1, A2, and A3. For all the three meetings, the transcripts were coded by two coders, who were the same individuals collecting observational data. This reduced the error where coders not present in the meeting assign wrong category to an act based on literal meaning of the transcript. The calculated inter-coder reliability for each of the meetings is provided below.

#### **Inter-coder Reliability**

Simple percentage agreement of occurrences between the two coders was calculated for all the three meetings. The agreements between the coders in case of Meetings A1, A2, and A3 were 87.5%, 88.4%, and 86.9% respectively. Considering 80% and above as acceptable, the percentage agreements between the coders in all the three meetings were acceptable.

Cohen's kappa ( $\kappa$ ) for each of the three meetings were also calculated, as  $\kappa$  takes into account the agreement occurring by chance. The  $\kappa$  value for Meetings A1, A2, and A3 were 0.85, 0.86, and 0.83 respectively. In all the three meetings, the coders exhibited excellent agreement, as  $\kappa$  value of 0.75 and above represents excellent agreement.

#### **Frequencies of Communication Categories**

The tables and graphs presented in this section provide the descriptive statistics for each of the individual meetings as also portray a holistic picture of communication in Project A. The frequencies of the categories and their respective percentages, an initial analysis of the trends and differences are reported.

### Meeting A1

Table 4-1 provides a summary of the different communication categories observed in Meeting A1. A total of 704 thought units were observed in this meeting spanning 110 minutes (continuous). The transcript of the meeting is attached in Appendix A. Considerably less communication was evident among the participants before or after the meeting. The majority of the communication that occurred before the meeting was contained within subgroups. Some of the participants were also found engaged with their phones. Conversations within the subgroups were neither loud nor whispered, and these discussions appeared to maintain interpersonal status. One of the participants (11) took effort to interact with others by greeting them, but other participants did not reciprocate. While waiting for the meeting to start, the participants organized their notes. The meeting was conducted in a formal and structured manner; meeting agenda and attendance sheet were circulated 5 minutes before the commencement of the meeting.

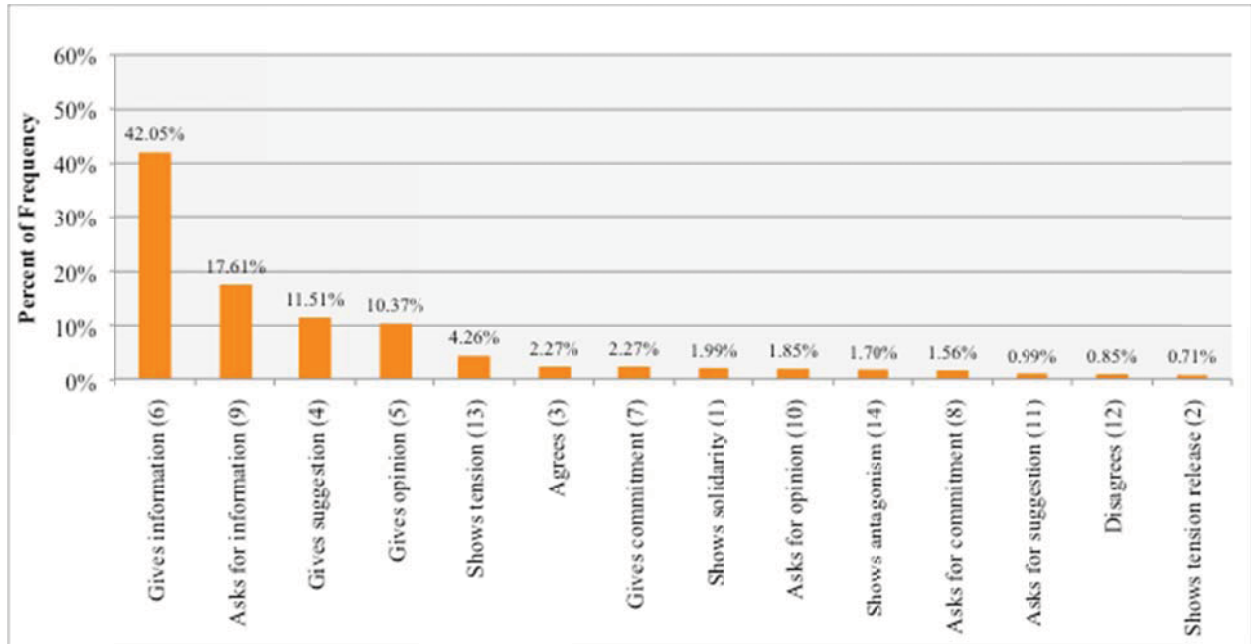
**Table 4-1:** Communication categories for Meeting A1

Categories	Units of Thought	
	Frequency	Percentage
Shows solidarity (1)	14	1.99
Shows tension release (2)	5	0.71
Agrees (3)	16	2.27
Gives suggestion (4)	81	11.51
Gives opinion (5)	73	10.37
Gives information (6)	296	42.05
Gives commitment (7)	16	2.27

Categories	Units of Thought	
	Frequency	Percentage
Asks for commitment (8)	11	1.56
Asks for information (9)	124	17.61
Asks for opinion (10)	13	1.85
Asks for suggestion (11)	7	0.99
Disagrees (12)	6	0.85
Shows tension (13)	30	4.26
Shows antagonism (14)	12	1.70
Total Units of Thought	704	100

Figure 4-2 represents the bar graph of the communication categories for Meeting A1. It is clearly evident from the graph that the most occurred communication category was ‘gives information’ (42.05%) followed by ‘asks for information’ (17.61%) and ‘gives suggestion’ (11.51%). These three categories comprised majority of the communication categories for Meeting A1 (71.16%). The other eleven communication categories added up to 28.84%. Among those, ‘gives opinion’ occurred 10.37% of the time. The categories that occurred very infrequently were ‘shows tension release’ (0.71%) and ‘disagrees’ (0.85%) that comprised mere 1.56% of the total number of communication categories. When examined in terms of task-based communications (categories 4-11) and relational communications (categories 1-3 and 12-14), relational communication categories (11.78%) occurred much less in comparison to task-based communication categories (88.22%). However, within relational communication, there was not much difference between positive relational communication (categories 1-3) and negative relational communication

(categories 12-14) that constituted 4.97% and 6.81% of the total number of communication categories.



**Figure 4-2:** Frequency of communication categories for Meeting A1

A noticeable trend in Meeting A1 is that frequency of the categories ‘gives suggestion’, ‘gives opinion’ and ‘gives information’ are considerably higher than that of the categories ‘asks for information’, ‘asks for opinion’ and ‘asks for suggestion’. This shows the number of issues raised in this meeting by the participants were less.

### Meeting A2

Summary of the different communication categories observed in Meeting A2 are presented in Table 4-2. A total of 759 thought units were observed in this meeting spanning 125 minutes (continuous). The transcript of the meeting is attached in Appendix B. Similar to Meeting A1 scant communication was evident among the participants before or after the meeting. The

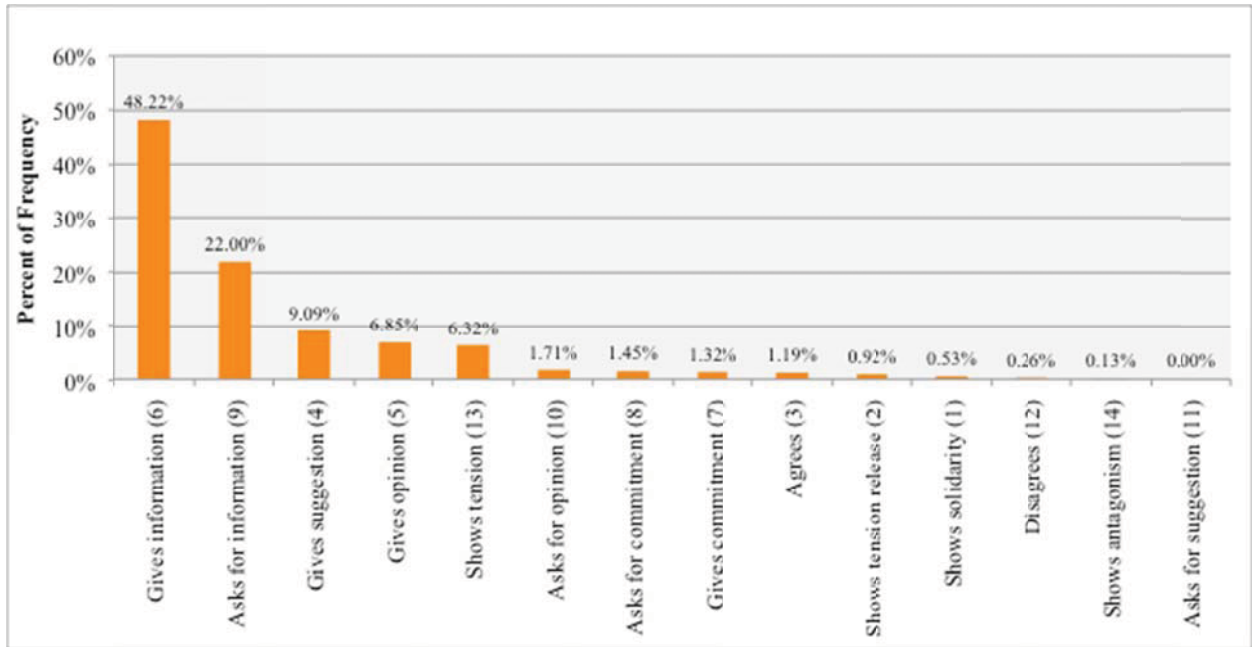
subcontractors started coming to the meeting 15 minutes before the scheduled start time of the meeting, which meant they had plenty of time for informal discussion. Majority of the communication that occurred before the meeting started was contained within subgroups. Conversations within the subgroups were loud and tended to focus on sports events such as a recent football match. The CM's representatives entered the meeting just before the meeting was due to start, which allowed them no time for informal discussion. The meeting commenced as soon as the CM's representatives arrived. The meeting was conducted in a formal and structured manner; meeting agenda and attendance sheet were circulated at the beginning of the meeting.

**Table 4-2:** Communication categories for Meeting A2

Categories	Units of Thought	
	Frequency	Percentage
Shows solidarity (1)	4	0.53
Shows tension release (2)	7	0.92
Agrees (3)	9	1.19
Gives suggestion (4)	69	9.09
Gives opinion (5)	52	6.85
Gives information (6)	366	48.22
Gives commitment (7)	10	1.32
Asks for commitment (8)	11	1.45
Asks for information (9)	167	22.00
Asks for opinion (10)	13	1.71
Asks for suggestion (11)	0	0
Disagrees (12)	2	0.26
Shows tension (13)	48	6.32

Categories	Units of Thought	
Shows antagonism (14)	1	0.13
Total Units of Thought	759	100

A bar graph of the communication categories for Meeting A2, shown in Figure 4-3, clearly indicates that the most frequently occurring communication category was ‘gives information’ (48.22%) followed by ‘asks for information’ (22.0%), and ‘gives suggestion’ (9.09%). These three categories comprised majority of the communication categories for Meeting A2 (79.31%). The other eleven communication categories added up to 20.69%. Among those, ‘gives opinion’ occurred 9.09% of the time. The categories that occurred very infrequently were ‘shows antagonism’ (0.13%), ‘disagrees’ (0.26%), ‘shows solidarity’ (0.53%), and ‘shows tension release’ (0.92%) that comprised mere 1.84% of the total number of communication categories. Category 11, ‘Asks for suggestion’ did not occur at all during the meeting. When examined in terms of task-based communication (categories 4-11) and relational communication (categories 1-3 and 12-14), the amount of task-based communication (90.64%) was much higher in comparison to relational communication. Within task-based communication, communication related to attempted answers (categories 4-7; 65.48%) occurred more than twice than that of communication related to questions (categories 8-11; 25.21%). Similarly, within relational communication, negative relational communication (categories 12-14; 6.69%) occurred more than twice the number of times than positive relational communication (categories 1-3; 2.62%).



**Figure 4-3** : Frequency of communication categories for Meeting A2

A striking feature of Meeting A2 is the absence of category 11, ‘asks for suggestion’ altogether. This indicates that the group members were not interested to get directions or resolutions of how to perform tasks from other members. In contrast, the participants were more interested to gather factual observation that is evident from the high percentage of category 6 ‘gives information’.

### **Meeting A3**

Communication categories observed in Meeting A3 are summarized in Table 4-3. A total of 821 thought units were observed in this meeting spanning 130 minutes (continuous). The transcript of the meeting is attached in Appendix C. Compared to Meetings A1 and A2, there was considerable amount of communication among the participants before the start of the meeting. The subcontractors started coming to the venue 20 minutes before the scheduled start time of the meeting. Conversations within the subgroups were loud, and majority of the discussion were regarding the barbeque that was organized in the job site by the CM last week. Few participants

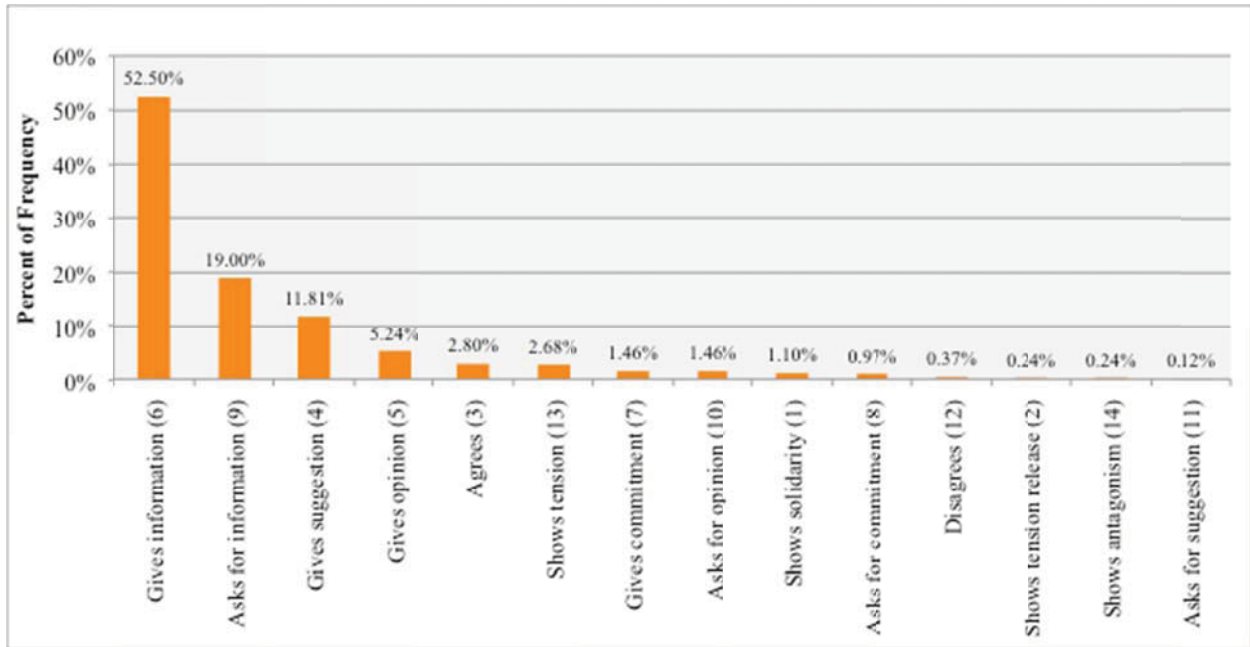
looked concerned while discussing about a co-worker who recently had a surgery. The CM's representatives entered the meeting just before the meeting was due to start and as a result could not afford any informal discussion. The meeting commenced as soon as the CM's representatives arrived. The meeting was conducted in a formal and structured manner; meeting agenda and attendance sheet were circulated prior to the beginning of the meeting.

**Table 4-3:** Communication categories for Meeting A3

Categories	Units of Thought	
	Frequency	Percentage
Shows solidarity (1)	9	1.10
Shows tension release (2)	2	0.24
Agrees (3)	23	2.80
Gives suggestion (4)	97	11.81
Gives opinion (5)	43	5.24
Gives information (6)	431	52.50
Gives commitment (7)	12	1.46
Asks for commitment (8)	8	0.97
Asks for information (9)	156	19.0
Asks for opinion (10)	12	1.46
Asks for suggestion (11)	1	0.12
Disagrees (12)	3	0.37
Shows tension (13)	22	2.68
Shows antagonism (14)	2	0.24
Total Units of Thought	821	100



Figure 4-4 represents the bar graph of the communication categories for Meeting A3. The chart indicates that the most occurred communication category was 'gives information' (52.50%) followed by 'asks for information' (19.0%), and 'gives suggestion' (11.81%). These three categories comprised majority of the communication categories for Meeting A3 (83.31%). The other eleven communication categories added up to 16.69%. Among those, 'gives opinion' occurred 5.24% of the time. The categories that occurred very infrequently were 'asks for suggestion' (0.12%), 'shows antagonism' (0.24%), 'shows tension release' (0.24%), and 'disagrees' (0.37%), which comprised less than 1.0% of the total number of communication categories. Similar to Meetings A1 and A2, the amount of task-based communication (categories 4-11; 92.56%) in Meeting A3 was much higher than the amount of relational communication (categories 1-3 and 12-14; 7.44%). Within task-based communication, communication related to attempted answers (categories 4-7; 71.01%) occurred more than thrice than that of communication related to questions (categories 8-11; 21.55%). However, within relational communication, positive relational communication (categories 1-3; 4.14%) occurred more than that of the negative relational communication (categories 12-14; 3.30%).



**Figure 4-4** : Frequency of communication categories of Meeting A3

Noticeable trend is that frequency of the categories ‘asks for opinion’ and ‘asks for suggestion’ are substantially lower than that of ‘asks for information’. This indicates that the participants were more interested to know factual observations related to tasks rather than requesting insight or direction from others.

**Communication Categories and Consistency Across Meetings**

Data of communication from Meetings A1, A2, and A3 are aggregated in Table 4-4 to provide a single dataset for Project A. The majority of IPA thought units across all the three meetings was category 6, ‘gives information’ (47.85%). The other categories that occurred frequently were ‘asks for information’ (19.57%), ‘gives suggestion’ (10.81%), and ‘gives opinion’ (7.36%). The remainder of the ten categories each accounted for less than 5%: ‘shows tension’ (4.38%), ‘agrees’ (2.1%), ‘gives commitment’ (1.66%), ‘asks for opinion’ (1.66%), ‘agrees’ (2.0%),

‘shows solidarity’ (1.18%), ‘shows antagonism’ (0.66%), ‘shows tension release’ (0.61%), ‘disagrees’ (0.48%), and ‘asks for suggestion’ (0.35).

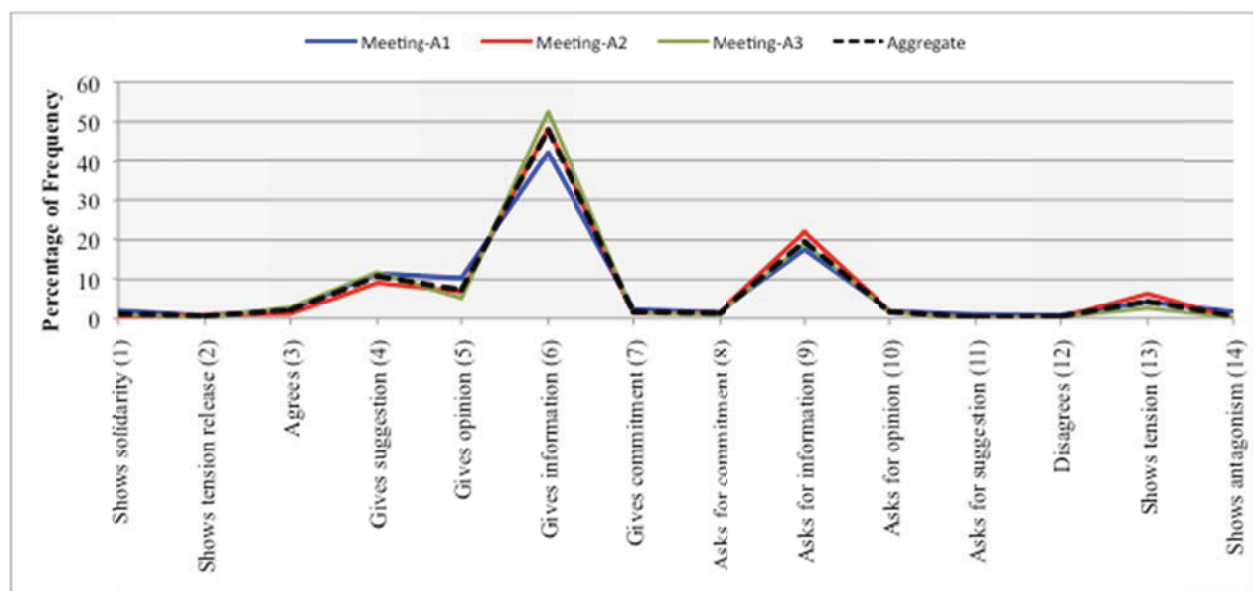
In terms of frequency, the task-based communication categories (categories 4-11: 90.57%) were significantly higher than that of relational communication categories (categories 1-3 and 12-14; 9.43%). Within task-based communications, attempting answers (categories 4-7: 67.68%) were higher in comparison to asking questions (categories 8-11: 22.89%). Between positive relational communications (categories 1-3: 3.89%) and negative relational communications (categories 12-14: 5.54%), there was not much to differentiate.

**Table 4-4:** Communication categories for Project A

Categories	Units of Thought			
	Meeting A1 N (%)	Meeting A2 N (%)	Meeting A3 N (%)	Aggregate N (%)
Shows solidarity (1)	14 (1.99)	4 (0.53)	9 (1.10)	27 (1.18)
Shows tension release (2)	5 (0.71)	7 (0.92)	2 (0.24)	14 (0.61)
Agrees (3)	16 (2.27)	9 (1.19)	23 (2.80)	48 (2.10)
Gives suggestion (4)	81 (11.51)	69 (9.09)	97 (11.81)	247 (10.81)
Gives opinion (5)	73 (10.37)	52 (6.85)	43 (5.24)	168 (7.36)
Gives information (6)	296 (42.05)	366 (48.22)	431 (52.50)	1093 (47.85)
Gives commitment (7)	16 (2.27)	10 (1.32)	12 (1.46)	38 (1.66)
Asks for commitment (8)	11 (1.56)	11 (1.45)	8 (0.97)	30 (1.31)
Asks for information (9)	124 (17.61)	167 (22.0)	156 (19.0)	447 (19.57)
Asks for opinion (10)	13 (1.85)	13 (1.71)	12 (1.46)	38 (1.66)
Asks for suggestion (11)	7 (0.99)	0 (0)	1 (0.12)	8 (0.35)
Disagrees (12)	6 (0.85)	2 (0.26)	3 (0.37)	11 (0.48)

Categories	Units of Thought			
	Meeting A1 N (%)	Meeting A2 N (%)	Meeting A3 N (%)	Aggregate N (%)
Shows tension (13)	30 (4.26)	48 (6.32)	22 (2.68)	100 (4.38)
Shows antagonism (14)	12 (1.70)	1 (0.13)	2 (0.24)	15 (0.66)
<b>Total</b>	704 (100)	759 (100)	821 (100)	2284 (100)

To verify the consistency of the three meetings and whether they were representative of Project A, the individual communication profile of the three meetings were plotted in a line graph. They showed analogous trend (Figure 4-5). The aggregate communication data for Project A denoted by a dashed line in Figure 4-5 shows that it is representative of the data collected from Meetings A1, A2 and A3.



**Figure 4-5** : Individual and aggregate communication profiles of Meetings A1, A2, and A3

### *Frequencies of Interacts*

Analyzing the communication categories singularly was helpful; at the same time, it was also important to understand how these categories were used in communication. One way to do this was to analyze the interacts. Interact is a set of two continuous units of thought. Simple frequencies of interacts were calculated. In addition, Table 4-5 illustrates whether the consecutive units of thought were voiced by the same participant or different participants. Interacts voiced by the same person are denoted as ‘monologue’ and interacts involving more than one participant are denoted as ‘dialogue’. Distinguishing interacts into ‘monologue’ and ‘dialogue’ helped to gain understanding of the collaborative involvement of the participants in the proceedings of the meetings.

The highest frequency interact across all the three meetings of Project A was the ‘gives information-gives information’ (6-6: monologue) that made up 17.79% of all interacts. Other frequently occurring interacts included: ‘asks for information-gives information’ (9-6, dialogue) with 10.87%, ‘gives information-asks for information’ (6-9, dialogue) with 6.09%, and ‘gives information-gives information’ (6-6, dialogue) with 4.78%. The interacts are listed in descending order of their frequency in Table 4-5. Interacts having frequency less than 1% in the aggregate have been grouped as ‘infrequent interacts’.

The higher frequency interacts were task-based and mostly included ‘gives information’ (category 6). Other communication categories such as ‘asks for opinion’ (category 9), ‘gives suggestion’ (category 4) and ‘gives opinion’ (category 5) were most often combined with ‘gives information’. The most often occurring interact with component of relational communication was ‘gives information-shows tension’ (6-13, monologue: 1.62%) sequence. Among the relational

communication categories, ‘shows tension’ (category 13) occurred most frequently. It is also noteworthy that only four out of the 15 frequently occurring interacts were dialogue, which shows that the participants were not engaged in communication.

**Table 4-5:** Frequently occurring interacts for Project A

<b>Category Pairs</b>	<b>Monologue/ Dialogue</b>	<b>Mtg. A1 N (%)</b>	<b>Mtg. A2 N (%)</b>	<b>Mtg. A3 N (%)</b>	<b>Aggregate N (%)</b>
GI – GI (6-6)	M	104 (14.77)	125 (16.49)	177 (21.59)	406 (17.79)
AI – GI (9-6)	D	73 (10.37)	75 (9.89)	100 (12.20)	248 (10.87)
GI – AI (6-9)	D	34 (4.83)	53 (6.99)	52 (6.34)	139 (6.09)
GI – GI (6-6)	D	22 (3.13)	41 (5.41)	46 (5.61)	109 (4.78)
GI – AI (6-9)	M	21 (2.98)	31 (4.09)	27 (3.29)	79 (3.46)
GI – GS (6-4)	M	19 (2.70)	24 (3.17)	31 (3.78)	74 (3.24)
GI – GO (6-5)	M	24 (3.41)	24 (3.17)	25 (3.05)	73 (3.20)
AI – AI (9-9)	M	16 (2.27)	37 (4.88)	17 (2.07)	70 (3.07)
GS – GI (4-6)	M	18 (2.56)	25 (3.30)	21 (2.56)	64 (2.80)
AI – GI (9-6)	M	12 (1.70)	18 (2.37)	15 (1.83)	45 (1.97)
GS – GS (4-4)	M	19 (2.70)	3 (0.40)	22 (2.68)	44 (1.93)
GO – GI (5-6)	M	11 (1.56)	20 (2.64)	8 (0.98)	39 (1.71)
GI – GS (6-4)	D	9 (1.28)	9 (1.19)	19 (2.32)	37 (1.62)
GI – ST (6-13)	M	7 (0.99)	23 (3.03)	7 (0.85)	37 (1.62)
GS – AI (4-9)	M	11 (1.56)	6 (0.79)	14 (1.71)	31 (1.36)
ST – GI (13-6)	M	7 (0.99)	17 (2.24)	7 (0.85)	31 (1.36)
AI – AI (9-9)	D	4 (0.57)	11 (1.45)	10 (1.22)	25 (1.10)
GS – GI (4-6)	D	9 (1.28)	7 (0.92)	8 (0.98)	24 (1.05)
Infrequent interacts (occurring < 1% in aggregate)					707 (30.98)

Category Pairs	Monologue/ Dialogue	Mtg. A1 N (%)	Mtg. A2 N (%)	Mtg. A3 N (%)	Aggregate N (%)
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GS = Gives Suggestions; GO = Gives Opinion; GI = Gives Information; AI = Asks for Information; ST = Shows Tension

**Frequencies of 3-interacts**

There were 393 mutually exclusive 3-interacts observed across three meetings for an aggregate of 2,279. The highest frequency 3-interact sequence across all the three meetings of Project A was three continuous sequence of ‘gives information’ (6-6-6) that represented 10.71% of all 3-interacts. The frequently occurring 3-interacts of Project A is arranged in descending order of their aggregate frequency in Table 4-6.

All the frequently occurring 3-interacts contained one or more ‘gives information’ (category 6). This phenomenon demonstrates that giving information was the main focus of the subcontractor coordination meetings of Project A. ‘Asks for information’ (category 9), ‘gives opinion’ (category 5), and ‘gives suggestion’ (category 4) were most often combined with ‘gives information’ category. The highest frequency 3-interact sequence with component of relational communication (6-6-13) occurred only 1.05% of the aggregate.

**Table 4-6 : Frequently occurring 3-interacts for Project A**

3-interacts Category	Mtg. A1 N (%)	Mtg. A2 N (%)	Mtg. A3 N (%)	Total N (%)
GI – GI - GI (6-6-6)	52 (7.40)	77 (10.17)	115 (14.04)	244 (10.71)
AI – GI – GI (9-6-6)	33 (4.69)	44 (5.81)	65 (7.94)	142 (6.23)

<b>3-interacts Category</b>	<b>Mtg. A1 N (%)</b>	<b>Mtg. A2 N (%)</b>	<b>Mtg. A3 N (%)</b>	<b>Total N (%)</b>
GI – AI – GI (6-9-6)	34 (4.84)	44 (5.81)	60 (7.33)	138 (6.06)
GI – GI – AI (6-6-9)	24 (3.41)	37 (4.89)	45 (5.49)	106 (4.65)
AI – GI – AI (9-6-9)	19 (2.70)	28 (3.70)	18 (2.20)	65 (2.85)
AI – AI – GI (9-9-6)	14 (1.99)	24 (3.17)	20 (2.44)	58 (2.54)
GI – GI – GS (6-6-4)	10 (1.42)	17 (2.25)	26 (3.17)	53 (2.33)
GI – GI – GO (6-6-5)	15 (2.13)	15 (1.98)	17 (2.08)	47 (2.06)
GI – AI – AI (6-9-9)	11 (1.56)	23 (3.04)	12 (1.47)	46 (2.02)
GI – GS – GI (6-4-6)	9 (1.28)	15 (1.98)	18 (2.20)	42 (1.84)
GS – GI – GI (4-6-6)	16 (2.28)	11 (1.45)	14 (1.71)	41 (1.80)
GI – GO – GI (6-5-6)	7 (1.00)	13 (1.72)	16 (1.95)	36 (1.58)
GO – GI – GI (5-6-6)	5 (0.71)	15 (1.98)	9 (1.10)	29 (1.27)
GI – GS – GS (6-4-4)	8 (1.14)	8 (1.06)	12 (1.47)	28 (1.23)
GS – AI – GI (4-9-6)	10 (1.42)	5 (0.66)	12 (1.47)	27 (1.18)
GO – AI – GI (5-9-6)	9 (1.28)	7 (0.92)	10 (1.22)	26 (1.14)
AI – AI – AI (9-9-9)	4 (0.57)	18 (2.38)	5 (0.61)	27 (1.18)
GI – GI – ST (6-6-13)	8 (1.14)	11 (1.45)	5 (0.61)	24 (1.05)
AI – GI – GS (9-6-4)	9 (1.28)	4 (0.53)	10 (1.22)	23 (1.01)
GI – ST – GI (6-13-6)	5 (0.71)	11 (1.45)	7 (0.85)	23 (1.01)
Infrequent 3-interact categories (occurring <1% in aggregate)				1054 (46.25)
GS = Gives Suggestions; GO = Gives Opinion; GI = Gives Information; AI = Asks for Information; ST = Shows Tension				



#### **4.2.4 Analysis of Communication Data**

Analyses of the communication data from the three meetings of Project A show that some trends occurred repeatedly. Some communication categories were consistent across all the meetings.

Although there were variations in the trends that occurred across the meetings, it was important that all the three meetings exhibited trends that were specific to Project A. The first stage of the analyses was to examine and discuss the trends revealed by the descriptive statistics of Meetings A1, A2, and A3, followed by detailed examination of the most consistent patterns.

##### **Positive Relational Communication (categories 1-3)**

Category 1 ‘shows solidarity’ accounted for a little over 1% of the total communication for Project A. So, it was not common among the participants to show solidarity, giving praise or reward type communication during the meetings. The participants were all too concerned about their own scope of work and did not show much support for fellow workers. All the trades were competing with each other rather than working in cohesion. Moreover, there were several instances when the participants discussed about workers of other trades being in their way that inhibited their progress. This was also evident from the content of the meeting minutes in which participants had expressed concerns about preceding trades slowing them down as also conflicts in their work as it related to improper work performed by others. This occurred due to lack of communication, which was highlighted during the conversation of the drywall subcontractor and the project manager of the CM in Meeting A1. The drywall subcontractor explained to the project manager that due to scaffolds of other trades in the way, they could not complete the framing of the stairwell. The project manager was overtly frustrated and did not hold back his disappointment. The communication is quoted below where ‘1’ refers to the project manager,

'37' refers to the drywall subcontractor, and '0' refers to the whole group (Line 410-415, Appendix A).

*[1-0] Seriously guys...this is pathetic...it's a \*\*\*\*\* stairwell. (I again showed his disappointment very clearly).*

*[1-0] We can't talk to each other? It is a secret that his scaffolding is in your way? Now come on seriously.*

*[1-0] Please talk. It's pretty bad. You all need to talk in the field. Guys in the field need to talk to B's (referring to 37) folks. Some of the works are not taken care of. This is ridiculous.*

The communication observed in category 2 'shows tension release' occurred less than 1% and was the least of the positive relational categories (categories 1-3). In most of the occasions, category 2 occurred after category 6 'gives information' or category 7 'asks for information'. This proves that the group member attempted to remove anxiety experienced by the other member. In one such instance during Meeting A1, the project manager wanted to complete paving of a section within a particular time frame. This was important to complete that section and hand it over to the owner. The site-work subcontractor assured that it would be completed well in time and thus relieved the anxiety of the project manager. The communication is quoted below where '1' refers to the project manager and '23' refers to the site-work subcontractor (Line 211-215, Appendix A).

*[1-23] Well, that is when all the work is supposed to be done, but I need to have the base course asphalt done.*

*[1-23] Is there any way you can crank out the base course asphalt in the next 2 to 3 weeks?*

*[23-1] No, my plan is to get done in the next week.*

*[1-23] Then, that should not be a problem.*

Though very less in number, there were some instances where a participant expressed satisfaction for the work accomplished by another participant. Incidentally in all the occasions, the participant expressing satisfaction was the project manager or other personnel of the CM. Very rarely one subcontractor expressed enthusiasm or satisfaction on the accomplishment of another subcontractor. This again signifies the lack of cohesiveness among the participants, due to which there was no sense of belongingness among the participants.

Category 3 occurred more than the other two positive relational categories (2.10%).

Communication in this category was fairly consistent across the meetings with a minimum of 1.19% in Meeting A2 to a maximum of 2.80% in Meeting A3. Generally, the agreement among the participants in Meeting A2 was low compared to the other two meetings. According to Emmitt and Gorse (2007), agreement could occur for a number of reasons. Agreement was often used to reassure participants that information provided or progress reported was that which was expected. Due to this, in most of the cases category 3 was found to occur following category 6 'gives information'. Support from the participants encouraged others to continue with their dialogue and reinforced the value of their contribution. In one such occasion, the drywall subcontractor showed agreement with the mechanical subcontractor on the issue of conflict between framing the stairwell and installing unit heaters. In the following quote from Meeting

A1, '1' refers to the project manager, '27' refers to the mechanical subcontractor, and '34' refers to the drywall subcontractor (Line 376-381, Appendix A).

*[34-1] No, no, the problem is that we haven't hung the drywall yet in the stairway where we have unit heaters in our way now. So, I don't know why we have unit heaters in Stair 1 when we have done piping in Stair 3.*

*[27-34] Actually Stairwell 1, Area A, 5th Floor they were framing up there, so we completed the outdoor patients' for the first floor, cabinet unit heaters...*

*[34-27] Right. We are not starting Stair 1. Can't close Stair 1 if we don't finish Stair 3.*

The level of agreement and strength of emotion showed by the drywall subcontractor surrounding the discussion recognized the importance of the progress made by the mechanical subcontractor. However, such instances were found to occur less in number due to lack of agreement between the participants. Looking critically into the matter, lack of agreement among the participants stemmed from their lack of involvement in the planning process. As evident from the description of the project manager, he prepared the schedule for Project A based on historical data and heuristic. Being contractually bound, the subcontractors had no other option but to abide by the schedule and naturally they found themselves in situations where they were behind schedules and running short of labor power. This created a breach between the expectation of the CM and the resources of the subcontractors that affected the level of agreement among the participants. This is manifested in the following quote from the focus group interview; 'I' refers to the interviewer; 'R2' and 'R4' refer to the respondents (Line 41-50, Appendix L).

*I: Do you get enough opportunity to express your thoughts and concerns during the coordination meetings?*

*R2: Not if you value your contract.*

*I: What do you mean?*

*R2: You just take the beating, and do what you need to do in order to get the portion of your job done.*

*R4: You can't voice your concern so much.*

*R2: And I think he just said it perfectly clear what I was trying to say. It doesn't make any difference. It doesn't make any difference for the simple fact that, if you are wrong you are wrong, if you are right you are wrong.*

#### **Task-based Communication: Attempted Answers (categories 4-7)**

The task-based information in the form of 'gives suggestion' (category 4), 'gives opinion' (category 5), 'gives information' (category 6), and 'gives commitment' (category 7) had a trend of higher occurrence across all three meetings. Among the four categories, category 6 was the most used followed by category 4 in all the three meetings. Category such as 'gives information' was used by the participants to report factual observations and background data related to tasks. From the meeting minutes, it was evident that category 6 was the most frequently used, followed by category 4. In comparison there was very less usage of category 7. Excerpts from one of the meeting minutes as shown below can be cited as example.

*CMU parapets should begin ASAP on the MOB [Medical Office Building] roof.*

*Roofing installation will begin in Mid-September. All trades with roof curbs, portals, pedestals, etc. must have them installed prior to roofing installation.*

Communication categorized as ‘gives suggestion’ (category 4) were often used to provide directions related to tasks. Such acts were usually autonomous statements, with the participant making the suggestion attempting to control how to perform tasks. In most of the cases for Project A, prominent use of suggestions was limited to the project manager or the superintendent of the CM. In one such communication from Meeting A1 quoted below, one of the personnel of the CM suggested the masons how to build the brick piers. In the following quote, ‘1’ refers to the project manager, ‘24’ refers to the masonry subcontractor, and ‘34’ refers to the personnel of the CM (Line 274-277, Appendix A).

*[34-24,1] The curb is here. So, he is going to be behind the curb.*

*[34-24] In a perfect world, the mason will go first. And the way I envision happening is that...the mason will go in there and probably run them all up 4 feet high, and then when he got it 4 feet high on both side, then scaffold behind the curb and then run rest of the wall.*

The multidisciplinary nature of the group meant that different perspectives could be offered by the participants. However, individual expertise of the participants was not fully utilized in these meetings, as all except a few were not actively involved in providing suggestions. Making suggestions and providing directions are assertive communication acts. Assertive communication was rarely prolonged, being punctuated by exchange of background information (category 6). This is evident from Table 4-6, which shows that some of the frequently occurred 3-interacts were 6-6-4 (gives information-gives information-gives suggestion), 6-4-6 (gives information-gives suggestion-gives information), and 6-5-6 (gives information-gives opinion-gives information). Excerpts of the communication during Meeting A2 can be cited as an example. In

the following quote, ‘0’ refers to the whole group and ‘22’ refers to one of the field personnel of the CM (Line 83-86, Appendix B).

*[22-0] Uh...MOB (Medical Office Building) stairwell 3, sheathing on the north face and then we will be putting Tyvek there. The fireproofers should be working there today. So you should be able to go back there tomorrow to start putting sheathing, Tyvek, brick ties, and whatever you need on it. And curtain wall in...*

Category 5 ‘gives opinion’ was used to offer views and provide reasoning relevant to tasks. Opinion based acts were sometimes used to sensitively offer suggestions, from an individual perspective. Opinions that were assertive were categorized as ‘gives suggestion’. Similar to category 4, a handful of the participants were more actively offering opinions. The participants offering most of the opinions were affiliated to the CM. Below is an example of such an act, where ‘4’ refers to one of the personnel of CM and ‘12’ refers to the plumbing subcontractor (Line 445-446, Appendix B).

*[4-12] My understanding is that the part of the problem has to do with the sink tops, which has impact on the fixtures of the lavatory, which has impact the accessory guys.*

Lack of involvement of the subcontractors in the planning process restricted them from providing opinions in the meetings. As there was minimal cohesiveness among the participants, the participants were reluctant to offer their views on tasks not directly related to their scope of work. In addition, as most of the decisions related to tasks were taken by the CM, there was

nominal opportunity for the subcontractors to present their insights or reasoning while deciding the course of action.

The frequency of category 6 ‘gives information’ was consistently the highest across all the meetings of Project A. The trend of construction professionals using higher frequency of category 6 in their communication was also noticed by Gameson(1992). In the meetings, the participants used construction jargons that had implied meaning without fully explaining them. This is evident from Table 4-6, which shows 6-6-6 (providing information without interruption) as the most frequently occurring 3-interact. Due to a degree of commonality in education, training, and experience among the participants, the participants could state relatively incomplete information that would otherwise need to be explained. A quote from Meeting A3 can be used to cite an example of such an act. In the following quote, ‘1’ refers to the project manager of the CM and ‘35’ refers to the exterior sheathing subcontractor (Line 354-357, Appendix C).

*[1-35] The loading dock area, we are still finishing on the ceiling. Is the DEFS going to be done sometime this week? Are you still planning on doing that?*

*[35-1] We will finish the plastering of the DEFS today...uh...we will clean that tomorrow. Then we will be working above the main entrance.*

In the above quote, the participants used DEFS to refer to a particular type of rigid vinyl external sheathing called Direct applied External Finish System (DEFS). There were several such instances across all the meetings where the participants used construction terms or acronyms. However as Emmitt and Gorse (2007) suspected, due to the temporal nature of construction projects and participants coming from different organizations, it was unlikely that the construction professionals “fully” understood all the information provided by the other



participants during meetings. According to Gameson (1992) when all the participants are knowledgeable about the project, a higher use of category 5 (gives opinion) is observed in comparison to category 6 (gives information). The reason being with knowledgeable participants, the others have to provide less information and more explanations and reasoning. However, descriptive summaries of communication data of Project A showed that category 6 was the one with highest frequency. This indicates that the participants did not have a common understanding of the project that forced them to ask for information. This inference is reinforced by the high amount of communication under category 9 'asks for information'.

The frequency of category 7 'gives commitment' was the lowest among the other categories of task-based response across all meetings of Project A. No occurrence of category 7 was noticed in the contents of the meeting minutes. While giving commitment referred to participants mutually agreeing to perform any task reducing uncertainty, it was profoundly dependent on the mutual trust and support among the participants. Project A evidently did not allow the participants to develop mutual trust and support among them. The participants were more of competitive rather than cooperative members, which resulted from the lack of cohesiveness among them. As a result, they were not involved in exchange of commitments. All the commitments offered by the subcontractors, except very few were in response to inquiries put forward by the personnel of CM. In addition, there was no instance when a participant said 'no' in response to inquiry of commitment from others. Having the right to say 'no' makes real commitment possible because participants are required to say 'no' when asked to act beyond the limit of their ability (Howell and Ballard 1997).

### *Task-based Communication: Questions (categories 8-11)*

Category 8 ‘asks for commitment’ was consistently the least frequent among all other categories in this phase across all the three meetings and accounted for 1.31% of all the communication in Project A. This was predictable given the lack of cohesion among the participants. As mentioned previously, the sense of belongingness to the group among the participants was very less. They were all too concerned about their own scope of work and were not supportive of others. This resulted very less amount of commitment inquired and offered. The very few commitments asked during the course of the meetings were by the personnel of the CM. A quote from Meeting A2 can be cited as an example of asking for commitment. In the following quote, ‘2’ refers to the superintendent of the CM, ‘27’ refers to the electrical subcontractor, and ‘31’ refers to the drywall subcontractor (Line 262-268, Appendix B).

*[2-27] When will you be done?*

*[27-2] Uhh...I will have it ready by tomorrow morning.*

*[2-31] If he (referring to 27) gets his inspection tomorrow, how long is it going to take you to hang the drywalls and finish it?*

*[31-2] I will see what I can do. May be 2 days.*

*[2-31] Well you know what, you need to work whatever overtime you need to make these dates work as much as possible.*

Category 9 ‘asks for information’ had some variations across the meetings, but emerged as the category with second highest frequency for Project A. Followed by category 6; category 7 was the second most frequently occurring category in the meeting minutes. Below is excerpt from a meeting minute that shows the usage of category 7.

X [Co.-A] requests update from Y [electrical contractor] when light fixtures/poles will be set. How long after the lights arrive will they be able to be turned on?

This was also the category that occurred most among the task-based communication that requested a response. Participants used category 9 'asks for information' (19.57%) more than five times in their communication than category 8 'asks for commitment' (1.31%), category 10 'asks for opinion' (1.66%), and category 11 'asks for suggestion' (0.35%) collectively.

Category 9 was used quite frequently by the participants to ask further information; however, it was rarely used to ask for explanation. Asking for information was often used to delve further into issues. When participants presented insufficient background information on any task, other participants would ask for further information. This is evident from the frequent occurrence of some of the 3-interacts such as 9-6-6 (asks for information-gives information-gives information), 6-9-6 (gives information-asks for information-gives information) and 6-6-9 (gives information-gives information-asks for information). Asking for explicit help was not observed in any of the meetings for Project A. The high level of category 9 observed in Project A can be related to the lack of common understanding among the participants about the project. As the participants were not involved in the planning process, they were not knowledgeable about the resources and constraints of other trades. Now faced with problems in the field due to overlap with other trades in terms of work area and schedules, the participants asked for information far more than the norm.

The other two categories of task-based communication requesting response categories 10 and 11 were very sparsely used in Project A. Category 10 'asks for opinion' was occasionally used to

insist that another participant offers insights. Such acts were used to bring a conclusion to exchanges of information and opinions and encourage the participants to commit to a direction. Example of similar communication from Meeting A2 is provided below. In the following quote, ‘2’ refers to the superintendent of the CM, ‘27’ refers to the electrical subcontractor, and ‘31’ refers to the drywall subcontractor (Line 261-266, Appendix B).

*[2-27] When will you finish roughing it in? We should be hanging drywall from 11/5.*

*[2-27] When will you be done?*

*[27-2] Uh...I will have it ready by tomorrow morning.*

*[2-31] If he (referring to 27) gets his inspection tomorrow, how long is it going to take you to hang the drywalls and finish it?*

*[31-2] I will see what I can do. May be 2 days.*

Category 11 ‘asks for suggestion’ was used mostly to encourage others who had initially given information and ideas to provide direction or resolution to perform a particular task. However, the occurrence of category 11 was least across all meetings of Project A, which signifies that the participants did not invite others for providing directions. Minimal involvement of the participants in the planning process did not allow exchange of ideas among the different subcontractors. Instead of developing a work plan through collaborative communication, the CM prepared the schedules and provided it to the subcontractors. This limited the chances of collaboration and hence less use of suggestions by the participants during the meetings.

### *Negative Relational Communication (categories 12-14)*

Category 12 ‘disagrees’ was one of the more rarely occurring categories in the meetings of Project A. Some of the conflicts or disagreement occurred over opinions and statements or as a result of different personal or organizational interests. Emmitt and Gorse (2007) concluded in their study that disagreeing with others is a trait associated with effective managers, as they are more critical of others’ ideas and opinions. In case of Project A, disagreement and thorough evaluation of ideas were often followed by deciding the courses of action. It was found in some instances that disagreement among the participants helped to expose and then resolve issues. A quote from Meeting A1 can be cited as an example of disagreement among participants followed by resolution of the issue. In the following quote, ‘1’ refers to the project manager of the CM, ‘27’ refers to the mechanical subcontractor, and ‘34’ refers to an employee of the CM (Line 372-380, Appendix A).

*[34-27] So what do they do? What do they do to the cavity from the unit heater?*

*[27-34] Either they come to Stair 1 and are not recessed in wall.*

*[1-27] But why?*

*[27-1] For some reason they did so.*

*[34-1] No, no, the problem is that we haven’t hung the drywall yet in the stairway where we have unit heaters in our way now. So, I don’t know why we have unit heaters in Stair 1 when we have done piping in Stair 3.*

*[27-34] Actually Stairwell 1, Area A, 5th Floor they were framing up there, so we completed the outdoor patients’ for the first floor, cabinet unit heaters...*

In the analyses of group communication for Project A, category 13 ‘shows tension’ was significantly higher in occurrence in comparison to the other two negative relational communication categories. In fact, it was the most frequently occurring category among the six relational communication categories. There were differences in the way this category was used; some group members used it to show general frustration, while others used it to express tension directly at another member. There were instances when group members showed dissatisfaction over an issue, but the others did not offer to defend their positions. This reflected the lack of empowerment and self esteem among the participants, which according to Geller (1994) are only generated due to worker involvement in the planning process. One such example of communication from Meeting A2 demonstrates the superintendent of the CM showing dissatisfaction on the subcontractors, as they could not meet the schedule. In the following quote, ‘0’ refers to the whole group, ‘2’ refers to the superintendent of the CM, and ‘31’ refers to the drywall subcontractor (Line 267-278, Appendix B).

*[2-31] Well you know what, you need to work whatever overtime you need to make these dates work as much as possible.*

*[2-0] Guys we will finish this job. We will finish it with you or without you, but we will finish. You are behind schedule, somebody is holding you up, you will notify Co.-A and you give us something in writing. You think that B (referring to the mechanical subcontractor) is the world, T (referring to the electrical subcontractor) is the world, or T (referring to the drywall subcontractor) is the world, Co.-A is going to stay beside you and get your crew supplemented by another subcontractor in order to finish their work, you have sadly mistaken. I*

*can guarantee you, when one starts to spend on your behalf they will start back charging you. So it's better you spend your own money than other people to spend your money for you.*

*[2-0] So, if we are really ugly sometime around March, April, and May it's your mistake that we are not working overtime the hours now in this job.*

Category 14 'shows antagonism' occurred inconsistently across the meetings of Project A. While it occurred on 12 occasions during Meeting A1, it occurred only once and twice during Meetings A2 and A3 respectively. On all the occasions, it was the representative of the CM who expressed anger on the other participants. Due to limited data, no conclusion could be made apart from this observation. However, anecdotal evidences showed that expressing antagonism did not help in creating any sense of belongingness among the group members towards the group. The following excerpt from Meeting A1 can be cited as an example where both the subcontractor and the representative of the CM showed rejection and expressed anger over the installation of light fixtures. In the following quote, '0' refers to the whole group, '1' refers to the project manager of the CM, '11' refers to the electrical subcontractor, and '37' refers to the drywall subcontractor (Line 601-627, Appendix A).

*[1-0] Couple of areas in the Tower real quick...Area F ...when we sat down 2 weeks ago to go over the finishing dates of the last few areas of the 1st floor, you know the serpentine soffits are the hardest ceilings of all the OR rooms, those were framed I think about 3 -3 ½ weeks ago. We just got the light fixtures installed last week.*

*[11-1] That's because the serpentine ceiling was not put up until about 2 weeks ago.*

*[1-11] That's what I am saying...they were done 2 weeks before LR (referring to a subcontractor) left, and now it is 3 weeks.*

*[11-1] Okay.*

*[1-11] So, its 2-3 weeks, we agree to that. So I think there is one high head in there...is that now inspected?*

*[11-1] They are all installed.*

*[1-11] They inspected?*

*[11-1] I am pretty sure they are. (11 expressing his dissatisfaction in a low voice)*

*[1-37] So our problem now B (referring to 37) when are you going to have the rest of that room to get the grid going?*

*[1-37] B (referring to 37) was the serpentine frame 3 weeks ago?*

*[1-11] The frame was put at least 3 weeks ago. I believe the conversation that took place last week with G (referring to a subcontractor) is that there is a high head in there. So what high head? What soffit?*

*[1-11] So I don't know why its bull \*\*\*\*, other than it is bull \*\*\*\* that it took 3 weeks to get installed and inspected.*

*[11-1] No, it wasn't. And those serpentine bulkheads were not up 3 weeks ago. That much I can tell you.*

*[37-11] Yeah...they were.*



*[11-1] Because I saw them putting up that night. And that was about week and a half ago.*

*[1-11] We can argue as long as you want.*

### 4.2.5 Concept map

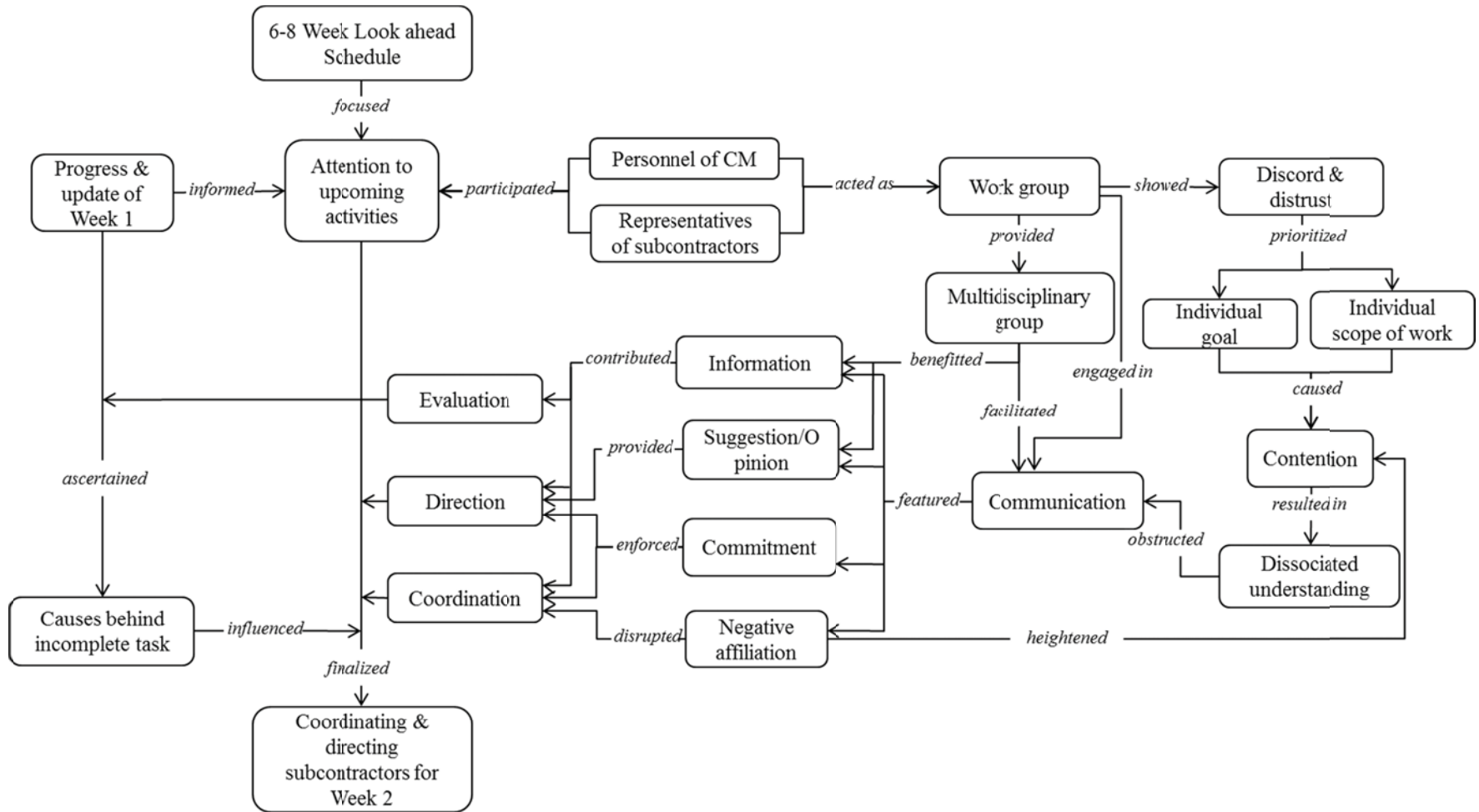


Figure 4-6 : Concept map illustrating role of communication during traditional project planning in Project A

#### **4.2.6 Safety performance**

Company A implemented a comprehensive safety and health program for Project A. A full time safety manager (SM) was hired to implement and monitor the program. The SM worked with all the subcontractors to service their unique safety related needs, reviewed the job specific safety plans (including material safety data sheets to be posted) submitted by the subcontractors, as well as ensured the implementation of the CM's safety and health program.

The safety and health program included site orientation and job specific safety training for all the workers and foreman orientation to ensure all the parties were aware of what to expect and what was expected of them prior to commencement of work. Weekly safety meetings were conducted by the SM to discuss current performance and special safety issues. It was the responsibility of the foremen of individual subcontractors to conduct the daily task hazard analysis and weekly toolbox talks. While task hazard analyses were used to evaluate imminent safety issues, toolbox talks were used to review tool use, project hazard and accident reports. As part of the CM's safety and health program, it was mandatory for all the workers on the job site to have formal safety training (OSHA 30 hour training). The SM also regularly walked the job site to ensure conformance with the safety program and also to identify any safety concerns or problems. The personnel of the CM were also responsible for safety inspections and correcting any deviance from safety regulations. In situations of incidents, there was an on site nurse to whom the injured worker had to report. Post incident analyses were conducted by the SM for documentation purpose and identification of root causes of incidents. The subcontractor(s) whose employee(s) had been involved in the incident had to submit an incident report within 24 hours of the occurrence.

The SM, during his limited participation in the weekly subcontractor coordination meetings, shared the outcomes of post incident analyses and observations from inspections with the attendees. For example, the SM shared his observation with the attendees of Meeting A regarding workers other than roofers accessing the roof. In the following quote, ‘0’ refers to the whole group and ‘35’ refers to the SM (Line 15-19, Appendix B).

*[35-0] I had couple of questions about roof work again. If you are not a roofer, going up on the roof requires a permit, fall arrest system and 100% tie of. All areas that I know are marked and there are signs everywhere. We had to write up a guy the other day for across the roof without being tied of.*

*[35-0] Don't do it.*

The safety and health program also included provisions for visual feedback to the workers by means of displaying the current safety record of the project. The total number of incidents occurred and total labor hour of the project were displayed at a conspicuous location and updated daily. As part of the safety and health program, the CM also took initiative to arrange for influenza vaccination for the workers, but it was not mandatory.

### **Recordable incidents**

Detailed record of all the incidents and labor hours for the period of August 2010 to January 2011 for Project A was gathered. The description of each of the incident and the post-incident outcomes were evaluated to identify the recordable incidents (see Appendix Q for list of reportable incidents of Project A). According to OSHA’s guidelines (29 CFR, Part 1904.7), a work related injury or illness could be considered as recordable if it results in one or more of the following:

- i. Death
- ii. Days away from work
- iii. Restricted work or transfer to another job
- iv. Medical treatment beyond first aid
- v. Loss of consciousness
- vi. A significant injury or illness diagnosed by a physician or other licensed health care professional

Based on the above recording criteria the recordable incidents for Project A are listed below:

**Table 4-7** : Recordable incidents occurred and labor hours utilized in Project A during August 2010 – January 2011

<b>Date of incident</b>	<b>Cum. project incidents</b>	<b>Injured part</b>	<b>Injury cause</b>	<b>Post incident outcome</b>	<b>Monthly labor hour</b>	<b>Cum. labor hour</b>
August 2010	1	Back pain	Moving 80-100 lbs beams with three other workers	Restricted duty for seven days	120,830	120,830
	2	Left little finger	Finger caught between cast iron pipe while unloading and stacking	Restricted duty for 14 days		
September 2010	3	Left elbow	Fractured when fell from ladder	Restricted duty for 133 days and lost time of 48 days	100,178	221,008
	4	Left ring finger	Laceration from sharp edge of metal box for fire alarm	Restricted duty for two days		
	5	Right hand	Drywall slid off cart and crushed hand	Restricted duty for three days		
October 2010	6	Back	Fell off from delivery truck	Restricted duty for 21 days	96,035	317,043

<b>Date of incident</b>	<b>Cum. project incidents</b>	<b>Injured part</b>	<b>Injury cause</b>	<b>Post incident outcome</b>	<b>Monthly labor hour</b>	<b>Cum. labor hour</b>
	7	Finger	Finger crushed between trash cart handle and dumpster	Restricted duty for 37 days		
	8	Right thumb	Exiting a ladder	Restricted duty for more than 120 days		
November 2010	9	Right ribs	Strained while leaning into a pipe to bend	Restricted duty for eight days	83,700	400,843
December 2010	10	Left ring finger	Laceration from sharp metal (corner bead)	Restricted duty for ten days	87,313	488,156
January 2011	10	-	-	-	68,620	556,776

Recordable incidence rate of Project A ( $RIR_{\text{PROJECT-A}}$ ) was computed using the following formula provided by OSHA (2004):

$$RIR = (\text{Total Number of Incidents} \times 200,000) / \text{Cumulative Labor Hours}$$

For Project A, during the period of August 2010 to January 2011:

Total number of incidents = 10

Cumulative labor hours = 556776

$$RIR_{\text{PROJECT-A}} = (10 \times 200,000) / 556,776 = 3.59$$

## **4.3 Case Study 2**

### **4.3.1 Overview of Project B**

Project B was a 235,000 square foot, US \$ 74 million health care project in the Mid Atlantic region. The project included a 174-bed hospital (private intensive care and medical/surgical patient rooms) with clinics and cafeteria. The 11-storied building with a penthouse was built in an existing health care facility campus.

The owner launched Project-B as a Design-Bid-Build and hired individual Architectural, MEP, Structural, and Civil Engineering firms to handle the design of the project. The project was designed as a LEED (Leadership in Energy and Environmental Design) certified facility. The General Contractor (GC) was hired by the owner by competitive lump sum bidding once the construction documents were complete (design-bid-build). Once the project was awarded, the GC selected subcontractors by competitive bidding for all trades. Construction commenced in September 2010, and was scheduled to be completed by May 2012. Data for the case study was collected during the period of September 2010 to February 2011. At the time of data collection, site-work was going on with rerouting of existing roads and pathways to keep traffic and pedestrians away from the construction zone. In addition rigging for auger cast pile, excavation for foundation, pouring of foundation, and site utility works were going on in tandem.

### **4.3.2 Description of the planning process**

The Last Planner ® System (LPS®) was utilized as a tool for formal production planning to organize and accomplish the tasks for Project B (Figure 4-7). The project team of the GC and the involved subcontractors had no prior experience, and were using LPS for the first time during

the project under discussion. Based on the construction documents and project objectives, the GC used work breakdown structure (WBS) to decompose the project into definable tasks. The WBS was also used as a framework for cost estimating and development of schedule. With the help of the WBS, the planning team of the GC created the milestone schedule based on the phases of the project such as foundation, structure, façade, interior fit outs, etc. This milestone schedule was much less detailed than the traditional master schedule, and included only the start dates, end dates and general sequence of the different phases of the project. Following this, the milestone schedule was broken into look-ahead plan for shorter window of time, which was the tool for workflow control. Look-ahead windows were structured such that week one is next week and week two is two weeks in the future, week three is three weeks in the future, and so on. The representatives of the subcontractors (foremen or superintendents of subcontractors) were invited to ‘pull’ tasks from the milestone schedule into the look-ahead schedule. Tasks were included in the look-ahead window only when they were confident that the task could be made ready for execution when selected. This process of decentralized planning helped the participants interact and collaborate while preparing detailed specification of the tasks and the constraints that might cause incompleteness of the tasks. The schedules, prepared by those responsible for the work, represented their best understanding as a group about how they will perform the tasks.

The second element of LPS<sup>1</sup> was the weekly production plan to make tasks ready by proactively acquiring the material, labor, and all necessary information needed, and by monitoring the completion of prerequisite works. From the look-ahead schedule, tasks that were free of any constraints could be included as assignments in the weekly production plan. The subcontractors’ foremen and superintendents had to offer commitment to the assignments, which formed the



weekly production plan. To make sure all the subcontractors take part in the process of production planning, the GC added a supplementary section in the contract outlining the responsibilities of the subcontractors in preparing the rolling look-ahead plans, weekly work plans, determining production plan reliability, etc. (Appendix P). When asked about the advantage of formal production planning, the scheduler of the GC responded:

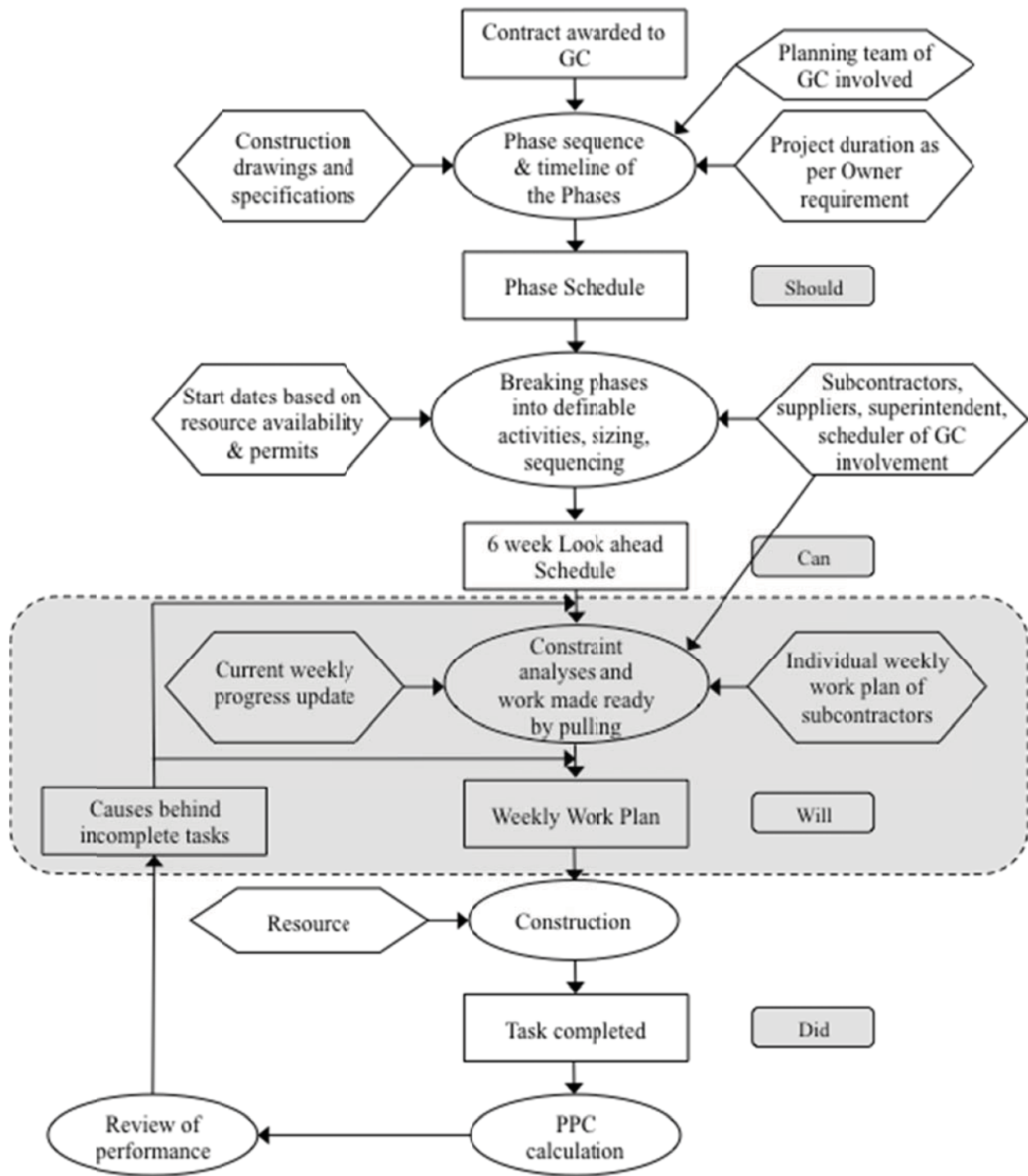
*“You get commitment from them (subcontractors), and you get actual dates. Okay...this is actually how long it is going to take us. The good thing about this (LPS) is that things come up when they put up the post-its on the wall. They say...oh okay...I cant do this now, I have to start earlier. So, this kind of coordination...you don’t have that while you yourself build the schedule.”*

The subcontractors were also supportive of the formal production planning process, which was evident from the following comment of a subcontractor during one of the individual interviews (Appendix N):

*“The way it is setup is that the general contractor and the subs with them and they make a group...and everybody is held liable for their stuff. So, at the back end everybody is going to make more money as well. So, it not like that the general contractor is holding everybody. This is your chance to get the schedule together...you know how many times you are handed a schedule by the general contractor and it is insane? So, this is chance to have your input.”*

An important aspect of LPS was to determine and monitor the reliability of the production plan. The variance of work committed and work actually executed in the field was measured by using

percent plan complete (PPC). If ten items were planned for one week, and eight items were completed according to the plan, the reliability was 80% or the PPC was 80%. They targeted to achieve 85% or higher PPC to ensure predictable, reliable handoffs, and therefore efficient use of resources. To measure progress, PPC for each day was measured and in turn, the weekly rolled PPC was calculated. Following this, the reasons for incompleteness of tasks were identified and categorized to find out the major causes of delay. This was done to identify trends for failure that might be improved in future planning.



*Note: This study focused on the highlighted segment of the process*

**Figure 4-7:** Process of formal production planning (utilizing LPS ®) in Project B

The weekly subcontractor coordination meeting conducted by the GC was an important vehicle for the effective functioning of the formal production planning process. These meetings attended by the subcontractors working in the job site were used to review the look-ahead schedules, weekly work plans, imminent problems, safety, and quality issues related to Project B. For the purpose of this research study, data of communication among the participants were collected from five such coordination meetings. As previously mentioned, the subcontractor coordination meetings took place once every week. In this document, the meetings will be referred as Meeting B1, B2, B3, B4, and B5.

#### **4.3.3 Descriptive Summary of Communication Data**

Data from Meetings B1, B2 and B3 were used to analyze communication among the participants during formal production planning, while data from Meetings B4 and B5 were used to verify the research process of this study (described in Chapter five). The following sections present the analysis of communication data collected from Meetings B1, B2, and B3. Two coders, who were involved in gathering observational data, coded the transcripts of the meetings. As the coders were aware of the context of the communication, their judgment were not entirely dependent on the literal meaning of the transcripts, which sometimes are ambiguous. Below is the calculated inter-coder reliability for each of the meeting.

##### **Inter-coder Reliability**

Simple percentage agreement of occurrences between the two coders was calculated for all the three meetings. The percentage agreements between the coders for the Meetings B1, B2, and B3

were respectively 89.04%, 86.7%, and 91.02%. Considering 80% and above as acceptable, the percentage agreements between the coders in all the three meetings were acceptable.

In addition, Cohen's kappa ( $\kappa$ ) for each of the three meetings was also calculated. The  $\kappa$  value for Meetings B1, B2, and B3 were 0.92, 0.88, and 0.93 respectively. In all the three meetings, the coders exhibited excellent agreement, as  $\kappa$  value of 0.75 and above represents excellent agreement.

### **Frequencies of Communication Categories**

The trend of communication among the participants in each of the meetings of Project B has been described in this section. The tables and graphs provide the descriptive statistics for the individual meetings as also illustrate a holistic picture of Project B. The frequencies of the communication categories and their respective percentages, an initial analysis of the trends are reported.

### **Meeting B1**

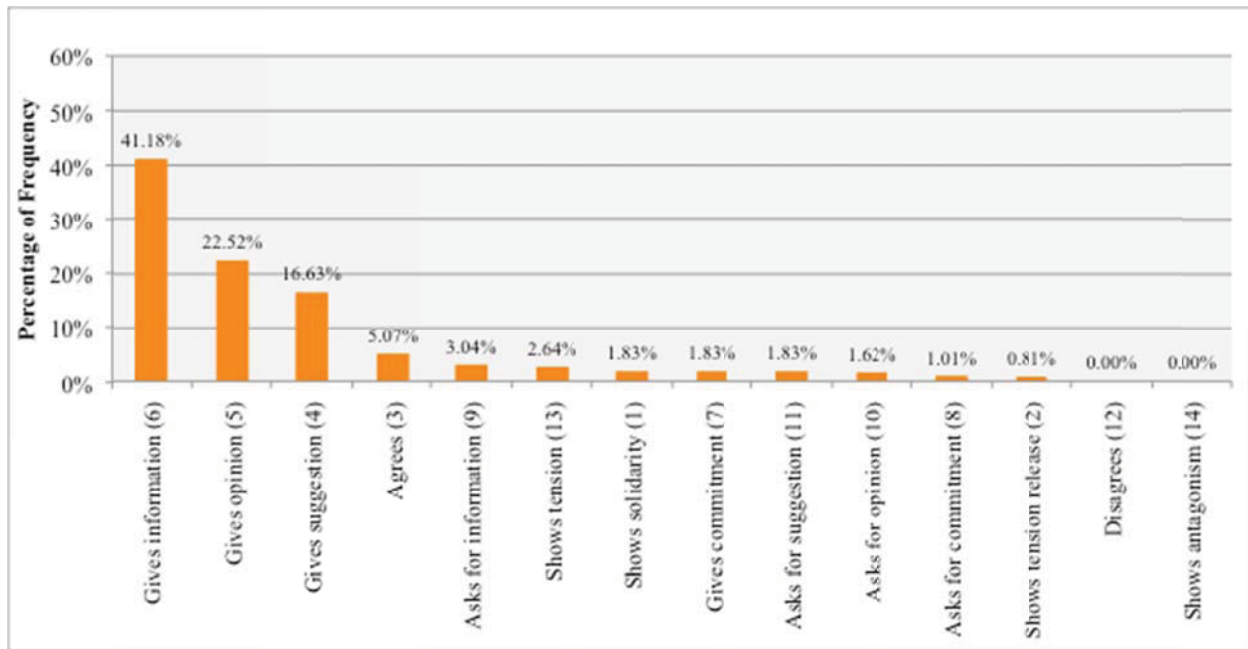
Table 4-8 provides a summary of the different communication categories observed in Meeting B1. A total of 493 thought units were observed in this meeting spanning 75 minutes (continuous). The transcript of the meeting is attached in Appendix D. Prior to the start of the meeting, most of the participants present in the room took part in informal conversations. The participants greeted each other and were forthcoming. Topics of discussion were diverse; one participant was discussing how interoperability of electronic devices had been beneficial for him. Conversations within the subgroups were loud and not whispered. At the same time, some of the participants were found talking over the phone and checking emails. While waiting for the

meeting to start, they organized their notes. The GC's representatives entered the room 15 minutes prior to the scheduled time of the meeting and engaged in discussion before the commencement of the meeting. The superintendent updated the participants about the resolution of the issues related to sheeting permit. The meeting was conducted in a formal and structured manner; a brief meeting agenda and look-ahead schedule were circulated at the beginning of the meeting.

**Table 4-8:** Communication categories for Meeting B1

Categories	Units of Thought	
	Frequency	Percentage
Shows solidarity (1)	9	1.83
Shows tension release (2)	4	0.81
Agrees (3)	25	5.07
Gives suggestion (4)	82	16.63
Gives opinion (5)	111	22.52
Gives information (6)	203	41.18
Gives commitment (7)	9	1.83
Asks for commitment (8)	5	1.01
Asks for information (9)	15	3.04
Asks for opinion (10)	8	1.62
Asks for suggestion (11)	9	1.83
Disagrees (12)	0	0.00
Shows tension (13)	13	2.64
Shows antagonism (14)	0	0.00
Total Units of Thought	493	100

Figure 4-8 represents the bar graph of the communication categories for Meeting B1. It is clearly evident from the graph that the most occurred communication category was 'gives information' (41.18%) followed by 'gives opinion' (22.52%) and 'gives suggestion' (16.63%). These three categories comprised majority of the communication categories for Meeting B1 (80.33%). The other eleven communication categories added up to 19.67%. Among those, 'disagrees' and 'shows antagonism' did not occur at all. The categories that occurred very infrequently are 'shows tension release' (0.81%) and 'asks for information' (1.01%) that comprised mere 1.82% of the total number of communication categories. When examined in terms of task-based communication (categories 4-11) and relational communication (categories 1-3 and 12-14), the amount of relational communication is much lower (10.34%) in comparison to task-based communication. However, within relational communications, positive relational communication (categories 1-3) occurred much more (7.7%) in comparison to negative relational communication (categories 12-14) that constituted 2.64% of the total number of communication categories.



**Figure 4-8:** Frequency of communication categories for Meeting B1

A noticeable trend is that frequency of the categories ‘gives suggestion’, ‘gives opinion’ and ‘gives information’ are considerably higher, which showed the participants were engaged in communication by sharing information, providing directions and offering insights to others related to the tasks. In addition, less occurrence of ‘asks for information’ demonstrated that the participants were familiar about the project and did not need to ask for information.

### **Meeting B2**

Summary of the communication categories observed in Meeting B2 are presented in Table 4-9. A total of 425 thought units were observed in this meeting spanning 55 minutes (continuous). The transcript of the meeting is attached in Appendix E. Similar to Meeting B1, a high level of communication occurred both prior to and after the coordination meeting. All the participants including the representatives of the GC were involved in the informal discussion. The superintendent of the GC apologized to the group that he could not deliver what he promised, as

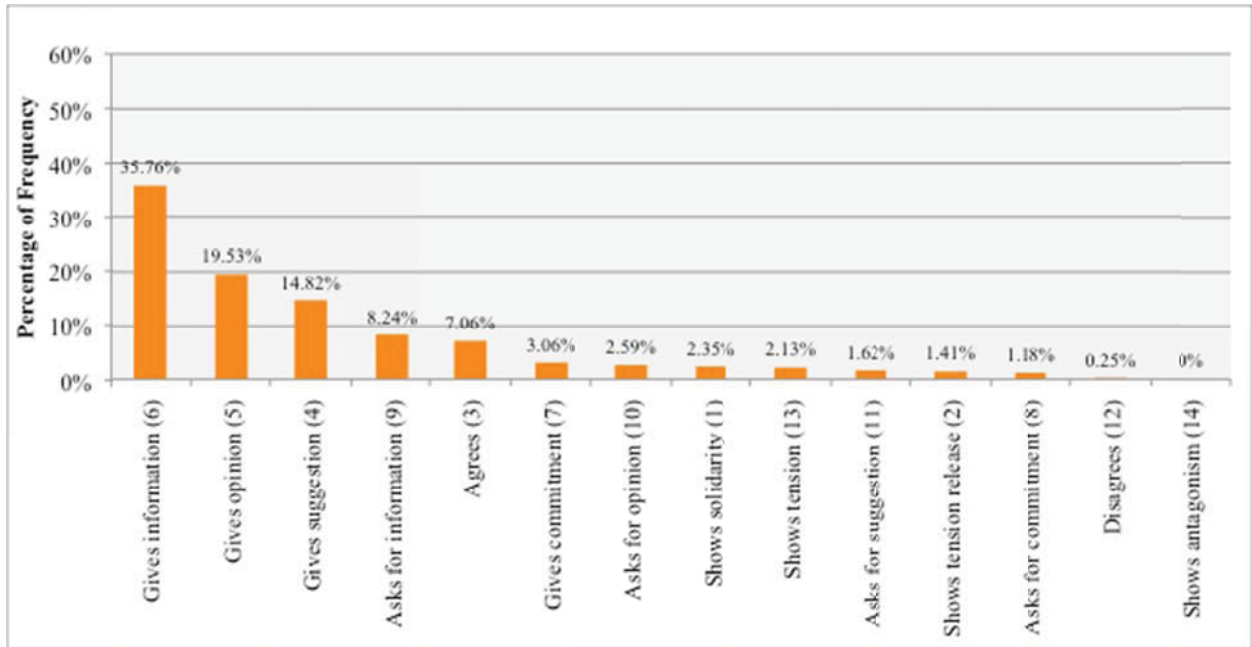


his computer ceased to function properly. There was a lengthy discussion on how he tried to recover data from the computer, but was unsuccessful. The meeting started ten minutes after the scheduled time; previous week's meeting minutes and look-ahead schedule were circulated at the beginning of the meeting.

**Table 4-9:** Communication categories for Meeting B2

Categories	Units of Thought	
	Frequency	Percentage
Shows solidarity (1)	10	2.35
Shows tension release (2)	6	1.41
Agrees (3)	30	7.06
Gives suggestion (4)	63	14.82
Gives opinion (5)	83	19.53
Gives information (6)	152	35.76
Gives commitment (7)	13	3.06
Asks for commitment (8)	5	1.18
Asks for information (9)	35	8.24
Asks for opinion (10)	11	2.59
Asks for suggestion (11)	7	1.65
Disagrees (12)	1	0.24
Shows tension (13)	9	2.12
Shows antagonism (14)	0	0.00
Total Units of Thought	425	100

Bar graph of the communication categories for Meeting B2 shown in Figure 4-9, clearly indicates that the most occurred communication category was ‘gives information’ (35.76%) followed by ‘gives opinion’ (19.53%), and ‘gives suggestion’ (14.82%). These three categories comprised majority of the communication categories for Meeting B2 (70.11%). The other eleven communication categories added up to 29.89%. Among those, ‘asks for information’ and ‘agrees’ occurred 8.24% and 7.06% respectively. Category 14, ‘shows antagonism’ did not occur at all during the meeting and ‘disagrees’ was the least frequent category (0.25%). When examined in terms of task-based communication (categories 4-11) and relational communication (categories 1-3 and 12-14), the occurrence of task-based communication is much higher (86.82%) in comparison to relational communication. Within task-based communication, communication related to attempted responses (categories 4-7; 73.18%) occurred more than five times than that of communication related to asking for responses (categories 8-11; 13.64%). Similarly, within relational communication, negative relational communication (categories 12-14; 2.35%) occurred four times less than that of positive relational communication (categories 1-3; 10.83%).



**Figure 4-9:** Frequency of communication categories for Meeting B2

Similar to Meeting B1, this meeting also demonstrated higher occurrence of communication categories: ‘gives information’, ‘gives opinion’ and ‘gives suggestion’. Frequent occurrences of category 3 ‘agrees’ and category 7 ‘gives commitment’ indicate that the participants had developed mutual trust among themselves as also a common understanding of the project, due to which they could offer assurance of performing tasks with certainty.

### **Meeting B3**

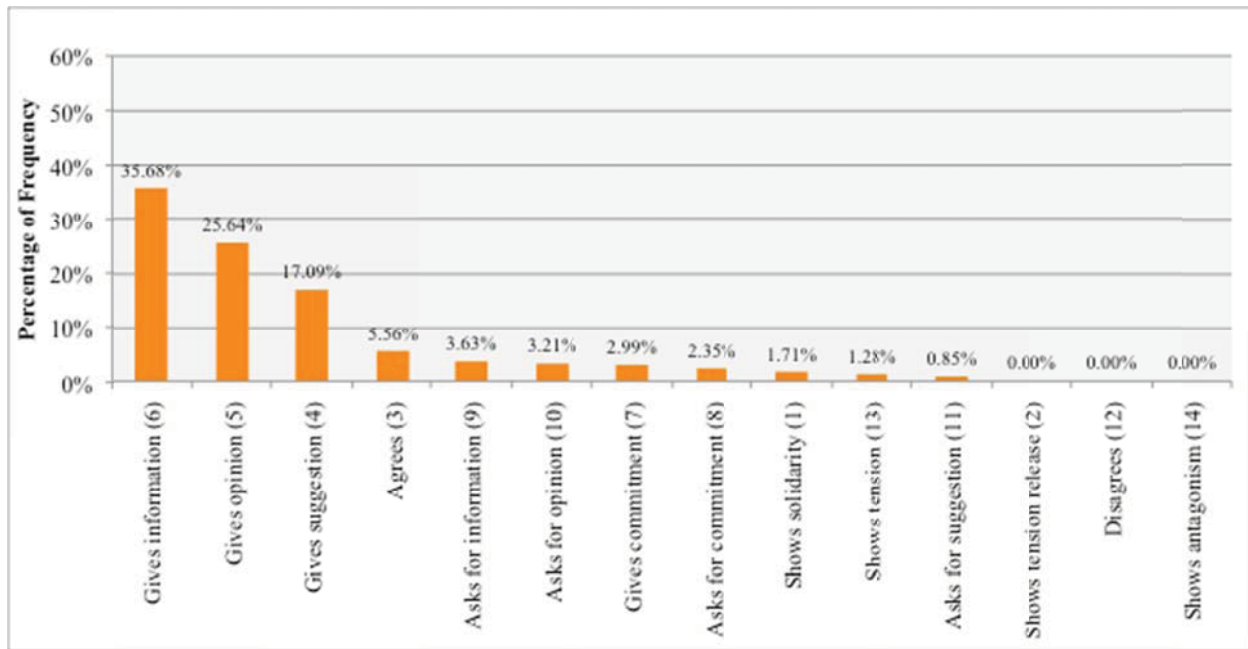
Communication categories observed in Meeting B3 are summarized in Table 4-10. A total of 468 thought units were observed in this meeting spanning 65 minutes (continuous). The transcript of the meeting is attached in Appendix F. Similar to the other meetings of Project B, considerable amount of communication among the participants were noticed before and after the meeting. The participants, including the representatives of the GC were engaged in conversations within subgroups and were loud. A few of the participants were discussing about the schedule and

identifying tasks that could pose safety hazards. The problem of insufficient car parking spaces in close proximity to the job site was another topic of discussion prior to the meeting. There was a lot of good-hearted jokes and banter going among the participants. The meeting was conducted in a formal and structured manner; the look-ahead schedule was distributed after the start of the meeting.

**Table 4-10:** Communication categories for Meeting B3

Categories	Units of Thought	
	Frequency	Percentage
Shows solidarity (1)	8	1.71
Shows tension release (2)	0	0.00
Agrees (3)	26	5.56
Gives suggestion (4)	80	17.09
Gives opinion (5)	120	25.64
Gives information (6)	167	35.68
Gives commitment (7)	14	2.99
Asks for commitment (8)	11	2.35
Asks for information (9)	17	3.63
Asks for opinion (10)	15	3.21
Asks for suggestion (11)	4	0.85
Disagrees (12)	0	0.00
Shows tension (13)	6	1.28
Shows antagonism (14)	0	0.00
Total Units of Thought	468	100

Figure 4-10 represents the bar graph of the communication categories for Meeting B3. The chart indicates that the most occurred communication category was 'gives information' (35.68%) followed by 'gives opinion' (25.64%), and 'gives suggestion' (17.09%). These three categories comprised majority of the communication categories for Meeting B3 (78.41%). The other eleven communication categories added up to 21.59%. Among those, 'agrees' occurred 5.56% of the time. Categories such as 'shows tension release', 'disagrees' and 'shows antagonism' did not occur at all in the meeting. Similar to Meetings B1 and B2, the amount of task-based communication (categories 4-11) in Meeting B3 is much higher (91.45%) than the amount of relational communication (categories 1-3 and 12-14). Within task-based communication, communication related to attempted answers (categories 4-7: 81.41%) occurred more than eight times than that of communication related to questions (categories 8-11: 10.04%). Within relational communication, positive relational communication (categories 12-14: 7.26%) occurred more than that of the negative relational communication (categories 1-3: 1.29%).



**Figure 4-10:** Frequency of communication categories of Meeting B3

Noticeable trend in Meeting B3 is the absence of negative relational communication such as ‘disagrees’ and ‘shows antagonism’, which demonstrates that participants developed a cohesive bonding among them and enjoyed an environment of support and trust. Similar to Meetings B1 and B2, the inclination of the participants using ‘gives information’, ‘gives opinion’ and ‘gives suggestion’ more frequently is apparent in Meeting B3 as well.

### **Communication Categories and Consistency Across Meetings**

The aggregate data of communication from Meetings B1, B2, and B3 are presented in Table 4-11 to provide a holistic representation of Project B. The majority of IPA thought units across all the three meetings was category 6, ‘gives information’ (37.66%). The other categories that occurred frequently were ‘gives opinion’ (22.66%), and ‘gives suggestion’ (16.23%). In the remaining eleven categories, none accounted for more than 6%: ‘agrees’ (5.84%), ‘asks for information’ (4.83%), ‘gives commitment’ (2.60%), ‘asks for opinion’ (2.45%), ‘shows tension’ (2.02%),

‘shows solidarity’ (1.95%), ‘asks for commitment’ (1.52%), ‘asks for suggestion’ (1.44%), ‘shows tension release’ (0.72%), and ‘disagrees’ (0.07%). Category 14 ‘shows antagonism’ did not occur even once during the course of all the three meetings.

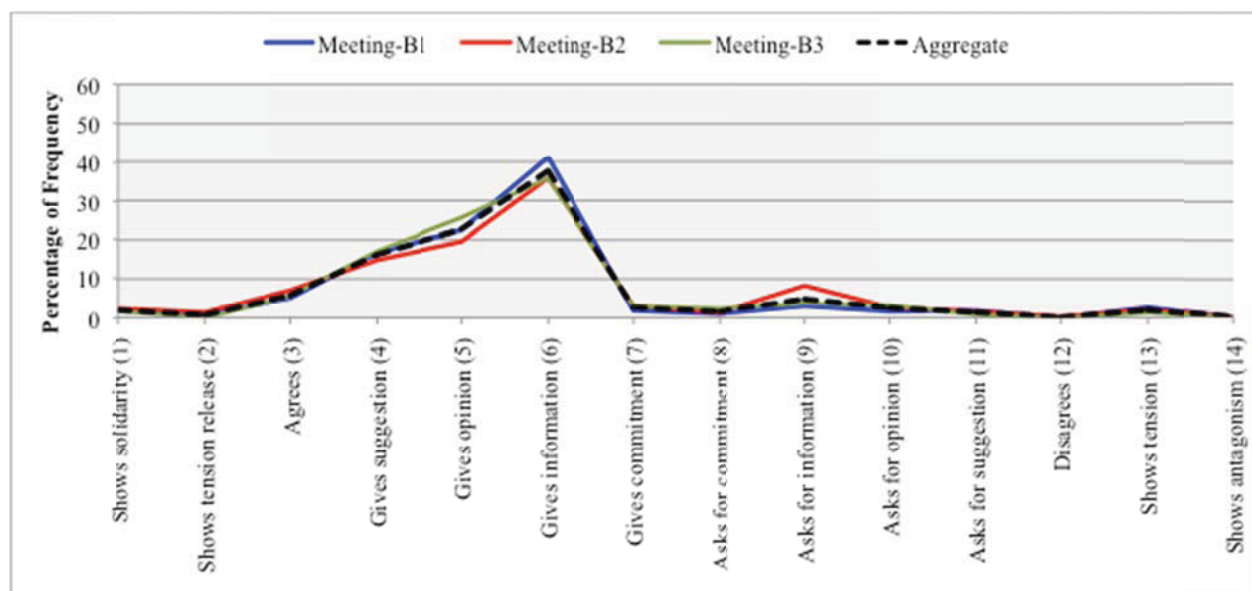
In terms of frequency, the task-based communication categories (categories 4-11) were significantly higher (89.39%) than that of relational communication categories. Within task-based communication, attempting answers (categories 4-7) were higher (79.15%) in comparison to asking questions (categories 8-11; 10.24%). Within relational communication categories, occurrences of positive relational communication (categories 1-3) were higher (8.51%) in comparison to negative relational communication (categories 12-14; 2.09%).

**Table 4-11:** Communication categories for Project B

Categories	Units of Thought			
	Meeting B1 N (%)	Meeting B2 N (%)	Meeting B3 N (%)	Aggregate N (%)
Shows solidarity (1)	9 (1.83)	10 (2.35)	8 (1.171)	27 (1.95)
Shows tension release (2)	4 (0.81)	6 (1.41)	0 (0.0)	10 (0.72)
Agrees (3)	25 (5.07)	30 (7.06)	26 (5.56)	81 (5.84)
Gives suggestion (4)	82 (16.63)	63 (14.82)	80 (17.09)	225 (16.23)
Gives opinion (5)	111 (22.52)	83 (19.53)	120 (25.64)	314 (22.66)
Gives information (6)	203 (41.18)	152 (35.76)	167 (35.68)	522 (37.66)
Gives commitment (7)	9 (1.83)	13 (3.06)	14 (2.99)	36 (2.60)
Asks for commitment (8)	5 (1.01)	5 (1.18)	11 (2.35)	21 (1.52)
Asks for information (9)	15 (3.04)	35 (8.24)	17 (3.63)	67 (4.83)
Asks for opinion (10)	8 (1.62)	11 (2.59)	15 (3.21)	34 (2.45)
Asks for suggestion (11)	9 (1.83)	7 (1.65)	4 (0.85)	20 (1.44)

Categories	Units of Thought			
	Meeting B1 N (%)	Meeting B2 N (%)	Meeting B3 N (%)	Aggregate N (%)
Disagrees (12)	0 (0.0)	1 (0.24)	0 (0.0)	1 (0.07)
Shows tension (13)	13 (2.64)	9 (2.12)	6 (1.28)	28 (2.02)
Shows antagonism (14)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
<b>Total</b>	493 (100)	425 (100)	468 (100)	1386 (100)

The individual communication profile of the three meetings when plotted in a line graph showed analogous trend (Figure 4-11). This illustrates the consistency of the data across the three meetings. The aggregate communication data for Project B denoted by a dashed line in Figure 4-11 shows that it is representative of the data collected from Meetings B1, B2 and B3.



**Figure 4-11:** Individual and aggregate communication profiles of Meetings B1, B2, and B3



### *Frequencies of Interacts*

As mentioned previously, interact is a set of two continuous units of thought. Simple frequencies of interact for the three meetings of Project B were calculated and presented in Table 4-12. In addition, the table also reports whether the consecutive units of thought were voiced by the same participant (monologue) or different participants (dialogue). Distinguishing interacts into ‘monologue’ and ‘dialogue’ helped to gain in depth understanding about the participation of the participants in active communication during the meetings.

Across all the three meetings of Project B, ‘gives information-gives information’ (6-6: monologue) occurred the maximum number of times (12.92%). Other frequently occurring interacts included: ‘gives information-gives opinion’ (6-5: monologue) with 7.55%, ‘gives opinion-gives information’ (5-6: dialogue) with 5.59%, and ‘gives information-gives suggestion’ (6-4: monologue) with 4.79%. The interacts are listed in descending order of their frequency in Table 4-12. Interacts having frequency less than 1% in the aggregate have been grouped as ‘infrequent interacts’.

As evident from Table 4-12, the higher frequency interacts are task-based and mostly included ‘gives information’ (category 6), gives opinion (category 5) and gives suggestion (category 4). Other communication categories such as ‘asks for information’ (category 9) and ‘agrees’ (category 3) were most often combined with categories 4, 5, or 6. The most often occurring interact with component of relational communication was ‘gives information-shows tension’ (6-13: monologue) sequence (0.80%). Among the relational communication categories, ‘shows tension’ (category 13) was found to be the most common component of the interacts. Another

significant observation is eight out of the 15 frequently occurring interacts were dialogue, which shows that the participants were actively engaged in communication.

**Table 4-12:** Frequently occurring interacts for Project B

<b>Category Pairs</b>	<b>Monologue/ Dialogue</b>	<b>Mtg. B1 N (%)</b>	<b>Mtg. B2 N (%)</b>	<b>Mtg. B3 N (%)</b>	<b>Aggregate N (%)</b>
GI – GI (6-6)	M	79 (16.02)	46 (10.82)	53 (11.32)	178 (12.92)
GI – GO (6-5)	M	43 (8.72)	19 (4.47)	42 (8.97)	104 (7.55)
GO – GI (5-6)	D	32 (6.49)	18 (4.24)	27 (5.77)	77 (5.59)
GI – GS (6-4)	M	28 (5.68)	15 (3.53)	23 (4.91)	66 (4.79)
GS – GI (4-6)	D	32 (6.49)	9 (2.12)	18 (3.85)	59 (4.28)
GS – GO (4-5)	M	21 (4.26)	17 (4.00)	15 (3.21)	53 (3.85)
GO – GS (5-4)	M	20 (4.06)	12 (2.82)	19 (4.06)	51 (3.70)
GO – GO (5-5)	M	18 (3.65)	10 (2.35)	17 (3.63)	45 (3.27)
AI – GI (4-6)	D	10 (2.03)	18 (4.24)	12 (2.56)	40 (2.90)
GI – GI (6-6)	D	6 (1.22)	13 (3.06)	10 (2.14)	37 (2.69)
GS – GS (4-4)	M	11 (2.23)	13 (3.06)	11 (2.35)	35 (2.54)
GO – GI (5-6)	D	8 (1.62)	9 (2.12)	15 (3.21)	32 (2.32)
GO – GO (5-5)	D	11 (2.23)	3 (0.71)	11 (2.35)	25 (1.81)
GO – AG (5-3)	D	6 (1.22)	11 (2.59)	6 (1.28)	23 (1.67)
AG – GI (3-6)	D	7 (1.42)	7 (1.65)	6 (1.28)	20 (1.45)
GI – AG (6-3)	D	5 (1.01)	11 (2.59)	3 (0.64)	19 (1.38)
GS – AG (4-3)	D	6 (1.22)	5 (1.18)	6 (1.28)	17 (1.23)
GI – AI (6-9)	D	3 (0.61)	8 (1.88)	5 (1.07)	16 (1.16)
GS – GO (4-5)	D	3 (0.61)	4 (0.94)	8 (1.71)	15 (1.09)
GI – GS (6-4)	D	2 (0.41)	10 (2.35)	3 (0.64)	15 (1.09)

<b>Category Pairs</b>	<b>Monologue/ Dialogue</b>	<b>Mtg. B1 N (%)</b>	<b>Mtg. B2 N (%)</b>	<b>Mtg. B3 N (%)</b>	<b>Aggregate N (%)</b>
Infrequent interacts (occurring < 1% in aggregate)					459 (33.31)
AG = Agrees; GS = Gives Suggestions; GO = Gives Opinion; GI = Gives Information; AI = Asks for Information					

### **Frequencies of 3-interacts**

There were 358 mutually exclusive 3-interacts observed across three meetings for an aggregate of 1,380. The highest frequency 3-interact sequence across all the three meetings of Project B was three continuous sequence of ‘gives information’ (6-6-6) that represented 6.01% of all 3-interacts. Almost all of the high frequency 3-interacts were task-based and were composed of sequences of ‘gives suggestion’, ‘gives opinion’, ‘gives information’, and ‘asks for information’. The only relational communication category featuring in the list of frequently occurring 3-interact sequences is category 3 ‘agrees’. The frequently occurring 3-interacts of Project B is arranged in descending order of their aggregate frequency in Table 4-13.

The occurrences of category 6 ‘gives information’ in majority of the 3-interacts testify that the coordination meetings were used to exchange information heavily by the participants. At the same time, frequent use of category 4 ‘gives suggestion’ and category 5 ‘gives opinion’ by the group members showed that they provided direction to the group. The group created an environment where they invited the opinions and suggestions by other members, and these were often used to bring discussion to a close. Attempting to close discussion in this way encouraged others to express their support, identify weaknesses of the ideas, or propose alternative solutions.

Category 3 ‘agrees’ was often used by the members to acknowledge their support as evidenced by its presence as the only relational communication category in the list of frequently occurring 3- interact sequences.

**Table 4-13:** Frequently occurring 3-interacts for Project B

<b>3-interacts Category</b>	<b>Mtg. B1 N (%)</b>	<b>Mtg. B2 N (%)</b>	<b>Mtg. B3 N (%)</b>	<b>Total N (%)</b>
GI – GI – GI (6-6-6)	30 (6.11)	26 (6.15)	27 (5.79)	83 (6.01)
GI – GI – GO (6-6-5)	26 (5.30)	6 (1.42)	21 (4.51)	53 (3.84)
GI – GO – GI (6-5-6)	19 (3.87)	7 (1.65)	17 (3.65)	43 (3.12)
GO – GI – GI (5-6-6)	17 (3.46)	8 (1.89)	11 (2.36)	36 (2.61)
GS – GI – GI (4-6-6)	18 (3.67)	4 (0.95)	9 (1.93)	31 (2.25)
GI – GO – GO (6-5-5)	11 (2.24)	4 (0.95)	12 (2.58)	27 (1.96)
GI – GS – GO (6-4-5)	10 (2.04)	9 (2.13)	7 (1.50)	26 (1.88)
GI – GI – GO (6-6-4)	9 (1.83)	11 (2.60)	6 (1.29)	26 (1.88)
GO – GO – GI (5-5-6)	10 (2.04)	4 (0.95)	11 (2.36)	25 (1.81)
GI – GO – GS (6-5-4)	9 (1.83)	4 (0.95)	10 (2.15)	23 (1.67)
GO – GI – GO (5-6-5)	5 (1.02)	3 (0.71)	14 (3.00)	22 (1.59)
GI – GS – GI (6-4-6)	12 (2.44)	4 (0.95)	5 (1.07)	21 (1.52)
GI – AI – GI (6-9-6)	5 (1.02)	10 (2.36)	6 (1.29)	21 (1.52)
GS – GO – GI (4-5-6)	4 (0.81)	8 (1.89)	7 (1.50)	19 (1.38)
GS – GS – GI (4-4-6)	5 (1.02)	5 (1.18)	8 (1.72)	18 (1.30)
GO – GI – GS (5-6-4)	10 (2.04)	3 (0.71)	5 (1.07)	18 (1.30)
GI – GS – GS (6-4-4)	7 (1.43)	4 (0.95)	7 (1.50)	18 (1.30)
AI – GI – GI (9-6-6)	4 (0.81)	7 (1.65)	7 (1.50)	18 (1.30)
AG – GI – GI (3-6-6)	5 (1.02)	8 (1.89)	4 (0.86)	17 (1.23)

<b>3-interacts Category</b>	<b>Mtg. B1 N (%)</b>	<b>Mtg. B2 N (%)</b>	<b>Mtg. B3 N (%)</b>	<b>Total N (%)</b>
GS – GO – GO (4-5-5)	8 (1.63)	4 (0.95)	5 (1.07)	17 (1.23)
GO – GS – GO (5-4-5)	6 (1.22)	2 (0.47)	9 (1.93)	17 (1.23)
GO – GS – GI (5-4-6)	10 (2.04)	1 (0.24)	6 (1.29)	17 (1.23)
GI – AG – GI (6-3-6)	2 (0.41)	4 (0.95)	11 (2.36)	17 (1.23)
GO – GS – GS (5-4-4)	2 (0.41)	6 (1.42)	7 (1.50)	15 (1.09)
GO – GO - GS (5-5-4)	6 (1.22)	6 (1.42)	3 (0.64)	15 (1.09)
GO – GO – GO (5-5-5)	7 (1.43)	1 (0.24)	7 (1.50)	15 (1.09)
GS – GO – GS (4-5-4)	3 (0.61)	3 (0.71)	8 (1.72)	14 (1.01)
GS – GI – GO (4-6-5)	3 (0.61)	3 (0.71)	8 (1.72)	14 (1.01)
Infrequent 3-interact categories (occurring <1% in aggregate)				694 (50.29)
AG = Agrees; GS = Gives Suggestions; GO = Gives Opinion; GI = Gives Information; AI = Asks for Information				

#### **4.3.4 Analysis of Communication Data**

Some consistent patterns of communication are identified from the analysis of the communication data from the three meetings of Project B. While variations have been noticed in the communication among the participants, by large they followed a pattern that determined the characteristic of communication among participants in Project B. The analyses have been carried out as a two step process. In the first step, the characteristics of the communication have been examined based on the descriptive statistics of Meetings B1, B2, and B3, presented in the previous sections. In the following step, the data has been qualitatively examined to identify the emergent patterns of communication.

### *Positive Relational Communication (categories 1-3)*

Category 1 ‘shows solidarity’ accounted for almost 2% of all the communication for Project B. Though based on numbers it appears that showing positive social gestures toward other participants was not common, there were many instances that defied the notion. Transcripts of the meetings show participants used positive emotional act of showing solidarity towards others by expressing faith in the suggestions or opinions provided by others. Scholars have noticed that occurrence of this category in the communication of group members imply established relationship among the members and help the group to advance further (Emmitt and Gorse 2007). In spite of being individual entities, the participants of Project B developed a strong bonding due to working cooperatively in the production planning phase. The resulting cohesiveness urged the group members to show support and praise towards others to reinforce the relationship. An excerpt from Meeting B2 presents such an instance where one member showed positive support toward another member. In the following quote, ‘1’ refers to the superintendent of the GC, ‘7’ refers to the excavation subcontractor, and ‘10’ refers to the concrete subcontractor (Line 159-163, Appendix E).

*[1-10] Okay, so probably...realistically next Thursday.*

*[10-1] I am going to finish the auger cast piling before you start the lagging.*

*[7-10] He is talking about C line (referring to grid line in construction document) ...C line.*

*[1-7] See that's what I am saying.*

*[7-1] You will get there next Wednesday. Monday and Friday for lagging or something.*

Category 2 ‘shows tension release’ occurred least among the three positive relational categories in Project B (categories 1-3 are the positive relational categories). Communication associated with category 2 were consistently low; it was uncommon for high levels of tension release to occur in the meetings. Showing tension release often occurred after episodes of tension, or while tension seemed to be building. In such situations, group members would provide insights or possible directions to solve the crisis at hand, thus alleviating the tension. As a result in most occasions, acts expressing release of tension followed category 5 ‘gives opinion’. On one occasion during Meeting B2, the electrical subcontractor expressed frustration, as he could not proceed as planned and was anxious about his crew’s productivity. The following excerpt illustrates the intervention by one of the field personnel of the GC to resolve the issue. In the following quote, ‘1’ refers to the superintendent of the GC, ‘2’ refers to the employee of the GC, and ‘5’ refers to the electrical subcontractor (Line 265-274, Appendix E).

*[1-5] We have to get it approved. We have the pricing to be reviewed by the owner right now. Trying to get a ‘proceed’ on it. Then we have to get the manhole over there. That manhole will probably take 3 or 4 weeks to get.*

*[5-1] Well then, that is pretty much going to stop me. Once I get this little bit of work outside that TMH2 manhole, then we are dead in the water.*

*[2-5] No, we can get some work around with you. There is the cast in place manhole...go and start the west side work...we will look at it. We will be able to keep you going buddy. It wont flow the way we originally talked about it because we originally talked about you completing...literally flowing from across the south side and coming up on the west. That’s not going to happen.*

Category 3 ‘agrees’ occurred maximum among all the relational communication categories (5.84%). Agreement was expressed by the group members in response to others opinion, direction or suggestion. A high occurrence of this category indicates that the group members were acceptable of others suggestions or directions. This is testified by the fact that category 3 occurred most often subsequent to category 5 ‘gives opinion’ and category 4 ‘gives suggestion’. In addition, agreement was also used to reassure participants that information provided or progress reported was that which was expected. Support from the participants encouraged others to continue with their dialogue and reinforced the value of their contribution. When some members were showing agreement with a suggestion, those members not agreeing had to promptly show their dissent or allow the proposal to be accepted. Display of agreement by participants sometimes helped in bringing conclusion to discussion. In one such occasion, the participants were discussing about the sequence of site-work activities, and sign of agreement aided to conclude the discussion. In the following quote from Meeting B1, ‘1’ refers to the superintendent of the GC, ‘2’ refers to the employee of the GC, and ‘7’ refers to the site-work subcontractor (Line 299-304, Appendix D).

*[2-7] Few things we will like to modify we think will make the flow smoother.*

*[7-2] Because when we start the north side, we are going to loose that whole asphalt. So there won't be any asphalt road.*

*[1-7] We understand that.*

*[2-7] Oh yeah...because you are digging it up.*

*[1-7] Yeah we understand that. We knew that.*



### *Task-based Communication: Attempted Answers (categories 4-7)*

The task-based communication attempting to respond such as ‘gives suggestion’ (category 4), ‘gives opinion’ (category 5), ‘gives information’ (category 6), and ‘gives commitment’ (category 7) were the more frequently occurring categories across all the meetings of Project B. In fact, category 6 was most frequently used followed by category 5.

Category 4 ‘gives suggestion’ was often used to offer direction to the group members related to tasks. Some members in group, according to Emmitt and Gorse (2007), who adopt leading roles would be more prominent in offering suggestions. However, for Project B no one participant could be identified who adopted the leading position. All the group members participated in offering suggestions for the advancement of the group. Due to common understanding among the group members about the project, the suggestions were precise, clear and resulted in actions. The use of suggestions had the effect of changing passive discourse of communication to active communication, directed toward specific member(s). For example, during the course of Meeting B2 the group members were discussing certain site-work issues regarding a manhole. The discussion was brought to an agreeable conclusion by the direction provide by the superintendent of the GC. In the following excerpt from the transcript of Meeting B2, ‘0’ refers to the whole group, ‘1’ refers to the superintendent of the GC, ‘2’ refers to the employee of the GC, ‘5’ refers to the electrical subcontractor, and ‘7’ refers to the excavation subcontractor (Line 283-294, Appendix E).

*[1-2] Now coming down here he has got another manhole down here and down this way (referring to the construction document)?*

*[2-1] Yeah, pretty much yeah.*

*[5-2] Well that's just about 3 days of work.*

*[1-0] Well let me ask everybody here right now that, how many of you think we should keep this manhole here (referring to the construction document) like this and then come across...we have a freaking hole right there!*

*[7-5] That is 30 feet deep over there.*

*[1-7] Well even if we box over it, it is still going to be...because I am just trying to see...we can may be figure out how to support this when we excavate underneath it...may be we have to put some beams or whatever to carry the load...I don't know...alright we have to take a look at that afterwards.*

A fine line differentiates category 5 'gives opinion' from category 4 'gives suggestion'. Group members offering views and insights in a less assertive manner were considered as opinions. Category 5 was used by the participants to analyze problems and explore issues (brainstorming). Due to the inclusion of the subcontractors in the production planning process, their self-esteem was heightened and they sensed belongingness toward the group. This probably urged them to offer views and insights that resulted in the frequent use of category 5 across all three meetings of Project B. In addition, the multidisciplinary nature of the group meant many different perspectives were offered. The length of discourses offering opinions were rarely prolonged, broken up by intermittent use of information sharing and providing assertive suggestions. This is evident from the list of frequently occurring 3-interacts (Table 4-13) that shows the high occurrence of 6-6-5 (gives information-gives information-gives opinion), 6-5-6 (gives information-gives opinion-gives information) and 5-6-6 (gives opinion-gives information-gives information). Below is an example of communication of the onsite safety manager with the whole group where he expressed his views and at the same time, shared information. In the

excerpt from Meeting B1, '0' refers to the whole group and '3' refers to the onsite safety manager (Line 27-36, Appendix D).

*[3-0] I need list and documentations of CPR, First aid training and the expiration dates. I need you to identify the competent persons for OSHA, because OSHA requires you have competent people for certain aspects of the work such as confined space, fall protection, trenching and excavating. OSHA says 5 feet and you trench is 4 feet...if your trench is greater than 4 feet, then we need to start examining the hole and do daily inspection of that hole.*

*[3-0] I need copies of your OSHA 30 hour cards and who is onsite. MSD sheet is going to be critical for this job as we are right next to the hospital. So make sure that not only you are getting those in to me, but if you are bringing something that's inherently more dangerous than usual in this project, bring it in these meetings and share it with everyone else. Then we all will be aware of it.*

Category 6 'gives information' was consistent in occurring most frequently across all the meetings of Project B. This demonstrates that the subcontractor coordination meetings were used as a platform to exchange factual observations by the participants related to the tasks. The trend of construction professionals using higher frequency of category 6 was also reported by Gameson (1992), Emmitt and Gorse (2007). Exchange of information by the participants informed all the group members about the progress of different trades as also issues faced by them. This provided group members the opportunity to offer suggestions/opinions and at the same time helped in coordination of the trades. As a result, in most of the cases information was

directed toward the whole group. In one such occasion, one of the field personnel of the GC shared information regarding site layout and logistics with the rest of the group members. In the following quote from Meeting B1, ‘0’ refers to the whole group and ‘2’ refers to the employee of the GC (line 145-154, Appendix D).

*[2-0] We don't have too much problem with company vehicles like S (referring to a subcontractor). We are okay with those being up in order to do your work with the equipment, but the rest of the vehicles need to be parked over there.*

*[2-0] Uh...the only other item I will touch on real quick...is as you have noticed that we have got temporary fencing out there. We are going to put permanent fencing as finish the flip flop of the road thing going on out there.*

*[2-0] Once we get the traffic back in south, we are going to take the north lane and put permanent fencing and permanent gates.*

*[2-0] Hopefully...uh...the tree protection and the erosion controls starts being of less impact to some degree once we finish all these work.*

The frequency of category 7 ‘gives commitment’ was fairly consistent across all the meetings of Project B with an aggregate of 2.6% of all the communication categories. While giving commitment referred to participants mutually agreeing to perform any task reducing uncertainty, it was dependent on the mutual trust and support among the participants. Involvement of the participants in the formal production planning process of Project B developed an environment of support and trust among them. A discourse between the superintendent of the GC and the excavation subcontractor during Meeting B2 can be cited as an example, where ‘1’ refers to the superintendent and ‘7’ refers to the subcontractor (Line 165-170, Appendix E).

*[7-1] I have figured I have got 2 or 3 more days to get everything 59 (referring to grid line in construction document) up there.*

*[1-7] Then south-east corner weather permitting Tuesday and Wednesday, you are finishing up that?*

*[7-1] I will definitely do that.*

*[1-7] Okay.*

The minutes of the coordination meetings showed evidences of exchange of commitments among the participants and fulfillment of those commitments. The look ahead schedule and the weekly work plan being integral part of the meeting minutes made it easier for the participants to interact among themselves. The weekly work plan of the project, which was populated from the individual work plans of the subcontractors listed the task descriptions, names of responsible parties, etc along with dates on which the tasks would be executed. The dates for each of the tasks as shown in the work plan were considered as commitments by the participants toward each other. In addition, the calculated PPCs for the previous weeks' performances were also included in the meeting minutes.

The common understanding about the project helped the participants to agree/disagree to perform any task with certainty. Being able to say 'no' in response to requests for commitment was also important, as it cleared the cloud of uncertainty. According to Howell and Ballard (1997) participants are required to decline requests for commitment when it is beyond the ability of the participant to fulfill it. This is noticeable among group members attached with trust and sense of responsibility to provide realistic and correct information to the group. A discussion between the personnel of the GC and the site-work subcontractor regarding an access hole in the

underground utility tunnel exemplified the importance of declining request for commitment. In the discussion quoted below, ‘1’ refers to the superintendent of the GC, ‘2’ refers to the employee of the GC and ‘6’ refers to the site-work subcontractor (Line 316-327, Appendix E).

*[1-6] Where are we with the clean water, steam line, chilled water, etc...where are we? Have we started to do any of that?*

*[6-1] I was thinking access hole.*

*[2-6] Well its not going to be till...as far as an actual access hole, we are not going to cut that open until...its on schedule for January...mid-January.*

*[6-2] So, what are going to do on that?*

*[2-6] But as far as ventilation, he is trying to corner that with underpinning...there is no reason we cant scoop the end of that out exposing it into the tunnel so that you can cut a hole for ventilation. That’s what we talked about before. But the actual end of the tunnel doesn’t go out until January.*

*[6-2] Okay...that I know.*

*[2-6] All right.*

### **Task-based Communication: Questions (categories 8-11)**

Category 9 ‘asks for information’ had some variations across the meetings, but emerged as the category most frequently used (4.83%) among the task-based communication categories asking for response. In comparison, the other categories in this phase such as category 10 ‘asks for opinion’ (2.45%), category 8 ‘asks for commitment’ (1.52%), and category 11 ‘asks for suggestion’ (1.44%) occurred less often.

Category 8 ‘asks for commitment’ was used less in comparison to that of category 7 ‘gives commitment’. This indicates that group members always did not have to ask in order to get commitment from others. However, given the involvement of the group members in the decision making process everybody was entitled to ask for commitment from others. So, the privilege of asking for commitment from others was not limited to specific member(s). Asking for commitment was a way to mutually agree upon performing any task with absolute certainty, which in turn improved the reliability of the formal production planning process and strengthened the mutual trust among the members. An example of asking for precise commitment can be found in the following communication from Meeting B3, where ‘1’ refers to the superintendent of the GC, ‘2’ refers to the employee of the GC and ‘13’ refers to the foundation subcontractor (Line 178-190, Appendix F).

*[1-13] Yes the building line is the critical thing for me...and then when you get back up there tomorrow, how long do you think you have to finish that line out and get back to for the transformer pad? Because that will kick of a lot of other stuffs...a lot of other guys.*

*[13-1] I will say 3 or 4 days. I mean you know...we need to get in there, drill it and getting ready to be topped off...*

*[1-13] So, you will get everything to the building line in 3 or 4 days? Finish that up?*

*[13-1] Yes.*

*[1-13] Okay.*

*[2-13] Do you see yourself finishing the line 5 today?*

*[13-2] Uhh...I am really hoping to...*

*[2-13] Almost?*

*[13-2] Yeah...I mean as soon as you are done with me I will get back out and make sure that we kind of drive this little hard.*

Category 9 was used by the participants to ask for further information and explanation. This category was used by group members when others had presented insufficient contextual or background information on any issue. Due to the multidisciplinary nature of the group, it was noticed that participants often asked for information to overcome difficulties presented by specialized issues. In addition, participants also asked for detailed and fundamental background information from others to decide their course of action. An example of such a discourse can be cited from Meeting B3, where '2' refers to the employee of the GC, '6' refers to the electrical subcontractor and '11' refers to the site-work subcontractor (Line 269-274, Appendix F).

*[2-6] So, you can go from that point head it back towards the transformer...you are getting something to do.*

*[6-2] We will figure out what we have got here.*

*[6-11] Do your screen wall and footer is going in prior to us?*

*[11-6] It has to go prior to you.*

*[1-6] It has to.*

The other two categories of task-based communication requesting response, category 10 'asks for opinion' and category 11 'asks for suggestion' were often used by the group members to insist others to offer directions or views. This was also facilitated by the fact that the group members were collaborating during the formal production planning process and already



developed a bonding among them. The high level of familiarity about Project B among the group members facilitated them to seek opinion and suggestion from other members. At the same time, those providing opinion/suggestion could do so due to their involvement in the planning process of the project. In the example cited below from Meeting B3, the electrical subcontractor sought the opinion of the waterproofing subcontractor regarding waterproofing an electrical manhole. In the quote, '2' refers to the employee of the GC, '6' refers to the electrical subcontractor, and '8' refers to the waterproofing subcontractor (Line 213-220, Appendix F).

*[6-8] Hopefully there is enough area where the manhole is going with the asphalt still there. Can we do it there?*

*[8-6] I will have to look.*

*[6-8] Because otherwise we have to unload somewhere, do that, load back on the truck, bring it back up.*

*[2-6, 8] When we get done with this meeting lets three of us talk real quick over that whole plan of how we are going to do that. We have to talk about the existing and how to do the waterproofing as well.*

#### **Negative Relational Communication (categories 12-14)**

The total amount of negative relational communication categories (2.09%) noticed in Project B was much lower than that of positive relational communication categories (8.51%). In fact, category 14 'shows antagonism' did not occur in any of the three meetings. Similarly, category 12 'disagrees' occurred only once across the three meetings. Negative relational communication was only manifested by the occurrence of category 13 'shows tension', which showed variation

across the meetings. As a general note, it can be said that the level of negative emotions was low in the meetings.

As a departure from the conclusion drawn by Emmitt and Gorse (2007) that disagreeing with others is a trait associated with effective managers, observers did not notice any disagreement among the group members during the meetings. This did not pose any question on the managing capability of the GC, but showed that all the members were equally competent and assumed equal responsibility for the advancement of the group. As all the group members were responsible for decision-making, they acted as cooperative participants leaving the path of customary agreement/disagreement toward a path of critical evaluation of the issues. However, when members were engaged in critical discussion with other members, and became increasingly concerned about other's view or direction, the level of critical communication increased. In such situations, the increased concern was vented in the form of dissatisfaction and apprehension as 'shows tension' (category 12). For example, while emphasizing the importance of ensuring safety of common people, the employee of the GC recollected an incident and expressed his concern. In the quote below from Meeting B1, '0' refers to the whole group, '2' refers to the employee of the GC, and '9' refers to the foundation subcontractor (Line 106-113, Appendix D).

*[2-9] Make sure even though you are inside the construction site you have got an open excavation...or a hole you need to keep open...make sure we protect it adequately. If there is something, unique...you know if there is a hole and you don't have plywood, put your bucket on it.*

*[2-0] Put something on it so that somebody is not going to fall in the hole.*

*[2-0] Hey...we had a lady who works for the hospital moving the fence panels to try to get in right where we are doing the canopy. She was going under the canopy to get to the main door. That's how bad it is.*

### 4.3.5 Concept map

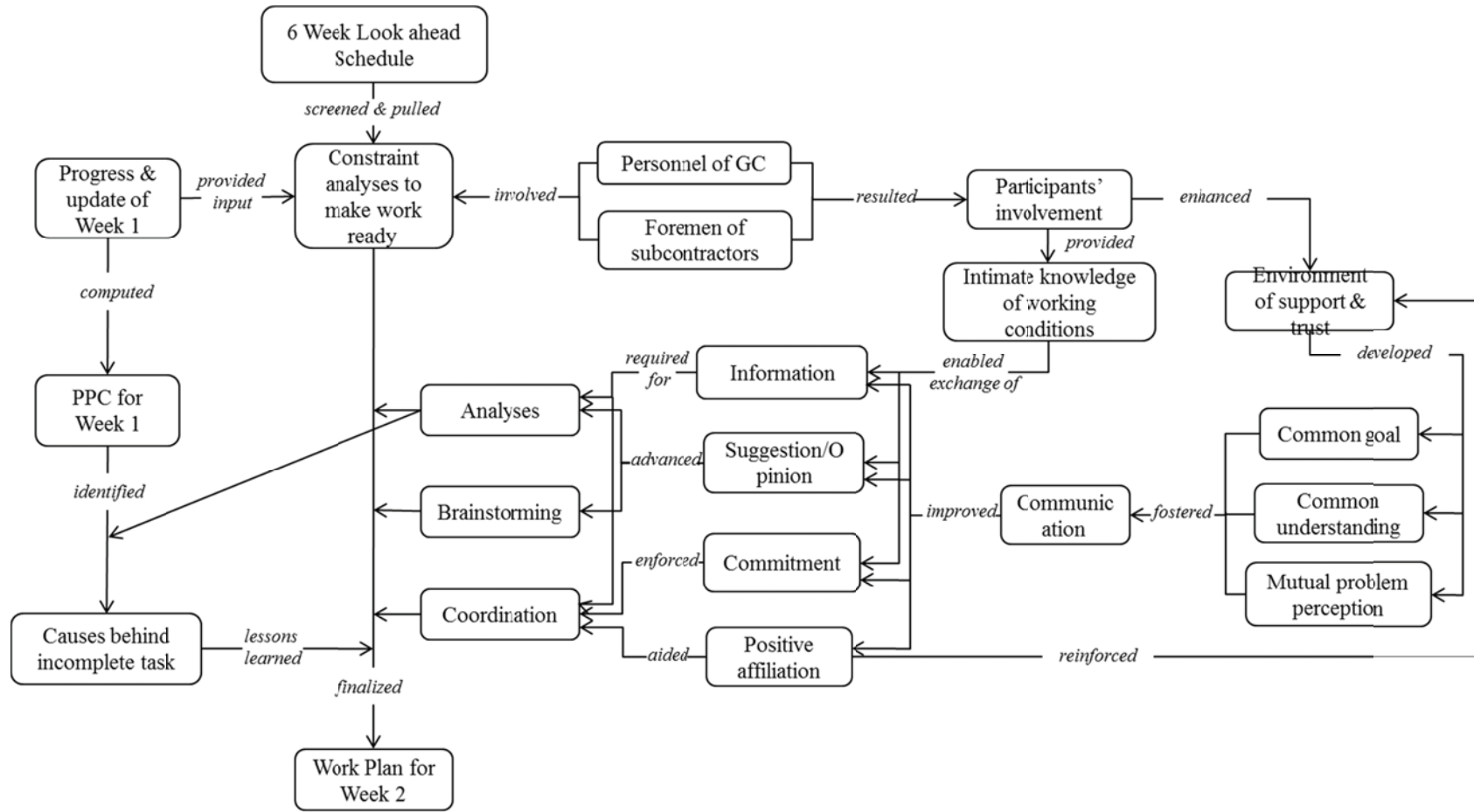


Figure 4-12: Concept map illustrating the role of communication during formal production planning process in Project B

#### **4.3.6 Safety Performance**

Company B had a structured safety and health program in place for Project B headed by an on site safety manager (SM). Safety was considered as the prime responsibility of the GC, the subcontractors and suppliers. The GC required subcontractors to have a project safety plan of their own. During the progress of the project, the SM monitored the workers compliance with the safety requirements of the GC as well as the subcontractors' own project safety plan.

The safety and health program included safety orientations for all the workers and foremen prior to commencement of work. The SM requested from all the subcontractors the names and proof of qualifications (such as OSHA safety training, CPR training, First aid training) of the competent persons for all shifts of the project. Weekly safety meetings were conducted by the SM to discuss current performance and special safety issues. Co.-B required every subcontractor to conduct weekly toolbox talks to review use of proper tools and imminent project hazards. The SM attended the toolbox sessions to make sure topics related to the project was covered and encouraged the workers to pay attention to safety. It was mandatory for all the operators of heavy equipment on site to inspect and submit 'daily check reports' to the SM. Job hazard analyses and hazardous materials plans submitted by the subcontractors were regularly reviewed by the SM to determine if hazards that poses risks had been identified and preventive actions taken. The SM also inspected for required material safety data sheets (MSDS) for materials to be used or incorporated into the work. Subcontractors were constantly encouraged to share any information and conditions related to the project with other participants to increase shared understanding. This is evident from the following excerpt from Meeting B1, where '0' refers to the whole group and '3' refers to the SM (Line 32-36, Appendix D).

*[3-0] I need copies of your OSHA 30 hour cards and who is onsite. MSD sheet is going to be critical for this job as we are right next to the hospital. So make sure that not only you are getting those in to me, but if you are bringing something that's inherently more dangerous than usual in this project, bring it in these meetings and share it with everyone else. Then we all will be aware of it.*

The SM regularly conducted job site inspections to ensure conformance with the safety program. The superintendent and project manager of the GC were also responsible for safety inspections and correcting any noncompliance of safety regulations. In case of any incident, post incident analyses were conducted by the SM for documentation purpose and identification of root causes of incidents. The SM regularly attended the weekly subcontractor coordination meetings and shared the outcomes of post-incident analyses and observations from inspections with the attendees to prevent recurrence. On one such occasion the SM shared an incident that occurred in the project, with the attendees of the coordination meeting. In the following quote, '0' refers to the whole group and '3' refers to the SM (Line 393-402, Appendix E).

*[3-0] Real quick, I will want you to leave with this in your mind...uh...we had an incident where we had a back hoe flip over...if he didn't have his seat belt hooked up he probably would not have been working. Very experienced operator...he has been operating the hoe longer than I have been alive and I am 41 years old, but we have to use the proper tools for the job. In this particular incident, the gentleman was attempting to lift a trench box without the lifting arm out of the trench and set it to the side. He was not using the lifting arm, he just used his bucket, tried to pick it up and set it across the top of the trench.*

*When he did that he exceeded the limit of the hoe, and this was a pretty big hoe and flipped it. So lets make sure your people don't get complacent in their jobs and make sure they have what they need to do the job correctly and safely.*

Another aspect of the safety and health program for Project B was the use of daily huddle meetings. A brief daily meeting before the start of work was conducted where all workers were briefed by the foremen about the work that needed to be done by the end of the day and the quality of work expected. They also reviewed the required safety equipment and practices and openly discussed any imminent safety issues.

**Recordable incidents**

Detailed record of all the incidents and labor hour for the period of October 2010 to March 2011 for Project B was gathered. The description of each of the incident and the post-incident outcomes were evaluated to detect the recordable incidents. Based on the criteria of OSHA (29 CFR, Part 1904.7), the recordable incidents for Project B are listed below:

**Table 4-14** : Recordable incidents occurred and labor hours utilized in Project B during October 2010 – March 2011

<b>Date of incident</b>	<b>Cum. project incidents</b>	<b>Injured part</b>	<b>Injury cause</b>	<b>Post incident outcome</b>	<b>Monthly labor hour</b>	<b>Cumulative labor hour</b>
October 2010	0	-	-	-	11,024	11,024
November 2010	0	-	-	-	10,664	21,688
December 2010	0	-	-	-	16,395	38,083
January 2011	0	-	-	-	12,707	50,790
February	1	Eye	Suffered corneal abrasion while	Medical treatment	14,754	65,544

<b>Date of incident</b>	<b>Cum. project incidents</b>	<b>Injured part</b>	<b>Injury cause</b>	<b>Post incident outcome</b>	<b>Monthly labor hour</b>	<b>Cumulative labor hour</b>
2011			welding	beyond first aid		
March 2011	1	-	-	-	19,500	85,044

Recordable incidence rate of Project B ( $RIR_{PROJECT-B}$ ) was computed using the following formula provided by OSHA (2004):

$$RIR = (\text{Total Number of Incidents} \times 200,000) / \text{Cumulative Labor Hours}$$

For Project B, during the period of October 2010 to March 2011:

Total number of incident = 1

Cumulative labor hours = 85044

$$RIR_{PROJECT-B} = (1 \times 200,000) / 85,044 = 2.35$$

#### 4.4 Comparison of the Cases

The two projects considered for this research study were comparable in respect to their scope, magnitude, and complexity. However, they were radically dissimilar in their approach toward planning. The following sections summarize the commonalities and disparities between Projects A and B.



#### 4.4.1 Commonalities in the Cases

The two projects selected for the case studies were health care facilities being added to existing health care facility campuses. Having similar end use the two projects had comparable scopes and complexities. Moreover, as both the projects were additions to existing facilities, they had to put serious consideration to isolate the construction zone from the current operations to avoid safety hazards to visitors and workers of the existing facilities.

The delivery methods adopted for both the projects can be characterized as fragmented. While for Project A construction management was adopted, the owner of Project B preferred general contracting (design-bid-build) as the delivery method. Due to the inherent characteristics of the two delivery methods, the CM firm for Project A was hired before the design was fully completed, whereas the GC for Project B was hired after the project scope was completely defined. However, the assistance provided by the CM firm to the design teams was limited, and did not set it apart from the GC in terms of involvement in the design phase.

Use of subcontractors for all the different trades introduced fragmentation of the workforce in both the projects. With respect to selecting subcontractors, competitive bidding was the method of choice for both the projects to receive the best price. With subcontractors hired for all the trades, flow of information and coordination became major issues in both the projects. In context of the research study, subcontractors acting as disintegrated outfits with exclusive interests working in close proximities of each other presented threat to the safety and health of the workers.

With respect to nature of project, both the projects were multistoried vertical construction. Thus, the complexities and issues related to vertical construction were present in both the projects,

which included sequencing of tasks and proper maneuvering of subcontractors. In addition, multi-level construction involved workers working at height that increased chances of fall from height. Considering the historical evidence of maximum number of fatalities due to falls from height among construction workers (CPWR 2008), this similarity between the two projects was deemed critical in context of the research study.

#### **4.4.2 Disparities in the Cases**

Despite the similarities between the two projects described above, there were differences as well, which were recognized during the observational study. A fundamental difference was noticed in the compensation mechanism of the CM/GC of the two projects. The GC for Project B was hired based on lump sum bidding, and CM for Project A was hired based on cost plus fee arrangement (without any cap amount to the contract). Due to the inherent characteristics of lump sum bid, the GC shouldered more risk in comparison to the CM. Traditionally it has been found that lump sum contracts foster adversarial relationships between the project participants and increase probability of disputes (Halpin and Woodhead 2011). However, no such adversarial relationships were perceived during the study of Project B. On the contrary, the participants were more involved and cooperative with each other in comparison to that of Project A. This could be related to the variation in approach toward planning adopted in the two projects.

#### **Approach Toward Planning**

The CM firm adopted a project planning approach for Project A. The approach involved using a work breakdown structure by the CM to develop list of tasks, which were used for sequencing as well for quantity takeoff. The productivities of the crews were determined by the project manager of the CM based on his knowledge and heuristics. All these information was integrated

into a master schedule with additional information for responsibility, cost, constructability and availability of resources, and all the subcontractors had to abide by that schedule in the job site to construct the facility. The subcontractors were not involved or consulted in planning process, and planning had been left to ad-hoc methods. The focus of the management was on project budgets, schedules, and other macro-level specifications of the tasks to be completed and the constraints that might be encountered in the execution of the tasks. It was the local responsibility of the subcontractors to accomplish the tasks being assigned and contracted. This approach facilitated the management of contracts rather than the management of production or workflow. Look-ahead schedules of six to eight weeks were used to focus management attention on in-progress and upcoming tasks. The subcontractors provided weekly progress updates and received directions from the CM regarding future tasks. In other words, the focus had been on project management.

Project B adopted formal construction production planning (utilizing LPS<sup>1</sup>), which was a different planning approach than that of Project A. Similar to Project A, the GC of Project B prepared a master schedule based on work breakdown structure. However, the master schedule was less detailed and only captured the major milestones (phase schedule). In the following step, the phase schedule was broken down into look-ahead schedule of four weeks where tasks from the phase schedule were pulled into the four-week window. This whole process involved the inputs from different project participants such as the subcontractors, suppliers and the GC. Incorporating the inputs of the participants in preparing the look-ahead schedule helped in removing resource shortages and made sure all the necessary permits were available to start the tasks. The tasks included in the look-ahead schedule formed the list of 'can do' tasks. Subsequently, the tasks listed in the look-ahead schedule were screened and pulled into the

weekly work plan. The project participants analyzed the tasks to identify any imminent constraints, and only tasks free of any constraints were included in the work plan. A formal process was followed by the participants to identify detailed specification of the steps to be followed and the constraints to be removed in order for the execution of the project to proceed in a reliable fashion. Due to repeated constraint analyses based on inputs and updates of the participants, there was a component of commitment attached to the tasks included in the weekly work plan, which formed the list of 'will do' tasks. The fundamental principle of formal production planning was to expose workflow issues at the task level and thus enabling better performance at the project level.

In the control phase of Project A, the CM devoted their efforts to monitor the performances of the subcontractors, with corrective actions as needed to conform performance to master schedule. Thus, in essence the control mechanism focused only on 'should' vs. 'did' as illustrated in Figure 4-1. Similarly, production control in Project B within the LPS\ process was to ensure that events conformed to plan. The control mechanism focused on 'will' vs. 'did' as illustrated in Figure 4-7. In addition, reliability of the weekly work plan was measured using PPC. The GC and other participants of Project B targeted to achieve 85% or higher PPC. Following this, the reasons for incompleteness of tasks were analyzed to identify major constraints. This was done to identify trends for failure that improved in future planning.

The goal of the formal production planning process was to coordinate actions among multiple crews and increase their accountability as it recognized the dynamic and interdependent nature of the construction tasks. One way to increase accountability of the participants was to increase their involvement in the planning process and foster communication among them. The different

approaches toward planning in the two projects resulted in contrasting patterns and characteristics of communication among the project participants, which are compared below.

### **Communication Among Project Participants**

As a general trend, scant informal communication took place among the participants of Project A both before and after the meetings, except for Meeting A3. Before the start of Meeting A3, participants were found to engage in informal discussion about a barbeque that was organized by the CM in the job site. Whatever informal communication noticed in Project A before the start of the meetings, was contained within subgroups and were never whispered. The personnel of the CM never showed any interest in participating in the informal discussion as they always arrived just in time for the meetings. In contrast, the representatives of the GC in Project B always arrived 15 to 20 minutes prior to the scheduled time of the meetings and engaged in discussion before the commencement of the meetings. The topics of the informal discussion varied from project related announcements to personal jokes and banter. Though the coordination meetings of both the projects were conducted in formal and structured manner, a striking difference was noticed regarding the documents distributed during the meetings. While in Project A participants received a lengthy document containing agenda and minutes, in Project B single page agenda and look-ahead schedules were distributed at the beginning of each meeting. Also, the meetings of Project A lasted longer than the meetings of Project B.

The transcripts of the meetings were coded using modified coding scheme of Bales' (1950) IPA and the results were aggregated to provide the communication profiles of Projects A and B.

Table 4-15 compares the summary of communication categories observed in the two projects.

When making references to frequencies across meetings, it is important to remember that

percentages are being used so that data are comparable. Thus, just because some meetings were longer than others and used more thought units, did not influence how frequencies were compared across meetings.

**Table 4-15** : Comparison of communication categories observed in Projects A and B

Phases		Categories	Units of Thought		
			Project A N (%)	Project B N (%)	
Positive Relational Communication		Shows solidarity (1)	27 (1.18)	27 (1.95)	
		Shows tension release (2)	14 (0.61)	10 (0.72)	
		Agrees (3)	48 (2.10)	81 (5.84)	
Task based Communication	Attempted Answer	Gives suggestion (4)	247 (10.81)	225 (16.23)	
		Gives opinion (5)	168 (7.36)	314 (22.66)	
		Gives information (6)	1093 (47.85)	522 (37.66)	
		Gives commitment (7)	38 (1.66)	36 (2.60)	
	Requesting Response	Asks for commitment (8)	30 (1.31)	21 (1.52)	
		Asks for information (9)	447 (19.57)	67 (4.83)	
		Asks for opinion (10)	38 (1.66)	34 (2.45)	
		Asks for suggestion (11)	8 (0.35)	20 (1.44)	
	Negative Relational Communication		Disagrees (12)	11 (0.48)	1 (0.07)
			Shows tension (13)	100 (4.38)	28 (2.02)
			Shows antagonism (14)	15 (0.66)	0 (0.00)
Total Units of Thought			2248 (100)	1386 (100)	

Based on the trends found in the descriptive statistics, ‘gives information’ was most frequently used by the project participants of both Projects A and B. If combined with the category ‘asks for information’ it is clearly evident that communications among the participants of both the projects

were characterized by high level of information exchange (categories 6 and 9 combined). As mentioned previously, these categories were used by the participants for exchange of factual information to decide their course of actions. It was noticed in Project B that participants often asked for information for further clarification. While all the participants in Project B were involved in asking for information (category 9), the personnel of the CM in Project A played a dominant role in extracting information from the other participants. The personnel of the CM had to incessantly ask for information from the participants as they were not forthcoming, which is reflected in the higher occurrence of category 9 'asks for information' in Project A. In Project B, 'gives information' was used for explicitly declaring the completion of the tasks. Unlike Project B, there was never a fluent exchange of information in Project A; it was more of a forced gathering of information by the CM.

Formal production planning utilizing LPS\ required the participants to engage in information exchange, which is evident in the high occurrence of categories 6 and 9 (42.49%) during the meetings of Project B. However, a much higher occurrence of these two categories in Project A (categories 6 and 7: 67.42%) could be due to the following factors. Firstly, the personnel of the CM for Project A played a dominant role in the meetings and influenced the communication categories heavily. They were more keen on gathering factual information about the project from other participants. Secondly, as the participants were not involved in the planning process they lacked background information about the project and required added explanation to get oriented with the context of discussion. Thirdly, the participants of Project B had no prior experience of using LPS\ and were in the initial stage of the project. It can be assumed that the exchange of information might have increased among the participants of Project B with the progression of the project. Fourthly, due to the construct of the communication categories, any form of

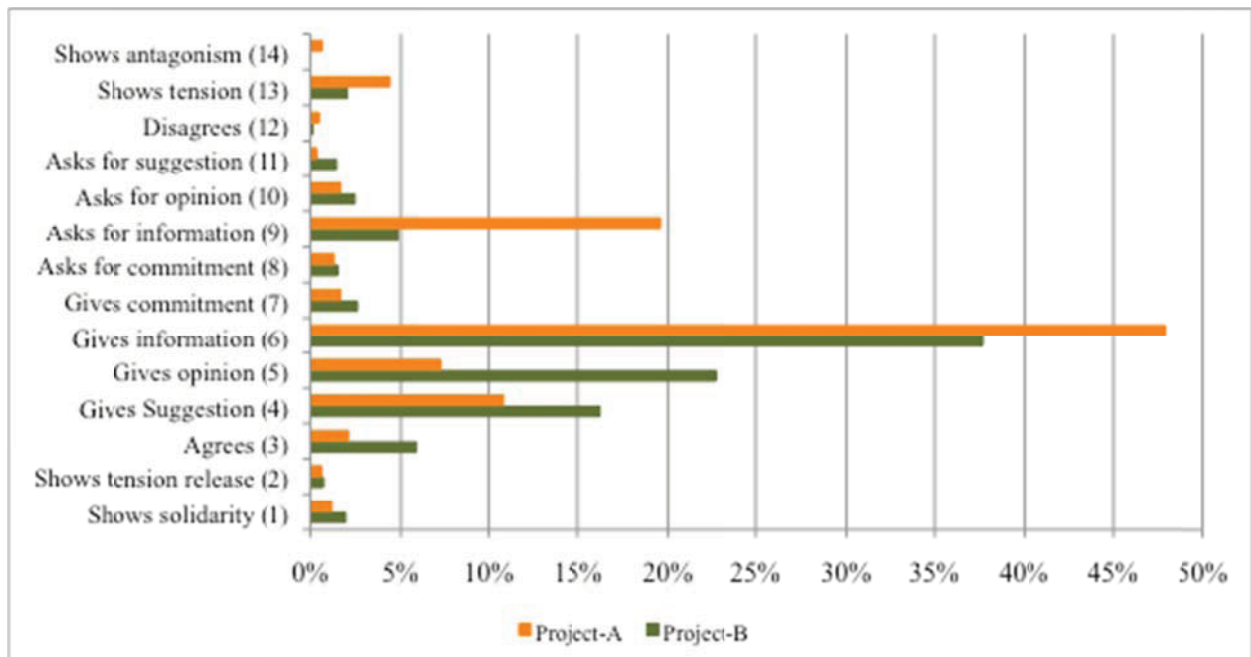
communication providing insight or reasoning relevant to the tasks were coded as category 5 'gives opinion' that can be overtly considered as giving information.

In contrast to Project A, Project B always valued the involvement of the participants in the planning process. Due to the involvement of the participants in Project B, mutual trust and camaraderie were developed among them that resulted in higher levels of suggestions and opinions provided by the participants. Both exchange of suggestions (categories 4 and 11: 17.67%) and exchange of opinions (categories 5 and 10: 25.11%) in Project B were higher in comparison to that of Project A (categories 4 and 11: 11.16%; categories 5 and 10: 9.02%). In concurrence with the conceptual model of communication among participants during formal production planning (see **Figure 2-4**), active involvement of the participants of Project B in the planning process empowered them to work toward the common goal of the group. As their opinions and views were valued, they felt part of the group and their belongingness to the group increased manifold. The augmented empowerment and belongingness among the participants of Project B helped to foster mutual trust and cohesion among the group members.

The CM's personnel in Project A were particularly dominant during the meetings. If suggestions were not forthcoming, they would provide proposals and make suggestions. In majority of the instances, proposals were not given by other participants; the personnel of the CM would draw together information and put suggestions/opinions to the group. If others agreed, management would ask them to commit for firm dates of completion of the suggested tasks. In comparison, exchanges of commitments among the participants were free flowing in Project B. Though the descriptive summaries do not show much difference in the occurrence of exchange of commitments (categories 7 and 8 combined) among the participants of the two projects (Project A: 2.97%; Project B: 4.12%), participants of Project B were more forthcoming in



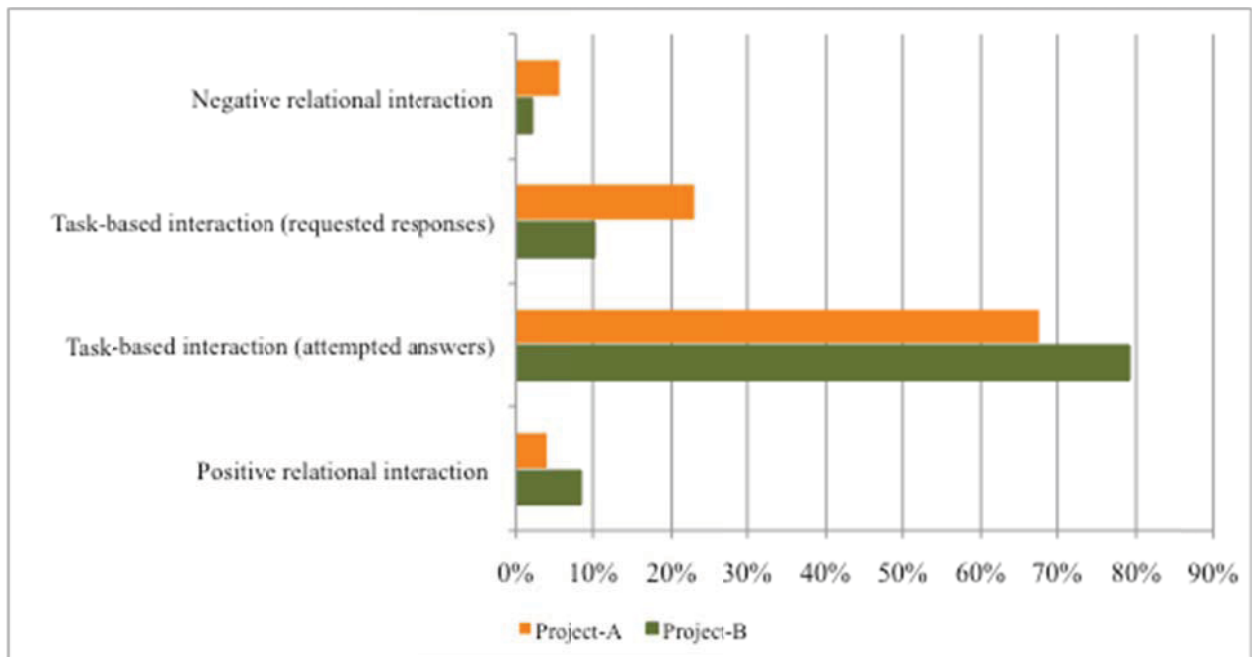
providing/asking for commitments, which was a natural consequence of the production planning process adopted in the project. Another prominent dissimilarity between the projects was the sense of sincerity among the participants to say ‘no’ in response to inquiry for commitments. There was no instance in Project A when a participant declined a request for commitment, while participants in Project B made real commitment by saying ‘no’ when asked to act beyond the limit of their ability. The bar chart in Figure 4-13 compares the communication profiles of the two projects.



**Figure 4-13** : Comparison of communication profiles of Projects A and B

In terms of relational communication, participants of Project A exhibited higher negative relational communication (Project A: 5.54%; Project B: 2.09%) and lower positive relational communication (Project A: 3.89%; Project B: 8.51%) in comparison to Project B as illustrated in Figure 4-14. Negative thought units in Project A were common in the form of the CM condemning the subcontractors and displaying dissatisfaction due to increasing variance between

the work performed and work planned. The occurrence of negative relational communication was sparse in Project B as the participants avoided negative comments except for the occasional display of concern and dissatisfaction. The meetings of Project B were positive in nature as indicated by the much higher occurrence of positive relational communication in comparison to Project A. The participants developed a strong bonding due to working cooperatively in the formal production planning process. The resulting cohesiveness urged the group members to show support and praise towards others to reinforce the relationship.



**Figure 4-14** : Comparison of communication phases of Projects A and B

After focusing on the emergent trends across the data collected from Projects A and B, the frequently occurring interacts of the two projects were compared for further insights as shown in Table 4-16. The comparison reiterated the predominance of uninterrupted information exchange in Project A and the use of suggestions and opinions when disseminating information in Project B. This observation reinstates the previously mentioned fact that participants in Project A only

presented the information, but participants in Project B evaluated the information. Moreover, the patterns of communication in Project B bear evidence that the participants were involved in brainstorming and coordination activities, while in Project A the participants most of the time received directions from the CM.

**Table 4-16** : Comparison of frequent interacts observed in Projects A and B

#	Project A	Monologue/ Dialogue	N (%)	Project B	Monologue / Dialogue	N (%)
1	GI – GI (6-6)	M	406 (17.79)	GI – GI (6-6)	M	178 (12.92)
2	AI – GI (9-6)	D	248 (10.87)	GI – GO (6-5)	M	104 (7.55)
3	GI – AI (6-9)	D	139 (6.09)	GO – GI (5-6)	D	77 (5.59)
4	GI – GI (6-6)	D	109 (4.78)	GI – GS (6-4)	M	66 (4.79)
5	GI – AI (6-9)	M	79 (3.46)	GS – GI (4-6)	D	59 (4.28)
6	GI – GS (6-4)	M	74 (3.24)	GS – GO (4-5)	M	53 (3.85)
7	GI – GO (6-5)	M	73 (3.20)	GO – GS (5-4)	M	51 (3.70)
8	AI – AI (9-9)	M	70 (3.07)	GO – GO (5-5)	M	45 (3.27)
9	GS – GI (4-6)	M	64 (2.80)	AI – GI (4-6)	D	40 (2.90)
10	AI – GI (9-6)	M	45 (1.97)	GI – GI (6-6)	D	37 (2.69)
11	GS – GS (4-4)	M	44 (1.93)	GS – GS (4-4)	M	35 (2.54)
12	GO – GI (5-6)	M	39 (1.71)	GO – GI (5-6)	D	32 (2.32)
13	GI – GS (6-4)	D	37 (1.62)	GO – GO (5-5)	D	25 (1.81)
14	GI – ST (6-13)	M	37 (1.62)	GO – AG (5-3)	D	23 (1.67)
15	GS – AI (4-9)	M	31 (1.36)	AG – GI (3-6)	D	20 (1.45)

AG = Agrees; GS = Gives Suggestions; GO = Gives Opinion; GI = Gives Information; AI = Asks for Information; ST = Shows Tension

Comparison of the frequent interacts also highlighted the difference between the occurrence of ‘dialogue’ during the communication of the participants. While four out of 15 frequent interacts in Project A were dialogues, there were seven frequent interacts that were dialogue in Project B. Higher presence of dialogue in Project B indicates that multiple participants were involved in the discourse. In contrast, predominance of monologues in Project A is due to the inclination of the participants (mostly the personnel of CM) to take extended speaking turns in order to present information to the group. This accounted for longer speaking turns, requiring individuals to listen for extended periods of time.

### **Safety Performance**

Well-structured safety and health plans were implemented in both the projects. Project A hired a third party safety manager to monitor the program, while an in house safety manager served the purpose for Project B. Though both the programs implemented similar mechanisms such as safety orientation for new workers, weekly safety meetings, weekly toolbox talks, preparing JHA reports, site inspections, etc., project participants had more opportunities to discuss safety issues in Project B. The safety manager of Project B regularly attended the subcontractor coordination meetings to share the outcomes of post-incident analyses (if any) and observations from inspections with the participants to prevent recurrence. Due to his presence during the meetings, any imminent safety issues related to future works were always brought out. This increased the awareness of all the participants even if not directly related to his/her scope of work. All the participants of Project B were constantly encouraged to share any information and condition related to the project that could impact safety with all the participants during the coordination meetings to increase the mutual understanding. In addition, Project B used daily huddle meetings before the start of work everyday. Along with other topics, workers reviewed the required safety

equipment and practices and openly discussed any imminent safety issues related to that day's work. No such initiatives were noticed in Project A.

Cross sectional data of safety records from Projects A and B were gathered for a period of six months each, which coincided with the time of collecting observational data from the coordination meetings of respective projects. Based on the recording criteria of OSHA (29 CFR, Part 1904.7), the recordable incidents of both the projects were identified and then recordable incidence rates (RIR) were computed. Based on the RIRs of the two projects (Table 4-17), Project B showed a better safety performance in comparison to Project A.

**Table 4-17:** Comparison of safety performance of Projects A and B

	<b>Project A</b>	<b>Project B</b>
Time period	6 months (August 2010 – January 2011)	6 months (October 2010 – February 2011)
Number of incidents	10	1
Cumulative labor hours	556,776	85,044
RIR	3.29	2.35

#### **4.5 Chapter Summary**

This chapter presented the detailed analyses of the communication among the participants as observed in the individual cases, as well as the cross case comparison. In spite of analogous characteristics of Projects A and B, they differed in the approach toward planning: Project A adopted traditional project planning while Project B utilized formal production planning. In Project A, the CM prepared the project budget, schedules and other macro level specifications of the tasks to be completed by the subcontractors. On the other hand, the GC and the

subcontractors of Project B followed a formal process to identify detailed specifications of the tasks and the constraints to be removed in order for the execution of the project to proceed in a reliable fashion. The difference in approach toward planning of the two projects was reflected in the patterns of communication among the respective project participants. The unit of analysis of the case studies, subcontractor coordination meetings was used as stage to exchange information in both the projects. However, a lower frequency of sharing information and higher frequency of providing suggestions/opinions and offering commitments among participants in Project B signified the prevalence of mutual trust and common perceptions of problems and goal among the participants in comparison to that of Project A.

This chapter reviewed the safety and health programs of the two projects and reported the safety performance data. While the safety and the health programs in place for both the projects were well structured, Project B offered more opportunities for the project participants to interact and share information and suggestions. The positive effect of improved communication among the participants of Project B was demonstrated in the safety performance data.

Concept maps were used as means to illustrate the roles of communication among the project participants of the two projects based on qualitative analyses of the data. The concept maps were developed based on in-depth analyses of the two cases by using multiple sources of data, and analyses based on description and themes. To verify the generalizability of the results presented in this chapter within the setting studied, Project B was revisited. The summary of the data collected from Project B during the revisit and the resulting concept map are presented in Chapter five.

# **Chapter 5. Verification**

## **5.1 Introduction**

The research study focused on developing in depth analyses of two case studies, using multiple sources of data collection and qualitative analyses based on description and themes. No attempt was made to generate a representative sample of the cases, since the aim of the study was to produce analytical, rather than statistical generalizations. Thus, the findings of this study concerning the role of communication among the participants during construction planning that impact project safety performance could only be generalized within the settings studied.

However, to ensure the validity of description, triangulation of data sources was used, and use of more than one observer and coder increased the reliability of the study. Finally, the internal generalizability of the findings was tested by verifying the accuracy and correctness of the methodology used. The verification process involved revisiting Project B and replicating the methods utilized in the first two case studies to collect and analyze communication data. The intent was to verify whether using the same methodology in similar settings resulted in consistent data. This chapter presents the process of verification that includes the summary of the second set of data from Project B, and comparison with that of the previous set of data from the same project.

## **5.2 Case Study 2 – Revisit**

### **5.2.1 Data Collection**

The job site of Project B was revisited after a period of more than two months since the first set of data collection was complete. During the revisit, data was collected from two sequential

subcontractor coordination meetings referred as Meetings B4 and B5 in this document. As mentioned previously, the coordination meetings were scheduled weekly, and attended by the superintendent and field personnel of the GC, and the lead foremen of all the subcontractors involved in the project at the time of data collection. Similar methods as detailed in Chapter three were employed to collect data of communication among the participants of the coordination meetings. Like previous instance, observational data was collected by two observers and same two individuals were used for coding the transcripts. The following sections present the summary of data collected.

### **5.2.2 Descriptive Summary of Communication Data**

Data from Meetings B4 and B5 were used to verify the accuracy and correctness of the methodology employed in the research study. As the same individuals were involved in collecting the observational data as well as coding the transcripts, they were well aware of the contextual meaning of the communication and their judgment during coding did not entirely depend on the literal meaning of the transcripts. The inter-coder reliability for each of the meetings was calculated presented below, followed by the descriptive summary of the data.

#### **Inter-Coder Reliability**

Simple percentage agreement of occurrences between the two coders was calculated for both the meetings. The percentage agreements between the coders for the Meetings B4 and B5 were respectively 90.2%, and 92.04%. Considering 80% and above as acceptable, the percentage agreements between the coders in both the meetings were acceptable.



In addition, Cohen’s kappa ( $\kappa$ ) for each of the two meetings was also calculated. The  $\kappa$  value for Meetings B4 and B5 were 0.93 and 0.96 respectively. On both occasions, the coders exhibited excellent agreement, as  $\kappa$  value of 0.75 and above represents excellent agreement.

**Frequencies of Communication Categories**

The summary of the communication data collected from the Meetings B4 and B5 has been presented in this section. The frequencies of the communication categories and brief analyses of the trends are reported.

**Meeting B4**

Table 5-1 provides summary of the communication categories observed in Meeting B4. In aggregate 431 thought units were observed in this meeting spanning 65 minutes (continuous). The transcript of the meeting is attached in Appendix G. There was considerable amount of informal discussion among the participants prior to the start of the meeting, which involved the representatives of the GC and the foremen of the subcontractors. Topics of discussion were diverse and conversations within the subgroups were loud. The meeting was conducted in a formal and structured manner; previous weeks’ meeting minutes, look-ahead schedule, and weekly work plan were circulated at the beginning of the meeting.

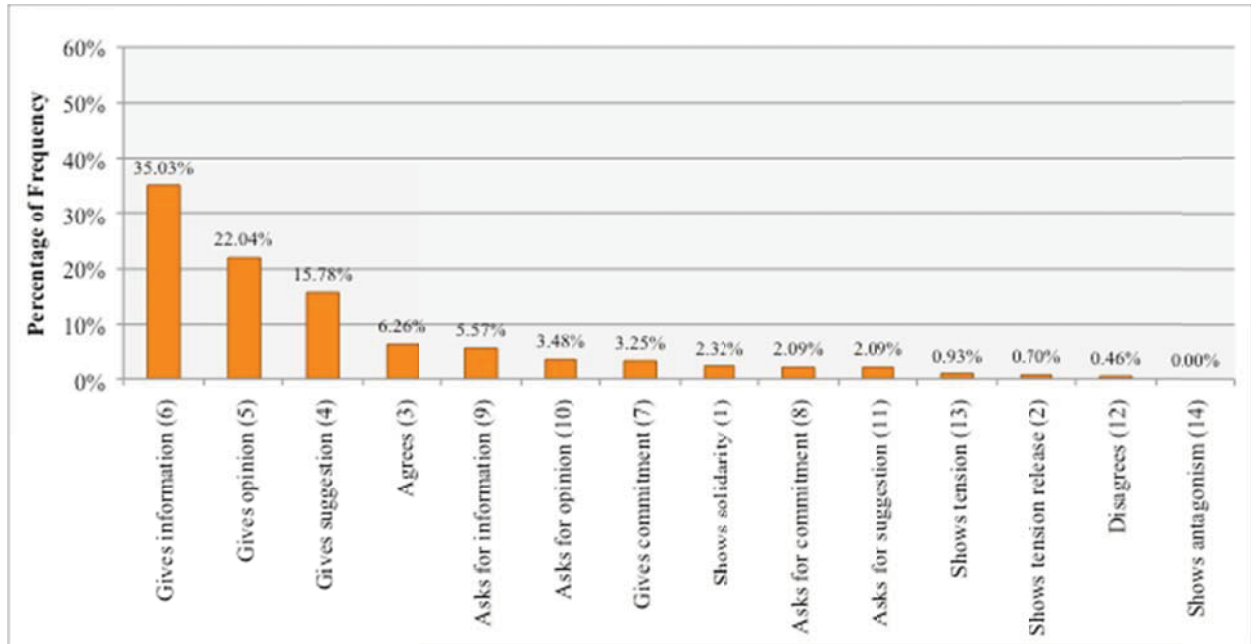
**Table 5-1:** Communication categories for Meeting B4

Categories	Units of Thought	
	Frequency	Percentage
Shows solidarity (1)	10	2.32
Shows tension release (2)	3	0.70
Agrees (3)	27	6.26

Categories	Units of Thought	
Gives suggestion (4)	68	15.78
Gives opinion (5)	95	22.04
Gives information (6)	151	35.03
Gives commitment (7)	14	3.25
Asks for commitment (8)	9	2.09
Asks for information (9)	24	5.57
Asks for opinion (10)	15	3.48
Asks for suggestion (11)	9	2.09
Disagrees (12)	2	0.46
Shows tension (13)	4	0.93
Shows antagonism (14)	0	0.00
Total Units of Thought	431	100

Figure 5-1 represents the individual and cumulative frequencies of the communication categories of Meeting B4. The bar graph shows that the most frequently occurred communication category was ‘gives information’ (35.03%) followed by ‘gives opinion’ (22.04%) and ‘gives suggestion’ (15.78%). These three categories comprised majority of the communication categories for Meeting B4 (72.85%). The other eleven communication categories added up to 27.15%. Among these, ‘shows antagonism’ did not occur at all. The categories that occurred very infrequently are ‘disagrees’ (0.46%), ‘shows tension release’ (0.70%) and ‘shows tension’ (0.93%) that comprised mere 2.09% of the total number of communication categories. When examined in terms of task-based communication (categories 4-11) and relational communication (categories 1-3 and 12-14), the amount of relational communication (10.67%) is much lower in comparison to task-based communication (89.33%). However, within relational communication, positive

relational communication (categories 1-3: 9.28%) occurred more frequently in comparison to negative relational communication (categories 12-14: 1.39%).



**Figure 5-1** : Frequency of communication categories for Meeting B4

**Meeting B5**

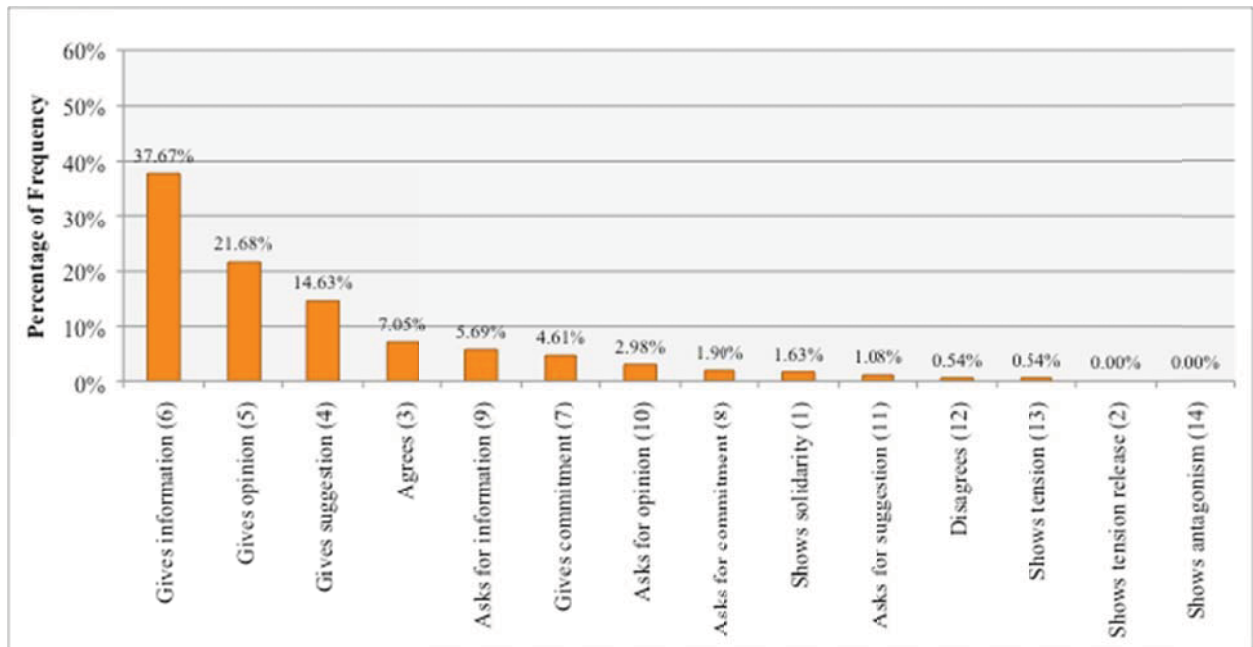
Summary of the communication categories observed in Meeting B5 is presented in Table 5-2. A total of 369 thought units were observed in this meeting spanning 55 minutes (continuous). The transcript of the meeting is attached in Appendix H. Similar to Meeting B4, informal discussion was noticed among the participants both prior to and after the meeting. All the participants including the representatives of the GC were involved in the informal discussion. The meeting was conducted in a formal and structured manner; previous week’s meeting minutes was circulated at the beginning of the meeting. The look-ahead schedule was not distributed due to the presence of identifiable errors.

**Table 5-2:** Communication categories for Meeting B5

Categories	Units of Thought	
	Frequency	Percentage
Shows solidarity (1)	6	1.63
Shows tension release (2)	0	0.00
Agrees (3)	26	7.05
Gives suggestion (4)	54	14.63
Gives opinion (5)	80	21.68
Gives information (6)	139	37.67
Gives commitment (7)	17	4.61
Asks for commitment (8)	7	1.90
Asks for information (9)	21	5.69
Asks for opinion (10)	11	2.98
Asks for suggestion (11)	4	1.08
Disagrees (12)	2	0.54
Shows tension (13)	2	0.54
Shows antagonism (14)	0	0.00
Total Units of Thought	369	100

Bar graph in Figure 5-2 shows the individual and cumulative frequencies of the communication categories of Meeting B5. The most frequently occurring communication category was ‘gives information’ (37.67%) followed by ‘gives opinion’ (21.68%), and ‘gives suggestion’ (14.63%). These three categories comprised majority of the communication categories for Meeting B4 (73.98%). The other eleven communication categories added up to 26.02%. Among these, ‘agrees’, ‘asks for information’, and ‘gives commitment’ occurred 7.05%, 5.69%, and 4.61% respectively. Category 14 ‘shows antagonism’ and category 2 ‘shows tension release’ did not occur at all during the meeting, and ‘shows tension’ (0.54%) was the least frequent category.

When examined in terms of task-based communication (categories 4-11) and relational communication (categories 1-3 and 12-14), the occurrence of task-based communication (90.24%) is much higher in comparison to relational communication (9.76%). Within task-based communications, communication related to attempted responses (categories 4-7: 78.59%) occurred more than six times than that of communication related to asking for responses (categories 8-11: 11.65%). Similarly, within relational communication, positive relational communication (categories 1-3: 8.68%) occurred substantially more than that of negative relational communication (categories 12-14: 1.08%).



**Figure 5-2** : Frequency of communication categories for Meeting B5

**Communication Categories and Consistency Across Meetings**

The aggregate data of communication from Meetings B4 and B5 are presented in Table 5-3. The most frequently occurring thought unit across the two meetings was category 6 ‘gives information’ (36.25%). The other categories that occurred frequently were ‘gives opinion’

(21.88%), and ‘gives suggestion’ (15.25%). ‘Shows antagonism’ did not occur in any of the meetings, and ‘shows tension release’ (0.38%), ‘disagrees’ (0.50%), and ‘shows tension’ (0.75%) were some of the rarely occurring categories during the meetings.

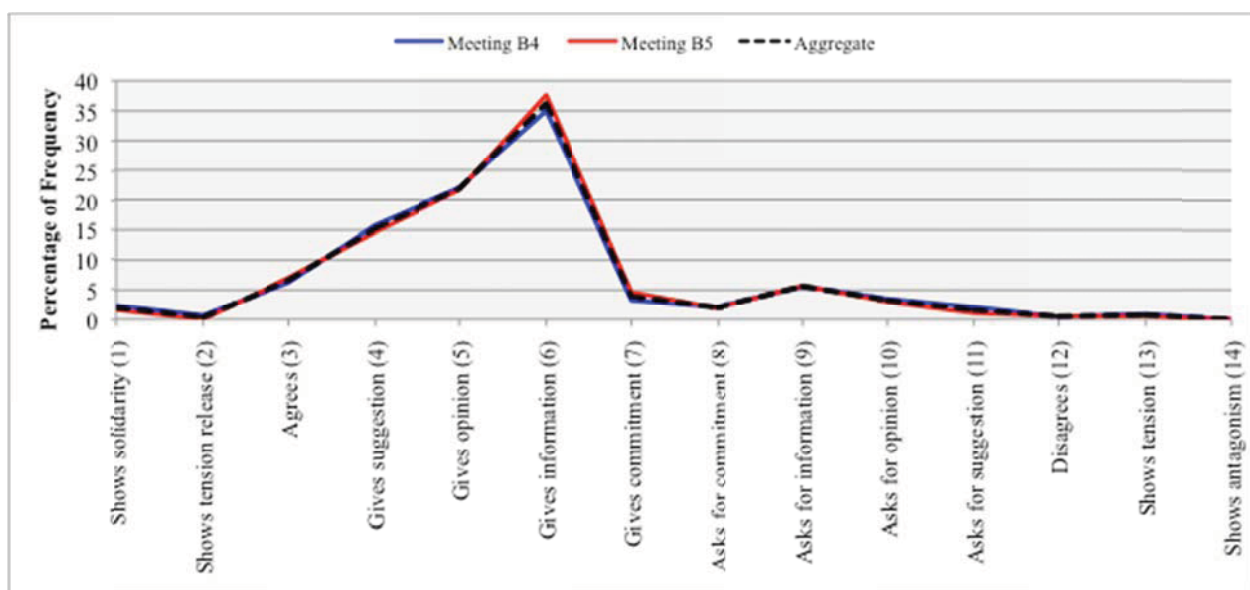
In terms of phases, the task-based communication categories (categories 4-11: 89.77%) were significantly higher than that of relational communication categories (categories 1-3 and 12-14: 10.23%). Within task-based communications, attempted answer (categories 4-7: 77.26%) occurred much frequently in comparison to requesting response (categories 8-11; 12.51%). Within relational communication categories, occurrences of positive relational communication (categories 1-3: 9.01%) were higher in comparison to negative relational communication (categories 12-14: 1.22%).

**Table 5-3:** Communication categories of Meetings B4 and B5

Categories	Units of Thought		
	Meeting B4 N (%)	Meeting B5 N (%)	Aggregate N (%)
Shows solidarity (1)	10 (2.32)	6 (2.17)	16 (2.00)
Shows tension release (2)	3 (0.70)	0 (0.00)	3 (0.38)
Agrees (3)	27 (6.26)	26 (7.05)	53 (6.63)
Gives suggestion (4)	68 (15.78)	54 (14.63)	122 (15.25)
Gives opinion (5)	95 (22.04)	80 (21.68)	175 (21.88)
Gives information (6)	151 (35.03)	139 (37.67)	290 (36.25)
Gives commitment (7)	14 (3.25)	17 (4.61)	31 (3.88)
Asks for commitment (8)	9 (2.09)	7 (1.90)	16 (2.00)
Asks for information (9)	24 (5.57)	21 (5.69)	45 (5.63)
Asks for opinion (10)	15 (3.48)	11 (2.98)	26 (3.25)
Asks for suggestion (11)	9 (2.09)	4 (1.08)	13 (1.63)

Categories	Units of Thought		
	Meeting B4 N (%)	Meeting B5 N (%)	Aggregate N (%)
Disagrees (12)	2 (0.46)	2 (0.54)	4 (0.50)
Shows tension (13)	4 (0.93)	2 (0.54)	6 (0.75)
Shows antagonism (14)	0 (0.00)	0 (0.00)	0 (0.00)
<b>Total</b>	<b>431 (100)</b>	<b>369 (100)</b>	<b>800 (100)</b>

The individual communication data of the two meetings when plotted in a line graph showed almost identical trend (Figure 5-3). The dashed line in Figure 5-3 denotes the cumulative frequency of the communication categories for Meetings B4 and B5. The overlapping of the individual communication profiles of the two meetings illustrates the consistency of the occurrences of communication categories across the meetings.



**Figure 5-3** : Individual and aggregate communication profiles of Meetings B4 and B5

### **Frequency of Interacts**

As mentioned previously, interact is a set of two continuous units of thought. Simple frequencies of interact for Meetings B4 and B5 has been calculated and presented in Table 5-4. In addition, the table also reports whether the consecutive units of thought were voiced by the same participant (monologue) or different participants (dialogue).

In both the meetings, ‘gives information-gives information’ (monologue: 10.03%; dialogue: 6.89%) were the two most frequently occurring interacts. Other frequently occurring interacts included: ‘asks for information-gives information’ (9-6, dialogue: 6.02%), ‘gives information-agrees’ (6-3, dialogue: 5.14%), and ‘gives information-asks for information’ (6-9, dialogue: 4.51%). The interacts are listed in descending order of their frequency in Table 5-4. Interacts having frequency less than 1% in the aggregate have been grouped as ‘infrequent interacts’.

As evident from Table 5-4, the higher frequency interacts are task-based and mostly included ‘gives information’ (category 6), gives opinion (category 5), gives suggestion (category 4), and ‘asks for information’ (category 9). Frequently occurring interacts with component of relational communication include ‘gives information-agrees’ (6-3, monologue: 5.14%) and ‘agrees-gives information’ (3-6, dialogue: 2.38%). Another significant observation is the predominance of dialogues among the frequently occurring interacts, which indicates that the participants were actively engaged in communication.



**Table 5-4** : Frequently occurring interacts of Meetings B4 and B5

<b>Category Pairs</b>	<b>Monologue/ Dialogue</b>	<b>Meeting B4 N (%)</b>	<b>Meeting B5 N (%)</b>	<b>Aggregate N (%)</b>
GI – GI (6-6)	M	41 (9.53)	39 (10.60)	80 (10.03)
GI – GI (6-6)	D	27 (6.28)	28 (7.61)	55 (6.89)
AI – GI (9-6)	D	24 (5.58)	24 (6.52)	48 (6.02)
GI – AG (6-3)	D	24 (5.58)	17 (4.62)	41 (5.14)
GI – AI (6-9)	D	22 (5.12)	14 (3.80)	36 (4.51)
GS – GI (4-6)	M	16 (3.72)	18 (4.89)	34 (4.26)
GI – GS (6-4)	M	16 (3.72)	17 (4.62)	33 (4.14)
GI – GS (6-5)	M	20 (4.65)	12 (3.26)	32 (4.01)
GS – GI (5-6)	M	19 (4.42)	9 (2.45)	28 (3.51)
AG – GI (3-6)	D	15 (3.49)	4 (1.09)	19 (2.38)
GS – GI (5-6)	D	7 (1.63)	12 (3.26)	19 (2.38)
GI – GS (6-5)	D	9 (2.09)	8 (2.17)	17 (2.13)
GI – GS (6-4)	D	9 (2.09)	7 (1.90)	16 (2.01)
AG – GI (3-6)	M	4 (0.93)	10 (2.72)	14 (1.75)
GS – GI (4-6)	D	11 (2.56)	3 (0.82)	14 (1.75)
GS – GS (4-4)	M	11 (2.56)	2 (0.54)	13 (1.63)
GO – GO (5-5)	M	8 (1.86)	3 (0.82)	11 (1.38)
GO – GS (5-4)	M	7 (1.63)	3 (0.82)	10 (1.25)
GS – AG (4-3)	D	4 (0.93)	4 (1.09)	8 (1.00)
GO – GO (5-5)	D	7 (1.63)	1 (0.27)	8 (1.00)
Infrequent interacts (occurring < 1% in aggregate)				262 (32.83)
AG = Agrees; GS = Gives Suggestion; GO = Gives Opinion; GI = Gives Information; AI = Asks for Information				

### 5.2.3 Comparison of Communication Data Between Meetings B1-B3 and B4-B5

To verify the consistency of the communication data collected by employing similar methodology within same settings, the two sets of communication data from Project B collected with a time gap of two months were compared (Table 5-5). Both sets of data showed similar trend: ‘gives information’ occurring most frequently followed by ‘gives opinion’ and ‘gives suggestion’. Vast majority (B1-B3: 79.15%; B4-B5: 77.26%) of the communication was based on task-based communication categories related to attempted answer (categories 4-7). The occurrences of task-based communication related to requesting responses (categories 8-11) in both the datasets (B1-B3: 10.24%; B4-B5: 12.18%) were comparable. In both the data sets, the least frequently occurring communication categories were that of negative relational communication (categories 12-14).

In addition to comparing the aggregate of the two datasets, Table 5-5 lists the range of frequency for each of the categories of Meetings B1-B3 and ascertains whether the frequencies of Meetings B4-B5 lie within the range. Frequencies of more than 70% of the communication categories of Meetings B4-B5 lie within the range of the respective categories of B1-B3, verifying the concurrent validity of the protocol used in this research study to collect and analyze communication data.

**Table 5-5** : Comparison of communication categories of Meetings B1-B3 & B4-B5

Categories	Units of Thought			Note*
	Aggregate B1-B3 N (%)	Range of B1-B3 %	Aggregate B4-B5 N (%)	
Shows solidarity (1)	27 (1.95)	1.17-2.35	16 (2.00)	Within
Shows tension release (2)	10 (0.72)	0-1.41	3 (0.38)	Within

Categories	Units of Thought			Note*
	Aggregate B1-B3 N (%)	Range of B1-B3 %	Aggregate B4-B5 N (%)	
Agrees (3)	81 (5.84)	5.07-7.06	53 (6.63)	Within
Gives suggestion (4)	225 (16.23)	14.82-17.09	122 (15.25)	Within
Gives opinion (5)	314 (22.66)	19.53-25.64	175 (21.88)	Within
Gives information (6)	522 (37.66)	35.68-41.18	290 (36.25)	Within
Gives commitment (7)	36 (2.60)	1.83-3.06	31 (3.88)	Higher
Asks for commitment (8)	21 (1.52)	1.01-2.35	16 (2.00)	Within
Asks for information (9)	67 (4.83)	3.04-8.24	45 (5.63)	Within
Asks for opinion (10)	34 (2.45)	1.62-3.21	26 (3.25)	Higher
Asks for suggestion (11)	20 (1.44)	0.85-1.83	13 (1.63)	Within
Disagrees (12)	1 (0.07)	0-0.24	4 (0.50)	Higher
Shows tension (13)	28 (2.02)	1.28-2.64	6 (0.75)	Lower
Shows antagonism (14)	0 (0.00)	0-0	0 (0.00)	Within

*\* The column indicates whether the aggregate value of B4-B5 lie within the range of B1-B3 for respective communication categories*

In spite of the consistent trends of communication between the two datasets, the few categories of Meetings B4-B5 that lie outside the range include category 8 ‘gives commitment’ (higher), category 10 ‘asks for opinion’ (higher), category 12 ‘disagrees’ (higher), and category 13 ‘shows tension’ (lower). Variances of categories 8, 10, and 13 from the range can be attributed to the development of the group and increase of mutual trust among the group members. The higher occurrence of ‘disagrees’ was due to increased brainstorming among the participants during the coordination meetings.

After focusing on the emergent trends of the communication categories across the two datasets, the frequently occurring interacts were also compared (Table 5-6). Both the datasets showed predominance of the use of category 6 ‘gives information’, category 5 ‘gives opinion’, and category 4 ‘gives suggestion’ in various sequential combinations. The consistency of the datasets are also illustrated by the high prevalence of ‘dialogue’ among the frequent interacts. Out of the 15 most frequently occurring interacts in each of the datasets, eight in Meetings B1-B3 and nine in Meetings B4-B5 were dialogues.

**Table 5-6 :** Comparison of frequent interacts observed during Meetings B1-B3 and B4-B5

#	Meetings B1-B3	Monologue/ Dialogue	N (%)	Meetings B4-B5	Monologue/ Dialogue	N (%)
1	GI – GI (6-6)	M	178 (12.92)	GI – GI (6-6)	M	80 (10.03)
2	GI – GO (6-5)	M	104 (7.55)	GI – GI (6-6)	D	55 (6.89)
3	GO – GI (5-6)	D	77 (5.59)	AI – GI (9-6)	D	48 (6.02)
4	GI – GS (6-4)	M	66 (4.79)	GI – AG (6-3)	D	41 (5.14)
5	GS – GI (4-6)	D	59 (4.28)	GI – AI (6-9)	D	36 (4.51)
6	GS – GO (4-5)	M	53 (3.85)	GS – GI (4-6)	M	34 (4.26)
7	GO – GS (5-4)	M	51 (3.70)	GI – GS (6-4)	M	33 (4.14)
8	GO – GO (5-5)	M	45 (3.27)	GI – GS (6-5)	M	32 (4.01)
9	AI – GI (4-6)	D	40 (2.90)	GS – GI (5-6)	M	28 (3.51)
10	GI – GI (6 -6)	D	37 (2.69)	AG – GI (3-6)	D	19 (2.38)
11	GS – GS (4-4)	M	35 (2.54)	GS – GI (5-6)	D	19 (2.38)
12	GO – GI (5-6)	D	32 (2.32)	GI – GS (6-5)	D	17 (2.13)
13	GO – GO (5-5)	D	25 (1.81)	GI – GS (6-4)	D	16 (2.01)
14	GO – AG (5-3)	D	23 (1.67)	AG – GI (3-6)	M	14 (1.75)
15	AG – GI (3-6)	D	20 (1.45)	GS – GI (4-6)	D	14 (1.75)

#	Meetings B1-B3	Monologue/ Dialogue	N (%)	Meetings B4-B5	Monologue/ Dialogue	N (%)
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AG = Agrees; GS = Gives Suggestion; GO = Gives Opinion; GI = Gives Information; AI = Asks for Information

### 5.3 Chapter Summary

As the study focused on specific aspects of communication and their impact on safety performance based on two case studies, it was not possible to generalize the findings of the study across settings. Thus, it was more appropriate to verify the generalizability of the findings within the boundary of the settings studied. Internal generalizability, and to a large extent trustworthiness of qualitative studies are dependent on the accuracy of the research methods employed. The goal of this chapter was to verify the accuracy of the research methodology adopted in this study. A second set of data was collected from Project B and compared with that of the first set. Comparison of the two datasets showed significant similarities with very less variations. The variations were indicative of improved communication and can be attributed to development of the group due to working together for a longer time. Most importantly, the emergent trends of communication among the participants of Project B such as information dissemination in combination with exchange of suggestions and opinions, exchange of commitments and increased occurrence of dialogues were consistently captured in both the datasets. The consistency of the two datasets provides support in favor of the accuracy of the methodology used in the research study.

# Chapter 6. Conclusion

## 6.1 Introduction

The goal of the research study was to *understand the role of communication during formal construction production planning and explore the impact on occupational incidents.*

The author was interested in understanding: (i) the role of communication among the participants of construction project during formal production planning, and (ii) how communication among the participants during formal production planning actually impacts the safety performance of the project.

In order to explore the role of communication among the participants during formal production planning, two construction projects having analogous characteristics were studied. However, approaches toward planning in the two cases differed. The results were analyzed in an effort to understand common patterns of communication salient to formal production planning.

Examination of the emergent trends in perspective of the underlying theories of communication has been presented in this chapter. In addition, the chapter sheds light on how communication during production planning increased safety awareness among the participants that impacted the project safety performance.

### 6.1.1 Summary of Findings

Table 6-1 summarizes the findings of the research study.

**Table 6-1 : Summary of findings of the research study**

<b>Proposition</b>	<b>Research Question</b>	<b>Objectives Accomplished</b>	<b>Overall Outcome</b>
<p>Communication levels afforded by the participants during formal production planning are the main reasons for arriving at lower incidence rates</p>	<p>RQ # 1: How can communication be assessed among group members in the construction industry?</p>	<p>Documented the chronological advancement of underlying concepts and theories of communication among group members by examining the historical, theoretical, and methodological issues pertaining to the discipline (Chapter 2)</p>	<p>Identified IPA as the instrument to assess communication among group members in construction environment. Used an adapted version of the instrument for the research study (Table 3-2)</p>
		<p>Reviewed methods and existing instruments to assess communication among group members. Selected Bales' IPA as the protocol to be used for the research study (Chapter 3)</p>	
		<p>Tested IPA in the preliminary case study. Modified the original coding scheme by adding two codes to the existing list: 'gives commitment' and 'asks for commitment' (Chapter 3)</p>	
	<p>RQ # 2: What is unique about the communication in formal production planning, which leads to reduced incidence rate?</p>	<p>Conducted in depth analysis of two case studies to identify uniqueness of communication during formal production planning in comparison to traditional project planning (Chapter 4)</p>	

Proposition	Research Question	Objectives Accomplished	Overall Outcome
			<p>suggestions or directions by displaying higher degree of agreement, and (6) demonstrated greater involvement by engaging in frequent dialogues with others</p>
		<p>Computed and compared the safety performances of the two projects selected for case study (Chapter 4)</p>	<p>The project using formal production planning showed a better safety performance in comparison to the project utilizing traditional project planning. This trend provided support in favor of the research proposition (Table 4-17)</p>
	<p>RQ # 3: How can the findings of Research Question 2 be translated to describe communication during formal production planning?</p>	<p>Concept maps were developed based on the findings to illustrate the process of communication among the participants (Chapter 4)</p>	<p>The concept maps graphically illustrated the role of communication among the participants of the two projects, one utilizing formal production planning and the other utilizing traditional project planning (Figures 4-6/ 4-12)</p>



## 6.2 Discussion

The first research question focused on the uniqueness of communication among the project participants during formal production planning (Project B) and how it differed from that of traditional project planning (Project A). Several points came to the forefront from the cross case comparison presented in Chapter four that illustrated the emergent themes of the communication among the participants during formal production planning: less amount of background information needed to get oriented to the discussion, showed more sensitivity and higher degree of control by frequently providing suggestions/ opinions, forthcoming in exchange of commitments, showed increased sincerity by declining inquiry for commitments in case of conflict of interest, showed acceptance and faith on others suggestions or directions by displaying higher degree of agreement, and demonstrated greater involvement by engaging in frequent dialogues with others.

### **Information Dissemination**

One of the clear findings of this research study was the high level of information dissemination (category 6) statements prevalent across all the meetings of both the projects. Bales' (1950) suggested that occurrence of 'gives information' should be higher than other categories, but the proportional distributions in the research study are higher than Bales' prediction. Not surprisingly, this resulted in the interacts and 3-interact sequences to be heavily influenced by the presence of 'gives information' thought units.

The predominance of 'gives information' categories can be both positive and problematic. One of the benefits of having higher frequencies of 'gives information' is that it suggests group members were sharing large amount of information pertinent to the tasks. Though the

predominance was evident in both the projects, a much higher proportion of ‘gives information’ in Project A indicates that more information were presented to aid understanding and help participants follow the issues associated with the problems being discussed. The need for more information by the participants of Project A was emphasized by the disproportionately higher occurrence of ‘asking for information’ (Project A: 19.57%; Project B: 4.83%). Clearly, the participants of Project A had inadequate knowledge about the project due to the lack of involvement during the planning process that hindered the development of a common understanding about the project. The claim is supported by the study conducted by Gameson (1992), which posits that when all the participants are knowledgeable about the project, a higher use of ‘gives opinion’ (category 5) is observed in comparison to ‘gives information’ (category 6). The reason being with knowledgeable participants, others have to provide less information and more explanations and reasoning.

In addition, the predominance of dissemination of information and lower occurrence of other categories shows that information was not openly evaluated or critiqued, it was simply being presented. There were less thought units in Project A asking for an evaluation of information, suggesting possible conflict avoidance (Emmitt and Gorse 2007). As a general observation, coordination meetings of Project A struggled without proper suggestion/opinion explicitly stated for the benefit of all. Bales (1953) argued that group members should ask for such evaluation if it is not present.

### **Exchange of Suggestion/Opinion**

Traditional planning approach adopted in Project A prevented the development of mutual trust among the project participants, which was reflected in the low occurrence of suggestions and

opinions among them. Both ‘gives suggestion’ (Project A: 10.81%; Project B: 16.23%) and ‘gives opinion’ (Project A: 7.36%; Project B: 22.66%) were used more frequently by the participants of Project B. One possible explanation for the low occurrences of ‘gives suggestion’ and ‘gives opinion’ in Project A could be that the decisions for many of the issues were not up for debate, but were simply being introduced to the group. Decisions were made previously by the personnel of the CM without the opinions of others.

Higher occurrences of ‘gives suggestion’ and ‘gives opinion’ in Project B suggest that when participants were debating problems (brainstorming) or making decisions, they shared significantly less information about the project. When offering suggestions, the participants gave directions that others ought to take. Suggestions and directions are relatively assertive statements when compared to opinions and information (Emmitt and Gorse 2007). Thus, a continuum of sensitivity and degree of control was required that developed among the participants of Project B due to common understanding, support and mutual trust among them. In addition, unlike Project B where all the participants were engaged in providing suggestions/opinions to each other, it was restricted to a handful of participants in Project A; mostly personnel of the CM were actively offering suggestions/opinions.

### **Acceptance and Decline of Commitment**

Overtly there is not much difference in the occurrence of thought units for exchange of commitments between the two projects. However, participants of Project B were more forthcoming in the exchange of commitments. Exchange of commitment appeared to have been an important component of affiliation among the group members in that project. It can be argued that the exchange of frequent commitments among participants of Project B resulted from the

mutual trust and vice versa. Fulfillment of needs related to tasks also generates group cohesiveness and trust (Argyle 2007). Formal production planning adopted in Project B ensured the preference of group success among participants above personal preferences. Another interesting observation was the ability to decline request for commitments by the participants of Project B. This suggests that the participants were autonomous in their decisions, and decisions were not afflicted on the group by the GC. Moreover, it also showed that the participants had the responsibility to trigger actions (declining commitment when asked to perform beyond capacity is an important action). According to Flores (1982) declining request for commitment is as important as accepting, since it brings forth the disclosing nature of the participants to enhance understanding of the project and its delivery.

Based on the observations of the research study, it is evident that participants involved in both the projects (Projects A and B) were involved in communication that led to commitments. Exchange of suggestions/ opinions by the participants provided the wherewithal for the establishment of commitments. Thus, at a broader level the extent of suggestions/ opinions exchanged among the participants of the two projects were indicative of the quantity of promises made and kept by the participants as these categories of communication helped in generating shared commitments among the participants. As previously mentioned, there was not substantial difference in the occurrence of thought units for exchange of commitments between the two projects (Project A: 2.97%; Project B: 4.12%). However, if exchange of suggestions and opinions are considered instrumental for the purpose of making commitments, the two projects studied exhibit marked difference. The combination of exchange of suggestion, opinion, and commitment for Project A was 23.15%, while that for Project B was 46.9%. This brings forth the

fact that the participants of Project B were much more involved in the process of exchange of commitment in comparison to the participants of the other project.

### **Involvement of Participants in Communication**

It is important to note that the participants of Project B were more actively involved in the discourse of the meetings than that of Project A. In other words, there was higher frequency of dialogues in Project B than that of Project A. Naturally, the meeting activities of Project A more often involved one person speaking for a long length of time. This required individuals to listen for extended periods of time, and from personal viewpoint appeared boring to the author. It can be argued that the trend of extended speaking turns in Project A might had deterrent effect on the involvement of the participants, as scholars have identified the discouraging effect of public meetings with single orator on public participation (Innes and Booher 2004).

### **Relational Communication**

There was low frequency of relational categories throughout the meetings. In both the projects, participants avoided negative relational comments unless the situation explicitly suggested they were appropriate. Bales' (1950) discussion of IPA suggests that the purpose of communication dictates the amount of task-based and relational categories. Specifically, it is observed that relationally oriented purposes will show more relational categories than task-based categories (Pena and Hancock 2006). The findings of the study support the claim; both Project A (categories 1-3 and 12-14: 9.41%) and Project B (categories 1-3 and 12-14: 10.6%) demonstrated an exceedingly low occurrence of relational communication. However, within primarily task oriented groups, relational issues are related to task issues in crucial ways. Groups cannot

accomplish their objectives or maintain the cohesiveness solely through task related communication (Keyton 1999).

While comparing the two projects, it was evident that Project B exhibited higher positive relational communication (Project A: 3.89%; Project B: 8.51%) and lower negative relational communication (Project A: 5.54%; Project B: 2.09%) in comparison to Project A. The higher occurrence of negative relational communication could have adverse implications on future communication of Project A. Gouran and Hirokawa (1996) provide support for this argument when they note that task-based function of a group can be constrained by the deterioration of relationships among the participants. The higher frequency of positive relational communication demonstrated by the participants of Project B facilitated the development of positively inclined relational outcomes, such as support, mutual trust, cohesiveness in a cyclical fashion. Indeed, Keyton (1999) suggested that relational outcomes affect subsequent tasks and relational communication, which, in turn affect subsequent relational processes, and so forth.

### **Evaluation of Findings from Systems Perspective**

One of the most dominant constructs applied to study of communication in small groups is Systems Perspective (Mabry 1999). It started with Lewin's (1945) movement to scientifically study groups based on group dynamics, modeled in part on theories of Physics. The concept of group dynamics was reflective of Systems Perspective, which considered entities to be composed of interlinked elements, and any alteration in the property of one element would predictably alter the properties of other linked elements (Mabry 1999). Within the realm of group communication, Systems Perspective showed evidence that changes in particular characteristics of groups are systematically related to changes in other characteristics (Wilson 1998).

Evaluating the communication among the participants of the two projects based on principles derived from Physics, the findings support that the participants of construction project could be perceived as purposive actors within a social system. As a social system is based on coherence, common understanding and common goal, the participants of the projects connected with network of communication demonstrated similar characteristics. Within this theory, networks, as concept derived from social mechanics, typically are explained as connections formed among system elements (Mabry 1999). The participants acted as an integrated assembly of elements held together in an equilibrated state as a function of their mutual relatedness and interdependence. In this state of equilibrium, when one element was altered (for example, different approach toward planning adopted in the two projects), it reflected a change in other characteristics of the group (for example, motivation and cohesiveness among participants), providing support to the claim of Systems Perspective.

As mentioned previously in Chapter two, one group of scholars during 1950s and 1960s focused their attention toward investigating communication sequences (dynamics), which was consistent with Systems Perspective. However, based on the findings, the scholars were divided into two schools of thought. While scholars such as Bales and Strodtbeck (1951) stated that communication sequences among group members were predictable and follow a linear fashion, Scheidel and Crowell (1964, 1966) concluded that discussion does not follow a linear fashion. Findings of the research study provide support in favor of Bales and Strodtbeck (1951). Data collected from the sequential meetings on three occasions during the study support that communication sequences were predictable and followed a linear fashion.

### **Impact of Communication on Safety Performance**

The second research question focused on the impact of social communication during formal production planning process on safety performance of the project. During discussion with the participants of Projects A and B, it was found that there was a high degree of ignorance about safety rules and regulations among the workers, and the temptations to defy the most simple safe practices were prevalent. This was partially due to the inability to inform individuals about their obligations regarding safety. The other practices that affected safety consciousness among the workers were: lack of accountability, failure to integrate safety into management decisions, and poor communication of safety related information to workers. The observational data and information collected from interviews provided more insights into the safety performance of the two projects.

The only health and safety issues that were discussed during the subcontractor coordination meetings of Project A were related to incidents that had occurred since the previous meeting. In contrast, during the coordination meetings of Project B attention was given to the steps followed to accomplish any task and resource allocated. Within the formal process of production planning, participants followed the standard procedure of constraint analysis to ensure that practices were safe and proper equipment and adequate resources were allocated. Exchange of information, opinions, and commitments among the participants played a critical role in the whole process. It was the correctness of the information, sincerity of the opinions, and reliability of the commitments that decided the proper and safe execution of the tasks.

Project B did not adopt a reactive approach toward safety by providing updates of past incidents. The participants took up a proactive approach by emphasizing on information exchange,



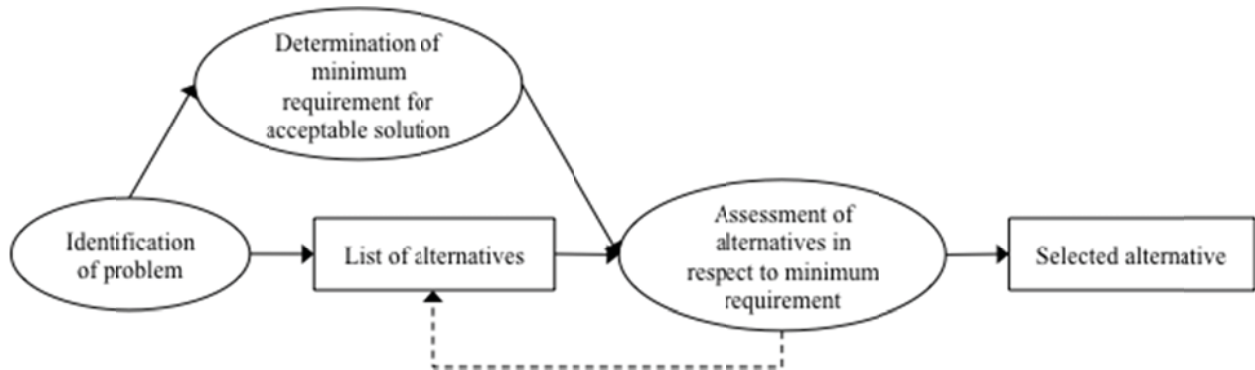
ensuring health and safety procedures were communicated, and safety was considered when designing production plans thus helping to improve awareness and reducing incidents. Moreover, information related to safety provided during the orientation meetings and weekly safety meetings could well be forgotten when engaging in work at later stages of the project. Discussion of the safety aspect of the tasks during the coordination meetings revitalized the necessary information among the participants. The use of daily huddle meetings also helped to improve the safety performance of Project B by providing opportunity feedback and face-to-face communication among the workers to discuss imminent safety issues related to the day's work.

### **Evaluation of Findings from Perspective of Functional Theory**

As discussed in Chapter two, the basic premise of Functional Theory is that communications among the group members help in the completion of tasks and thus affect the outcome of the group. In other words, communication is the instrument by which members of the groups, with varying degree of success, reach decisions and generate solutions to problems (Gouran and Hirokawa 1996). The Functional Theory served as the theoretical foundation for the hypothesis of this research study: *communication levels afforded by the participants during formal production planning are the main reasons for arriving at lower incidence rates*. In context of this study, achieving lower incidence rate was the desired outcome of the groups.

According to the Functional theorists, the critical requirements of a task, as shown in **Figure 6-1**, are performed by group members (Gouran et al. 1993). Although, no two groups will arrive at the same decision in the same exact way, but satisfying the critical requirements increase the likelihood of their achieving desired outcomes. From the findings of the research study, it is

evident that participants of Project B could achieve the desired outcome better than that of Project A ( $RIR_{PROJECT B} < RIR_{PROJECT A}$ ).



**Figure 6-1** : Conceptual framework of Functional Theory

Incidentally, the process illustrated in **Figure 6-1** appears to be very close to what happened during the coordination meetings of Project B, providing support for the Functional Perspective. With the involvement of the participants in the formal production planning process, Project B adopted a proactive approach to identify problems or issues that might disrupt the workflow. The participants could recognize possible obstacles to be confronted during the formal constraint analysis process. Common understanding of the project along with frequent and sincere exchange of commitments among the participants helped in identifying the issues to be resolved. Next, they would determine the minimal requirement(s) that any alternative, to be acceptable must possess. Subsequently, the participants would identify a set of realistic alternatives based on the information and opinion presented by the multidisciplinary group members. The presented information was then evaluated and critiqued to examine the alternatives in respect to the agreed upon minimum requirements. The high amount of opinions and directions exchanged among the participants facilitated the evaluation of the alternatives. Although the desired outcome of

interest in context of this research study was better safety performance, the process remained the same for any other outcomes.

### **Summary**

Based on anecdotal evidence, the research study had hypothesized that: *communication levels afforded by the participants during formal production planning are the main reasons for arriving at lower incidence rates*. Accordingly, research goal was formulated to *understand the role of communication during formal construction production planning and explore the impact on occupational incidents*. Key findings from the case studies provided insight into the role of communication during formal production planning, and identified the common trends of communication among the participants involved in formal production planning. The emergent trends were compared with that of participants involved in traditional project planning to highlight the uniqueness of communication during production planning. In addition, data regarding safety performance from both the cases were collected and compared. Trend in support of the hypothesis was found: the project following formal production planning reported better safety performance than the project following traditional planning. The research study presented an exploratory account of the role of communication among the participants of production planning and supported the claim that it has beneficial impact on project safety performance.

#### **6.2.1 Theoretical Contributions**

The field of group communication and communication has received very little attention from researchers (Emmitt and Gorse 2003; Dainty et al. 2006; Emmitt and Gorse 2007), and despite communication among participants being a fundamental aspect of construction there appears to be very little evidence of applied research. One of the important contributions of this study is the

attempt to make communication comparisons across several meetings of two construction projects. While researchers have investigated specific aspect of communication during construction meetings such as flow of formal and informal information (Pietroforte 1992), patterns of communication among participants of construction projects in response to crisis (Loosemore 1996, 2000), and methodological aspects of investigating meeting (Hugill 2001), this study adopted an exploratory approach to decipher the role of communication among participants during construction planning process. This study will not only benefit the communication scholars, but also greatly benefit researchers in the field of construction. The findings provide a ‘meso’ level understanding for what is actually happening during communication among actors within a social setting.

Scholars have compared construction projects with social system (Macomber 2004; Andersen et al. 2008) and project participants as competitive or cooperative actors. Anecdotal evidences exist in favor of participants being cooperative within the production planning process due to their involvement and cooperation becoming self-enforcing strategy. Analyses of communication in this study demonstrated trend and behavioral evidence in support of their claims. Comparison of communication among the participants in two contrasting settings provided a better understanding of communication in context of the distinctive planning processes. The concept maps developed in this study offer framework of communication, which can be used by future researchers to expand and add unexplored concept spaces.

Scholars claim that formal production planning utilizing LPS\ helps in making workflow more reliable, which is a successful way to reduce the unexpected events that lead to incidents (Howell et al. 2002). Moreover, construction firms (such as MT Højgaard, Baker Concrete Construction, Inc, and many more) are claiming improvement in many areas including safety by adopting

production planning. However, to date minimal effort has been directed toward actually comparing the safety performance of similar projects, which differ in their planning mechanisms. This study advanced the claims of the scholars and the industry professionals, at the same time provided the groundwork for future research to investigate further.

Along with the extension of current theory, the study also contributed to the advancement of methodology to analyze communication. While the original coding scheme of Bales' (1950) IPA consisted of 12 categories, two more categories were added to the existing list in the present study. The two categories added are: 'gives commitment' and 'asks for commitment'. Exchange of commitment is an exclusive act and could not be captured by the existing coding scheme. The modification of the coding scheme is hoped to provide the necessary clarification. Operational definitions of the two categories were developed for this study, but can guide future researchers to utilize these two categories in their analyses as well.

### **6.2.2 Practical Contributions**

The findings of this project have wide ranging effects for construction professionals, as well as other application-oriented groups. The concept maps provide framework of communication that can be used by construction firms for evaluation and modification of their current processes. The framework can also be used for training purposes because instead of talking about or around communication during meetings, it can actually identify communication and portray in accordance with their functions. It provides a comprehensive understanding of how communication is fostered in formal production planning, and hopefully will increase the awareness of the firms still reluctant to adopt it. Formal production planning advocated by lean construction is a new way to think about and manage construction activities, and as any novel

ideas, these are also resisted. In so far as the production planning approach appears to coincide with current practice, construction firms often dismiss it as similar to their current practice. This increases the need for educating them. The findings of this study clearly illustrate the difference between formal production planning and traditional project planning highlighting the improvement of communication among the participants and safety performance of the project.

Finally, this study strengthens the link between theories of group communication and application. Meetings and other gatherings are prevalent across all industry sectors, and continuous efforts are being made to make them more effective and efficient. Similar efforts are also in place to improve the meetings of construction industry. This study provides an in depth understanding of how communication among the participants take place during the course of the meetings, and how communication shape the outcome of the meetings. It also provides a tool for the management to use that moves beyond looking at the outcomes and focuses on the processes that lead to the outcomes.

### **6.3 Delimitations of the Study**

- i. The sample of projects was delimited to vertical construction.
- ii. The sample was delimited to construction projects in the United States.
- iii. The sample was delimited to projects where English was the primary language for oral and written communication among the participants.

#### 6.4 Limitations of the Study

- i. The study was cross sectional and based on two cases. This limited the ability to establish cause and affect relationships between independent and dependent variables of the study, and only trend and pattern could be identified.
- ii. The sample chosen for the case studies was purposeful with similar project type, delivery method, nature of subcontracting, and construction height, but was polar opposite in approach as it relates to planning. However, data collected from the two projects during different phases of the entire construction process may have possibly introduced a potential threat to the validity of the findings.
- iii. The sensitivity of the information exchanged during the subcontractor coordination meetings of the selected projects forced to negotiate the degree of observation and method of recording communication. This meant that some degree of compromise on method was needed. For instance, video and audio recordings provide rich sources of data, but the participants of this research were reluctant to let such method be used. Using direct observation reduced the richness of the data collected, but could not be avoided.
- iv. As part of Bales' IPA used in this research study, the observers' perceptions of the communication was considered. The observers took the position of receiver rather than being blind to the group communication. In spite of using two observers/coders, some element of biases might have crept in when attributing meaning to the collected communication data.
- v. During the individual and focus group interviews, a variety of interviewee errors might have occurred. Faulty recollections, tendencies to exaggerate activities or

underplay events or perceptions, and inclinations to give answers that appear more 'socially desirable' are several reasons why an interviewee might have provided faulty information. To the extent that this has occurred, it would be a threat to the internal validity of the findings from this study.

## **6.5 Inferences from Observations**

The following inferences have been derived based on the limited observations from the two case studies selected for the research study.

- i. The GC/CM might consider looking beyond the project budget, schedule, and macro level specifications of tasks, and focus on following a formal process of production planning (as outlined in Section 2.3) to identify detailed specification of the steps to be followed and the constraints to be removed. The project participants can be encouraged to be part of the formal process of planning for prior consideration of how tasks will be executed with attention to safe practices and usage of proper equipment and allocation of adequate resources.
- ii. The involvement of the project participants in the formal production planning process will require additional engagement and responsibility on their part. Participants who are less informed about the process of formal production planning may be apprehensive and unwilling to spend the added time and effort to attend the pull sessions, prepare weekly work plan, calculate PPC, and so on. It was observed in Project B that the GC appended a section to the subcontractors' contract (Appendix P) to make it contractually binding for all the participants to take part in the formal production planning process. The GC/CM might consider using this approach.



- iii. The GC/CM are responsible for encouraging an environment of support and mutual trust among the project participants. Supportive environment will foster participants to provide feedback that helps in clarifications of issues where information is unclear or needs further explanation. Even if information is understandable, sometimes further clarification can help to reinforce the message. All the participants including the GC/CM should actively take part in discussion sessions and devote time to listen to others. Participants engaged in listening should give their full attention to the sender, providing non-verbal and verbal signals in response to the sent messages.
- iv. Feedback and formal face-to-face communication could be encouraged by the GC/CM to remove boundaries and barriers among the project participants. Participation of the workers in decision-making can improve upward communication and increase belongingness and accountability of the workers.
- v. The GC/CM might consider disseminating information regarding safety at an appropriate time. The initial orientation meetings at the start of a project or weekly safety meetings may cover all items of health and safety, but some specific issues may be forgotten when engaging in work during later stages of the project. Relevant safety information might be communicated to the workers prior to the commencement of the specific tasks. Brief daily start-up meeting involving all the workers can provide the opportunity to review the tasks that needed to be completed along with review of required safety equipment and practices.
- vi. Phasing of information can be a useful strategy for the GC/CM. Safety information should be provided during relevant planning functions. Information provided during long safety meetings can be lost due to distractions and also tendencies of selective

- listening found among attendees. Sometimes alternative setup such as workshops can have better result and help in getting the information across more efficiently.
- vii. Participants could be encouraged to consider the weekly progress meetings as platform to exchange suggestions, opinions, and commitments; not being limited to only exchange of information. Providing suggestions, opinions, and commitments require common understanding of the project objectives and goal.
  - viii. Participants might consider using positive relational communication more frequently (such as showing support and appreciation for others) during their communication with the group members. This helps in increasing the trust among the members, which increases the cohesiveness of the group. Members of a cohesive group are more likely to engage in exchange of suggestions and commitments.

## **6.6 Recommendations for Future Research**

- i. The current study was a cross sectional analyses of communication among the participants following traditional project planning and formal production planning. It would be beneficial for future communication analysis to focus on longitudinal studies of multiple projects to understand the effect of communication among project participants on safety performance of projects. In addition, future study can focus on validating the inferences derived in the current study based on observations by gathering feedback of construction professionals.
- ii. The focus of the current study was to explore the communication at the interface of the site personnel of the GC/CM and the foremen of the subcontractors. While it is the first level of information exchange between the management and the operatives, future studies can attempt to explore the transfer of information at the interface of

- foremen of the subcontractors and the direct workers. It will be beneficial to gain insights in the processes of upward communication within construction projects adopting traditional project planning and formal production planning. However, this can be difficult to measure considering the less formal structure of the events, fluid nature of the groups, and frequent use of construction jargons.
- iii. For the current study, categories of communication were the independent variables and safety performance was considered as the dependent variable. The present study can be expanded in future by considering other key performance indicators as dependent variables. Other key performance indicators can be in the form of construction cost, construction time, profitability, productivity, or client satisfaction. This will throw more lights on the impact of improved communications among the projects participants on key performance indicators of construction projects.
  - iv. This study made claims to the occurrence of certain patterns of communication during the course of communication. Unlike the use of coding schemes such as IPA, future studies can focus on speaking turns of the participants in order to investigate how individuals use messages to influence one another. This can be difficult, but can be approached by modifying the coding scheme to look at communication in meetings in terms of power and control. Moreover, future research can explore other methodological approach outside the realm of coding schemes. A multilevel observation, where the perception of the participants regarding the same communication will be considered may provide a better understanding of the communication process. This approach could be beneficial, as it will consider the perception of the participants who may not be vocal but active listeners.

## 6.7 Chapter Summary

Based on the analyses of communication in natural settings, this chapter compared the patterns of communication among the participants of two construction projects having contrasting approach toward planning. As a result of this communication analytic approach, insights were gained about the respective planning processes and variations in the use of task-based and relational communication by the participants of the projects. It came to forefront that weekly coordination meetings may lead to high amounts of information sharing, but participants of formal production planning are more likely to evaluate and critique the information in comparison to that of traditional project planning. Moreover, when critique is present, it is often embedded in longer sequences of communication that include offering suggestions/opinions along with sharing of information. Participants of formal production planning were also found more forthcoming in exchange of commitments, and showed sincerity in declining inquiry for commitment in presence of conflict of interests. Comparison of safety records between the two projects showed an improved performance by the project adopting formal production planning. Following this observation, argument was presented in favor of the beneficial role of communication among the project participants during formal production planning on the safety performance of the project. Due to limited sample size and cross sectional design of the study, no cause and effect relationship between communication among project participants and safety performance of the project identified. But most importantly, this study identified emergent patterns of communication among participants during formal production planning, and illustrated the trend of improved safety performance associated with the process.

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## Appendix A: Transcript of Meeting A1

*Date of observation was October 25<sup>th</sup>, 2010. Venue of the meeting was job site trailer set aside for meetings. The meeting started at 9:00am in the morning. There were 39 attendees in the meeting. The Project Manager of the project is number 1; 25, 33 and 34 were also employee of GC. The rest were subcontractors. The attendees started coming into the room 10 minutes prior to the start of the meeting. 11 said "hi" to everybody, but nobody responded. 8 and 9 were talking with each other, which neither of the observers could hear. 11 was found to be talking with 23. Attendees were talking in small groups of 2 or 3. Some were found talking over the phone.*

- 1 [1-0] All right, good morning every body. We will get started. Before I begin...ah...I just want  
2 to remind that I mentioned 3 weeks ago that we have a student from Virginia Tech here doing a  
3 study on survey of lean versus non lean construction... ah...safety aspect and that kind of thing.  
4 I have given everybody a copy of the...ah...the form you need to sign by each individual. Two  
5 weeks ago...I emailed you last week...sure everybody has brought their copies today. Does  
6 anybody here mind? Your name will not be referenced in the study, your company is not going  
7 to be used. Does anybody have any problem with that, being listened to? Just writing down  
8 notes.
- 9 [0-1] No.
- 10 [1-0] Ah...so please...I just passed out the form, or if you have it with you please sign it ... in  
11 the last page...and then...uh...drop off somewhere here before you leave. [1-0] Lets get going.
- 12 [1-0] Anybody has any safety issues?... ah...couple of things real quick...tickets...please make  
13 sure you turn in the tickets daily. Please don't add them all for four days, and then turn them all  
14 together, our memories aren't that great when it comes to signing tickets. Uh...please make sure  
15 they are taken care of.
- 16 [1-0] Ah...additional work...guys I put this in here because there seems to be a challenge out  
17 there and I am going to read of the statement...this is in everybody's contract. In the event that  
18 the contractor directs the subcontractor to perform extra or additional work, subcontractor agrees  
19 that it will promptly perform and diligently complete such work whether or not contractor and  
20 subcontractor have agreed on the cost of such work.
- 21 [1-0] I put it there for a reason.
- 22 [1-0] Can you figure out why?
- 23 [1-0] I will explain to you.
- 24 [1-0] Because we keep getting in the filed...oh...that is the extra work area...that is the extra  
25 work area...oh those two hoist rooms...that's later on or something.
- 26 [1-0] The hoist was there for benefit the entire time...its gone ...now we have to go ahead and  
27 wrap up the two rooms each floor.
- 28 [1-0] You should listen to direction on the field and not hold up your work by saying I will get to  
29 it next week and that kind of thing.
- 30 [1-0] Guys you need to diligently pursue and diligently perform the work.
- 31 [1-0] We shouldn't be saying this if these things were taken care of...uh...please make sure we  
32 pursue the work.

33 [1-0] Ah...two rooms in the hoist is not extra work ...and its been in everybody's plan from day  
34 1.  
35 [1-0] Its in everybody's contract that the material hoist is going to be there. You can tell exactly  
36 what column lines those are located at from the time the job was bid...so...please make sure we  
37 identify these and get this done.  
38 *Brief pause*  
39 [1-0] I do want to go through the garage and the B schedule, then the site-work and skin  
40 packages real quick (*referring to the items in the agenda*).  
41 [33-0] Fire proofing at stair 3 is taking place today.  
42 [33-30] Where are you with framing for stair 3?  
43 [30-33] Its going on.  
44 [33-30] Fine  
45 [33-30] You will have to work around the glazing.  
46 [33-30] We are not going to hold off the curtain wall.  
47 [33-20] J (*referring 20*) you should be good to start tomorrow, your part should be complete.  
48 [33-24] Ah...brick on the west elevation. I have heard that we are not done with the wash down  
49 over there? We are not going to be complete by the end of this week?  
50 [1-33] J (*referring 24*) said they started today on the washing and will be done by Friday.  
51 [24-33] Yeah...yeah...yeah.  
52 [33-29] How are we doing with roofing?  
53 [29-33] We have passed the 5 line and will go ahead and carry it around the corner of elevator  
54 room. We have to get that ridge and will be done.  
55 [29-33] What's the purpose of the stopping there, let me ask you.  
56 [33-29] To work on stair 3.  
57 [2-33] What about 3 steel stairways we are putting back there?  
58 [33-2] 2 stairways.  
59 [29-2] 2 stairways and that low deck.  
60 [33-2] Right...ah...we hope to get you on the stairways ..stair 2 today and stair 3 tomorrow if  
61 they are fireproofing the stairs tomorrow...I don't think they are done worth the blocking in  
62 either of them.  
63 [2-0] Yes... stair 2 should be complete in an hour or so ... and...hmmm...the same thing for  
64 stair 3...we will be done on the same day  
65 [29-0] We get started on the coping this weekend...and we still have some that metal to cut  
66 down  
67 [17-29] Will this be the last coping?  
68 [29-17] Yes we have some left to run on the canopy itself...but luckily we don't have to run  
69 more.  
70 [33-20] Curtain walls on the east side ... think you guys with the sprinklers...some line broken?  
71 [20-33] Broken  
72 [33-20] Broken?  
73 [33-0] Ahhh...we talked about the roof at the stairs, brick on the east elevation starting ?  
74 [24-33] Tomorrow  
75 [33-24] Tomorrow? ....and because you are ahead of the date roofing will be able to start  
76 hopefully earlier than that.  
77 [33-0] And... that we had for the garage.  
78 [1-0] Will there be any questions that will be on garage?

79 [29-0] You guys going to build a walkway from the main door to all the way over to the other  
80 elevator shaft?  
81 [33-29] Yeah...on the roof?...yes  
82 [29-33] We get back up there to do the roofing and people walking on my walk-pads to avoid  
83 walking on the edge.  
84 [1-0] We got to have the handrails or otherwise everybody has to be tied off.  
85 [33-1] Yes  
86 [29-1] Does OSHA require that in place?  
87 [1-29] We wish OSHA didn't require  
88 [29-1] Can we have cables from the columns instead of handrails?  
89 [1-29] No it wouldn't work  
90 [34-1] What he is talking about is static line  
91 [34-29] The problem with that is...Co.-A (*referring to the GC*) installs it ...Co.-A has the  
92 responsibility for liability for it... if somebody hook of to it and then fall of the building ...then  
93 Co.-A will be liable  
94 [34-0] In reality every body here is responsible for their own fall protection .. so to answer C's  
95 (*referring to 29*) question...are we going to build a walkway across there?  
96 [34-29] We probably will facilitate that, but it's really not our (*referring to the GC*) cost.  
97 [34-29] Its really upto C's (*referring to 29*) people to figure out how they are going to get their  
98 people from one end of the building to the other safely.  
99 [1-0] We did it up in the main hospital.  
100 [1-0] We wouldn't have anybody left on the job if we have to turn people off the job for not  
101 following fall protection  
102 [1-0] Anything else before I move on?  
103 [1-6] As far as site work schedule...umm...couple of things real quick.. the entrance to the site  
104 ..ah...I think... you need to coordinate regarding the entrance gate post being in the way  
105 [1-34] As far as south parking lot ... we talked last week about the CUP and beginning to work  
106 in the cooling tower area ... we will have the stoops installed today... ah  
107 [1-11] I just come up with the door ...I think it was a double door ...like a 5x8 or something..  
108 with a single door 5x5 ...I don't remember ...  
109 [1-11] If it's a double door we will get a similar door...but I don't remember...but that's the  
110 plan...double door same as it is called out in the plan... that makes sense?  
111 [11-1] Yeah...back to the entrance...the changed line three pair  
112 [1-11] Yes...aha  
113 [11-1] There will be irrigation conduit and also power lines that stop behind the curb ..and I  
114 assume that while under the road it will be cable and not conduit there  
115 [11-1] Are they (*referring to an subcontractor not present in this particular meeting*) coming out  
116 to do a split conduit around there or ?  
117 [1-11] Because they are ready to barricade the area behind the curb which now being pushed  
118 back  
119 [11-1] All right  
120 [1-11] If we are burying in asphalt it's a problem  
121 [23-1] Now if the bring the conduit till the behind of the curb and then direct burry the cable  
122 under the asphalt, there can be maintenance issues.  
123 [1-23] now..good point  
124 [1-23] Do you see the irrigation sleeves as well?



125 [23-1] Well..then there is the irrigation sleeves through the asphalt ..is it going to be the deep  
126 one?  
127 [1-23] Well ...we are not irrigating that side of the medical parkway. We are not irrigating  
128 between the small ponds and the curb. No irrigation ...so there should not be any conduit for  
129 irrigation.  
130 [23-1] Anything on outside of the perimeter road is ot irrigated?  
131 [1-23] That's yes..correct  
132 [11-1] Do we put one in the entrance? Along the Concert Drive?  
133 [1-11] There's nothing running I guess. Although I check it again, the irrigation plan wont show  
134 it.  
135 [11-1] Do you want to put one just in case?  
136 [1-11] Probably not a bad idea.  
137 [1-11] When will you be able to start that work? I am really getting concerned that  
138 [11-1] Ah..we will probably try to start this week, and see what best we can do it.  
139 [1-11] Okay...all right.  
140 [1-0] I did add some dates on here (*referring to the meeting agenda*) for the Healing Garden  
141 work and then we have the various hard-scaped areas referenced as stair 2, 3 and 4...uh.. excuse  
142 me stair 4, 3 and 2. That's the order we are got it here. Stair 4 we got the sidewalk poured last  
143 week. Uh... then stair 3 is next stair and stair 2 is the main ...the large stair wall on the  
144 northwest corner of the building wit ht brick screen wall.. and that sort of thing  
145 [1-0] Uh...so we put together some dates...we are going to meet this Thursday at 2:30  
146 uhh...with the irrigation folks and the gardening contractor to go over the bio-falls and that kind  
147 of things.  
148 [1-23] I don't think you need to be there constantly, you need to get the grading done this  
149 week..uh..  
150 [23-1] All right.  
151 [1-23] Just as a heads up ...we are going to catch up before further going with that.  
152 [1-0] Based on what we are looking at with the storm pipe and the grades left to do, we are  
153 figuring...you know...starting next Monday to the 9<sup>th</sup> at latest ... and then getting the spoils of  
154 cut out and also taking care of the garage area. There is little bit of irrigation and utilities out  
155 there yet which we have to extend. Power to the pump that's what it says...you see the dates.  
156 Install bridge and pre-cast footings followed by the stream liners, and the rocks and installing the  
157 pavers.  
158 [1-0] We have put the dates right now. Things are going to happen and we will know more on  
159 Thursday regarding the nursery.  
160 [23-1] Let me know if you need more irrigation conduits.  
161 [1-23] Okay... will do.  
162 [1-0] As far as the next three areas...the hard-scapes and the sidewalks...based on the plan...in  
163 each area we get the sidewalk installation followed by the cast in place concrete benches that will  
164 be poured by...poured by C (*referring to 24*)  
165 [1-24] There's some footings for bike racks...I think you guys have.  
166 [1-24] Make sure you are aware of that.  
167 [1-0] Once those concrete is done hopefully all of you guys will be picking up stuff from the side  
168 of the sidewalks to let the mowing crew in.  
169 [1-24] For the precast benches and lights...I think we have those correct bases made  
170 [24-1] 80% of those are ready

171 [1-24] You are ready to start?  
172 [24-1] Yes  
173 [1-0] Then we will start putting those precast benches, then we will clad the benches in granite,  
174 is J (*referring to 35*) here somewhere?  
175 [35-1] Yeah  
176 [1-35] Do you guys have the granite yet?  
177 [35-1] Now we have it. Last week it came in.  
178 [1-35] Okay...  
179 [1-35] Will it also be the entrance granite that goes on the wall as well?  
180 [35-1] I have got the granite for the radius thing in the outside, not the three together that goes on  
181 the big perimeter in the Emergency entrance, I guess ...under the canopy... I got that granite  
182 [1-35] Okay  
183 [1-35] I have to look into the detail, I can't remember the how the granite sits...I think the  
184 granite go past the brick wall and abuts it. If it goes then its not an issue at all. The pavers and the  
185 river rocks will be done at the same time.  
186 [1-0] That's the general plan for the each area. We will see the sidewalk and granite in the next  
187 few days, and as far as stair 2 there is a precast screen wall there...when we are doing the  
188 concrete benches and the pad, the screen will go in ...and then obviously 2 days after that we  
189 will start with the CMU, and bricks for the screen wall.  
190 [1-0] Any question on the precast issues before I move on?  
191 [24-1] Actually just got a call this morning from the architect they want ...uh... I put a note on it  
192 that the customer recommends doing an acid wash or sand blasted that on the precast...I actually  
193 sent the email forward to you  
194 [1-24] Okay I will get back to you on that...  
195 [1-0] We have little pieces in our precast going on the bridge ...and they went through third or  
196 fourth color change  
197 [36-1] She said the color was good and wants to see if the ..uh...the acid wash on it will look  
198 good.  
199 [1-0] Then Dam Neck/Wellness Way... uh...everybody should put it on the official delivery date  
200 the 3<sup>rd</sup> ...B (*referring to a subcontractor*) will be on site to work on the sidewalk... but will give  
201 me access to the first part of the parking drive lane area.  
202 [1-0] In order to get out work done in that area, we need the base course done, we need to have  
203 the landscaping taken care of, and irrigation, sod, whatever...that way we are not around the  
204 occupied area ... we will put fence in there. We will not to get into the drive area. On their side  
205 of the fence will be buttoned up and taken care of.  
206 [1-23] We need atleast 2 weeks for landscape and irrigation till we are done.  
207 [23-1] What about the site lighting?  
208 [1-23] What's that?...Yeah...we need to take care of that...so put that under your agenda.  
209 [1-23] I think we will have it wrapped up by....into the 12<sup>th</sup> or 19<sup>th</sup> ...12<sup>th</sup>  
210 [23-1] I thought it to be 19<sup>th</sup>  
211 [1-23] Well that is when all the work is supposed to be done, but I need to have the base course  
212 asphalt done.  
213 [1-23] Is there any way you can crank out the base course asphalt in the next 2 to 3 weeks?  
214 [23-1] No, my plan is to get done in the next week.  
215 [1-23] Then that should not be a problem. Once you are done with the base course, then we will  
216 start filling down the islands and get wrapped up.

217 [34-23] What is your plan for the north side? Regarding the curbs...once the burms are knocked  
218 down...then rest of the corners knocked down  
219 [34-23] Is the curb machine in here yet?  
220 [23-34] Yeah..  
221 [34-23] We want to go ahead and do the curb around the south side of the Area B.  
222 [1-0] Lets finish up the skin real quick, then we have got few questions...ah...C/D skin...what's  
223 happening with the gutter machine hear? Is that one sorted out yet? Will that be here soon?  
224 [2-1] There has been some change orders. And there something we could do, and something we  
225 couldn't do, and haven't heard anything back from them you all.  
226 [1-2] What do you mean?  
227 [1-2] You mean...when I saw the change order...for the last 2 weeks you were waiting. You  
228 know what you could do. Okay...it is important that you proceed with the work.  
229 [2-1,50] There was a certain gauge of metal, 16 or 20 going in the mechanical room. I will have  
230 to talk to B (*referring to 50*) how we can handle that.  
231 [1-15] Uh...windows/glass at material hoist room ...you got those today? Right?  
232 [15-1] Yeah  
233 [1-29] Healing garden metal panels by Friday, you are out of there? Correct?  
234 [29-1] Yeah...we are doing okay.  
235 [1-29] By end of the week you will be out of there? Right?  
236 [1-29] The rest you will be hanging from the side of the building.  
237 [34-15] Those are really big.  
238 [1-34] But we will be done by the end of the next week. Someday right?  
239 [34-0] Someday...(*jokes*)  
240 [1-29] The atrium roof...we have been talking about it...we need to get that started tomorrow.  
241 [29-1] The material won't be delivered till...uh...Thursday.  
242 [1-29] How that happened? (*clearly not happy with the lateness of the delivery*)  
243 [1-29] So you can get the atrium wrapped up by next week?  
244 [29-1] We will be close.  
245 [29-24] Are you going to be done with the brick?  
246 [24-29] We are done with brick, we need to wash it.  
247 [34-24] What do you washing?  
248 [33-34] The need to wash the corner.  
249 [1-17] And...DEFS at the ceiling of the loading dock ceiling...we are still looking at 11/5?  
250 [17-1] Yeah.  
251 [1-23] The stoops will get to you today. Phase II ...we are going to start asphalt next week, and  
252 go into the following week.  
253 [1-23] Have you got anything else?  
254 [1-40] I know we have irrigation out there left and right, what's going to take to get the sod  
255 done?  
256 [40-1] Probably close to 2 weeks.  
257 [34-40] Once we do that, we need to make sure people stay off it.  
258 [1-34,40] We are thinking about probably putting fence out there. Some kind of hard safety  
259 fence.  
260 [1-40] Otherwise we are not going to stop.  
261 [1-40] Once you put the sod, we probably have to put fence around it.  
262 [34-40] Large safety fence...that's going to keep you out of the nuisance.



263 [1-40] And of course this Thursday at 2:30 we have got meeting. You have anything else?  
264 [40-1] I am just waiting for the temperature to moderate before we start putting it.  
265 [1-40] Do you think these trees we have will do well if we put it now?  
266 [40-1] I have got bunch of willows, which will do well if we wait till November, the others will  
267 be put down this week.  
268 [1-24] How are we doing on the brick piers?  
269 [24-1] We laid it down. We will be starting on it shortly.  
270 [1-24] Do you have people to start working on that?  
271 [24-1] Yeah  
272 [34-24] The curb cannot go there? Is it?  
273 [24-34] No  
274 [34-24,1] The curb is here. So he is going to be behind the curb.  
275 [34-24] In a perfect world the mason will go first. And the way I envision happening is that...the  
276 mason will go in there and probably run them all up 4 feet high, and then when he got it 4 feet  
277 high on both side, then scaffold behind the curb and then run rest of the wall.  
278 [1-16] How do you think we are doing with the DFES at the canopy on those overhang soffits?  
279 [16-1] Yes, we have been going back correcting some of the areas.  
280 [1-16] Good.  
281 [1-16] When do you think they will be corrected?  
282 [16-1] Uh...the Area D we have already corrected...we have one back in B...that's it...yeah, we  
283 have one more in B to correct.  
284 [16-1] For main entrance canopy, the back portions that will it get DFES, when do you think that  
285 will get the roof?  
286 [1-16] I don't know.  
287 [16-1] Okay, I just thought of asking will it be done before the weather gets too cold outside.  
288 *Pause of about one minute.*  
289 [1-19] Roof drains done up there?  
290 [19-1] Yes, those are done.  
291 [1-19] Okay...so you guys have your roofing up there now?  
292 [19-1] Is it showing correctly in the architectural drawing?  
293 [1-19] I think so...is it different in the architectural from the plumbing drawing?  
294 [19-1] Yes.  
295 [19-1] I need two men to get that drain right behind form the next drain in, and all the way to the  
296 wall.  
297 [1-19] I thought the... you were going of from the plumbing drawing and not the architectural  
298 drawing. Correct?  
299 [1-19] The architecture shows lot more drains. When you have that together...  
300 [19-1] We think we can start that today.  
301 [1-19] How much time do you need to wrap up then?  
302 [19-1] Probably in 2 weeks  
303 [1-19] So by the end of next week?  
304 [29-1] Which one do you want us to work on first...you want us to work on canopy or you want  
305 us to work on A/E frame?  
306 [1-29] A/E is the first thing we will do, and then we will have you both of these. The areas in  
307 A/E has to be done early.  
308 [1-29] You got anything else here?

309 [29-1] No  
310 [1-0] Uhhh...so I think we are done with the skin ... anybody those who are going to head out  
311 please the your ...uh...signed paperwork (*referring to the consent form for the study*), drop in the  
312 corner here while you walk out. Or, leave it with M (*referring to an employee of the GC*) we can  
313 get it afterwards.  
314  
315 *This concluded the meeting related to skin of the building. With this 2,11, 15, 17, 22, 23, 24*  
316 *walked out of the trailer. In came 37, 38, 39.*  
317 [1-0] All right... uh...we will go over few things of the hospital now as far as the schedule. For  
318 C/D Penthouse all of the metal panels have been installed, columns are painted.  
319 [1-6] Where are we with getting the dampers and the plenum wrapped up?  
320 [6-1] We did pass the water test on the plenum. We are pressing to get done with it. We should  
321 be done with the plenum by 29<sup>th</sup>...by Friday.  
322 [1-6] Both C/D and B or just C/D?  
323 [6-1] Just C/D  
324 [1-6] That will be sealed as well...right?  
325 [6-1] Yes.  
326 [1-6] What have you got? A week there?  
327 [1-6] Will you get the relief dampers too?  
328 [6-1] No. The relief dampers ...as we don't have the floors in now, put the flooring in and put it  
329 back together to make sure everything works all right. And give me till 11/3, like give me till  
330 next Wednesday to make sure everything is good with those.  
331 [1-6] Will you be done by next Wednesday? Or you need the week?  
332 [6-1] No, we will be done.  
333 [26-6] You sure will be done?  
334 [6-26] Yeah  
335 [26-6] Weather is not going to bother you?  
336 [6-26] Not unless it a whole day rain. A little bit of rain is not going to bother us.  
337 [1-6] And then what about the B Penthouse?  
338 [6-1] B Penthouse...I figured plenums by the end of that week 11/5 and relief dampers by 11/10.  
339 [1-6] Okay.  
340 *Pause*  
341 [1-26] And...tomorrow and Thursday I believe we will be putting in a epoxy mockup around the  
342 drain areas where water will be coming ...and we are talking about mockup ...so it will be nice  
343 to have the small section of concrete worked with anyway...we will use it as mockup and leave  
344 it there.  
345 [1-26] So that's going to happen I think on tomorrow or Thursday.  
346 [1-26] I think its tomorrow though...just you guys are aware of that  
347 [1-26] It's in the general area...and we need to make sure we are out of it.  
348 [1-19] You know what we are talking about...right?  
349 [34-19] Yeah...it's basically the epoxy flooring going in the kitchen area near water ...we are  
350 going to do a mockup. The architects not decided yet...in case of locations near the water we do  
351 not end up in a pool of water.  
352 [1-19] This is just going to be a 5 x 5 space in one of those units...all right?  
353 [1-0] Uh...Stair 3 ...guys we were supposed to have our inspections last Thursday. We did not  
354 get, looks as though the copper piping was run a foot shorter to the main heater.

355 [1-27] When are we getting the close in inspection of the walls?  
356 [27-1] We are working on the plumbing rough-ins of the upper floor and then get the inspections  
357 soon.  
358 [1-27] In the upper floor?  
359 [26-1] That's the 5<sup>th</sup> floor. 1<sup>st</sup> and 3<sup>rd</sup> are done.  
360 [1-26] They have been inspected?  
361 [26-1] Yeah.  
362 [1-26] When did you get them inspected?  
363 [26-1] Uh...Friday.  
364 [1-32] How about electrical?  
365 [32-1] I don't know where that stands, we will find out?  
366 [1-37] B (*referring to 37*) are you getting your part inspected as well?  
367 [37-1] No, we can't do that until we are ready upstairs.  
368 [27-37] B (*referring to 37*) needs to needs to take a walk up there. We cannot get to the unit  
369 heater with the scaffoldings in place.  
370 [27-37] So we did a good job keeping that secured.  
371 [37-27] But again, you cannot put cavity in there with drywall.  
372 [34-27] So what do they do? What do they do to the cavity from the unit heater?  
373 [27-34] Either they come to Stair 1 and are not recessed in wall.  
374 [1-27] But why?  
375 [27-1] For some reason they did so.  
376 [34-1] No, no, the problem is that we haven't hung the drywall yet in the stairway where we have  
377 unit heaters in our way now. So, I don't know why we have unit heaters in Stair 1 when we have  
378 done piping in Stair 3.  
379 [27-34] Actually Stairwell 1, Area A, 5<sup>th</sup> Floor they were framing up there, so we completed the  
380 outdoor patients' for the first floor, cabinet unit heaters ...  
381 [34-27] Right. We are not starting Stair 1. Can't close Stair 1 if we don't finish Stair 3.  
382 [1-27] We have to finish Stair 2...we have get that completely done before we move to Stair 3.  
383 [1-0] We are not going to touch Stair 1, till we get done with Stair 3.  
384 [1-0] Can somebody get B (*referring to 37*) today and show him what's the problem with caps in  
385 Stair 3?  
386 [1-37] And ...uh...we are probably going to get the close-in inspections done before you hang  
387 the drywalls in side the building?  
388 [1-37] Do you think if you get the inspection tomorrow, you can get it done next week?  
389 [37-1] Yeah...may be couple of days. Once I finish that up, I need to build couple of those  
390 bulkheads.  
391 [1-37] Is there any reason you are not running the framing to the bulkheads now?  
392 [37-1] There is a fire rated wall. I need to get first through the walls.  
393 [1-37] Okay.  
394 [1-27] Stair 5...in Stair 5 the plan was to get the inspection on Friday and starting hanging today  
395 ...where are we in Stair 5?  
396 [27-1] We got our inspection...the 5<sup>th</sup> floor here we are working right now.  
397 [1-27] The 5<sup>th</sup> floor and Stair 5?  
398 [27-1] Yes...we are working right now.  
399 [27-1] We will be done on Friday...so the drywall can be hung from Friday.  
400 [1-37] B (*referring to 37*) did you send drywallers in the 5<sup>th</sup> floor Stair 5 on Friday?

401 [37-1] No ...no.  
402 [1-37] I figured you did something in there.  
403 [1-37] What's going on with Stair 5?  
404 [1-37] All the framing done, right?  
405 [37-1] Framing was done in 1<sup>st</sup> and 2<sup>nd</sup> floors.  
406 [7-1] Top floor is not done.  
407 [37-1] Top floor is not done. I need to get the scaffolding in there.  
408 [1-37] B (*referring to 37*) this is going around and around. It is pretty \*\*\* \*\*\*\* sad. (*I was very*  
409 *disappointed and expressed it to 37*).  
410 [1-0] Seriously guys...this is pathetic...it's a \*\*\*\*\* stairwell. (*I again showed his*  
411 *disappointment very clearly*).  
412 [1-0] We can't talk to each other? It is a secret that his scaffolding is in your way? Now come on  
413 seriously.  
414 [1-0] Please talk. It's pretty bad. You all need to talk in the field. Guys in the field need to talk  
415 the B's (*referring to 37*) folks. Some of the works are not taken care of. This is ridiculous.  
416 [1-0] Stairwell...it should not be that difficult. I am talking about just whole bunch of \*\*\*\*  
417 ...it's a unit heater and little bit of studs in the wall. If we are not right by now, the stairwell will  
418 give me problems.  
419 [1-0] 3<sup>rd</sup> floor... R (*referring to a subcontractor not present in this meeting*) probably coming in  
420 tomorrow, correct? What I have done is basically...  
421 [1-0] Just so everybody know that R (*referring to a subcontractor not present in this meeting*)  
422 coming in here tomorrow, and probably the caseworks will be installed by P (*referring to a*  
423 *subcontractor not present in this meeting*) starting tomorrow...about 3 days per area per floor.  
424 [1-0] Once those areas are done, we can start the pendant lights. That's the last big thing we want  
425 to get out of the way.  
426 [32-1] As long as you plan on having scaffolds and ladders...  
427 [1-32] Well I cannot promise there won't be any guys with ladder.  
428 [34-32] I guarantee T (*referring to a subcontractor*) will be back up with their ladders.  
429 [1-32] So the plan is to get as much s done and start as soon as R (*referring to a subcontractor*  
430 *not present in this meeting*) is out of way.  
431 [5-37] B (*referring to 37*) are those guys drug tested and everything? And other routine?  
432 [37-5] I think those guys are routine tested and everything. I found out from J (*referring to 34*).  
433 [1-0] As far as the 4<sup>th</sup> floor ...um...I believe the paint in the patient rooms are done. And R  
434 (*referring to a subcontractor not present in this meeting*) starting on 29<sup>th</sup>.  
435 [1-26] For plumbing fixtures in 5<sup>th</sup> floor, I think you guys will probably get wrapped dup today,  
436 and don't worry if can't get done.  
437 [1-26] For the 5<sup>th</sup> floor plumbing fixtures, as far as I know the only case work that not installed  
438 in both towers are of course at the 2 patient rooms and all the points of the court areas.  
439 [1-26] Are those going to be done this week?  
440 [26-1] I am going to wrap up the stuffs probably today.  
441 [1-26] The point fixtures in C/D are wrapped up now?  
442 [26-1] We need some eye-washes drilled.  
443 [1-26] Need some eye-washes drilled?  
444 [26-1] If its all marked, get with D (*referring to a subcontractor*).  
445 [1-0] As far as the patient rooms are considered please make sure you guys look at the point-up,  
446 the guys who finished up in court last week should be in 5 now.

447 [1-0] Patient rooms should be wrapped this week...I think Wednesday is the goal.  
448 [1-7] The B tower, toilet accessories will be done this week?  
449 [7-1] Yes.  
450 [1-7] Okay...doors hardware...we still got a little bit left in 5 ...so 3B will start late. We will  
451 wrap up 3B by the end of this week.  
452 [38-1] 3B will be probably by the end of the week. 3A will be done in couple of days.  
453 [1-0] The points up of the patient rooms have to wrapped by the end of next week...as long it is  
454 done prior to the paint. The R starts and get wrapped up in 3 days.  
455 [1-0] 4<sup>th</sup> floor, the sheet vinyl/VCT team...we will have them here the 2<sup>nd</sup>. We have been talking  
456 with their office to get some these floors by the Friday prior. Uh...we think this Friday we will  
457 finish in 4B.  
458 [10-1] I will have everything covered.  
459 [10-1] If there is anything left behind, that will be just touching up.  
460 [1-10] Real good.  
461 [10-1] The only question I do have is in B tower, for 3, 4, 5 when are we going to put that wall  
462 under the soffit of the room at the end of the corridor in the Isolation Area?  
463 [1-10] You talking about the Resource Center that have the changes now?  
464 [10-1] Uh...no  
465 [35-1] The other end of the corridor.  
466 [10-1] We were out in the corridor, and I am assuming that it was called an Isolation Area and  
467 they got to put a wall on there before I can install by stuffs.  
468 [37-10] There's not a wall in there. It's a sliding door in there...8 feet high door.  
469 [10-37] Right...whatever it is.  
470 [37-1] They are talking about the opening that leads into the hallway. There will be a sliding  
471 glass door. It takes up the whole hallway.  
472 [1-10] Is it in all 3 floors?  
473 [10-1] Its in C/D tower I guess.  
474 [37-1] Its in C/D and both floors.  
475 [1-10] Is it installed in C/D? Everybody knows more about this?  
476 [9-1] My drawing shows drywall header in C/D.  
477 [1-9] Well...we will take a look at it.  
478 [1-38] Doors for 4B probably should be starting next Monday then.  
479 [38-1] Should be receiving doors on 3<sup>rd</sup>.  
480 [1-10] 5<sup>th</sup> Floor...go over few dates...finish what you have to get it done.  
481 [1-0] Based on what I have got, the close-ins start next Monday, right?  
482 [10-1] I have materials to be delivered on Thursday. We will start the vinyl, the hoist being  
483 removed, then the elevator shaft...  
484 [1-10] Right...right.  
485 [10-1] Yeah...I will have people up there once the drywall gets started.  
486 [1-10] So sounds like we will most likely hit that first date.  
487 [10-1] Yeah.  
488 [1-0] One of the things I want to talk about is we have been kind of not hitting the 3,4,5 rooms in  
489 Area A as we have been going up.  
490 [1-0] Rooms are ready. We need to do the core door sequencing and get that wrapped up.  
491 [1-10] When you have a crew you can start putting on the doors in these rooms.  
492 [1-10] Most of them are either ceramic tile or VCT. When do you have that work starting?



493 [10-1] I have to get with the office and get back to you on that.  
494 [1-10] How many VCT guys do you have?  
495 [10-1] I only have 2 right now. They are staying ahead of game. But if I have got to get more I  
496 need to call in to office.  
497 [1-0] The last thing I have here for the two Towers is the base of the 5<sup>th</sup> floor is going to be the  
498 Area A court. This will be...the most time we are talking about the lobby. The main lobby area  
499 for the patient elevators ...  
500 [1-37] I believe B (*referring to 37*) you got the shear frame in this weekend for 4 and 5. Is that  
501 correct?  
502 [37-1] Yes.  
503 [1-0] So we are ready to rough-in the walls in the passenger elevator in the elevator side. Is that  
504 fair?  
505 [37-1] Yeah... you can rough the framing.  
506 [37-1] I need the shop drawing which shows the gauge of the studs which gets the tiles and  
507 stones.  
508 [1-0] Uh...just so everybody understands the plan is if we get the elevator jacks and elevator  
509 beams set in 4 and 5, the rest of them, 3,2 and 1 will be installed this Wednesday.  
510 [1-0] So based on that can we get this week the rough-in done? There is only handful of devices,  
511 and not whole lot.  
512 [1-0] What ever devices we have, you can rough-in and get inspected this week. Then the 4<sup>th</sup>  
513 floor will be the week after that, and then the 3<sup>rd</sup> floor will be the week after 4<sup>th</sup> floor. So in the  
514 next week we should be wrapping up the 4<sup>th</sup> floor with MEP rough-in inspections. And then the  
515 following week we will be finishing up the 3<sup>rd</sup> floor.  
516 [1-37] And our framing will be done the following week.  
517 [1-37] So B (*referring to 37*) starting next Monday you start hanging the drywall. And then you  
518 are probably starting the soffit the next week once you get the drywall hung and painted and so  
519 we go from there.  
520 [1-0] So what this will do...this will finish up base of the two towers by the end of the year  
521 including the passenger elevators. That complete finished flooring, and the only issue we have to  
522 deal with is some flooring and doors possibly. With all the work done and painted we should be  
523 able to be wrapped up these areas...uh...so plan is by the first week of January we will start  
524 getting inspections from the city. I am talking about plumbing finals...uh...  
525 [1-26] Is there any reason we cannot do plumbing inspections? Any issues?  
526 [27-1] My gas will be all done.  
527 [1-26] Plumbing will need some coordination. Hopefully we will look at it and work towards  
528 solving issues.  
529 [1-26] You might want the inspector to walk around and say if everything is well coordinated.  
530 [26-1] I am sure the plumbing inspector will do that. I don't know if the heating inspector would.  
531 [1-26] Who won't what?  
532 [26-1] The heating inspector or HVAC.  
533 [34-26] He has looked at all the parts and there is nothing for him to look at now. So we  
534 probably going to tell you he is not going to do it.  
535 [26-1] The plumbing inspector has been very cooperative. If we ask him to come through...he  
536 will come through and will say if its okay.  
537 [1-26] Yeah...we want to make sure all the sinks and everything are okay.  
538 [1-26] We don't have the time to do the entire building inspection at the end of the job.

539 [1-26] We have to make sure the towers are basically inspected by the end of February.  
540 [1-0] Please start thinking about that when we do our inspections.  
541 [1-0] The last item in the tower is the 6<sup>th</sup> floor. Guys there are a lot of work left up there. We  
542 walked it last week and bunch of issues...there's some dampers missing where the ductworks go  
543 through the fire rated partitions, there's some gaps around it , there is a big section of the drywall  
544 not installed, so a lot of pieces and parts up there. The sprinklers are not fire caulked yet.  
545 [1-0] A lot of things like that are not done yet.  
546 [1-0] We need to make sure we are hitting these areas.  
547 [34-18] There is a conduit rack up there that comes out of the Data Center and probably stops  
548 where 2 dozen conduits stop there going further...and then comes out of the hallway...and over  
549 the lobby there...another electrical rack and couple dozens conduits...these electrical racks need  
550 to connected there.  
551 [18-34] I will take a look at it.  
552 [1-0] Anybody got any questions with the towers?  
553 [1-0] Few things on the floors below ...uh...C/D...I know you we have a list of various items  
554 ...D (*referring to 26*) have guys you seen that list?  
555 [1-26] Caseworks will be installed on Tuesday, pipes will also start next week.  
556 [26-1] We saw that...we walked around.  
557 [1-26] Good.  
558 [1-37] And walls will be taken care of B (*referring to 37*)?  
559 [1-37] You will have a crew working this weekend I believe on miscellaneous stuffs that haven't  
560 done yet, right?  
561 [37-1] Yeah. Just make sure we are hitting the dates.  
562 [1-0] I have put down here just as a side note...kind of get an idea of most of important dates.  
563 [1-10] Really the key here is and before that I have one question...D (*referring to a*  
564 *subcontractor*) was talking about they are still trying to finish it by 3<sup>rd</sup> ...but when do you  
565 realistically think we will be done in 2 C/D?  
566 [1-0] If you are not finishing the 5<sup>th</sup> floor B until the 12<sup>th</sup>, will we be able to start 2C prior to  
567 that?  
568 [1-0] The 8<sup>th</sup> or 15<sup>th</sup> will be my guess.  
569 [10-1] We should be able to send people down there because if the pipe takes 4 days, I should be  
570 doing the water. 2 guys finishing the other work, we can transfer everybody to C/D.  
571 [1-10] So these areas in 2C have been really struggling and drag us behind.  
572 [1-10] For the critical path of the project few areas are important...flooring as well as kitchen  
573 serving area. Those are 2 areas of this project that cannot slip.  
574 [1-0] We are starting in 2 weeks. We have 2 weeks to get this area wrapped up. That means this  
575 week we have to get every bit of framing and minor stuffs wrapped up. And if there is any MEP  
576 ductwork that not wrapped up yet, it has to be done by today or tomorrow.  
577 [1-0] I think that should be behind us now finally.  
578 [1-37] B (*referring to 37*) it puts the pressure on you guys to get this last bit of drywall hung.  
579 Specially these column areas, column wraps has to be done, because these long corridors will be  
580 blocked off at times, big rooms will be blocked off when the flooring guys get going.  
581 *Pause*  
582 [1-0] Do we know when the doorframes are coming for the doors in the middle by chance?  
583 [1-33] Do you know?  
584 [33-1] No...I don't know.

585 [1-0] That's holding up the stair right there. We can't finish the framing and probably one  
586 section.  
587 [1-38] Cart washers for C/D area coming this Wednesday. Right B (*referring to 38*)?  
588 [38-1] Yes.  
589 [1-38] If we need to deal with the central stairwell area, the cart-wash need to be done by  
590 tomorrow. The little plumbing we have to do and all other little things has to be taken care  
591 tomorrow.  
592 [1-37] Procedure Rooms...I think B (*referring to 37*) we are hanging that drywall?  
593 [37-1] We are in the last 2 rooms.  
594 [1-37] The last 2 rooms? What about the 3<sup>rd</sup> one?  
595 [1-37] You think your guys will be finished by next Wednesday?  
596 [37-1] Uhh...will be real close.  
597 [1-37] We need the first coat of prime before the ceiling grid goes in there.  
598 [37-1] Uhhh...weather.  
599 [1-37] It will be warm enough. We did few rooms last week...didn't have any problem at all. All  
600 that corridor side...long corridor.  
601 [1-0] Couple of areas in the Tower real quick...Area F ...when we sat down 2 weeks ago to go  
602 over the finishing dates of the last few areas of the 1<sup>st</sup> floor, you know the serpentine soffits are  
603 the hardest ceilings of all the OR rooms, those were framed I think about 3 -3 ½ weeks ago. We  
604 just got the light fixtures installed last week.  
605 [11-1] That's because the serpentine ceiling was not put up until about 2 weeks ago.  
606 [1-11] That's what I am saying...they were done 2 weeks before LR (*referring to a*  
607 *subcontractor*) left, and now it is 3 weeks.  
608 [11-1] Okay.  
609 [1-11] So its 2-3 weeks, we agree to that. So I think there is one high head in there...is that now  
610 inspected?  
611 [11-1] They are all installed.  
612 [1-11] They inspected?  
613 [11-1] I am pretty sure they are.  
614 *11 expressing his dissatisfaction in a low voice.*  
615 [1-37] So our problem now B (*referring to 37*) when are you going to have the rest of that room  
616 to get the grid going?  
617 [1-37] B (*referring to 37*) was the serpentine frame 3 weeks ago?  
618 [1-11] The frame was put atleast 3 weeks ago. I believe the conversation that took place last  
619 week with G (*referring to a subcontractor*) is that there is a high head in there. So what high  
620 head? What soffit?  
621 [1-11] So I don't know why its bull \*\*\*\*, other than it is bull \*\*\*\* that it took 3 weeks to get  
622 installed and inspected.  
623 [11-1] No it wasn't. And those serpentine bulkheads were not up 3 weeks ago. That much I can  
624 tell you.  
625 [37-11] Yeah...they were.  
626 [11-1] Because I saw them putting up that night. And that was about week and a half ago.  
627 [1-11] We can argue as long as you want.  
628 [11-1] The lights are in. That's all what matters.  
629 [1-11] That's correct.  
630 [34-11] Are those inspected?



631 [11-34] I will let you know today.  
632 [1-5] As far as low voltage, where are you all with?  
633 [1-5] I saw you last week, a guy running yellow cable for door connection in the 3<sup>rd</sup> floor of C/D  
634 through Area A. B or something.  
635 [5-1] Right...4 and 5 we have got couple of more wires to pull through the elevator lobby for the  
636 card readers.  
637 [1-5] Okay.  
638 [5-1] And ...and then 3,4, and 5 will be completed.  
639 [1-5] All 3, 4, and 5? When?  
640 [5-1] Right, right...this week  
641 [5-1] We got couple of issues as far as the pathways for the DPSs and the electric strikes. I guess  
642 the electricians will be providing the pathways.  
643 [40-5] At the aluminum frame?  
644 [5-40] Yeah.  
645 [40-5] We all met on Friday. We got that worked out.  
646 [5-40] Okay.  
647 [40-5] T (*referring to a subcontractor not present in this meeting*) will be running 2 pathways.  
648 They should be working on that.  
649 [1-5] What about trunk line? You guys have any trunk lines coming up through the column lines  
650 eventually had to go across the corridors?  
651 [5-1] Umm...I don't think so.  
652 [1-5] You got anything else?  
653 [5-1] I got another question. The stairwell in 3, 4, and 5 are...in C and D...when are the sheet  
654 rock going in there so that we can put up the card readers in place?  
655 [1-5] Well...C/D stairwell is up till 2. Stair 3 ...the outside will be probably ready in a week.  
656 [5-1] Okay.  
657 [1-5] Your card reader is probably going outside?  
658 [5-1] Yes, correct.  
659 [1-5] Anything else?  
660 [1-0] Anybody have anything else?  
661 [1-0] That's all I had got. Thank you.  
662 *Ends*

## Appendix B: Transcript of Meeting A2

*Date of observation was November 1<sup>st</sup>, 2010. Venue of the meeting was job site trailer set aside for meetings. The meeting started at 9:00am in the morning. There were 37 attendees in the meeting. The Project Manager of the project is 1; 2, 3, 4,5 and 22 were also employee of GC. The rest were subcontractors. The attendees started coming into the trailer from 8:45am. When they walked in the attendees were not interacting with each other. 11 greeted 6. 2,11,7 were discussing about sports. Attendees in groups of 2 or 3 (2,11 & 7; 3 & 11; 17 & 6; 15 & 18; 3 & 11) were talking about sports, personal stories, etc. The meeting agenda was distributed 5 minutes before the start of the meeting and the attendance sheet was circulated as well.*

- 1 [2-0] All right...please make sure the phones are off please.  
2 [2-0] VOSHA people will be here on November 18<sup>th</sup> at 8:30 to remind everybody.  
3 [2-0] Most of the lifts are gone for the CUP, however ...  
4 [4-0] The scissor lift in the first floor belongs to the mechanical subcontractor.  
5 [2-0] Guys you cannot leave a lift on elevated platform unless you follow all the manufacturers  
6 written instructions. A lot of them require written permission from the manufacturer in order to  
7 leave it on an elevated platform.  
8 [2-0] Uh...seen a guy last week got up to the height he wanted to work, opened up the gate and  
9 walked right out on top of a pipe rack...uh...unhooked from the lift. There was a moment from  
10 the time he was unhooked to the time he was completely hooked up, he was not tied of  
11 anywhere. If he would have fall, he would have died.  
12 [2-0] It's not allowed guys. If anybody else is seen working on the lift without proper permission  
13 or doing things properly he will be sent through the gate.  
14 [2-35] E (*referring to 35 who is the Safety Director for this project*) have you got anything?  
15 [35-0] I had couple of questions about roof work again. If you are not a roofer, going up on the  
16 roof requires a permit, fall arrest system and 100% tie of. All areas that I know are marked and  
17 there are signs everywhere. We had to write up a guy the other day for across the roof without  
18 being tied of.  
19 [35-0] Don't do it.  
20 [2-0] I put off one of the guys for walking on the roof without being tied of.  
21 [2-0] Anybody got any questions regarding safety issues?  
22 [2-0] Uh...quality control...I am sure you are going over it weekly.  
23 [2-4] D (*referring to 4*) is there anything else you got?  
24 [4-0] Make sure you write in your report your company, the area what you are looking at, should  
25 include in the text section any reference such as purlins, woodworks, ductworks and that kind of  
26 thing. Sometimes I get QC and has to guess as to whom did I get it came from.  
27 [2-0] Um...general items...clean up guys...please make sure you are cleaning up daily. [2-0]  
28 Last week we had stopped work in the G mechanical room, it was such a mess that E (*referring*  
29 *to 35*) felt that it was a safety concern.  
30 [2-0] We stopped work till the whole area was cleaned up. We can do that for the whole building  
31 if you would like. Uh...it cost everybody a lot of money when you have bunch of equipments not  
32 working because your labor is not cleaning up. Uh...daily cleanup means everyday.  
33 [2-0] If you work Saturday and Sunday, you must clean up as well.

34 [2-0] Sidewalks and lot of areas in 2<sup>nd</sup> floor and the areas in 1<sup>st</sup> floor where the guys were  
35 working this weekend, make sure they clean up daily.

36 [2-0] Item number 10 (*referring to items on the meeting agenda for the day*)...the use of tobacco  
37 products onsite is prohibited. That's includes chewing, snuffing, smoking, whatever else...you  
38 should not be using it. That means in your car at lunch your guys were found in the truck, sitting  
39 around smoking, please stop.

40 [2-0] We don't want cigarette butts on the ground, trashy areas that we have to clean up...not  
41 allowed.

42 [2-0] Guy went home last week for 3 days of using the building with tobacco in his mouth. Tell  
43 your guys not to do it.

44 [2-0] Um...item 29...sod starts 11/15 ...anyone caught walking on the grass will be put away  
45 from site. You have to make sure your people understand that.

46 [2-0] We have to keep people off the grass. When the sod first laid is going to be loose, if they  
47 walk on it there will be spots all around or whatever. Its not going to be product the owner has  
48 bought. So may be keep people off of it.

49 [2-0] Sidewalks are built. Use valley gutters through the islands. If they need to cut through the  
50 islands, tell them to stay off the grass.

51 [2-0] Item 32, gang-boxes...you need to keep gang-boxes 6 feet off the wall, any materials  
52 stored against the wall need to be 6 feet away from the wall. So we can get in there for hanging  
53 the wall, finish the wall, paint the wall, put ceiling grid up and finish the building.

54 [2-0] Item 33, we have a barbeque scheduled for November 4<sup>th</sup>. What I want to do is we start  
55 feeding everybody at 11 o'clock; we will like to have another raffle...you know get some  
56 different items. But I want to make sure everybody is in agreement with that its okay. We don't  
57 want to have your guys standing up there and hear people b\*\*\*\* about ...uh...loss of production.

58 [2-0] Is anybody here has any problem with doing a raffle at 1 o'clock and 1:30?

59 [2-0] We will give away some tools and what ever maybe...stuffs from Best Buy or gift cards,  
60 stuffs like that.

61 [2-0] Also we are thinking of going over some safety issues at 1o'clock with your guys, workers  
62 in the field also make sure everybody understands the whole issue of keeping off the grass.

63 [2-0] Item 34, materials management area on the on the 1<sup>st</sup> floor...we want to get that area  
64 finished, so that we can give it to the owner. Owner has got persons coming on site in the next  
65 month or so and will be here full time to receive deliveries.

66 [2-0] We have to get all our materials, gang-boxes ...the...uh...you know pipe, ductwork,  
67 finishing compound, all that stuff go out. The whole area has to be emptied out, we will finish it  
68 and let the owner use is to receive the materials.

69 [2-0] Does anybody have any questions?

70 [4-0] Um...Saturday morning at 3:00 am two persons were arrested onsite. They have alleged  
71 that they climbed over the fence and searched over cell phones, according to the story of the  
72 officers that they were in possession of burglary tools, copper pipe and were arrested.

73 [4-0] We think they were the same guys who were spotted here in Thursday evening during the  
74 night shift and were stopped by W-T (*referring to the GC*) employees to ask them if they work  
75 here. These people will be prosecuted according to the law.

76 [4-0] These are guys who have studied the job, who knows the night shift ceases at 1:00 am and  
77 took the opportunity to climb over the fence to steal copper pipes. Fortunately the police caught  
78 them and found them in possession of stolen goods. I think that is a felony and they will be  
79 prosecuted. ...You all should know that.

80 [2-0] All right...anybody got any questions? Anything about safety, general items?  
81 [2-22] All right...M (*referring to 22*), you want to go over the garage schedule?  
82 [22-2] Sure.  
83 [22-0] Uh...MOB (Medical Office Building) stairwell 3, sheathing on the north face and then we  
84 will be putting Tyvek there. The fireproofer should be working there today. So you should be  
85 able to go back there tomorrow to start putting sheathing, Tyvek, brick ties, and whatever you  
86 need on it. And curtain wall in...  
87 [22-17] Did you get that in today?  
88 [17-22] Not today.  
89 [22-0] Sheathing and Tyvek on the south face. We had a discussion if we can get at least to 3<sup>rd</sup>  
90 floor with sheathing, Tyvek and brick ties, so that C (*referring to 32*) can start tomorrow  
91 morning.  
92 [22-32] How are we doing on that now?  
93 [32-22] The area is very tight there...I think we are working there now. With the crane sitting  
94 there, we don't have enough room. We will do what we can do.  
95 [22-32] Right now he has the boom lift. I can't ask him to remove the lift.  
96 [22-17] Will you be there all day?  
97 [22-17] Yeah  
98 [22-30] Curtain wall M will be complete end of this week?  
99 [30-22] Yes...we will get to it sometime this week.  
100 [22-30] Brick is going to start tomorrow morning.  
101 [22-16] After completing the brick on the south elevation, are you going to leave some scaffold  
102 there?  
103 [16-22] We are going to leave that one corner.  
104 [22-0] Any questions with the MOB?  
105 [2-31] I have got one comment. B (*referring to 31*) we cannot afford any more delays on Stair 3.  
106 If you cannot finish your work by today, start putting in more time. Start working 3:00 – 11:00 or  
107 3:00 -1:00 in the morning or whatever it takes. We are not going to hold up the mason because  
108 you are a month behind on Stair 3.  
109 [2-31] If you don't have the manpower or the ability to do it, let us know. We can take care of it  
110 for you.  
111 [4-22] Any painting news?  
112 [22-0] Painting is completed on the 2<sup>nd</sup> floor.  
113 [22-0] I think this weekend they will start on the perimeter walls on level 2. So any materials or  
114 anything against the wall have to be shifted. Anything that doesn't need to be there has to be  
115 taken out.  
116 [2-0] As far as site-work goes...site-work continuing in the West Parking Lot...closed to be done  
117 on.  
118 [35-2] We are working on the curbs. I am trying to get the islands done as well. I think we will  
119 be done this week.  
120 [2-35] When do you anticipate paving?  
121 [35-2] Sometime this week.  
122 [2-35] I know...say 5 days?  
123 [4-27] Is there anything that holding you up? You are waiting on a box right?  
124 [27-2] Those boxes should be here this morning.  
125 [2-27] What about the rest of the light pole bases? When are you planning to put hose in?

126 [27-2] Uh...light poles came in today morning. I did not have a chance to look at those. The  
127 bigger poles also came in.  
128 [16-27] When are you doing the underground in the garden area?  
129 [27-16] We are working on that right now.  
130 [2-0] As far as the Healing Garden goes, we started the storm pipe rough grading in there. If you  
131 have any work over at the Healing Garden after yesterday, you can get off the building from  
132 ladders. See the dates there for bio-falls starting next week. The remaining utilities the following  
133 week.  
134 [2-0] Once the Healing Garden work is done you all should be out of there.  
135 [4-0] We need to stop the traffic through there...pretty early on as we need the guys walking out  
136 through the garden.  
137 [4-0] You should be walking out through the garage.  
138 [2-0] The...uh...Stair 4 hardscape...the grading is done. The benches footing...the rebar are in  
139 place...they (*referring to the site work subcontractor*) should be pouring some of the pads.  
140 [2-17] You will start putting the concrete benches from tomorrow then?  
141 [17-2] Yes.  
142 [2-0] And then we are getting to the dates for the under ground electric and granite. That work  
143 starting on as well.  
144 [2-0] Stair 3...we are working on that...getting the grading and benches done this week. U  
145 (*referring to a subcontractor not present in this meeting*) should be there as well.  
146 [2-27] G (*referring to 27*) they will take care of the de-contamination tank, sidewalks that are  
147 supposed to come all the way around Stair 4.  
148 [2-0] Stair 2...next week...some of the benches start tomorrow as well. We are left with  
149 underground electric. We will be done next week.  
150 [2-0] Wellness Way...we just talked about...we will be paving next week, and then we will be  
151 finishing up our landscaping there. So that we can open the area back up to the hospital on 3<sup>rd</sup> for  
152 ambulance traffic.  
153 [2-0] We still need some to do at the front entrance.  
154 [2-35] You know when you are starting on that column...the curb at the front entrance?  
155 [35-2] We are working on the curbs at the north side of the building and then head east way.  
156 [2-35] All right...you are going to leave gaps in the curbs so that we can still get to the front of  
157 the building?  
158 [2-35] You will not be able to block the front of the entrance.  
159 [35-2] I can leave some gaps if you want me to.  
160 [2-35] We need some access so that we can get through there.  
161 [2-35] Well...he needs to get in there to pour footing and the masons need to go in there to finish  
162 brick.  
163 [2-16] How we are doing with the sheathing of the front canopy?  
164 [16-2] All area all scaffold high and we will start working on those.  
165 [2-0] Any...uh...do you have any questions on site-work?  
166 [2-0] Uh...as far as soffit goes in Area F, we got to get in there and do some fire-proofing that  
167 wasn't done, prior to the chains, which are supposed to be here tomorrow.  
168 [2-11] Once we get that, we will close that up.  
169 [2-0] Any materials that underneath the G soffit needs to be moved out, so that we can get in  
170 there and grade and do the site work in there.  
171 [2-35] H (*referring to 35*) you need to do the stoops. The stoops at the electric room...uh...

172 [35-2] Right...that's a standard 4" stoop.  
173 [35-2] Then I think we got to straighten all the repairs of the concrete around the loading dock.  
174 About saw cut and all...we have talked about it.  
175 [1-2] Yes he has.  
176 [2-35] Yeah...you will saw cut it 3 feet back and then dowel 4 feet on center.  
177 [35-2] All right.  
178 [2-0] Uh...as far as Building Schedule Skin...  
179 [2-36] The canopy...the gutter, what's the latest on that?  
180 [36-2] The last thing I have been told the material is...  
181 [36-2] Are you asking about the gutter or canopy?  
182 [2-36] Gutter...C/D side  
183 [36-2] I believe they are back now...I believe they are backing it up this week.  
184 [2-36] Do you know if they will be out here?  
185 [2-36] We have to get out there and get the grading and all the hard-scaping taken care of.  
186 [2-6] Uh...Skin of the Material Hoist...11/3 is the date, will we be done? 100 percent?  
187 [6-2] Yeah  
188 [2-30] You will be starting Thursday here?  
189 [30-2] Yeah, I mean we...we probably will be working right after they (*referring to 6*) are done.  
190 Then we will take it as day to day.  
191 [2-30] Are you doing it on lifts, or doing it on chairs?  
192 [30-2] On the lifts.  
193 [2-36] A/E roofs...what's the status? How many days do you think you have got there?  
194 [36-2] We are on it now. I am hoping I can finish it in 5 days.  
195 [4-36] You need to make sure that the tie in to the end is in good shape.  
196 [36-4] Oh yes.  
197 [4-36] Just make sure its ready to go.  
198 [2-11] Are we good for the loading dock DEFS to complete by the end of this week?  
199 [11-2] I think it will be 9<sup>th</sup> or 10<sup>th</sup>. We have been going back to do some repair works.  
200 [2-11] Hooh  
201 [11-2] We need the dumpster relocated tomorrow.  
202 [2-11] Okay.  
203 [5-2] The dumpster goes between the MOB and the West Parking Lot.  
204 [2-5] Where the flag pole is? I am wondering where the flag pole is? Is it further west?  
205 [5-2] Yes.  
206 [2-0] Anybody got any question about the skin?  
207 [2-0] Skin people if they want to leave they can.  
208 *6, 10, 11, 16, 25, 30 leaves the trailer.*  
209 [2-0] Um...the Penthouse...are we trying to go through the panels so that we finish this  
210 weekend?  
211 [25-2] Yes the panels are almost done.  
212 [2-25] So...are we good on the relief dampers? Are they putting those on?  
213 [25-2] Yes  
214 [2-25] So this Friday we should be done.  
215 [2-0] The epoxy...is there anybody here from them?  
216 [1-2] They are not here. There is one color that has to be approved.



217 [2-0] Is there anything missing from the meeting minutes of what has to be done in the C/D  
218 Penthouse?  
219 [12-2] I have to finish the D Penthouse and also have to finish the connection to the back wall. I  
220 have pipe underneath that ductwork.  
221 [2-12] And then you will also do the pipe under the fire dampers. How long will it take? 2  
222 weeks?  
223 [12-2] 1 week.  
224 [18-12] 1 week!!  
225 [12-2] I already got C done.  
226 [34-12] You already got C done? Okay.  
227 [34-18] Don't forget lights. About repairing the lights.  
228 [18-4] I need 1 week to finish all the lights over there.  
229 [34-18] When do you think we will have the lights near the door?  
230 [34-4] The reason I ask...we are going to be doing the various test and what not, and air balance,  
231 and VAS and just want to make sure that everybody is aware we are scheduling the tests.  
232 [4-34] Because of the materials being stacked there, we will remove those during weekdays and  
233 work in weekends.  
234 [34-4] Okay.  
235 [4-31] Heads up to T (*referring to 31*) you got drywall repairs.  
236 [4-31] Will you be able to go up there?  
237 [4-0] You all really need to walk through to make sure you are aware where you are. You think  
238 you are.  
239 [4-0] You are not there. We will make sure that you are out of there.  
240 [4-0] That room needs to get finished. We will no longer give you permit to access the room. We  
241 want to reduce the area you have to concerned about. We want to you to finish and get out of  
242 here.  
243 [4-0] All right...nobody knows better that where you are than you...right?  
244 [2-60] The roof insulation, and the ductwork, is that complete up there?  
245 [60-2] We need to get a mock up there this Saturday. We are finished in B, C, and D, but no  
246 jackets.  
247 [2-60] So B, C, and D are insulated without jackets?  
248 [2-0] Who is reviewing that?  
249 *60 referred to 4*  
250 [2-31] Stair 3, how are we doing B (*referring to 31*)?  
251 [31-2] Uh...I am hanging vapor barrier, then I need to hang the drywall.  
252 [2-31] Will we be done by the end of the week?  
253 [4-31] I inspected your vapor barrier, as it doesn't match with the Architect's specification. You  
254 should not be sealing them.  
255 [31-4] I don't know, I have to look into it.  
256 [2-31] You know that we are shooting to start painting from next Monday. So we need to do  
257 whatever we need to do to finish and get done before that.  
258 [2-0] Stair 5, how are we doing there?  
259 [2-27] What's happening G (*referring to 27*)?  
260 [27-2] We are roughing in.  
261 [2-27] When will you finish roughing it in? We should be hanging drywall from 11/5.  
262 [2-27] When will you be done?

263 [27-2] Uhh...I will have it ready by tomorrow morning.  
264 [2-31] If he (*referring to 27*) gets his inspection tomorrow, how long is it going to take you to  
265 hang the drywalls and finish it?  
266 [31-2] I will see what I can do. May be 2 days.  
267 [2-31] Well you know what, you need to work whatever overtime you need to make these dates  
268 work as much as possible.  
269 [2-0] Guys we will finish this job. We will finish it with you or without you, but we will finish.  
270 You are behind schedule, somebody is holding you up, you will notify Co.-A and you give us  
271 something in writing. You think that B (*referring to the mechanical subcontractor*) is the world,  
272 T (*referring to the electrical subcontractor*) is the world, or T (*referring to the drywall*  
273 *subcontractor*) is the world, Co.-A is going to stay beside you and get your crew supplemented  
274 by another subcontractor in order to finish their work, you have sadly mistaken. I can guarantee  
275 you, when one starts to spend on your behalf they will start back charging you. So it's better you  
276 spend your own money than other people to spend your money for you.  
277 [2-0] So if we are really ugly sometime around March, April, and May it's your mistake that we  
278 are not working overtime the hours now in this job.  
279 [2-31] Days are here...ceiling grid to be installed on 11/10. B (*referring to 31*) I don't know how  
280 many people its going to take to make up the date when you were held up by other trades.  
281 [31-2] I have to check the make sure there is no more issues with the scaffolding.  
282 [2-31] You know what if those were your only issue T (*referring to the electrical subcontractor*)  
283 wouldn't have been in the stairwell right now.  
284 [2-27] Uh...C/D Tower, pendant lights, are we getting on to those today?  
285 [27-2] I don't know. The last time we went there the ceiling tiles were not in place.  
286 [4-27] We are dropping the ceiling tile for 3 C/D today. As soon as there is tile, those lights can  
287 go in because by any definition that floor is finished?  
288 [4-27] We don't need to wait till spring to finish it of, or finish it now and just stay off of it.  
289 [4-0] I hope you are listening to J (*referring to 2*). Do you think you should be saying to  
290 something? You need to communicate that when need arrive very loud and very often.  
291 [4-0] When work past the point of holding off on certain things. The C/D 3 ceiling is being  
292 dropped today with or without you. When you go back to it, the tickets will be already out.  
293 [4-0] Okay. We will make sure so that we will finish on time.  
294 [2-26] The 4<sup>th</sup> floor, the 3<sup>rd</sup> coat paint will be done tomorrow?  
295 [26-2] Yes sir.  
296 [2-26] The trim out in 4<sup>th</sup> floor will be done tomorrow B (*referring to 34*)?  
297 [26-2] No. We don't have the devices installed on 3<sup>rd</sup> floor sir.  
298 [4-26] You are not completely done with the devices on 4<sup>th</sup> floor. I can bet I have pictures of it.  
299 [26-4] I don't know. I have to look into it.  
300 [4-26] You all need to take a look. I have spent the whole weekend working in that \*\*\* \*\*  
301 \*\*\*\*\*. You need to walk around the site more man.  
302 [2-24] How are you doing with the plumbing fixtures installation?  
303 [24-2] Uhhh...eyewashes need to be drilled.  
304 [2-24] My understanding is that they are all done. All the way up trough the Tower they are  
305 done.  
306 [2-24] So is there anything else? I know there is some issue with the strainer.  
307 [2-31] What about the grid, the Rulon?  
308 [31-2] It's coming tomorrow.



309 [2-31] Do you see any problem in being done by tomorrow?  
310 [31-2] No.  
311 [2-0] Then we will get done with drop ceiling tile next Monday starting on 4<sup>th</sup>.  
312 [2-0] Anybody see any reason why we might not be able to drop ceiling tile?  
313 [2-19] Are you guys done pulling wire in the C/D?  
314 [19-2] I know I am pretty close. If I have anything I will take care of it today. I will make sure I  
315 am done.  
316 [4-31] The picture frames go on both sides of the wall. There are some points where the drywall  
317 mud is missing. Can you put somebody with a lift to hit all those spots? So that when the City  
318 comes through it just seamlessly inspected and approved.  
319 [31-4] Which ones are you talking about?  
320 [4-31] Okay...the first one that I saw is when you enter C/D, you walk in and you will see the  
321 drywall mud missing. On the A side of the wall.  
322 [4-31] We are not going to look above the ceiling. We are still leaving a few tiles out. Those tiles  
323 are being identified by testing and balancing and...  
324 [34-31] And fire dampers.  
325 [4-31] We have a system where we have string. Other than that tiles are dropped. Once we get all  
326 tested we will drop the rest of the tiles. We all agree that this gives the owner the best chance of  
327 having a very crisp and clean ceiling.  
328 [4-0] 5<sup>th</sup> floor doors and hardware...we are done up there. Correct?  
329 [2-23] Plumbing fixtures, eyewashes are drilled...is that all you have left? And whatever  
330 strainers you have got up there?  
331 *23 nod his head showing agreement.*  
332 [2-26] 3<sup>rd</sup> coat of paint in the patient room will be done on Wednesday?  
333 [26-2] Should be.  
334 [2-31] Then point up in the corridor by Wednesday B (*referring to 31*)?  
335 [2-26] Then finishing the paint in the 5<sup>th</sup> floor corridor by the end of the week.  
336 [2-31] Rulon...you have Rulon coming, which you can finish of by the end of this week with  
337 additional people. Do you know when you have the crew available?  
338 [31-2] I don't know exactly if I will be having crew?  
339 [2-31] You know when the Rulon is coming though?  
340 [2-31] When will you know?  
341 [31-2] Uh...probably when I get out of here.  
342 [2-0] Uh...final trim out, we are getting started next week, pendant lights next week, and ceiling  
343 tiles 2 weeks for today.  
344 [4-0] That means all the corner guards are in, all the handrail, trash rails in, everything is in.  
345 Correct? We will get the 3<sup>rd</sup> coat of paint, Rulon in, drop the ceiling tiles in and we are done.  
346 [2-7] What's the status of the corner guards?  
347 [7-2] I am now working on 104 corners. Will be done this Friday.  
348 [2-23] The B Tower plumbing fixtures, as per my understanding are waiting on the nipples for  
349 the water closets. Will those be here Wednesday?  
350 [23-2] Yeah. Wednesday or...  
351 [2-23] Is 11/5 reasonable to be done with all that?  
352 [24-2] There is the problem with the nipples. I know the engineer called in to get the alternatives  
353 with the price and everything. But we don't have final decision as yet.  
354 [2-24] What does that mean?

355 [24-2] That means ewe will probably be using plastic.  
356 [34-2] I will look into it.  
357 [2-34] So they are not coming on Wednesday?  
358 [34-2] No. They have specified cast iron nipples. Plastic nipples are standard, they are anti-  
359 corrosive. They are threaded the whole length. You have to just cut it as you want.  
360 The iron nipples are not used any more. There are mold issues. The standard is plastic. That's  
361 what our engineer has told the designer.  
362 [2-31] As far as 3<sup>rd</sup> floor toilet accessories, where are we with blocking done?  
363 [31-2] All the blockings are redone.  
364 [7-2] We have got all the tiles.  
365 [8-2] We installed all of the tiles on Friday.  
366 [2-0] 3<sup>rd</sup> floor point out will be done by Thursday.  
367 [2-31] In the corridors, will you be okay there B (*referring to 31*)?  
368 [31-2] Uh...yes.  
369 [21-2] T (*referring to 27*) is going to get inspection in the outdoor where lights were added.  
370 [2-27] When are you getting that inspection?  
371 [27-2] It will be today or tomorrow.  
372 [4-27] In 3 and 4 I think you are finished.  
373 [2-0] Next couple of weeks, we will be finishing up the Rulon, paint, trim out, and finish of by  
374 19<sup>th</sup>. 4<sup>th</sup> floor fixtures will be done by the end of this week. Toilet accessories in 4<sup>th</sup> floor, we will  
375 be done by the end of the week. Wall repairs whatever.  
376 [7-2] We got tiles in.  
377 [21-2] Looking good.  
378 [2-36] Sheet vinyl...are we done sheet vinyl?  
379 [36-2] We have couple of guys here starting today.  
380 [2-7] Headwall...are we done testing up there all the headwall support? Are you done in 5?  
381 [7-2] Can't get in that room due to flooring.  
382 [2-31] Uh...as far as the 5<sup>th</sup> floor, there are some posts up there you need to grind of for the  
383 flooring guy. You are aware of that?  
384 [31-2] In A?  
385 [2-31] I think it should be B.  
386 [5-31] Yeah...I can show you that.  
387 [2-0] I see all the dates. I don't want to go over all the dates, which are further than 2 weeks or  
388 more. But you should make sure you are pushing to hit those dates.  
389 [2-31] Area A, closing drywall should be done finishing by the 10<sup>th</sup>.  
390 [2-21] C (*referring to the concrete subcontractor*) should be pouring that floor today.  
391 [21-2] Once we get that poured, we will be able to close up that last wall right beside the  
392 elevator.  
393 [21-2] In the 6<sup>th</sup> everybody got work to do up there as far as caulking walls, ductwork needs to  
394 be caulked, damper, flashing needs to go in.  
395 [21-27] G (*referring to 27*) you guys will be shutting down the elevator today so that you can  
396 move that box out of the wall.  
397 [27-21] It's already done. We pulled the box out of there.  
398 [4-27] There has to couple of drywall sheets behind the box.  
399 [4-27] J (*referring to 2*) and I walked on Friday and started to develop a relatively  
400 comprehensive completion list for you all. I don't know why you all don't see it.

401 [4-0] There are things that everybody needs to pay attention to it from expansion joints, there is  
402 sprinkler heads, sprinkler pipe caulking, electrical pipes and electrical caulking, leveling the  
403 walls, preparing for ceiling grid, preparing for floor. I don't know why you don't see it. But the  
404 management expects that you will get yourself up there and take a hard look at it. And just get  
405 off of it.

406 [4-0] You guys haven't got it yet. Get in and get out of the each area. J (*referring to 2*) is just  
407 giving you a road map of how to do this successfully. You need to get your manpower, which is  
408 spread out everywhere, right, get it down. That's what you are main focus is, man-hours. You are  
409 all struggling with man-hours. It is very clear that you are running out of labor dollars. You have  
410 not run out of work yet. So this is the way for you to go after your work smartly and finish by  
411 compressing that area down to a manageable area so that you can manage. So that you can be  
412 with your people working them efficiently. You need to look.

413 [12-4] I got an inspection.

414 *12 leaves*

415 [2-31] The ...uh...as far as getting gall the radiant panels, how are we doing with the ceilings  
416 framed where the radiant panels need to go? Anything above 3?

417 [34-2] I think there's one in the elevator lobby...you know in the east side.

418 [4-0] The elevator lobbies are now safe to go work in. We worked all weekend, we got all the  
419 drywall, shaftwall in every elevator 1, 2, 3. Now its upto the electrician to rough in the wall to  
420 put in fire alarm, pull stations, all call buttons and close up in front of these elevators.

421 [4-0] Quite honestly they are not very bog lobbies. We should be able to pull them together and  
422 get the heck of each floor.

423 [4-27] Therefore T (*referring to 27*) if you can go to the front of every elevator and rough it in. If  
424 there is any kind of T-stat, or sensor or anything else that needs to go in. Get an inspection and  
425 lets just finish this.

426 [2-0] You all know what's going on in the 6<sup>th</sup> floor. Walls that are roughed in and inspected,  
427 drywall should be hung and get down on the lobby work.

428 [2-37] 2<sup>nd</sup> floor C/D how are we doing in the casework?

429 [37-2] 2<sup>nd</sup> floor C/D? We are doing pretty good.

430 [2-37] I hope so. We are supposed to be done month ago.

431 [4-0] Well, pretty good is an interesting measure.

432 [2-37] When will you be done?

433 [37-2] I will receive the remainder of the materials this week on Saturday. I have 3 of the OR  
434 rooms and hopefully we will be done by next week.

435 [2-37] All right...nurses station and business center?

436 [37-2] We got one in, and the rest I will be able to do it on Saturday.

437 [2-7] What about the wall protection? How are we doing on that?

438 [7-2] We got lot done. We have already got 1000 feet installed.

439 [2-7] When will you be done with C/D?

440 [7-2] Well for us to finish, all the toilet accessories have to be in place.

441 [2-7] All the toilet accessories are done.

442 [7-2] We are not starting there today.

443 [2-7] Lets start today; you will be done by Friday.

444 [2-7] Are running short of man-power? I don't think we are running short of work.

445 [4-12] My understanding is that the part of the problem has to do with the sink tops, which has  
446 impact on the fixtures of the lavatory, which has impact the accessory guys.

447 [2-28] The S (*referring to 28*) will be going to start moisture mitigation next week.  
448 [2-28] Can you start there?  
449 [28-2] We can.  
450 [2-36] Make sure all the floors are cleaned up; all materials off the floors before they move into  
451 start mitigation. Get with S (*referring to 28*) to find out where he wants to begin.  
452 [2-5] Uh...what is the status of door frame?  
453 [5-2] I got an email during the weekend that the frame doesn't fit us. So I will follow it up today.  
454 Even though there is a guy out here who fixed it.  
455 [4-5] So the guy fixed the door that doesn't fit the frame?  
456 [2-4] It was Halloween!  
457 *Everybody laughs*  
458 [2-25] Cart-wash with levers, you are working on those to be installed in ORs. How we are doing  
459 on the ceiling? Will we be done tomorrow?  
460 [25-2] Framing will be done, yes.  
461 [2-25] Lights and diffusers will be done by the end of this week?  
462 [25-2] No sir. There is problem with the diffusers. I was under the impression that the diffusers  
463 were in the warehouse. The diffusers are all back ordered. They don't ship till November 4<sup>th</sup>.  
464 [2-25] Where are they shipping from?  
465 [25-2] Uh...I have to get you a location for that.  
466 [2-25] Do you have any anticipation when they will be here?  
467 [25-2] Monday...if they ship it on 4<sup>th</sup>, the materials should be here on Monday.  
468 [2-25] Are they fabricated and just pending shipment?  
469 [25-2] I don't know. I will have to get back to you on that.  
470 [2-27] Will you go start the lights G (*referring to 27*)?  
471 [34-2] No. We talked about this last week. We can't put in the lights until he puts in the access  
472 for the 16 fire dampers that taps right off it. If he puts in the light we cannot get to them.  
473 [4-34] That's a problem. How will the owner get up there?  
474 [34-2] Once the air balance is right, they never have to get up there.  
475 [2-28] Okay...moisture mitigation starting from next week and they start in the OR floor in 2  
476 weeks from today.  
477 [2-27] As far as Minor Procedure Room goes, G (*referring to 27*) I saw an email about you all  
478 missing some electrical rough in and you have to take drywall off the wall in order to install.  
479 [2-27] Is it now installed and inspected? Or when will it be installed and inspected?  
480 [27-2] It is installed. The inspector will be coming tomorrow.  
481 [2-31] Once that is done, B (*referring to 31*) can you get in there and hang the drywall back and  
482 do the finish? Then get the ceiling grid by Thursday afternoon.  
483 [31-2] If we get in there and do the wall and the ceiling together, is it fair enough?  
484 [2-31] Well...I don't know if it is fair enough, T (*referring to 27*) has some overhead work still  
485 need to be taken care of.  
486 [2-27] Don't you?  
487 [2-27] Will you be working through the grid?  
488 [27-2] I will not like to do it. If it is necessary then we will try.  
489 [31-27] It is the room with the small perimeter. May be it won't be that bad.  
490 [2-36] There's no casework in the Minor Procedure Room. Isn't it?  
491 [4-0] Yoooooo!!  
492 [2-60] Well there is 2 rooms that getting no caseworks.

493 [2-0] Area B, we are going to finish the main ceiling grid today. Is that going to happen?  
494 [4-33] Now, how is that going on with all the sign offs on the grid?  
495 [33-4] We got all B signed off. We got the corridors. There's a lot of grids.  
496 [33-4] Can we go back to C/D real quick? The fire dampers we can get in there and also the  
497 smoke detectors.  
498 [33-31] Well B (*referring to 31*) around those areas we will take a walk this afternoon. We will  
499 leave that one section and grid around that.  
500 [2-33] Is that the hallway outside the Minor Procedure Room?  
501 [4-33] Other than that, how is the ceiling grid coming together?  
502 [33-4] We are getting there? As for the A/E we are going to be complete by Wednesday.  
503 [2-33] So, how much grid have we got left in B?  
504 [33-2] The main corridor, we have to get that part where the material hoist was, the stair well,  
505 and little bit here and there. I will walk in today to see what's going on there.  
506 [2-33] Are you caught up with the grids for the lights and diffusers?  
507 [33-2] Yeah...I mean we are close. The grid will be up during this weekend. We will catch up  
508 with that.  
509 [2-36] As far as Area B Nurse's Station, the casework will be done by about 15<sup>th</sup>. How are we  
510 doing there? Any issues?  
511 [36-2] We have the same issues.  
512 [2-0] Wall fixtures will be going up next week, sheet vinyl starting on 12<sup>th</sup>.  
513 [2-31] Area A/E 2<sup>nd</sup> floor how are we doing on the bulkheads?  
514 [31-2] Uhh...I don't have any issues, but we have not started in that yet.  
515 [2-31] Have you got man-power to do that?  
516 [31-2] Uh...I have to make some calls to the office.  
517 [33-31] In D, we will have inspections of 2 small bathrooms sometime today. You will be able to  
518 hang drywalls in those. The 2 larger public bathrooms...they are ready to go back and hang  
519 drywalls. You will get the two vestibules framed.  
520 [2-31] How are we doing with the ceiling grid?  
521 [31-2] We have put a little bit in A but everything is not ready.  
522 [2-0] So we could not start grid until we are done with lights? Anybody sees any problem with  
523 that? The lights and diffusers should be done today.  
524 [2-31] But we haven't started the grid yet. Why haven't we started the grid B (*referring to 31*)?  
525 [2-31] Because T (*referring to drywall subcontractor*) was so far behind that no other trades  
526 could get their work done.  
527 [2-27] No one from T (*referring to the electrical subcontractor*) worked yesterday. No one was  
528 doing work on the 1st floor.  
529 [2-27] Are you all done on the 2<sup>nd</sup> floor? Are your all sign off on the ceiling grid?  
530 [2-27] If B (*referring to the mechanical subcontractor*) and T (*referring to the drywall*  
531 *subcontractor*) are done, then why were you not working yesterday? Or Saturday working on  
532 that?  
533 [2-27] Why weren't you here yesterday?  
534 [2-36] How are we doing in casework D (*referring to 36*)?  
535 [36-2] A/E? We will complete by the date we have in here.  
536 [2-36] You will complete by 11/8 date?  
537 [2-36] You are getting material on Saturday. If you are supposed to be done next Monday, I  
538 expect you to be here all Saturday and Sunday working.



539 [2-0] Sheet vinyl is supposed to start on 24<sup>th</sup>.  
540 [2-31] Area F, the grid will it be complete by the 11/10?  
541 [31-2] 80% of it is signed off and ready to go.  
542 [2-31] You said 80% of it is signed off?  
543 [2-27] How about the lights and diffusers? Are we caught up with that? If 80% of the grids are  
544 up, that means is 80% of the lights and diffusers are installed? How are you doing up there G  
545 (*referring to 27*)?  
546 [27-2] We are doing pretty good with lights up there.  
547 [2-19] How are the low voltage guys? How are you all doing up there? Where are you at C/D, B?  
548 [19-2] Probably not in D or B. Nothing.  
549 [4-19] You are all working 40 hours a week? If you work 40 hours math says you will never be  
550 able to catch up on things. We need you to step it up.  
551 [20-2] On the 2<sup>nd</sup> floor we have some issues.  
552 [2-20] Are you working 40 hours a week as well? Who are you with?  
553 [20-2] I am with W.  
554 [2-20] How are you doing? Are you done on the 2<sup>nd</sup> floor?  
555 [20-2] We are right behind the drywall guys.  
556 [2-19] How many days do you all need to get caught up? From G, C/D, B and F?  
557 [19-2] Probably going to be next week.  
558 [4-19] Here's what available for you all. It appears that all you low voltage guys are locked in  
559 the 40 hours work week. We build hospitals for living and we can't build hospitals working 40  
560 hours week. So we offer you an opportunity to still stay at 40 and just get another crew and have  
561 them come in every afternoon at 3 o' clock and they leave every night at 1. So that means you  
562 stay at 40 hours, but you work 2 crews each day and get twice as much work done. How about  
563 that deal?  
564 [2-31] As far as Alternate 3 goes, I don't believe we are hanging drywalls up there yet. What's  
565 holding you up there?  
566 [31-2] Wall inspections. We have got electrical inspection Thursday, and guys started hanging  
567 Friday morning.  
568 [2-0] Hard ceiling were supposed to be framed today and tomorrow. Sounds like its not going to  
569 happen.  
570 [2-31] But we want to get the hard ceilings by the end of the week. B (*referring to 31*) we need  
571 you to get on it. Okay?  
572 [2-31] Area G, closing ceiling and bulkheads. Will you be able to do that by the 3<sup>rd</sup>?  
573 [2-31] Can you get the ceiling inspection, hard ceiling inspection, all that Area in G and close it  
574 off and get done by Wednesday?  
575 [31-2] We have most of the bulkhead hung in Area G. We have only 1 bathroom left to work on.  
576 [2-27] Are you providing them light G (*referring to 27*)?  
577 [27-2] We will.  
578 [4-27] Where else do we need light? It should be paramagnet light fixtures where we have  
579 permanent ceiling fed by temporary circuit.  
580 [2-31] The 1<sup>st</sup> floor C/D, bulkheads and hard ceilings. Those were supposed to be done by 10/25.  
581 You are way behind.  
582 [4-31] What's happened there yesterday?  
583 [2-31] Well I know there was a wall that was moved.  
584 [2-23] We adjusted that wall. We did jack hammer and got all the conduit up trough the wall.

585 [2-27] Have you seen that?  
586 [2-27] All your electrical...basically the wall got installed on the wrong side of the line. So that  
587 wall got moved during this weekend and now everybody should take care of whatever need to be  
588 moved over.  
589 [2-0] Of course that right over the bulkhead goes and that's holding up bulkhead framing though.  
590 [2-0] All of you should be seeing the dates her. We should be prime coating by end of this week.  
591 And most of the hard ceilings aren't done, there's sheetrock wall everywhere. Guys I don't know  
592 what the answer is. We need to get all the subs to be working during the weekends. You can't get  
593 people working during the weekends, they are tired, hunting, what ever.  
594 [2-31] Area B, close-ins hard ceilings...how are we doing there B (*referring to 31*)? How many  
595 people have you got to put in hard ceilings and the part of bulkheads as well?  
596 [31-2] Well I am planning to be done in C.  
597 [2-31] Okay...what is T's (*referring to the drywall subcontractor*) plan to be done with B? When  
598 do you think you will have all the bulkheads and hard ceilings done in Area C?  
599 [31-2] I am trying to get done with C first. There were some issues with the inspections. Most of  
600 the bathrooms are framed in B.  
601 [2-31] Have you now straightened all the issues? Do you think you will be done with Rea B this  
602 week as well?  
603 [31-2] I don't think any bulkheads are left in Area B.  
604 [2-31] What about 1<sup>st</sup> floor are A/E? We were supposed to get done 10/7?  
605 [2-31] Lets think about the drywall right now. As soon as we get the hard ceiling installed, we  
606 will get the MEP inspections, get it closed in and get the drop ceilings following behind.  
607 [2-0] As far as Kitchen and Serverry goes, look at the dates in here. The drywall close-ins and  
608 miscellaneous framing need to be completed by 11/5. You all can read dates, I don't need to read  
609 for you.  
610 [2-0] One thing to notice is that see at the bottom. This work is way behind schedule and its on  
611 the critical path of finishing the job now.  
612 [2-0] So T (*referring to drywall subcontractor*), E (*referring to fire sprinkler contractor*), T  
613 (*referring to electrical subcontractor*) need to be working overtime to meet these dates necessary  
614 so that we can get this work done in schedule.  
615 [2-0] 1<sup>st</sup> floor Area G the walls are closing in. So we know that we are done.  
616 [2-0] Is anybody not finished so that the walls cannot be closed of? Any wall rough in  
617 incomplete in Area G?  
618 [23-2] There were couple of walls that went up Thursday and Friday, that we are roughing in  
619 today.  
620 [2-31] How many finishers do you have on site?  
621 [31-2] About 35.  
622 [2-31] Chances are that you will probably need about 70.  
623 [2-27] You need to caught up with a lot of work...B, F, G, A/E, all of it.  
624 [2-27] In the Atrium, how are we doing with the electrical rough in inspection? Will you get it  
625 this week?  
626 *27 nods showing agreement*  
627 [2-31] The perimeter bulkhead framing...you have got a lot done already though.  
628 [2-0] Looking 11/8 to start hanging all the stuffs from high ceiling. Getting out bulkhead  
629 inspection and the 1<sup>st</sup> coat of paint by the 22<sup>nd</sup>. Ceiling grid on the 26<sup>th</sup>.

630 [1-0] I am sorry...does everybody understands that there are 2 areas...the high ceiling will be  
631 inspected this week and then the perimeter the next week.  
632 [2-0] Does anybody here have any questions in so far what we discussed?  
633 [1-37] What have you got...a separate crew or same crew working on 3A, 4A, 5A on VCT?  
634 [37-1] I have got 2 crews right now.  
635 [2-0] As far as Center Plant goes, we should be done. Are we done 100%?  
636 [23-2] We are all done. We are ready to go. All the boilers and everything is hooked up and will  
637 be up running in couple of days.  
638 [2-23] When will we have hot water in the building?  
639 [23-2] Today. We will start the hot water today.  
640 [2-23] For plumbing?  
641 [23-2] No hot water for the heating line.  
642 [34-2] If you want plumbing hot water, we haven't thought about it. We can run hot water for  
643 plumbing if you want.  
644 [4-34] We don't want hot water for plumbing right away. But we need hot water for unit heaters  
645 that are sitting in the stairways, in the penthouses, which keep systems from freezing. Its time to  
646 start these heating devices on.  
647 [34-4] Right now all the C/D and B Tower are all ready for heat today.  
648 [2-0] Do we have anything else? Anything else regarding schedule?  
649 [2-0] All right we can't stress enough guys that you get towards the end of this thing we don't  
650 want you to be here 24 x 7 trying to finish up. That's where we are going. I have been in there, I  
651 have done it before, it really s\*\*\*\*. We will do whatever it takes to finish the job. The other  
652 thing is...  
653 [4-0] Is there anybody who has finished a job with us before? We will have people doing your  
654 work. When it comes to the end, an executive decision will be made by Co.-A and then we  
655 would go. If that whistle gets blowing we will start spending all kinds of money. Because they  
656 are very important client for us. So we will finish the project on time and go till the end. We will  
657 go with you to the end, we will go without you. But we will go to the end. That is how Co.-A  
658 does this kind of work. We encourage you to be with us. You have worked with us this far, so we  
659 want you to do work with us.  
660 [2-0] I will give you an example. First job I ever did with T (*referring to the electrical*  
661 *subcontractor*) 10 years ago, the whole reason T was there because the other electrical company  
662 was failing. We brought T in and they bail us out and the other electrical company has not done  
663 work with us until...about a month ago they got with us. So its typically 10 years to get another  
664 job with Co.-A after they failed us. You do not want to be one in the failed list.  
665 [2-0] You will be blacklisted and what it means...it will be state of Virginia, Maryland, North  
666 Carolina, where ever. We are very big company and we work all over the United States. So we  
667 need to get done. Another thing, if you are missing any materials or anything stolen this  
668 weekend, let us know we will pass the information to one of the police officers.  
669 [1-0] Just one more thing while you guys are here...I want to let you know that S (*referring to*  
670 *the owner*) they will be hiring all the low voltage work after we hand over the building to them.  
671 There's a lot of work involved and we think you can look into this as your next job if you get  
672 straightened up here.  
673 [2-0] All right...that's all I got.  
674 *End*



## Appendix C: Transcript of Meeting A3

*Date of observation was November 8<sup>th</sup>, 2010. Venue of the meeting was job site trailer set aside for meetings. The meeting started at 9:05 am in the morning. There were 46 attendees in the meeting. The Project Manager of the project is 1; 2, 3, 4,5, 6 and 11 were also employees of GC. 43 was the safety manager for the project and 41 was the nurse on site. The rest were subcontractors. The attendees started coming into the trailer from 8:40am. 28 and 14 were talking to each other about a worker, who had a surgery recently. They were also talking about the barbecue they had on site last week. Some of the attendees were talking in small groups (8 & 9; 25 & 23; 6 & 27; 6 & 9; 19 & 35). Meeting agenda was distributed at 9:00 am.*

- 1 [1-0] Okay, good morning everybody we will get started. And as always, though I made the  
2 mistake the last time I didn't mention, please turn off the sounds of your phones so that we can  
3 talk about business. Uh...we will get through the skin and the site items and then head out to the  
4 finishing interior work. Uh...safety I guess E (*referring to 43*) you have got something with  
5 safety.
- 6 [43-0] Yes...couple of things...I don't have much scope to teach you guys how to do  
7 investigative efforts after accidents. But when you are submitting a report to us about an  
8 incident, one thing it has to be timely and also include certain things like...uh...what was the  
9 cause of the accident will be really helpful in your opinion. I know you guys are not trained as  
10 investigator. And interviews of people who were hurt and any witnesses to the event. It is very  
11 important if we can get as timely as possible. If you have 2 people involved in an incident it is  
12 very helpful if as soon as practicable to get them separated and get them a piece of paper and say  
13 tell me what happened. You will often learn an awful lot about simple statements like that.
- 14 [43-0] Uh...there has to be some causation effort. In other words accidents will happen, but if  
15 there is not a causation...that's a surrender. And then when you are submitting separate topic,  
16 when you are submitting your weekly reports through the chain of command, your daily task  
17 hazard analyses, you weekly roll-up tool-box talks, don't forget to put your company name on it  
18 and date. Then I cannot give you credit for that and you get a nasty feedback from either me or  
19 the superintendent saying why didn't you submit the report. I usually get 4 or 5 of these every  
20 week.
- 21 [43-0] So make sure you check you got your name on that. Okay?
- 22 [43-41] Over to E (*referring to 41*).
- 23 [41-0] To dovetail on that...for the OCIP (Owner Controlled Insurance Program)...these are  
24 packets that I have created. I have them as also Co.-A has them. Especially on weekends if  
25 somebody gets hurt, it is critical that this piece of it is completed and given back to me or A  
26 (*referring to the secretary of Co.-A who is not present in this meeting*) if I am not here, because  
27 we need to get this in the system within 1 to 2 days of the accident. Because your workers need  
28 to be followed up for physical therapy and whatever. So please make sure that's a priority on  
29 your list when somebody gets injured.
- 30 [41-0] The other thing is I talked to you something about flu vaccine last time. We have acquired  
31 flu vaccine a lot of it from S (*the owner of the project*) but I am still working with the Health  
32 Department for coming in here and giving you flu vaccine. So for all of you who do not have it

33 and want to get it, we will have it available and will have it available for your workers too. So we  
34 can get that coordinated hopefully within the next week.  
35 [41-0] Any questions from anybody?  
36 [2-0] Actually the reports need to be turned in with 24 hours of the incident. If you do not we can  
37 suspend your work till you turn it in. Just so you know.  
38 *43 and 41 leaves*  
39 [1-0] Uh...just one last general item to over quick. You all should have seen a note last  
40 week...those of the low voltage folks who have not seen it...there should be a sign up on the  
41 various floors and C/D Tower. Those are signing sheet to work on the floor. Now the reason for  
42 that is...uh...we have people going through when they are destroying and or removing the  
43 ceiling tile around...uh...leaving screws on floor and things like that.  
44 [1-0] So you all need to be accountable for what you are doing up there for things that surely be  
45 done. So for all the low voltage people who were not on the email string, I don't know if you are  
46 here or not, make sure you sign in those sheets. I believe if you don't sign in there may be some  
47 challenges and issues and you may be removed from the project. So the best thing is to do the  
48 sign, so that we know exactly what you were doing, why you were doing, why you were up  
49 there.  
50 [1-4] Few things in the Garage schedule. A (*referring to 4*) can you go over those?  
51 [4-0] I am sorry...I am fighting with laryngitis (*4 had real problem talking and her voice was*  
52 *also not clear*)  
53 [4-0] On Stair 3, T (*referring to the drywall subcontractor*) has to stay ahead of the mason.  
54 [4-33] J (*referring to 33*) we got an email from K (*referring to somebody not present in this*  
55 *meeting*) over the weekend that said that you were not able to complete one stair?  
56 [33-4] It was ready on the 2<sup>nd</sup>. It was not ready before.  
57 [4-33] What were you not being able to do on 2<sup>nd</sup>? You must be doing layout, correct?  
58 [33-4] What we had talked about is we will go in and layout. And we had some boom-lift over  
59 out head, not that we are working on them. And then we are going to flash it and start setting up  
60 scaffold and then the same thing. And now we started setting up the scaffold on the front wall on  
61 Friday. We were not being able to set the scaffold around the corner because you know...they  
62 couldn't get around the corner to scaffold it. So you know we had to address all that.  
63 [33-4] I am not able to work on weekend when T (*referring to the drywall subcontractor*) works.  
64 [4-33] T (*referring to the drywall subcontractor*) will not be working on the weekend. So you  
65 have priority there.  
66 [33-4] That's good. I will then try to make up over there working weekends.  
67 [4-33] Yes...whenever you are held up you should come to us straightway and let us know.  
68 [33-4] I did.  
69 [4-33] But during this weekend did you come and tell anybody of Co.-A that you were not able  
70 to work?  
71 [33-4] No.  
72 [4-33] Okay.  
73 [4-0] You can see the items that have been completed.  
74 [4-17] Now curtain wall on South side...we have the frames in. But the lift was not approved. It  
75 is sitting in the garage. So we need to figure out what we are going to do there.  
76 [4-0] For the east elevation of the building, curtain wall change...

77 [33-4] The east elevation was also not done on 2<sup>nd</sup>. The Tuesday report that I wrote several  
78 weeks ago that was not addressed and I did that work myself over the weekend. We will flash  
79 that iron starting this morning.  
80 [33-4] Look what I have in writing. The QC report that I wrote 3 weeks ago.  
81 [4-33] Yes it shows about the angle being out.  
82 [33-4] Correct. I took of that during the weekend.  
83 [4-0] Great...curtain wall J/K will be starting on 11<sup>th</sup>. And windows on the Parking Garage on  
84 the 15<sup>th</sup>. You can see the dates for the roofing.  
85 [4-16] Uh...interior painting is ongoing in the 1<sup>st</sup> floor and will be finishing this Friday.  
86 [16-4] We won't be able to finish it this Friday.  
87 [4-16] Okay...do you think you will be done next week?  
88 [16-4] Next weekend.  
89 [16-4] Next weekend? Okay.  
90 [6-33] On the east side brick, we have got a handrail right on the roof at 3<sup>rd</sup> floor. He is prepared  
91 to go in and put it by Friday. His guys just need to coordinate with you guys of how to do that so  
92 that you are not held up. So when will you be up to that elevation where that handrail needs to  
93 be?  
94 [33-6] Where is that? That's at the 32 feet height, correct?  
95 [6-33] Right.  
96 [33-6] I should be there by the end of today. I will be working there and will be at that height  
97 by...I will be there today, towards the end of the day. Probably around 2:30. T (*referring to one*  
98 *of the mason not present in this meeting*) is up there, so whenever you are ready.  
99 [4-23] The sprinkler stand pipe getting inspected today. Correct?  
100 [23-4] Yes, at 2:30.  
101 [4-16] And...we need to get the steel in that elevator pit.  
102 [16-4] We won't put the steel members in all the pits. We will do it one after the other.  
103 [4-16] Okay...it's the first one that we need to be put in right now.  
104 [16-4] Yes, we will get that.  
105 [4-16] Okay, cool.  
106 [4-0] Uh...elevators are being delivered tomorrow.  
107 [4-39] And J (*referring to 39*) you need to be focusing on getting the electrical rooms on the 1<sup>st</sup>  
108 and 5<sup>th</sup> floor ready. I think we talked to you last week about it.  
109 [39-4] We are working on the 2<sup>nd</sup> The 1<sup>st</sup> one is ready.  
110 [4-39] Okay.  
111 [39-4] You said 1<sup>st</sup> through 5<sup>th</sup>?  
112 [4-39] 1<sup>st</sup> and 5<sup>th</sup>. You need to focus on those two first so that we can get them started on Friday.  
113 [4-0] That is pretty much it for the Garage. Any question there for me?  
114 [33-4] Yes. Make sure the roofer has a little bit of flashing ready for the 3<sup>rd</sup> floor at the 32 feet  
115 level.  
116 [1-0] Any more questions for the MOB Garage?  
117 [1-0] Uh...for site-work, the paving for the Western Lot is supposed to be wrapped up by end of  
118 this week.  
119 [1-20] Is that going to take place?  
120 [20-1] The final grade crew will be here Tuesday or Wednesday. And the paving crew will be  
121 coming behind that. Probably first of next week it will be paved.  
122 [1-20] They will be here tomorrow you said?

123 [20-1] Tuesday or Wednesday. In the morning.  
124 [1-20] There are some places we need to take care off before the final grading crew comes in.  
125 We are trying to get the irrigation and landscape done and get it ready for you.  
126 [1-21] What's happening with our sidewalk installation in the west side? We were supposed to  
127 finish the sidewalk between Stair 2 and 3 and the helipad last week and some other areas but are  
128 you working on that now?  
129 [21-1] Right...we are now working on the MRI canopy and whenever C (*referring to the*  
130 *concrete subcontractor*), I don't know what's the status is, have all the benches set in that area  
131 between Stair Tower, MRI and Stair Tower 4...uh...as soon as that area is cleared we will get it  
132 formed.  
133 [1-21] I believe between Stair 3 and Stair 2, there is no granite. Granite is at Stair 4 and  
134 somewhere around the front entrance. Those stairs have precast. So what's holding up that  
135 sidewalk?  
136 [21-1] Nothing. Its laid out and ready to go. We were waiting on C (*referring to the concrete*  
137 *subcontractor*) to set the benches before we pour.  
138 [1-21] So are you pouring that this week?  
139 [21-1] Yes. We will start at the MRI and work our way towards the Stair towers.  
140 [2-21] You have to do the decontamination tank. D (*referring to a subcontractor who was not*  
141 *present in this meeting*) drove over it and broke it.  
142 [28-2] What do you mean?  
143 [21-28] You know the ramp I was opposed to? And some body drove up over the ramp and  
144 broke the decontamination tank.  
145 [28-21] Must have been some \*\*\*\*\*.  
146 [3-21] Get rid of the ramp...all right? And lets keep rubber tires in the parking areas.  
147 [21-3] I put barrels on those castings, so there should be nobody.  
148 [1-21] The South Parking Lot...you guys have the stoop information. Have you poured the stoop  
149 in the south area?  
150 [21-1] Yeah...they will be poured this week.  
151 [1-21] As far as the Healing Garden Area, the rough grading will be wrapped by 9<sup>th</sup>?  
152 [21-1] I will be done today.  
153 [1-21] So it's going to be tomorrow or the next day for establishing the bio-falls and the stream.  
154 [1-0] As far as hard-scape of Stair 4, couple of things, we have made a few changes since out last  
155 meeting. Once we learnt about the pavers for Stair 4 are not available till the end of the month,  
156 Stair 2 and 3 are available.  
157 [1-10] As long as granite is not going to be available till the end of November, that kind of  
158 changed a few things. So as far as Stair 4...uh...as the granite won't be here till the end of the  
159 month...uh...it will take first couple of days in the December to install it.  
160 [2-1] Are the rocks in the perimeter work held up?  
161 [1-2] Rather than have to rake back all the rocks, we are trying to put it in later. We will get the  
162 ramp installed, get it caulked and everything else and then put the river rocks afterwards.  
163 [1-2] And then the pavers will go in at the same time.  
164 [1-0] As far as Stair 3 though, that should start next week. You should be starting the pavers in  
165 Stair 3. We work there this week. Regarding benches, there are no concrete cast in place  
166 benches, they are all precast.  
167 [1-33] I think some of those are setting out there. Correct?  
168 [1-33] Will those be done this week?

169 [33-1] They should be. I have been asking for all these to be delivered. Still I haven't got it. I  
170 will go over to the yard and see what's happening.

171 [1-33] So you are saying you do not even have them on site?

172 [33-1] They are not on the site. I have to go to the yard. I am getting 4 small ones and I don't  
173 know about the other ones. I will have to go and check it.

174 [4-33] You saw the CIs that affect those?

175 [2-33] All the ones at Stair 4 are set, right?

176 [33-1] Yes sir. The B West is what we are talking about. They all are in B West except the 2 that  
177 wrap that column. And I will not be able to set that till the disconnect box to the elevator and the  
178 temporary plumbing needs to be cleaned up.

179 [2-26] We all are working on running the underground electric to benches that are set?

180 [26-2] I will check on that. Probably the pipes are there. It will be more pipes that come to the  
181 fixtures and tie it all in.

182 [2-26] Aren't your fixtures in the precast?

183 [26-2] Well we have lot more fixtures going out in those benches. It depends on what area the  
184 benches are.

185 [1-26] We need to get out there and sort this out. This is going to be a problem.

186 [3-26] Do you have the fixtures?

187 [26-3] Yes.

188 [3-26] So you can just put man-power on it. And kill it all. The benches and these stand alones.

189 [26-3] Right, the little wall plate fixtures. I have got the end bolts and the wall plates going in the  
190 fixtures. So all that will be going in. Already I have got the materials for the cone fixtures. They  
191 are going to prefab all those holes, that way conduits are stubbed out right there. When we get to  
192 tie in for the wires, it will be easier.

193 [2-33] Stair 4...when are benches going to be done in Stair 4?

194 [33-2] Stair 4 is done except for the 2 that I have to disconnect in the temporary plumbing area.

195 [2-33] You have the benches here?

196 [33-2] They should be at the yard.

197 [2-26] So you should be starting those benches today. When are you going to start the benches?  
198 And those lights?

199 [26-2] We have already started. We are installing conduits in there.

200 [1-26] What J (*referring to 2*) was just trying to say is benches should be wrapped up tomorrow.  
201 When benches are already set you should be out there with man-power running the rest of the  
202 conduits to terminate in the light fixtures that will go in there, to get that going.

203 [26-1] That's fine.

204 [1-22] W (*referring to 22*) is there any problem there?

205 [22-1] Yes sir.

206 [3-22] You can take the disconnect for the hoist down today and put it to the corner.

207 [1-33] Now Stair 3 is on C/D list.

208 [33-1] Okay...I know what you are going to ask. Stair 3 I don't have any materials in here yet.  
209 And I have to find out what's there is in the shop now and when is it going to be here and all  
210 that.

211 [1-33] We have been talking about this for 2 weeks. Plus the thing that the start date is today is  
212 kind of bothers me.



213 [33-1] I know I have 3 of them coming tomorrow with the others, with what I need to finish Stair  
214 4. And 3 for Stair 3...and so next 4 should be here Tuesday. That's what I have been told. That's  
215 where I am going from there.  
216 [2-33] How are you going to drive in there to set the precast benches?  
217 [2-33] H (*referring to the paving subcontractor*) is fine grading and paving.  
218 [33-2] That's what I know...I know.  
219 [2-33] Does your office know?  
220 [33-2] He knows.  
221 [1-33] Please let us know where are all the benches?  
222 [33-1] Yes I was there Wednesday, and now I will go after this to find out what's going on.  
223 [1-33] So as far as Stair 2, do you have those benches?  
224 [33-1] The way the granite is in the middle, we formed it back on Friday, I set that one Saturday.  
225 Now we can go to the other 2 and get the stuff done. And then I will go and find out when the  
226 deliveries are coming. I am ready...all my bases are ready. But I need to get them here so I will  
227 find out and let you know.  
228 [1-33] So bases are ready, just don't have anything to put on them yet.  
229 [33-1] Right...I mean my footing is ready, I have all my underground, I will have to set the  
230 benches. I set 6 a day, that's what we did.  
231 [1-33] And next week you will be ready to go to start to the start the CMU brick, screen wall up?  
232 [33-1] Which is at Stair 2? The footing is all done; I think we will be done this week.  
233 [1-33] It should be done this week?  
234 [33-1] Yes.  
235 [10-1] These benches...are the ones in the corner have granite on them as well?  
236 [1-10] These are of 2 types...one is precast...that what he (*referring to 33*) set. You don't have  
237 to touch the lamp, because the light fixture runs linearly along the...  
238 [10-1] But the ones I am setting are poured in place?  
239 [1-10] Yes.  
240 [10-1] Okay. And they are all ready...they are good to go?  
241 [2-10] They are in the process. They started last week they are pouring, strip the form and for  
242 forming up some more today.  
243 [1-10] Are you concerned about anything else?  
244 [10-1] Well...the only thing that concerns me little bit is that they are kind of thick and we have  
245 some kind of mortar going on it, the manufacturer says that needs 28 days of cure time before  
246 putting things on. As far curing that concrete...that concerns me a little bit. I don't know how  
247 much dry it will get...may be it will dry out.  
248 [1-10] They seat on some angles...don't they?  
249 [10-1] No. We are putting it up with an epoxy set.  
250 [4-1] Yeah.  
251 [3-10] So you are going to wrap something?  
252 [10-3] No, no, no. It won't be on like a mud base, it will be a stone epoxy. And it will have a full  
253 bed on the top. So it will have a solid...uh...solid backing. There is not void underneath the top.  
254 And on the side it will be epoxy set.  
255 [3-10] Have you submitted that? Because if moisture is a problem, we can go back to what is  
256 shown in the drawings.

257 [10-3] We can. The only problem with that method (*referring to the method specified by the*  
258 *drawings*) is that I don't get a lot of leeway as far as squaring up things. So I think epoxy is  
259 better to make it square.

260 [1-22] As far as all the conduits for the signage has not been installed on the intersection of the  
261 Dam Neck and Wellness. The poles will be going back to the CUP, and we have asked the  
262 designers if there is a way to go to one of those existing light poles out there or something, so  
263 feed the site signage probably from one of them. So we are waiting to hear back from them and  
264 will go from there.

265 [1-0] Let me go through the skin real quick...

266 [2-26] Light poles...when are we going to see the East Lot lit up? What are we waiting on?

267 [26-2] I have got more fixtures along down at that end where the little round alcove is out  
268 there...I got to get those fixtures in and the junction box down there. I got to lay pipes to the  
269 parking lot from there. So in order to turn around that area I need to get through the turn around  
270 or whatever you call at the end, I need to get my conduits through there.

271 [2-26] What about the poles along the Wellness Center?

272 [26-2] I got to get all the temporary out and removed and then out the piece of conduit.

273 [2-26] When do you plan on doing that?

274 [3-26] Is it going to be done in the near future? This week? Next week?

275 [3-26] We may ask repeatedly this because we couldn't eliminate this parking lot for the  
276 workers, as it is getting darker, we have all changed our clocks, to work through the winter. So  
277 we need to light that up soon.

278 [1-26] I think last week you mentioned that the majority of the pole bases in the western side  
279 would be done last week. Did that take place last week?

280 [26-1] No I had a hold up. It should be up there today.

281 [22-1] We cancelled it because of weather as well. Kind of hard to work with pole bases when  
282 they get filled up with water.

283 [3-22] Did you reschedule the work and checked that the weather is good this week? Today is  
284 the kind of day when the sun is coming out...

285 [22-1] I am not sure exactly if they are coming today or not. I did not have a conversation with  
286 them.

287 [3-22] If it is sunny today, and tomorrow can we get back on that?

288 [22-3] Yeah.

289 [26-3] They are working on it. There are 6 more I can pour.

290 [1-26] Is that all left?

291 [26-1] No I have to put all those in the front. We are talking about say a total of 21 all of which  
292 are around 18 inches (*in diameter*).

293 [2-26] Why can't you put those in?

294 [1-26] You know that the curb has to be installed out there.

295 [1-26] Why can't we put those in?

296 [2-26] Just lay those out and get rolling right on it. You can get all the ones in the front to the  
297 hospital where the turn around is...

298 [1-26] Kind of where the horse-shoe is?

299 [2-1] Yeah.

300 [1-8] City construction and gutters at the...uh...do you know when will the gutters be here?

301 [8-1] Its in fabrication now and should be here by next weekend.

302 [1-8] So it should be in site on Monday next week?

303 [8-1] Yeah.  
304 [1-8] How long do you all need to finish installing that?  
305 [8-1] Its going to take couple days.  
306 [8-1] Has that concrete got counter flashing?  
307 [1-8] I have no idea.  
308 [8-1] I will check on that. The drawing is showing that the counter flashing is coming off the  
309 brick.  
310 [1-21] Did you finish the caulking last week at the B louvers?  
311 [21-1] Uh...I am not sure. I was actually on vacation last 2 weeks. C (*referring to the foreman*  
312 *who was in charge in his absence*) was handling that. I know we are about 95% complete.  
313 [1-21] The Emseal joint at the Healing Garden, is that all done yet? Do you know?  
314 [21-1] I know the material has been ordered. And waiting for the brick to be replaced.  
315 [1-0] Has that brick been taken care of?  
316 [2-1] What are you talking about?  
317 [1-2] Over at the Healing Garden, that's been done...right? The bricks been corrected?  
318 [3-1] Yes those are done. Correct.  
319 [8-1] The brick that coming of the metal?  
320 [3-1] He is talking about...what we are talking about is the right here where the brick butts right  
321 against the garage.  
322 [8-1] Oh...I am still waiting on material for that.  
323 [1-8] So it did not come on Friday?  
324 [1-0] Well that and the roof is what still have us getting water inside that area of the building,  
325 which is holding up the rest of the framing and drywall in that section.  
326 [1-8] Where are we with the roof? On the east side of the MOB it should be buttoned up.  
327 [8-1] We should be as far as we can get them on.  
328 [1-8] What does that mean? Is somebody pulling you up? (7)  
329 [8-1] Well yeah. There is 1 area we cannot complete.  
330 [1-8] What area is that?  
331 [8-1] Well I don't know.  
332 *Everybody laughs and chuckles.*  
333 [1-8] That's very funny. So we don't know we can finish it, we don't know what's up there to  
334 finish?  
335 [8-1] Tomorrow I can roof as far as I can do.  
336 [1-8] Okay.  
337 [3-7] There is just one area where there is a gap in the gutter...I mean...gap in the curtain wall.  
338 [7-3] He is running caulk all the way to the expansion joint.  
339 [1-20] The expansion joint...you have any issue working with H (*referring to another*  
340 *subcontractor*) in the area now?  
341 [20-1] No we will be done.  
342 [1-20] It has to be done extremely quick.  
343 [3-20] That's the problem. The point we are getting at now is that if anybody is trying to get  
344 around the building, if you are inside the curb line, or you are in an area in the recess here in the  
345 Healing Garden, you must get with Co.-A because there are things in the ground that can be  
346 damaged. We certainly don't have time to redo most of those. So everything sits outside...some  
347 longer pieces of equipments or you are building some scaffold erection, get with us. J (*referring*  
348 *to 2*) or I will help you out.



349 [1-29] T (*referring to 29*) there's probably a fire bladder needed between the Hospital and the  
350 MOB. Do you guys have any more fire bladder here? Do you have that specific material here?  
351 [29-1] Yeah...it's a 4 inch fire bladder. And we have it here.  
352 [1-0] Yeah...that expansion joint...the Emseal needs to go in, the roof needs to be tied in, the  
353 fire bladder needs to go in, then we can work on the framing of the last area in the wall.  
354 [1-35] The loading dock area, we are still finishing on the ceiling. Is the DEFS going to be done  
355 sometime this week? Are you still planning on doing that?  
356 [35-1] We will finish the plastering of the DEFS today...uh...we will clean that tomorrow. Then  
357 we will be working above the main entrance.  
358 [8-1] Speaking about main entrance...when are we going to weld that two pieces of steel angle  
359 on the two ends up?  
360 [2-8] I think...uh...steel guys need 2 weeks to get their crews out here.  
361 [8-2] I am going to put some fire treated nailer on the two ends so that I have something to nail  
362 the tubes to, its an angle and not a square tube. And I like to start on that this Thursday.  
363 [2-8] We still need to resolve the issue with the roof drains where they butchered the decking and  
364 then I think there's going to be metal...  
365 [3-2] That was while adding angle. I have met with J (*referring to somebody not present in this*  
366 *meeting*) and to get proper deck support.  
367 [2-32] There is another issue out there too. The piping for the roof rain leaders is below the  
368 required elevation, and I am not sure if it will go up any higher or not.  
369 [8-2] I don't have work. Can he cut the angles in after I have the roof on? He is coming back on  
370 Monday.  
371 [3-8] Yes. He is supposed to work on Friday. If he works it should be marked up.  
372 [2-8] Issue will be isocyanurate laying on top and the heat transference of the welding melting  
373 the insulation.  
374 [1-33] He (*referring to 8*) is starting Thursday, can you have the angles done by tomorrow?  
375 [33-1] Yeah...the angles supposed to be here today or tomorrow. And we probably need half a  
376 day to be done.  
377 [1-33] So you will be done tomorrow, worst case on Wednesday?  
378 *33 nods head showing agreement.*  
379 [1-0] You got anything else?  
380 [1-40] When is sod showing up?  
381 [40-1] Next Tuesday.  
382 [1-40] Do you have the water thing sorted out?  
383 [40-1] We are going to run this week the water. The rest of the trees for the West Parking Lot are  
384 coming tomorrow. Since we are not building any protection, everybody should stay away from  
385 the sod.  
386 [1-40] That's correct. I think we had note about that.  
387 [1-0] Everybody it's just a reminder that sod is going down. Please talk to your men about  
388 staying off the grass. Do not let your guys walk on the grass. Please tell them. If we see that  
389 happen, he will be sent off.  
390 [40-1] We will start on the whole West Lot. The main thing that can help us if people can park  
391 their trucks and cars, without overhanging the bumpers 2 to 3 feet on the islands. I don't know  
392 any way of stopping that, but we are trying to grade it, lay the sod and get it done.  
393 [2-40] How much are you going to do a day?  
394 [40-2] We are trying to get it done in 2 days.

395 [2-40] So we can block half the parking lot of.  
396 [40-2] Yes block half one day and may be block the other half the next day.  
397 [2-40] Yeah...you can come in at 5 o'clock or 5:30 when everybody leave and then block. I am  
398 sure we have got enough parking here, so that we can block half of the lot at a time.  
399 [21-2] There is one issue with putting the topsoil. There is an island at the entrance where there  
400 is a light pole foundation that goes in there. We cannot get to there from outside, and we have  
401 ladders and all kind of stuffs stored on top of that island.  
402 [2-21] We have always told not to store stuffs on the islands.  
403 [21-2] But we had to do this because the island was inaccessible because of the fact that you got  
404 containers all way around it. If you can take that out I can get it graded and out of there very  
405 soon.  
406 [1-21] Yes, I can take care of that. Have you got anything else?  
407 [21-1] No, we are good to go.  
408 [1-33] Do you guys know if the sign...the precast sign is made?  
409 [33-1] I don't know...but I will get to know this afternoon exactly. My guess would be 'no'.  
410 [1-33] Have you got anything else?  
411 [33-1] Uh...the dumpsters...where are we putting the dumpster?  
412 [1-4] Isn't that right here?  
413 [4-1] Right there.  
414 [33-4] That's what 2 weeks out? 3 weeks?  
415 [3-33] We will do this when we do the additional curb here.  
416 [2-33] C (*referring to the concrete subcontractor*) has been told to proceed. They are waiting on  
417 rebar.  
418 [33-2] Okay.  
419 [4-33] I think the plan is to do the ramps, do the footings of the walls inside and then come  
420 around and do the dumpsters.  
421 [1-33] Do you have anything else?  
422 [33-1] No sir.  
423 [1-21] I know we talked about Emseal; do you have anything else?  
424 [21-1] Nothing I can think of right now.  
425 [1-13] Aren't the Atrium door installed?  
426 [13-1] Correct. Those are done.  
427 [1-0] Does anybody have any question for skin?  
428 [6-0] One thing I want to mention is that the MOB elevator machine room has some water in it.  
429 So the elevator equipment coming out this week, we need to keep that shaft dry as well as the  
430 elevator machine room.  
431 [1-0] Okay those who have got skin and MOB stuff other than interior can head out.  
432 [1-0] B Penthouse, I believe plenums are wrapped up and was supposed to be done last Friday.  
433 Did that take place?  
434 [28-1] Yeah.  
435 [1-28] And this Wednesday you are still planning to do the relief dampers?  
436 [28-1] Yes.  
437 [1-0] B (*referring to the electrical subcontractor*) will be done with the conduits of the B  
438 Penthouse. The mockup in C/D and B for the urethane and epoxy floor should be taking place  
439 today.

440 [1-14] And L (*referring to 14*), you mentioned that you need another week to install the  
441 sprinklers at the Atrium.  
442 [14-1] Yeah...there was one that was missing.  
443 [14-28] Will you get that (*referring to the DEFS ceiling*) up?  
444 [28-14] It should be done.  
445 [14-1] Okay, then I will get up there and get it done.  
446 [1-14] He says he is done...on Friday. So how much time do you think you will need to get your  
447 sprinklers done? They will be done this week?  
448 [14-1] Yes, they will be done this week.  
449 [1-0] The exterior insulation of the frames, I believe that some has been installed. Do we have  
450 them both types installed?  
451 [1-32] Do you know?  
452 [32-1] I have to find out when S (*referring to one of his leading field personnel*) comes back.  
453 [1-32] D (*referring to the architect*) will be here today or tomorrow. So when we do the walk  
454 through, lets talk with him and figure out which one we are going to go with.  
455 [1-32] What is the status of the rest of the exhaust fans?  
456 [32-1] They (*referring to the exhaust fans*) are scheduled to start today. With S (*referring to one*  
457 *of his leading field personnel*) being gone for medical emergency I just need to find out what the  
458 status is, but they were all ready to go. They were supposed to be starting today.  
459 [1-22] When are all VFDs (*for the kitchen equipment*), starters, and conduits that being run till  
460 the 6<sup>th</sup> floor storage area that I believe serves fans for something will be done?  
461 [22-1] Well we are still missing some of the VFDs. They come with the kitchen equipments. And  
462 that won't be here till early next week.  
463 [1-22] What about the VFDs that are there now?  
464 [22-1] We are in the process of finishing them.  
465 [1-22] We will have them ship them this week.  
466 [22-1] Okay...well that will be great.  
467 [3-22] Well he is talking about conduit above the ceiling, and you are talking about VFDs that  
468 poke through the wall. So you can still run all the stuff under the ceiling till you get the VFDs.  
469 We will expedite the VFDs.  
470 [22-3] Yes, we are.  
471 [1-22] When can we get the conduits wrapped up so that we can get the hard ceiling framed up?  
472 [22-1] I will have check how my guys are doing right now. But I will say definitely by the end of  
473 this week.  
474 [1-22] Are those serving the kitchen exhaust?  
475 [22-1] Yes those are all the kitchen exhausts. There are 4 or 5 of them.  
476 [1-46] Stair 3, as far as the work in there...uh...I know we talked last week, week before you  
477 said that you were a day or 2 behind. But I saw last Friday there is lot more to be done than a day  
478 or 2.  
479 [1-46] Will you have any problem hitting that?  
480 [46-1] No problem.  
481 [1-46] If you finish this week so that we can get the prime coat painted.  
482 [1-46] Have you got people working on that this week?  
483 [46-1] Yes they are working on the bulkheads. All bulkheads around the 5 should be done. Then  
484 we will start on the bulkheads below the stair landing. The measurements that are on the RFI  
485 now push the bulkhead out way under the stairway.

486 [46-1] So, are we going to pull that back and hold it in line with the brick there?  
487 [1-46] Yes.  
488 [46-1] There is a beam...the tubes steel that runs through there gets into the way of the bulkhead.  
489 When we probably frame around, we will have to stop before we get to that beam, because he  
490 needs to put the intumescent paint on the beam before we can close it up.  
491 [1-46] Can he (*referring to the subcontractor for applying fire retardant paints on beams*) do  
492 that now?  
493 [46-1] Yes.  
494 [1-2] We need to call A (*referring the subcontractor for applying fire retardant*) to get that done.  
495 [1-46] What about Stair 5? You know I was walking on Friday, and R (*referring to another*  
496 *subcontractor*) will be done very quickly and will be done this weekend. Will you have any  
497 problem finishing Stair 5 by the end of this week?  
498 [46-1] Well...in Stair 5 we have troubles with the scaffolds. We have got the scaffold up but the  
499 walls under are not done. G (*referring to the electrical subcontractor*) told me that the inspection  
500 for the first 2 levels would be tomorrow.  
501 [1-26] You guys did not get your inspections? Are you getting the inspections tomorrow for Stair  
502 5?  
503 [26-1] Yes.  
504 [1-26] Well I thought we had these inspections by last Friday.  
505 [1-26] Did you send me a note that the Stair 5 schedule was showing till January?  
506 [1-26] I had to remind you that we talked about these 3 weeks ago and we agreed. You said a  
507 week ago that you would have your wall inspections by Friday. Did you miss that?  
508 [26-1] Yeah...we kind of missed it.  
509 [1-46] Then you have to agree to hang and finish the drywall by this Friday. Just use all. Use 60  
510 hours a week.  
511 [1-0] Couple of things really quick regarding the C/D Tower.  
512 [1-16] The corridor you finished last Friday. Correct?  
513 [1-16] The 4<sup>th</sup> floor corridors.  
514 [16-1] Yes.  
515 [1-16] So that's done.  
516 [3-1] That was 5. 4 was done last week.  
517 [16-1] Yes that's 5.  
518 [1-46] You hung the Resource Center wall. You started finishing them on last week. Didn't you  
519 work on that Friday?  
520 [26-1] Yeah...they are working on that. I didn't go up there to check. We cannot really finish till  
521 we are done with the bulkheads. We did not have the bulkhead completed above the door with  
522 the light shifted around. I am hoping by the end of the week that should all be pretty much done.  
523 [1-46] 5<sup>th</sup> floor...we will finish the Rulon tomorrow. Correct?  
524 [46-1] 5 is done. There is one panel they did not ship us.  
525 [1-16] As far as 5<sup>th</sup> floor, the corridor painting is starting this week?  
526 [16-1] Yes sir.  
527 [1-16] So when you are done with 5, you will get us as far as the patient rooms?  
528 [5-1] He is going to start...I think he has started touching up around the Rulon, and the filling in  
529 the gaps.

530 [46-1] There is 1 panel on 5...a panel on 5 and 4 having the same location, the angles of the  
531 Rulon are wrong. Front part of the panel doesn't sit flushed square to the grid. So we need to  
532 figure it out.  
533 [46-1] So the Rulon angles are wrong. So there is one panel that is a half size, not the big one  
534 right outside the Isolation Rooms...the 1<sup>st</sup> one starts in the west corridor from the Isolation  
535 Room...the 1<sup>st</sup> half panel on the left that is at 45 (45°). We have to figure out which one is right  
536 and which one is wrong.  
537 [1-0] As far as the Towers on the B side...uh...before I forget, is S (*referring to 44*) here?  
538 [1-44] As far as carpet and base, once the 3<sup>rd</sup> coat of paint in the corridor is done...you are going  
539 to star the carpet and base, right?  
540 [44-1] No...I will say we will pretty much follow the final trim out.  
541 [1-44] Okay...so they are trimming out I think 4 this week, and the next week it will be 5. So  
542 you can follow behind them.  
543 [1-32] How are we doing with all the rest of our barrels and nipples and such for the water  
544 closets?  
545 [32-1] We will be caught up with the water closets this week. We have got the first order of cast  
546 iron nipples last week and we have another order coming in Wednesday.  
547 [1-37] So that mean...we have to deal with the strainers. Will you get that taken care off?  
548 [37-1] Yes the strainers came in on Friday, and we tested one of them. They will test all of them  
549 and then take care of the issue.  
550 [1-37] So how much time do you all need to wrap up all the strainers of the towers?  
551 [37-1] By the end of the week we will be done.  
552 [1-37] Okay. Then you will have the plumbing fixtures taken care of?  
553 [3-37] Are we missing some of the fixtures?  
554 [37-3] Yes...and those are coming in this week. But I haven't heard the exact delivery date.  
555 [1-0] The biggest thing with the Towers right now is...uh...obviously keeping ahead with the  
556 Rulon and then following with the trim out like first the 5 Core Patient Rooms, then 3 Patient  
557 Rooms, then 5 corridor, then 3 corridor and so on.  
558 [1-46] So B (*referring to 46*) you make sure that you are keeping ahead with the point out crew,  
559 and as soon as the painting in the corridor is done, we start on trim out basically once every week  
560 in different area...for this week it should be 5, following week it should be 3, etc.  
561 [1-46] Do you understand? Do you have any issue with that?  
562 [46-1] They will be done with the Rulon on the 3 and 4 this week. So it should not be a problem.  
563 [1-46] Good.  
564 [3-7] Have you heard from the Architect's office this morning about the R10 versus the R12?  
565 [7-3] No, we haven't heard anything about potentially restock the R12 or the R10.  
566 [1-46] As far as Area A goes, I will highlight couple of things...uh...the biggest thing right now  
567 for you guys are that you will finish the complete soffit framing by Friday. Is that going to  
568 happen?  
569 [46-1] Yes, the bulkhead is done. They are now going to put the framing. I am sure those will be  
570 done in 5 and 4 today.  
571 [1-46] Good.  
572 [1-0] All the soffit frames are done, so MEP guys get your work done up there.  
573 [1-14] Basically get your work done in 4 and 5...and worst cases get your inspections on 5 by  
574 17<sup>th</sup>, and 4 the week after. If you can get the both at the same time it will be awesome.  
575 [46-14] Hey I have a question regarding one of your sprinkler head.



576 [46-14] We got a drywall ceiling that basically runs all the way through the lobby. Then there are  
577 3 sections of wood panels that need to be hanged down. I don't know where your heads  
578 (*referring to the sprinkler heads*) are.  
579 [14-46] We got to get above and we got to hold down as well.  
580 [46-14] Okay. I can lay it out on the floor so that you can see where exactly the panels are going.  
581 [14-46] Right, we will do that. There is a steel pipe coming through the ceiling.  
582 [14-46] The head above is a concealed head-bulb on the sheet rock and with Rulon on an angle, I  
583 got to come down and swing there.  
584 [46-14] The Rulon is flat right there.  
585 [14-46] When we talked before we said it was at an angle.  
586 [46-14] It's the one that coming down the corridor. That Rulon is flat.  
587 [14-46] Okay, you lay it out and I will find my way.  
588 [46-14] So that way you can get your head. I will be able to put the Rulon and probably get the  
589 drywall across there and get it all finished.  
590 [14-46] Yeah...go ahead and cut that head coming through.  
591 [14-46] You know the height of the bottom of the Rulon. Right?  
592 [46-14] Yes, the height matches the soffit. The Rulon is at the same height.  
593 [14-46] I will cut the head and fit in there.  
594 [1-32] Whatever pipe you guys have got, we have been discussing back and forth about the  
595 valves and access panels, have all those been taken care of?  
596 [32-1] Those have not been done. But they know where it is going.  
597 [1-32] 17<sup>th</sup> you said when these would be wrapped up.  
598 [46-1] I have to frame all the access doors.  
599 [1-46] Do you know where all those access doors are going and how many of those?  
600 [46-1] He has got 5 of them.  
601 [1-0] Well everything just follows as we have got the dates.  
602 [1-0] In the 6<sup>th</sup> floor I think right now the passenger elevators should be wrapped up. It is  
603 supposed to be wrapped up this week. They are going to be real close to that work and if they are  
604 done then we will keep them out of the Elevator Machine Room so that we can finish the rest of  
605 the area.  
606 [1-0] I think the drywalls have been corrected, I don't know if the dampers have been fixed  
607 yet...I think it has.  
608 [13-1] It has been corrected.  
609 [13-46] Have you got inspection for that?  
610 [46-13] It's coming today.  
611 [2-28] Do you have steel angles put around the dampers?  
612 [28-2] I have talked with C (*referring to the inspector*) about that last week. So I am going to  
613 look at it. Because the way they have shown in the drawing, they have put foam insulation  
614 around the dampers. When he comes to inspect that, if there is no gap around the damper, I don't  
615 think he is going to pass it.  
616 [28-2] It's going to be just like caulking. It should be able to expand and contract.  
617 [28-2] I don't know if you know some way of to get that foam insulation out of there.  
618 [3-28] It can't be there...because foam is combustible. We can put it in a 2-hour rated space.  
619 [28-3] Okay.  
620 [2-28] What about the...uh...insulation on the fire blanket that goes on the exhaust stub?

621 [2-28] S (*referring to a person not present in this meeting*) was saying that he didn't think that  
622 the ductwork hanger design was adequate.

623 [28-2] Yes he wants to take straps down to trapeze it.

624 [1-28] Speaking of dampers...there is a floor damper in 2<sup>nd</sup> floor in Area E, there is a gap  
625 between the concrete and the ductwork. Do you guys have any detail to close of and finish of  
626 that?

627 [28-1] Where is it in E?

628 [46-28] You come out of the MOB and towards the Atrium, it's on the first left if you are going  
629 back towards the G Area. It's right there by the bathroom...just a small one duct riser.

630 [28-46] Right...I think that's the supply riser.

631 [46-28] We have got one side, but I can't close it because it has got a gap.

632 [46-28] You know where that damper was that you removed, the damper was way down low  
633 than the raised floor. You moved it internal to the duct and put an access door on it, it's only  
634 about that much room between the slab and the side of the duct.

635 [46-28] There's no way I can build the bottom of the shaft wall right there. It will need a close to  
636 16 gauge angle or something to close that gap.

637 [28-46] Okay, I will go and take a look at it. We will do what we did on the one by the elevator.  
638 We can close it of with a heavy gauge angle and fireproof it.

639 [1-0] In 2<sup>nd</sup> floor I will go over couple of items...I am not going to go over everything. But sheet  
640 vinyl VCT...we should be working on moisture mitigation this week (4).

641 [1-44] You need to bust your \*\*\* and get your \*\*\*\* installed quick. Because we talked about  
642 months that flooring will be critical in this job. So you guys in bare minimum have to have your  
643 stuff installed prior to flooring. And guess what you are not.

644 [1-44] What don't you work late this week and get that casework installed in 2 C/D.

645 [44-1] Okay.

646 [1-38] Have you done the OR Station?

647 [38-1] Yes. Some of the OR electrical outlets they need to move by 27 ½ inches.

648 [1-2] Can you look into that please?

649 [2-1] We have to cut all the OR walls, shift the electrical rough-ins...because...they have put  
650 those in the wrong spot.

651 [1-26] Can you get those started today?

652 [26-1] I will have those corrected and started today.

653 [2-46] Can you get somebody to cut the walls, so that those don't get butchered?

654 [46-26] Okay we will cut it. But we need layout. Lay it out, and we will get it done.

655 [1-0] Just so everybody understands flooring installation in this project is driving the schedule.  
656 There are areas up in the 2 C/D that are still missing the drywall. I have put some dates down in  
657 the Minor Procedure Rooms to keep us going to flooring. But in the next 2 to 3 weeks between  
658 now and middle of December when we will be installing flooring on 2 C/D, you guys have to  
659 know that when they are putting flooring on the corridors, those will be inaccessible.

660 [1-0] You can no longer be in there. You surely be done and surely be out of there.

661 [1-28] Did you get the rest of the framing for OR last week?

662 [28-1] No, they are putting up the last frame this morning. They will be done today.

663 [1-28] So they are including the diffusers as well or...

664 [28-1] No, the diffusers are coming tomorrow morning.

665 [1-28] So when we will have the diffusers installed?

666 [28-1] We are going to do the first set in the mock-up room, and let everybody look at it and  
667 make sure everybody is happy with it. And that is about 2 days of work.  
668 [2-28] If they are not happy with it, will you going to do them all?  
669 [28-2] Well, they have looked at everything in that mock-up room so far. I mean I will have the  
670 insulation on and the diffuser in and have a good look at them. I mean they are going to be in  
671 their location...I guess it's just final install.  
672 [2-28] OR flooring installation starts on 11/15. I suggest you get out of there before 11/15  
673 otherwise you will be responsible to for any damage to the floor due to your work.  
674 [28-2] Okay. We will just press on.  
675 [1-28] What kind of diffusers are we getting here?  
676 [28-1] They got back ordered. It is the heavy deflective type.  
677 [1-0] Uh...regarding flooring...I think I am lost in here.  
678 [1-0] They have their work in the mockup in the C/D and Penthouse today. Once approved they  
679 can start their work.  
680 [1-46] Minor Procedure Room...while walking last week I saw there is still some hard ceiling  
681 framing that has to be done around the perimeter.  
682 [1-46] Correct? As far as the higher ceiling in one room, the whole room has to be done?  
683 [1-46] Will that be done by tomorrow?  
684 [46-1] Yeah...I can get that done by tomorrow.  
685 [46-28] Are all the fire dampers installed?  
686 [28-46] The fire dampers are here, the fire smokes are going to be shipped on 12<sup>th</sup>.  
687 [1-28] But most of the areas in 2D have got fire dampers; there are 1 or 2 fore smokes. Correct?  
688 [28-1] Yeah. I will look into that Procedure Room.  
689 [1-28] I mean there are 4 in the Minor Procedure Room and we need that complete. And  
690 everywhere in the corridor may be you can get that complete so that we can get out of there.  
691 [1-22] Do you guys have the higher cans or any of the perimeter housings for those 2 rooms?  
692 [22-1] Yes, they are all here.  
693 [1-26] Can you make sure you have people up there to set these in the openings when the drywall  
694 is up?  
695 [26-1] Sure, no problem.  
696 [1-26] Make sure those are inspected.  
697 [1-14] Have you dropped you heads (*referring to sprinkler heads*) over there?  
698 [14-1] As far as the two, I have got the 1/16<sup>th</sup> and the other one that go around the corner.  
699 Hopefully G (*referring to 26*) will get his light in there so if I have any conflict I can test it one  
700 time and be done.  
701 [1-26] Can you get your people in these lights so that he can get his (*referring to 14*) heads  
702 afterwards?  
703 [26-1] Yes.  
704 [1-0] Uh...do you have anything else?  
705 [1-0] If no...then that's all I had.  
706 *End*



## Appendix D: Transcript of Meeting B1

*Date of observation was November 11<sup>th</sup>, 2010. Venue of the meeting was a room in job site trailer of the GC set aside for meetings. The meeting started at 8:00am in the morning. There were 13 attendees in the meeting other than the observers. The Superintendent of the project is number 1; 2 and 3 were also employee of GC. The rest were subcontractors. Pre-construction meeting was scheduled before the coordination meeting. Some of the attendees of the previous meeting stayed back and the rest of the attendees started coming into the room 10 minutes prior to the start of the meeting. 8 said "hi" to everybody, and started a conversation with 1. 8 and 9 were talking about other projects. 8, 9 and 7 were talking about interoperability of different devices such as phones, tablet, desktop, etc and how it has benefitted him. 1 announced to everybody that the issue with the sheeting permit has been resolved. Some of the attendees were found talking over the phone and checking emails. 1 distributed the agenda (1 page) and the look-ahead schedule (6 week) at 8:00am.*

- 1 [1-0] Uh...the agenda here...we will try to keep the meetings to an hour with the work plans and  
2 everything. That's the goal. I got work plans from most of you guys and we will go through that.  
3 Then I have got the 6-week production schedule here we are going to talk about.
- 4 [1-0] Okay...so first thing first...safety...for those of you, who don't know, this is V (*referring*  
5 *to 3*) who is going to be our onsite safety manager. From now on he will be here pretty much full  
6 time. He is going to free himself up from another job, but that's happening faster and faster.
- 7 [1-0] So V (*referring to 3*) will be here. He is going to keep us straight and keep us out of  
8 trouble. Couple of things is that safety orientations are mandatory for everybody onsite before  
9 they start work. Many of you have but if you haven't, or if you have new people coming on  
10 board they all need to come in the safety orientation.
- 11 [1-3] And we can...uh...can we start at 7 o'clock? I know you are here early.
- 12 [3-0] We can set it up for whatever time you guys need to do it. Just give me a call ahead of time,  
13 because if it's a large group we need to schedule one of these rooms. But preferably if you guys  
14 start at 7:00 am or 6:00 am, I am typically here if you call me and set something up. But I am  
15 going to make myself available Mondays, Wednesdays, and Fridays from 7:00 – 8:00 am. We  
16 will have one of those rooms available in that time as well for safety orientations.
- 17 [3-0] During my walks in the jobsite for the last couple of days and I have a few things I will like  
18 to bring up very quickly.
- 19 [3-0] Any trenching or excavations have to be examined and worked over by competent persons  
20 and that has to be documented. So I will work out some forms which needs to be filled up after  
21 the field inspection and I can start seeing those daily inspection start coming in...to prove that  
22 we were documenting while working through these excavations and trenches.
- 23 [3-0] Also we need to start doing the safety tool box...the weekly tool box stuff. Few other items  
24 that I wanted to bring up...I think it is part of your contract and we need to make sure that you  
25 are getting these items in to me. This is the required safety documentation for subcontractors.  
26 This should be part of your actual contact including the safety manual.
- 27 [3-0] I need list and documentations of CPR, First aid training and the expiration dates. I need  
28 you to identify the competent persons for OSHA, because OSHA requires you have competent  
29 people for certain aspects of the work such as confined space, fall protection, trenching and

30 excavating. OSHA says 5 feet and you trench is 4 feet...if your trench is greater than 4 feet, then  
31 we need to start examining the hole and do daily inspection of that hole.

32 [3-0] I need copies of your OSHA 30 hour cards and who is onsite. MSD sheet is going to be  
33 critical for this job as we are right next to the hospital. So make sure that not only you are getting  
34 those in to me, but if you are bringing something that's inherently more dangerous than usual in  
35 this project, bring it in these meetings and share it with everyone else. Then we all will be aware  
36 of it.

37 [3-0] Make sure you have your job hazard analyses (JHA) form in to us. Typically with the  
38 safety notes your company will submit a generic day check and it covers pretty much everything  
39 you typically do historically. But let's really take a look at if we are going out of the realm of the  
40 generic daily check and make sure your guys have the training and we have a JHA that covers  
41 the work that is to be performed.

42 [3-0] If you are bringing any equipment on the job site, heavy equipment, the tire equipment, or  
43 track equipment it needs to be inspected and documented daily by the operator. And I need to see  
44 the operator certification card. Same goes for forklifts.

45 [3-0] If anyone has any questions for me or need some of these forms, I will help as much as I  
46 can with the forms. Like yesterday I passed out some forms for trenching and excavating. I am  
47 still trying to get my hands wrapped around the project. Next week I will pass around some more  
48 information.

49 [3-0] I will suggest you to discuss beforehand than later me or somebody else walk upon and get  
50 yourselves in trouble.

51 [2-0] Before we get into production, couple of things quick about safety and security. Toolbox  
52 talks and DCR (*daily check report*)...I have got only one sub giving me toolbox talks and DCRs  
53 on regular basis. I need everybody who has got crews onsite give me your DCR and if you don't  
54 have them there is a box right beside L's (*referring to the site office assistant*) desk...there are  
55 two boxes...one has got the DCRs in it and the one to drop them in to. Just grab some and fill  
56 them up.

57 [2-0] You will see in the form space for journeyman and apprentice, but there is a line beside  
58 there for trade work. So if you got a guy who is a mechanic or operator, check beside the  
59 journeyman and put operator so that we can know. You can put 1 operator or 2 operators or  
60 whatever. You just need to fill them up so that we know what's your man power is on the job,  
61 what you are doing, any equipment you have brought on the job, any major material delivery and  
62 so forth.

63 [9-2] Is our personal log acceptable...because our superintendent does all of those?

64 [2-9] Absolutely...as long as it has all the details on it.

65 [2-9] Grab one copy of ours and make comparison. We need to track what your manpower  
66 is...you know the kind of breakdown. And we have to track minorities for the job.

67 [2-9] Just do the comparison and make sure you fill up the stuffs yours is missing. I am happy to  
68 accept your forms as long as it has all the information and legible.

69 [9-2] Can we email it to you as well?

70 [2-9] That's fine. Email both me and L (*referring to the site office assistant*) so that I am kept up  
71 to date. I have a file and then she will do the data entry.

72 [2-0] The DCR has to up to date. Technically for the contract we are not supposed to submit you  
73 r pay application if we don't have the DCRs from you. We are not going to hold your pay  
74 application, but we may hold up your check if you are not up to date. We don't want to do  
75 that...just come up to date.

76 [2-0] Turning the DCRs and the tool-box talks, I will forward the tool-box talks over to V  
77 (*referring to 3*), or you can directly send it to him.

78 [2-0] Gates and security...I guess you have noticed that the combination for the compound and  
79 site is the same combination that you need if you come in pickup equipment or come in early for  
80 whatever reason...it is \*\*\* (*referring to the code to open the gate of the site*). I need you to  
81 make sure that your crews know that when they open the gate they have to close it back and lock  
82 it. They have to lock it so that I don't have to walk up behind you to lock the gate. So just make  
83 sure if you are last out, the guys know the security.

84 [2-0] I have got 8 gates around this place I have to keep an eye on. So the lower lot, lot 9 doesn't  
85 have a chain and a lock and the gate needs to stay closed even during the day.

86 [2-0] The problem is being a hospital we are getting folks here that are easily disoriented,  
87 confused or elderly...an older one week ago drove in and busted a tire because she  
88 couldn't...they just get confused.

89 [2-0] They get confused...they don't know. Some of them come here in a hurry, they are going  
90 to the hospital, or ER, and they are not really thinking straight...we got to protect them from  
91 themselves.

92 [2-0] So just keep the gates closed and kind of be aware.

93 [2-0] We are having problem. It's kind of been less here lately but we have had people walking  
94 right into the site trying to figure out how to get in the hospital through the construction site.  
95 *Attendees laughed and chuckled.*

96 [2-0] Everybody laughing...but that's really happening. I mean they are actually walking  
97 through the site.

98 [2-0] Please be aware of that...please keep an eye on that for me. When you are out of the site  
99 tell your crews if you see somebody who is obviously not a construction worker, let help him or  
100 her back out of the site.

101 [2-0] Unfortunately for us we have got a county mental facility right here...the one at the back of  
102 the site. We will get those folks coming for a visit...we know first hand they had come to visit us  
103 before due to the odds of the location...we got to get those folks out.

104 [9-2] Where do the crews park?

105 [2-9] Well that's my next point...I am glad you asked the question.

106 [2-9] Make sure even though you are inside the construction site you have got an open  
107 excavation...or a hole you need to keep open...make sure we protect it adequately. If there is  
108 something unique...you know if there is a hole and you don't have plywood, put your bucket on  
109 it.

110 [2-0] Put something on it so that somebody is not going to fall in the hole.

111 [2-0] Hey...we had a lady who works for the hospital moving the fence panels to try to get in  
112 right where we are doing the canopy. She was going under the canopy to get to the main door.  
113 That's how bad it is.

114 [2-0] You got to protect them from themselves.

115 [2-0] So any kind of excavation or any kind of hazard within the site also need to be protected.

116 [2-0] Regarding parking...management can park here in this lot. Company vehicles if they are  
117 part of the work...

118 [1-0] 1 or 2 vehicles.

119 [2-0] Right...you have got a limit. This is for management only...for foreman,  
120 superintendent...whatever you call your lead guy...the project manager that kind of thing.

121 [2-0] If you have got 8 sub-foremen for different crews, all of them won't be able to park here.  
122 We don't have that kind of space here.  
123 [2-0] When we get going full steam there is not going to be enough space.  
124 [7-2] Where is that parking lot?  
125 [2-7] That parking is on \*\*\*\*\* Street.  
126 [2-1] Is that right?  
127 [1-0] Yeah...we have a map.  
128 [2-0] We have a map. It's right behind the Home-depot.  
129 [2-0] There is the \*\*\*\*\* Parking System. They have a big lot there, and they have lie 6  
130 shuttle buses. They are going to run it in rotations. As we increase the manpower they will have  
131 busses...  
132 [1-0] And the other thing is when you come in for orientation, I have got a parking pass. You  
133 will sign of for that parking pass. Like of the guy leaves the site for whatever reason, he got to  
134 turn these parking passes back in, because it costs me \$80 a month for a pass.  
135 [1-0] And I am getting charged for what I use right now. So can't have a whole bunch out and  
136 not being used. I want to manage that so the guys need to sign name when they will be given a  
137 pass.  
138 [1-0] So when you guys show up for orientation next week, all you guys just pull in here.  
139 Uh...we will give out the passes and then you can go out then park and get the shuttle to bring  
140 you back down.  
141 [7-1] And they (*referring to the shuttle*) will be coming in right out here?  
142 [1-7] Right.  
143 [9-7] That waiting area is where the shuttle buses come.  
144 [1-0] Right...so far it's working out pretty good.  
145 [2-0] We don't have too much problem with company vehicles like S (*referring to a*  
146 *subcontractor*). We are okay with those being up in order to do your work with the equipment,  
147 but the rest of the vehicles need to be parked over there.  
148 [2-0] Uh...the only other item I will touch on real quick...is as you have noticed that we have  
149 got temporary fencing out there. We are going to put permanent fencing as finish the flip flop of  
150 the road thing going on out there.  
151 [2-0] Once we get the traffic back in south, we are going to take the north lane and put  
152 permanent fencing and permanent gates.  
153 [2-0] Hopefully...uh...the tree protection and the erosion controls starts being of less impact to  
154 some degree once we finish all these work.  
155 [2-0] But that said, if for some reason, just let your guys know...if for some reason they staple  
156 the silt fence or drop pipe on it to knock it all down, just let us know. It's only some staples to fix  
157 it.  
158 [2-0] If we don't know, they sheet gets laying there and we end up getting write up.  
159 [2-0] Every week...the erosion control system...ESP (Erosion Sedimentation Plan) is being  
160 monitored and documented back to the county on weekly basis. They are coming out, they drive  
161 through, they are taking pictures...if you have not already seen, you will see that the site  
162 inspectors are driving through and watching.  
163 [2-0] We are kind of in the limelight being the \*\*\*\*\* Hospital. So if they damage the erosion  
164 control, they damage the tree protection fencing or anything like that just let me know so that we  
165 can fix it and we don't get a write up.

166 [2-0] That said, the tree protection area...if you have to encroach on it I have to get permission.  
167 Something they have been good about...something they haven't. Uh...you know they have  
168 allowed us to roll the fencing back to move the machines to do our work...but they don't want  
169 lay down over in that area. They don't want us to excavate anything that will endanger the trees  
170 and roots and so forth.  
171 [2-0] Uh...that said, because it's a LEED (Leadership in Energy and Environmental Design) job,  
172 there's a LEED component...we don't want to endanger that because that's a pre-requisite.  
173 [2-0] That can cause us not to obtain our LEED certification for the project.  
174 [2-0] Okay? So anything beyond the limit of the service or beyond tree protection please get with  
175 me first, let me see what you have going, let me make some phone calls, and get their blessings  
176 before we go too far.  
177 [2-0] Okay? Any questions or comments?  
178 [7-2] When we go to the other side and start excavating, are you okay with the orange fence?  
179 Can we use that to barricade the excavation?  
180 [2-7] Sure. I will prefer if we hold it back by 6 feet so that even if somebody falls from the fence  
181 they will land on dirt and not dropping of into the hole.  
182 [2-7] Hold the orange fence back where ever you can.  
183 [7-2] Yeah...we will do that if there is no obstruction.  
184 [2-7] Hopefully future works will be less constricted than we are right now.  
185 [1-0] All right...uh...this is the 6 week production schedule that we have been working of. And  
186 ...uh...to play a little bit catch up here. What we tried to do is that I have got...uh...what I will  
187 like to do is with the work plans...an I have only got from G, S, and T (*referring to the*  
188 *subcontractors*).  
189 [1-11] Uh...and...you guys did well to get the 6 weeks out in front.  
190 [1-11] The only thing I have in yours is we have to do the tunnel work in more detail...try to nail  
191 it down a little bit.  
192 [1-0] But what I want is looking at the schedule is...the week of the December 20<sup>th</sup>...I want to  
193 concentrate on that.  
194 [1-0] I am seeing next week as the done week and so 6 weeks out is the 20<sup>th</sup>. What I want to do is  
195 I want to concentrate on week 6. Because we have to do some catch up we will spend some time  
196 on week 3 to 5. As we progress further hopefully we will be caught up and reviewing to make  
197 sure everything is on track and then concentrating on week 6 so that if there is any restraints or  
198 whatever we can identify them and get them work out of the way.  
199 [1-0] Like T and S (*referring to 2 subcontractors*) has listed the work, so we know these  
200 activities and have to bring them up and we will see what we got to do to get them resolved. We  
201 have to make sure...you know that somebody is done ahead of you and make sure that's still on  
202 track.  
203 [1-0] So if there is a change in the game plan then you have a little bit of notice anyway.  
204 [1-0] And to bring everybody up to speed the good news is that we have got our sheeting and  
205 shoring permit approved yesterday, and we are looking to get the critical structures meeting  
206 scheduled for sheeting and shoring, and footing and foundation next week, which get us get  
207 loose on the foundation work.  
208 [1-0] Uh...that being said something is going to be moved up here a little bit. We will talk about  
209 that as we go through.  
210 [1-0] Earthwork and foundation we are taking it down to 372. We are taking the east side of the  
211 site down to 360.



212 [1-0] So what that means right now is that probably this afternoon B (*referring to a*  
213 *subcontractor*) will move their drill rig onsite for the auger cast piles, which is little bit earlier  
214 than we talked about. Its pretty close...we talked about the 15<sup>th</sup>, which is Monday.  
215 [9-1] That's when crews coming in.  
216 [1-0] Yes, crews coming in Monday. So we are looking to start on Monday. The plan is to drill  
217 the test pile on Tuesday morning.  
218 [1-0] Monday we are going to set the rig up, Tuesday drill the test pile, a week from Tuesday  
219 which is the Tuesday before the Thanksgiving we will test the pile, and then based on the test  
220 and everything we are looking to start production piles the Monday after Thanksgiving.  
221 [1-0] I think that's what we talked about. We are starting the production piles...we said we re  
222 going to test on 29<sup>th</sup>...but we got moved up so we can test before Thanksgiving.  
223 [1-0] And also...uh...because of the approval of the sheeting and shoring permit we will start the  
224 sheeting and shoring on 27<sup>th</sup>, that is the week of Thanksgiving.  
225 [1-8] Uh...you will be drilling and starting the underpinning pits.  
226 [9-1] The way tasks are kind of broken now, I talked to S (*referring to the scheduler of the GC*)  
227 about this the other day, I am little uncomfortable how it breaks it down to small corners  
228 recognizing that you know it suggests we have to hit this area.  
229 [1-9] Yes, you are a little bit different because you can't stay in just one area, because you got to  
230 move around as you cannot finish a pile a day.  
231 [9-1] Yeah, specially a cap a day.  
232 [1-9] You can't finish a cap a day because you have to let it set a day before you can come in a  
233 draw the next one.  
234 [9-1] I am trying to get my arms around it and I need 3 days for that area.  
235 [1-9] Well...we try to get the general areas based on the number of piles and everything.  
236 [9-1] Do you want me to stay within these parameters to some extent?  
237 [1-9] Well...yes...uh...I mean if you don't have anything to drill and you are going to turn  
238 around and drill outside the D line (*referring to grid lines in the construction drawings*) or  
239 something like that, you got to drill outside the D line.  
240 [9-1] Yes, that's what I was saying.  
241 [8-1] I need to know where he is working, as I need to work around him too.  
242 [1-8] Uh...we have looked at that and once we get the stuffs laid out, we will see how it lays out.  
243 But we try to...realizing that we can't have 2 rigs at the same place in same time and tried to  
244 keep you guys separated.  
245 [1-12] And even to the extent of...you know...the auger cast going in the...come around and  
246 move back. One of the things we have a pre-construction meeting this morning with B (*referring*  
247 *to a subcontractor*), and one of the things that they brought up is that he is going to make the  
248 ramp down into the holes to get their machines down. But we probably need...as he starts  
249 progressing with the auger cast, he may have to jump up to the upper elevation.  
250 [1-12] So have to make some accommodations there to get him up.  
251 [12-1] Okay.  
252 [1-0] So right now looks like everything is going on track...uh...the underpinning and sheeting  
253 will start a week earlier than we anticipated because of the permits. So we will make those  
254 adjustments.  
255 [1-0] So that's a good thing.

256 [1-7] We will start the auger cast and then we will take a look at the timeframe of the  
257 underground...you know how that's going to work because...uh...little bit different than what  
258 we were supposed to do when the sheeting and shoring permit had come later.  
259 [1-7] Sort of put that slope in there and so we are going to have to...we were talking little bit this  
260 morning about bringing that excavation keeping the piles going...the auger cast going.  
261 [7-1] And coming back out?  
262 [1-7] Yes, and coming back out of the building so that to open that space...your work is right  
263 between 3 and 4, and that's where my slope is going to be.  
264 [1-7] I think once we get going here and see how fast B (*referring to a subcontractor*) can move  
265 and get out of the way, then get that area to finish of.  
266 [1-7] I think we will be all right.  
267 [1-7] But you know we will keep an eye on as we go for the next couple of weeks.  
268 [7-1] Okay.  
269 [1-2] Uh...I don't have the uh...you are going to give me your plan for the road...but we are  
270 looking to wrap that up weather permitting mid week next week.  
271 [1-0] S (*referring to 2*) said he would get back on the north side and get the permanent fence up  
272 and get out of that hassle we have there right now.  
273 [1-0] We understand it's tight.  
274 [2-7] Well ideally, if you backfill and compact the backfill today, you are pretty much done on  
275 the south.  
276 [2-7] The only person I need to get out of the way is H (*referring to a subcontractor*) who got his  
277 piece in the morning inspected by the fire marshal.  
278 [2-7] More importantly he is out of there.  
279 [2-7] So realistically by mid-day tomorrow your site utility should be done in the south.  
280 [2-12] The only thing I need is G (*referring to 12*) to go back in and put the sub-grade.  
281 [2-12] We left it a bit high. I have got L (*referring to the surveyor*) coming out today in the  
282 morning to stake that curb and gutter and give me some points. At the intersection we are cutting  
283 down a little bit and skim that off to where it needs to be.  
284 [2-0] M (*referring to the paving subcontractor*) is expecting paving to be out in the morning.  
285 [2-0] I am little concerned because forecast for Tuesday, Wednesday, Thursday and Friday next  
286 week are all calling for thunderstorm or rain.  
287 [2-12] I am trying to keep that in mind.  
288 [2-12] I will love to see you guys putting on sub-grade Friday afternoon...uh...even if you have  
289 to work over an hour or two.  
290 [2-12] In that way I can get him (*referring to the paving subcontractor*) in on Saturday morning  
291 and try to get a jump on it before the weather gets bad.  
292 [2-12] That will allow me to immediately get the paint on Monday afternoon.  
293 [2-12] That's what I am targeting...I am hoping.  
294 [12-2] I will talk to the office about this and see if that is feasible.  
295 [2-12] Okay.  
296 [7-2] Do you have a traffic pattern?  
297 [2-7] We do. It's not too much different from what you saw 2 weeks ago when we had it on the  
298 south...little bit different but not by much.  
299 [2-7] Few things we will like to modify we think will make the flow smoother.  
300 [7-2] Because when we start the north side, we are going to loose that whole asphalt. So there  
301 won't be any asphalt road.

302 [1-7] We understand that.  
303 [2-7] Oh yeah...because you are digging it up.  
304 [1-7] Yeah we understand that. We knew that.  
305 [2-7] That is supposed to be the temporary. We are going to tear the hell out of it.  
306 [2-7] Now we do ask you to...there is rock in there and you don't set it in 1 pile. So that when  
307 you top off the ditch and back and top off with the rock...so that we have a fairly decent driving  
308 surface for trucks and heavy equipment coming in.  
309 [1-0] Okay...I guess looking at the look ahead, the activities we will be starting in the coming up  
310 next 2 to 3 weeks is right now roughly...may be a little bit earlier...it looks like is the excavation  
311 of the elevator pit by the time we get all the sheeting done and everything else like that.  
312 [1-0] To get that work going...underground rough-in north of column line E5...  
313 [1-7] That will be the tail end of some of your work.  
314 [1-0] And then hopefully we will be in the process of drilling and casting and grout on the  
315 tieback. And that will allow us to start the tunnel excavation.  
316 [1-0] Uh...backing up a week, right now the majority of the activities are going to be excavation,  
317 sheeting, shoring, auger cast piles, and I think rally around first part o December, which is first  
318 week of December 6<sup>th</sup>...I think...is that we are hoping to have areas opened up so that you can  
319 start some of your underground.  
320 [7-1] I guess when we get closer to that we are going to watch it and get more updates on it.  
321 [1-7] Yeah...you know next week we will have a better handle on it and we can fine tune it a  
322 little bit. Right now we say December 6<sup>th</sup> and let's say it may be December 4<sup>th</sup> or December 7<sup>th</sup>.  
323 The plan is to give you enough notice that you are not here on December 6<sup>th</sup> and nothing to do  
324 and standing around and you are getting upset because you are wasting money. And I don't want  
325 that to happen.  
326 [1-7] So we can guess and plan that ahead of time. Give you little bit of warning.  
327 [7-1] Yeah as long as we can...you know...open up the ditch and get out stuff in there and close  
328 backed up so that it is not open for extended period of time.  
329 [1-7] Specially during this period of time.  
330 [7-1] Right.  
331 [1-0] I guess one of the other items is that S (*referring to the mechanical subcontractor*) is  
332 starting work down the steam tunnel on the chilled water lines. We are planning a shutdown of  
333 the chilled water system starting mid January.  
334 [1-0] And right now trying to work out how long that's going to be. Will that be 6 weeks or we  
335 are going to have a bunch of weekend outages?  
336 [1-0] We are looking. I don't have any information yet but S (*referring to 2*) have been taking  
337 about bringing a temporary chiller to put out on the east side and feed back to help minimize the  
338 duration of the shutdowns.  
339 [7-1] In the Women's and Children's footprint (*referring to the Women's and Children's*  
340 *hospital which is a part of this project*)? Is that where you will put it in?  
341 [1-7] No, right now we will either over in the south east corner of the site over near the helipad,  
342 or if its feasible may be put it down in the parking lot in front of the pharmacy.  
343 [1-0] Number one, I don't know what the size is I need here. And if I go that route we definitely  
344 need some temporary power.  
345 [2-0] What we are trying to do is to figure out some way to maintain, I mean even if in winter  
346 time they have to manage the cooling inside the unit in term ob the buildings. So we are trying to  
347 come up with some ways to keep feeding cool air to keep them running.



348 [1-0] You know...we could be looking at 6 to 8 weeks shutdown on the chilled water system.  
349 [2-0] What we don't know yet is...about bringing in a mobile chiller in tractor-trailer in the  
350 parking down there...we don't know what size and the power requirements.  
351 [2-7] So as soon as we get some feedback on that we will give it to you guys to try to investigate  
352 form where we can bring something to feed it.  
353 [1-7] Put that in the back of your mind, and we need to find these information. And probably  
354 sooner than later because we need to get a ballpark...you know...if we need to get a generator.  
355 [7-1] We have to look and see. We may be talking about some substantial feed.  
356 [1-7] We may have to get a generator because of the sound. It will be what it is...but you know  
357 we have to power it some way.  
358 [7-1] If you get a rough size of the service you are looking for, just let me know. I will see  
359 what's available.  
360 [1-0] I think some of your constraint push...uh...we know we got to have the excavation cleared  
361 for you. We are monitoring that, as we are getting closer to the day.  
362 [1-0] Control lines...we are going to be...will probably blow my budget with survey...but we  
363 have already got control line in here, there is rough control lines in there and if everybody wants  
364 I have a layout sheet of the control lines.  
365 [1-0] I can send it to you electronically or give you the hard copy if you want.  
366 [6-1] We will like to get it electronically.  
367 [1-6] Okay...I will send to you all just so everybody has them.  
368 [1-0] You know...there will be targets on the walls and stuff like that...and as we progress there  
369 will be other marks and stuff like that. We just need to be...  
370 [8-1] You will be giving me the columns...the building columns.[1-8] Yeah...we are going to do  
371 a little more for you than for him (*referring to 7*)  
372 *Everybody laughs.*  
373 [1-7] He (*referring to 8*) negotiated a better deal...what can I say.  
374 *Everybody laughs.*  
375 [1-8] So that's going to be lot tighter when we start getting the footings in and pile caps going  
376 and stuffs like that.  
377 [7-1] See I don't know what's going to be established, and what will be accessible. If we can get  
378 that worked sooner than later, then we can go and start. I have got all the information.  
379 [1-0] The other thing that I have on my list is that when we start working on the duct banks on  
380 the west side of the site coming outside the building...getting the pad and the transformer layout  
381 from the power company.  
382 [1-7] It will be critical for you turning up and then decide the opening of the side and things like  
383 that.  
384 [7-1] They may make it bigger, may be smaller.  
385 [2-1] When is the meeting with the power company?  
386 [1-2] J (*referring to an employee of the GC*) has the meeting scheduled with the power company  
387 on Monday afternoon.  
388 [2-11] Is your steel here?  
389 [11-2] Yes. It is unloading right now.  
390 [2-11] How long do you anticipate...when do you think you will have the steel in place and the  
391 hangers in place?  
392 [11-2] Probably will do all at the same time.  
393 [2-11] So you are thinking they will be hanging the hangers at the same time?

394 [11-2] Yeah...they are working on it and are pretty close.  
395 [2-11] So you are thinking end of the day today...at the latest tomorrow morning may be to take  
396 care of few things.  
397 [11-2] Absolutely yes.  
398 [2-11] Okay.  
399 [2-1] See he was speaking around...he knew I was coming right there.  
400 [2-12] I want to try to sneak K (*referring to a worker of 12*) back into that corner...I don't know  
401 if he was looking to work Saturday necessarily. But I might need him work Saturday to be able  
402 to scratch that corner out.  
403 [2-12] I reviewed there were some questions about the stairs.  
404 [12-2] Yeah.  
405 [2-12] From what I am seeing you have got it. We can look into that after this meeting.  
406 [12-2] Okay.  
407 [2-12] But I need to scratch that corner...I have got 2 things that I am planning back in there.  
408 One is ...  
409 [2-1] Did you by chance discuss or are you confident that there's no way we can take that swap  
410 better than you are thinking?  
411 [2-12] We have got an issue...  
412 [1-2] Let's talk...we will talk about it.  
413 [2-1] Okay.  
414 [2-12] We need to talk with you after this meeting in reference to the temporary storm line.  
415 [2-12] In addition to that we need to kind of get together after this may be...we can keep  
416 everybody here...but we need to look at also about the piece at the end of the ETB because that  
417 affects S (*referring to the mechanical subcontractor*).  
418 [2-12] So that corner is kind of a...it's funny how that corner can make that piece of site a hot  
419 spot for work.  
420 [2-12] We need to look at that for a minute before you take off.  
421 [12-2] Okay, sounds good.  
422 [1-11] And in outside we are really not going to start anything until probably first of the year  
423 (*referring to 2011*) by the time when the underground get caps and stuff in.  
424 [1-11] Your work will be mainly inside right now.  
425 [11-1] I have all the prefabs coming in. We need to store them.  
426 [1-0] All right...the other I have is to review last week's performance. What that is, is that when  
427 you give us the work plan...you have noticed over here on the right hand side there is a little  
428 check box that says 'done' or 'not done'.  
429 [1-0] What you will do is you know...you said you would be done on the 8<sup>th</sup>, mark of that it was  
430 done. So what we are trying to get you know at 70% completion rate...realizing that \*\*\*\*  
431 happens.  
432 [1-0] You know the best-laid plan in the world...something always happens and you can't finish  
433 something...uh...we are looking to get 70% completion rate. So we sort of monitor that and have  
434 that in place. Over the next couple of weeks we will have some stuffs done.  
435 [1-0] Next week...weekly work plan...uh...I think we have talked about that. Most of you guys  
436 have given me till the week of December 20<sup>th</sup>. Most of you have enough till 20<sup>th</sup>.  
437 [1-0] So next week we will start looking at the week of 27<sup>th</sup> December. What's going to be  
438 happening that week from long range and then getting back in.  
439 [1-0] But I need you guys to do is to develop...I will give you the form.

440 [8-1] Can you send it to me electronically?  
441 [1-0] Yes I will give it to you in hard copy and also email it to you.  
442 [1-8] But you know you can come in here and give us a plan...you know piles in which you are  
443 working...what you will get done.  
444 [1-9] And that may overcome some of the stuffs that your concern with S (*referring to the*  
445 *scheduler of the GC*) is that you are going to do piles 55 through 100...you know in that week.  
446 [1-9] We can have the thing up on the wall so that everybody can come in and see where those  
447 piles are. They can come in and get an idea because then everybody will have that information.  
448 [1-9] So you know I think that will address that issue.  
449 [1-9] But as far as you know...when you will have piles done...I mean your sheeting piles done,  
450 so that we can plan on bringing G (*referring to the excavating subcontractor*) back in the site.  
451 [1-9] So you have to get another crew for underpinning and stuff like that.  
452 [1-9] Hopefully this will get little bit easier...because you have already done 6 weeks and now  
453 you have to 1 more week. Looking 1 week out.  
454 [7-1] Do we leave this information still there for the next one?  
455 [1-7] Well you need this information to drop 1 week of and you just another week. Because right  
456 now your week 1 is this week which is done. So week 2 will become week 1 in next week. It's  
457 just going to be rotating.  
458 [7-1] Okay.  
459 [7-1] So, we drop one of and add one?  
460 [1-7] Yes.  
461 [7-1] And as far as comments, do we still leave those?  
462 [1-0] What I am going to do is I am going to take these and any comments on here I am going to  
463 have a separate sheet of paper so we don't loose track of them. We will make sure that they are  
464 getting done.  
465 [1-0] And we are not getting done, we will start raising flag.  
466 [1-0] The whole purpose is that...you know...it is sort of easy now because we are just getting  
467 started. But as we get into it more, if we have identified the stuff way out, then we will have time  
468 to work on those so that we can sign action items...it might be S (*referring to 2*), it might be me,  
469 it might be somebody else in this room that has to get out of the way. So every week we can  
470 say...okay...are you going to make you said? Then you will know that you are good to go.  
471 [1-0] So I didn't transfer these to the constraint log, but I will. That will be a separate handout  
472 than what we have. So that we can go through those separately, because I don't want to lose  
473 track of those.  
474 [12-1] They affect the work.  
475 [1-12] Yes they can affect the work. We got to knock them off.  
476 [2-7] When you drop that week off if you have a loss or acceleration of production, of course  
477 that will be transferred and then you will modify your work plan accordingly.  
478 [2-7] So from your 6 week plan you will be dropping of week 1 and adding o the next week 6. If  
479 there is some dysfunction of production then it will come up.  
480 [7-1] So if we have rain and we loose a whole week, then what?  
481 [1-7] Then the whole thing will shift by 1 week.  
482 [2-7] It may push.  
483 [1-7] It may push the whole thing.  
484 [2-7] Necessarily not...but he is right. If you have any loss of production it will shift the whole  
485 thing.

486 [2-0] You may also make time and move into some of your week 2 activities.  
487 [2-0] The purpose for the whole thing is that especially if...let's say you are getting done a lot  
488 sooner...you are getting your work done faster, you are starting to pull stuff in a day or  
489 two...that's going to show in the weekly work plan. And it will show in the schedule so that the  
490 other trades that are following you who ever that might be will see that you have started to gain  
491 and they can plan their work accordingly.  
492 [2-0] Or push back...then you will be able to adjust. This gives us the ability to do that.  
493 [9-2] So every week, week 1 drops off you update weeks 2, 3, 4, 5 ?  
494 [1-9] Yeah...you have to update weeks 2 to 5 based on what you did the following week and  
495 then week 6.  
496 [9-1] And then if something pops out, we will obviously make change in week 2 and you guys  
497 will pick that up and highlight that?  
498 [2-9] Sure, because say your production rate for auger cast piles will be quicker. If conditions  
499 allow for you to move much faster and the trades who are waiting for you can see that.  
500 [2-9] Say D (*referring to the concrete subcontractor*) is waiting for you and he has his guys  
501 planned for January 10<sup>th</sup> but you are gaining in time. He will see that 6 week out.  
502 [2-9] So everybody is in the same book.  
503 [2-0] This is not your only job. You have to give schedule to your crews accordingly. This  
504 allows you to start refining that number and watching the dates.  
505 [1-0] And then one of the other things too is that when I spent about 3 or 4 days at a job site at  
506 University of \*\*\*\*\*, we had 1,000,000 SF hospital they were building down there. 1,000,000  
507 SF and they had only 10 superintendent, engineers, and field staffs.  
508 [1-0] What they did is...and I want to try to do it here...we are small enough group right now so  
509 it's relatively easy but when we get bigger things going...they had what they called the 15  
510 minute huddle.  
511 [1-0] And so you will walk out every day...and it was in an areas...so it might be we are  
512 working on the bases...I have got D (*referring to the concrete subcontractor*), I have got you, I  
513 have got you, I have got G (*referring to the excavation subcontractor*) in there...we all stand  
514 around and just check off your progress and work plan...so everybody know...oh \*\*\*\* he is  
515 moving up now...you know I got to get it done next week...so it gives you an idea everyday  
516 what is coming up and a reminder of where we are and what we are doing.  
517 [1-0] Now if he starts making time, the guys following will now that he will have to start couple  
518 of days early. He will be able to see that and hopefully understand that in the huddle.  
519 [1-0] Likewise if something happens...you know...material deliveries, snow storms, whatever  
520 that stuffs not getting here...then we can adjust the others too.  
521 [1-0] Just for planning purpose, it will help you manage your man power. So that you are not up  
522 and down with your man power or jumping all around.  
523 [1-0] The other thing is not jumping all around because you every time start something and if  
524 you don't finish it, it doesn't do any good.  
525 [1-0] That's the other thing. As we get into this we will get better at it by all means.  
526 [1-0] But one of the other thing is if we have an activity or task and we know we will not be able  
527 to finish it for whatever reason, may be we wont start that...because we can't finish it.  
528 [1-0] Because every time you start something and you don't finish something its get hard to  
529 come back and finish it and then you have so many loose ends you become unproductive.

530 [1-0] However probably there is always exceptions to that rule, but if we know we are not going  
531 to finish something because of the constraint of the other end, then we don't need to do that. And  
532 that's why identifying backlog work you can move those that may not affect other trades.  
533 [2-0] Talking about T (*referring to the electrical subcontractor*), there may be sections you  
534 might jump over because it may not be making sense to send S (*referring to the excavating*  
535 *subcontractor*) and MEP trades to do overhead rough-in when they can do a certain portion and  
536 then pull out and then have to come back again.  
537 [2-0] You know what I mean...it's better to leave the whole potion and then come back and  
538 knock it off in one shot.  
539 [9-2] That's so valid...it depends on the coordination between these guys and me.  
540 [8-9] I and you are the same...so its your problem.  
541 *Everybody laughs.*  
542 [7-1] I have got a question...since our activities on the schedule don't start before December 6<sup>th</sup>  
543 ...I guess these activities that I have on here now stays here and I will add another week to that  
544 until I start getting complete.  
545 [1-7] Yes, what isn't on here is the work you are doing in the road right now and that's comes in  
546 and you know...you have got those duct banks on the west side...there's a lot of work going on  
547 there.  
548 [1-7] We need to get that coordinated also...because that not just going to happen.  
549 [2-0] They were so irritated with all the activities of the building itself, I didn't incorporate the  
550 site and the peripheral work into that...  
551 [2-10] And I wonder in 6 week look ahead D (*referring to the concrete subcontractor*) you need  
552 to go ahead and look because B (*referring to the sheeting and shoring subcontractor*) is getting  
553 ready to dominate the foot print with sheeting and shoring and auger cast, and G (*referring to the*  
554 *excavation subcontractor*) taking precedence right now...you will be on the periphery.  
555 [2-10] So note that as to what you have got going and how much production are you having. All  
556 that stuff should be in your 6 week look ahead so that you can start seeing...basically he will be  
557 seeing through your eyes.  
558 [1-7] What's going to happen you know especially what I am really concerned about is that D  
559 (*referring to the concrete subcontractor*) is gong to start with his concrete and he is going to  
560 spread out...just sort of like cancer (*every body laughs*) ...so he spreads out and there is no room  
561 to do anything other than concrete...so what I wan to focus is getting the site work done early  
562 before he gets going.  
563 [1-0] Because there are lot of work and are going to need that sooner than later ...if its later its  
564 hard coming back to get things done.  
565 [7-1] I think we will have a couple day more actually until we get this whole thing put back and  
566 move everything over. But we are ahead in the power and telephone...the more get into ground  
567 the more I need those surface out there.  
568 [1-7] Yeah.  
569 [2-7] And right we have a plan of how we are going to keep access for G (*referring to the*  
570 *excavation subcontractor*) to start getting gin and out when you are doing your thing.  
571 [2-7] We will flip-flop...we are going to have 2 entrances.  
572 [2-7] You are right...the intent is to get this work complete and get you out of the roadway prior  
573 to end of December so that there will be a point when we will be having truck coming non-stop,  
574 concrete coming...if you are already done in the section you are out of it.  
575 [7-1] Okay...so I am going to cut loose and then middle of next week I will be cranking up.

576 [2-7] There will be little bit of disruption while we do the lane shifts.  
577 [1-0] Okay...any other questions? We will meet again next Thursday.  
578 *End.*



## Appendix E: Transcript of Meeting B2

*Date of observation was December 2<sup>nd</sup>, 2010. Venue of the meeting was a room in job site trailer of the GC set aside for meetings. The meeting started at 8:10am in the morning. There were 14 attendees in the meeting other than the observers. The Superintendent of the project is number 1; 2, 3, 4 were also employees of GC. Attendees started coming into the room 15 minutes prior to the start of the meeting. The meeting minutes of the last meeting and the 6 week look-ahead schedule were distributed. 6 and 5 were talking about welders. 1 entered and apologized for not being able to update the look-ahead schedule as his computer crashed. There was a lengthy discussion on how he tried to recover the data in the hard drive of his computer, but was unsuccessful (he could only recover his emails). 7 and 8 joined in the discussion with 1. 6 and 7 were found to talk and chuckle in a low voice.*

- 1 [1-0] All right we will start of with the safety V (*referring to 3*).
- 2 [3-0] Yeah sure...uhh...this is the copy you have received for the claim letter about the evidence  
3 of asbestos abatement...uh...please review that with your employees so that they understand that  
4 those areas have been cleaned and tested to be asbestos free now. Make them aware of the areas  
5 that have cleaned and the areas that are still under abatement. So abatement is still on going.  
6 They are now up on the 5<sup>th</sup> floor...and I believe the schedule has they are coming back  
7 down...basement level. Does it not say basement level?
- 8 [2-3] Yeah...D2...well sub-basement.
- 9 [3-0] Yeah sub-basement...a week or two. We still have not received any excavation inspection  
10 form...we have a lot of excavation and trenches out there...they need to be inspected daily, and  
11 documented. Guys you have to document these excavation and trench inspections.
- 12 [7-3] Do we put that in our daily report?
- 13 [3-0] There is an actual form that I have handed out during the...
- 14 [7-3] The ones you gave us in the meeting of 18<sup>th</sup>?
- 15 [3-7] Yes.
- 16 [7-3] I got it. I will give it to K (*referring to a person not present in the meeting*).
- 17 [3-7] Okay.
- 18 [3-0] We haven't got any documentation of toolbox talks from T (*referring to the electrical*  
19 *subcontractor*). If you need any toolbox talks that your company does not have one available,  
20 please let me know. Co.-B (*referring to the general contractor*) will make them available to you;  
21 or if there is a specific topic that you want us to review with your guys please let me know.
- 22 [3-0] In the very near future...probably in the next meeting I will be passing around the sheet in  
23 which I want to know when you are having toolbox talks and where you are having them, so that  
24 I can attend them.
- 25 [3-0] Okay? In that way if there is any question I will be answering them. And I also want to  
26 ensure that those are related to the work.
- 27 [3-0] Umm...item number 001 and 004 (*referring to item numbers in the agenda*), safety  
28 requirement for the subcontractors...I looked them up and guys I am going to tell you I have not  
29 received a lot at all. If I don't get them very shortly, I am going to ask Mr. K (*referring to 1*) to  
30 start withholding the checks. It is very important that we have this information, which includes  
31 the list that I gave out. If you miss that it will definitely give you a kind of warning. One thing I  
32 want to point out is the drug testing aspect of the submittals for safety.

33 [3-0] Sending me a letter that your employees has been drug tested is not compliant. I need the  
34 actual drug test, with their name on it, the results from the testing laboratory.  
35 [6-3] Well I gave those to S (*referring to 2*).  
36 [3-6] You are with whom?  
37 [6-3] I am with S (the concrete subcontractor).  
38 [3-6] Okay.  
39 [7-3] Have you got ours?  
40 [3-0] I can...you know...I will give out an actual list of each of you.  
41 [7-3] Oh well.  
42 [3-7] If you want to get with me after this meeting, its not difficult.  
43 [7-3] I will get it to you.  
44 [3-7] Okay.  
45 [10-3] I will get to you after this meeting to get thing straightened.  
46 [3-10] Sure. I can print a list for each one of you.  
47 [3-0] And that's about all I had for this week.  
48 [1-0] All right...uh...couple of things...I didn't get any 6 weeks look-ahead from anybody. And  
49 uh...I know last meeting I talked about having the new forms that I had to send out but I didn't  
50 get anything from the old forms that we had from anybody.  
51 [1-0] What I did and I apologize little bit...that due my computer crash...uh...so what I did is I  
52 tried to recreate the 6 week look-ahead schedule...the ones we are looking at right now. I want to  
53 go through that and then take a few minutes to go through the work plan stuff for the next  
54 week...what every body is planning on doing the next week and...uhhh...and I really want to try  
55 and get you guys start working on these work plans and getting these back. You know try to get  
56 the look-ahead and try to get this thing up so we know what everybody is doing and we know  
57 where we are going...you know what the next step is for everybody.  
58 [1-0] I am sure you are wondering what you are going to be able to get into the underground and  
59 the basement...you know  
60 [5-1] Yes...the schedule I am having is basically the first schedule when we first started on the  
61 look-ahead. I don't have like 3 weeks worth of work on the look-ahead.  
62 [1-5] Well yeah...then the other thing is that what I am trying to get out is...I have to get back  
63 and get onto S's (*referring to 2*) computer...  
64 [1-0] And if you guys...you and S and you (*referring to 5, 7, 10*) sort of huddle together one  
65 afternoon and put together the site work...you know everything that you are doing on the  
66 site...you are doing that now but I need to get that information and get that on the schedule. So  
67 you know there are some things that...it's a work in progress right now and I just need to  
68 get...we need to get some of this...uh...I got to get that up on the schedule...you know 6 week  
69 look-ahead schedule.  
70 [1-0] The other thing is that now we are getting more and more people on site...probably in the  
71 next couple of weeks we will have another sub on board, with the concrete crew looking to get  
72 started...this uhh...is that S or myself going to each one of you individually and running back  
73 and forth and coordinating that...now we will just take your time everyday whether its 8 o'clock  
74 or 9 o'clock that we will meet on site...go through the work plan...are we on track for today or  
75 are we on track for tomorrow's work...hopefully we are looking at a day ahead of work...so we  
76 are already. I want start doing that as the daily communication tool. Just to make sure we are on  
77 track.



78 [1-0] Couple of things we do want to go over that...we have got to make some adjustments  
79 already...umm...the load test for the auger cast piles wasn't the result we were hoping for. We  
80 are waiting for the engineers to get back to us right now for the...you know...what we are going  
81 to do...whether we have to drill deeper, or do some load test. Hope we will have this information  
82 this morning to know what direction we are going. So that's sort of little bit of...uhh...up in the  
83 air but...uh...based on the results that we got yesterday, talking with B (*referring to the deep*  
84 *foundation subcontractor*) we have decided right now as we are not getting anything done, we  
85 will jump down and get the piles done around the elevator pit, the mechanical pit and some stuff  
86 over the tunnel before the drill rig starts.

87 [1-10] And then we can get up...and you are saying 3 or 4 in that tunnel?  
88 [10-1] Yes, I think so.  
89 [10-1] And the crane is sitting kind of across. Is there place to get it parked so that we can get a  
90 little more room to work around that crane?  
91 [10-1] Is there any place?  
92 [2-10] You can move it over. We will just have to notify.  
93 [1-10] Yeah.  
94 [10-1] We can get it around the back of the building.  
95 [1-10] Yeah. We can move it around. If it is parked, we can move it around. We just have to let  
96 him know.  
97 [2-10] You need to notify them before moving.  
98 [10-3] Also when we have delivered our filed tanks empty, I need to have a spot to put it before  
99 it gets filled.  
100 [3-10] Okay. Picking a spot will be him (*referring to 2*).  
101 [3-10] Make sure we are meeting all the safety requirements. Building a hospital has regulations  
102 on how close to the building it can be.  
103 [2-10] We really need to keep it out like...my thinking was to put it in front of the CCW  
104 (*transformer*)...just inside the gate to the right.  
105 [10-2] Keeping out of the dirt or mud, keeping it on the edge of the barricades...somewhere  
106 inside the job.  
107 [2-10] I am talking about just inside the job, right inside.  
108 [10-2] Okay.  
109 [3-10] From the safety stand point this thing need to have all the placards and fire extinguishers.  
110 [10-3] I will get another fire extinguisher.  
111 [3-10] We all know there is no smoking in this site. Still we need to put the non-smoking signs  
112 on it.  
113 [2-10] We can put it on the left hand side of the gate. Probably that will work better. May be next  
114 to the porta-johns, will keep all the gas at one place.  
115 [10-2] Okay.  
116 [1-0] So I guess for the lack of having work-plans and having shift stuff around a little bit...I  
117 guess we will take a few minutes here and go through with every body what the plan is for the  
118 next week and a half. Get something so we can...everybody knows here what's happening.  
119 [3-1] Hey I am sorry to interrupt. Is there a signing sheet?  
120 [3-0] If you want me to go and pick that stuff for you, please go ahead and sign in the sheet. I  
121 will go and print it up for you while you are in the meeting.  
122 [3-0] I am still not familiar with everybody. So please bear with me.

123 [1-0] So what we are doing right now is that...we are going to be starting today with the elevator  
124 pit and down lower elevations done?  
125 [10-1] Yes sir. My guys will be here shortly.  
126 [2-10] They are here.  
127 [10-2] Here?  
128 [2-10] Yes. They are laying it out right now.  
129 *Brief pause*  
130 [2-0] Hey does everybody have this weekly work-plan electronically? Like an excel spreadsheet?  
131 [2-0] Yes?  
132 [10-2] I am not sure if I have it electronically.  
133 [1-10] I sent it to J (*referring to somebody not present in the meeting*) I think. But I will double  
134 check and make sure.  
135 [1-10] If you have an email, just let me know, and then I can just send it directly to you and keep  
136 J out of it (chuckles)  
137 [2-0] And if any of you need it printed out just blanks, let me know. I will print it this morning  
138 for you. That way if you can fill it up and just hand it on to us, that's fine.  
139 [10-2] If you can give me some blanks, I can do that. What we are doing is...actually things have  
140 changed.  
141 [2-10] That's fine. Okay.  
142 [1-10] From the elevator pit, will you be going down to the mechanical pit? What are you going  
143 to do next?  
144 [10-1] Whatever you want me to do. If we come back down we can do everything on the low  
145 area. So, come back down?  
146 [1-10] Yeah, I mean if we can maintain before A (*referring to a subcontractor*) starts drilling the  
147 auger cast, than you and I are not going to be screwed and held up, if he is in your way or what  
148 ever.  
149 [10-1] Right, we have more steel coming. Hopefully we will get everything done ahead of us.  
150 [1-10] Then probably next week you will be up on the top then; middle of the week you think?  
151 [10-1] Tuesday, probably about the middle of the week.  
152 [1-10] Tuesday/ Wednesday?  
153 [1-10] You will pour on the same day right?  
154 [7-10] The goal is yes. We will go behind the same day. We will put plywood around if  
155 necessary to make sure it is okay.  
156 [1-10] And then will we be able to start lagging on it the next day? Or we need some set up time?  
157 [10-1] Yeah if you get a modified mixture, you might be able to start lagging on it the next day.  
158 But this stuff takes a little bit more time...about a day or so.  
159 [1-10] Okay, so probably...realistically next Thursday.  
160 [10-1] I am going to finish the auger cast piling before you start the lagging.  
161 [7-10] He is talking about C line (*referring to grid line in construction document*) ...C line.  
162 [1-7] See that's what I am saying.  
163 [7-1] You will get there next Wednesday. Monday and Friday for lagging or something.  
164 [1-7] That's what I am saying. That will put us back on.  
165 [7-1] I have figured I have got 2 or 3 more days to get everything 59 (*referring to grid line in*  
166 *construction document*) up there.  
167 [1-7] Then south-east corner weather permitting Tuesday and Wednesday, you are finishing up  
168 that?

169 [7-1] I will definitely do that.  
170 [1-7] Okay.  
171 [7-1] So I was telling S (*referring to 2*) that I don't know about the weather yet, I hope we can  
172 get it somewhere.  
173 [1-7] Yeah.  
174 [7-1] You know in a few minutes, I can...you know with all the utility works going on there, I  
175 will get the trucks back down there. I cannot get so many trucks.  
176 [1-7] Right you cannot get 40 trucks.  
177 [7-1] It might be 20 trucks you know, and we have to deal with it.  
178 [1-9] C (*referring to 9*) I got to call F (*referring to somebody not present in the meeting*) right  
179 now, but then we are going to get back. As soon as I get out of here, I will call him. I tried  
180 yesterday, again this morning. He called back. Bur I wasn't here last time he called.  
181 [1-9] So I will call him and get that squared away.  
182 [1-9] We really need that underpinning going over now, east side over there.  
183 [9-1] Okay, great!  
184 [1-7] Uhh...one thing you know...you get by doing this here early is that probably you know  
185 may be when the underpinning gets done...the underpinning is going to dictate, you may start  
186 this while we are still doing the auger cast piles. Then because you don't have too close of it.  
187 [7-1] Yeah. I am on this. I can always come down while I am there.  
188 [1-7] Yeah, right. I think so.  
189 [7-1] I can get in there and dig.  
190 [10-1] Can I get a copy of the schedule?  
191 [1-10] Well he (*referring to 3*) is going to print a copy for you.  
192 [1-0] Uh...okay...with the stress on the underpinning right now in the east side, is...me having a  
193 conversation with F (*referring to a subcontractor not present in the meeting*). I will have that this  
194 morning. And then get that going.  
195 [1-5] Uh...as far as the underground electric, I guess right now until I get any answer around the  
196 auger cast piles, we have just to push that right now until...hopefully later on this afternoon  
197 today I will have the answers. We can get that reevaluated and plug that into the schedule.  
198 [5-1] Yeah, as soon as I can get an idea about what is going to happen, then I can get back into it.  
199 [1-5] Right. One thing that...uh...I do want to discuss is the duct bank work outside that we are  
200 doing along the road right now and where we are with that...uh  
201 [5-1] We are on the east side running the telephone line right now...that will be in here couple of  
202 hours and then we will pour up to that manhole TMH2, probably like 15 feet short of that. And  
203 then tomorrow...some time tomorrow we will drop back and start the 6" electric wire.  
204 [1-5] Okay.  
205 [5-1] We will start moving that down...but you know.  
206 [1-5] Well, this is the 6" (*referring to the construction document*) stuff that is going over the  
207 telephone line you are doing right now?  
208 [5-1] Yes.  
209 [2-1] Remember that this is the old drawing.  
210 [1-2] Yeah, I know.  
211 [5-1] We are putting this piece right now.  
212 [1-5] Right.  
213 [5-1] And then we are going to go on top of that with the 6" and then we will be here.

214 [1-5] Speaking of which...uhh...we talked to Water Authority and we have got our site plan  
215 approved now. I have the site plan here on site, so if anybody wants to have a look at it. We have  
216 to do the blow ups.  
217 [2-1] We are anyway going to do the blow ups.  
218 [1-0] Well we have the site plans. So...  
219 [9-1] C (*referring to a person not present in the meeting*) is going to be here today?  
220 [1-9] Yes. Just so you know we have the official site plans.  
221 [9-1] Okay.  
222 [1-5] So you are going to pick up where you left of tomorrow on this thing, and then coming up  
223 this way here?  
224 [5-1] Yes.  
225 [1-5] We have to figure out where this is now.  
226 [5-1] It's gone.  
227 [1-5] It's gone already. So we have to just deal with this one only.  
228 [1-0] One other thing I was just hoping that...probably will talk about in the pull session this  
229 afternoon...about the structure...uhh...probably the week of the 13<sup>th</sup> we are going to put the  
230 crane pad in.  
231 [1-0] The crane pad will go down here (*referring to the construction document*), sort of down  
232 this corner...right here. So to get the crane pad in I am probably looking towards the end of the  
233 year in the December...trying to get the crane put up. Then that way what we will be able to is to  
234 pour...coming out of the auger cast piles we will able to pour the pile caps without the bucket  
235 and putting in some pump or whatever. Probably that will be lot more easier and get those auger  
236 cast piles going.  
237 [5-1] Can I get some input about where I should put that feeder? Outside?  
238 [1-5] Yeah...how are we going to run the?....  
239 [5-1] I don't know what are your plans outside for what, when, where. So I don't want to stick it  
240 in the ground before somebody tell me anything.  
241 [1-5] No, right. We will take a look at it.  
242 [1-5] So you are going to be on those duct banks rest of this week and most of next week?  
243 [5-1] Rest of this week...next week. I have got manholes that should be in...but I don't know.  
244 [9-5] I can stake it out.  
245 [1-9] I think you worry...you are doing right in this area (*referring to the construction*  
246 *document*), right here right now, right?  
247 [9-1] Yeah, we are getting ready to tie to that water line there.  
248 [1-9] Okay. So you have made that thing tie in back here, and then we are going to test it?  
249 [9-1] Yeah.  
250 [2-1] We are not going to tie in...we are going to put blow offs for testing. We want to test back  
251 in the existing pipe.  
252 [9-1] Yeah.  
253 [1-9] So we are going to test it. Now then can we tie it in?  
254 [9-1] Yeah.  
255 [1-9] Okay. And then probably we can stick this hydrant and then...  
256 [2-1] Well we have to get the sanitary cross first and then he (*referring to 5*) has to get that  
257 telephone across and power across and then we can do the hydrant.  
258 [1-0] Sanitary? We don't have the sanitary here for a while. Here we come to this manhole and  
259 sanitary?

260 [2-1] That sanitary is going way too deep and way too big a hole to try to go underneath...that  
261 need to go before all those duct cross it.  
262 [9-1] It's about 30 feet deep in here.  
263 [2-1] Yeah...its way too large.  
264 [5-9] You still on track with that?  
265 [1-5] We have to get it approved. We have the pricing to be reviewed by the owner right now.  
266 Trying to get a proceed on it. Then we have to get the manhole over there. That manhole will  
267 probably take 3 or 4 weeks to get.  
268 [5-1] Well then that is pretty much going to stop me. Once I get this little bit of work outside that  
269 TMH2 manhole, then we are dead in the water.  
270 [2-5] No we can get some work around with you. There is the cast in place manhole...go and  
271 start the west side work...we will look at it. We will be able to keep you going buddy. It wont  
272 flow the way we originally talked about it because we originally talked about you  
273 completing...literally flowing from across the south side and coming up on the west. That's not  
274 going to happen.  
275 [1-5] Well...  
276 [2-5] The way the sanitary is going, but we can keep you moving. You have to go till the  
277 stopping point in the west side till the manhole is up.  
278 [1-5] No I see what his point is. Because really that manhole now is coming out over here  
279 (*referring to the construction document*), we are putting a new manhole in over here somewhere.  
280 Then coming down to this...  
281 [2-1] Well it goes here, right there and here (*referring to the construction document*). But we can  
282 still pick him up over here and go to the west.  
283 [1-2] Now coming down here he has got another manhole down here and down this way  
284 (*referring to the construction document*)?  
285 [2-1] Yeah, pretty much yeah.  
286 [5-2] Well that's just about 3 days of work.  
287 [1-0] Well let me ask everybody here right now that, how many of you think we should keep this  
288 manhole here (*referring to the construction document*) like this and then come across...we have  
289 a freaking hole right there!  
290 [7-5] That is 30 feet deep over there.  
291 [1-7] Well even if we box over it, it is still going to be...because I am just trying to see...we can  
292 may be figure out how to support this when we excavate underneath it...may be we have to put  
293 some beams or whatever to carry the load...I don't know...alright we have to take a look at that  
294 afterwards.  
295 [10-7] Hey we are trying to get some concrete trucks down and it is a little muddy, do you have  
296 any problem trying to clean that up a little bit?  
297 [7-10] Nope, clean it up!  
298 [10-7] What do you mean clean it up!  
299 *Everybody laughs*  
300 [10-7] I mean you know trying to get the truck up and down...the concrete truck.  
301 [7-10] Put someone to clean it up...you know if you can if you have a Bobcat...you know what I  
302 am saying.  
303 [7-10] Kind of where the sidewalk is going across the street...cut it off...get it off the slope and I  
304 will get rid of the mud hopefully tomorrow. I don't know if I can get there tomorrow.  
305 [10-7] Okay.



306 [7-10] When is your concrete coming?  
307 [10-7] I will be able to get something this evening. Yeah.  
308 [1-7] Try to keep it dry.  
309 [10-1] Yeah...really...its surprising...all the water you get is during the time of business and its  
310 dry the rest of the time. I was surprised!  
311 [10-1] I need some help. Can I get some pumps? Will make a hole and put it down there...it  
312 sucks it up.  
313 [1-10] It's potentially dry the rest of the week.  
314 [10-0] Good.  
315 [1-0] Alright...uh...coming into the inside now where are we?  
316 [1-6] Where are we with the clean water, steam line, chilled water, etc...where are we? Have we  
317 started to do any of that?  
318 [6-1] I was thinking access hole.  
319 [2-6] Well its not going to be till...as far as an actual access hole, we are not going to be cut that  
320 open until...its on schedule for January...mid-January.  
321 [6-2] So what are going to do on that?  
322 [2-6] But as far as ventilation, he is trying to corner that with underpinning...there is no reason  
323 we cant scoop the end of that out exposing it into the tunnel so that you can cut a hole for  
324 ventilation. That's what we talked about before. But the actual end of the tunnel doesn't goes out  
325 until January.  
326 [6-2] Okay...that I know.  
327 [2-6] Alright.  
328 [6-2] I have loads coming up to go into the tunnel today.  
329 [1-6] Okay, so you are ready to go.  
330 [6-1] Well if we load the pipe, with the formwork, how am I going to get all those down there?  
331 [1-6] No, you got to be smart down there. You have less space to work down there.  
332 [6-1] So there are a lot of pipes out there.  
333 [1-0] Alright...uh...I will out this together and try to get this out to you guys this afternoon or  
334 first thing tomorrow morning. And then probably have to have some discussion...but I  
335 really want to get the work plans...you guys are working through the work plans...so hat we can  
336 review everything in these meetings and se where we are headed.  
337 [1-0] Like I said 6 week coming up this tower crane, sheeting, shoring, auger cast piles and then  
338 we might even get some pile caps towards the end of the month or whatever like that so...  
339 [1-0] Anybody has any thing else that need to be brought up right now?  
340 [1-2] You have anything?  
341 [2-0] Just one thing...if you need to take the fence apart for any reason, to do any work, you  
342 have to put it back together. Don't leave that fence apart.  
343 [10-2] We put it back...but the wind we had yesterday took it apart.  
344 [2-10] Yeah...we stood up a section yesterday and wind kept knocking it down. We are going to  
345 put permanent fencing up round the corner of the site once the duct banks are complete. We are  
346 still going to carry some temporary fencing in the interim. So if you are taking the temporary  
347 fence panels for reason, it is your responsibility to out it back after your work.  
348 [1-0] Uh...I guess one other thing...if we have any guys...you know you will start growing your  
349 crews...you will be starting tomorrow morning here...you know...before you start work you got  
350 to be here doing the orientation. V (*referring to 3*) has it Monday/ Wednesday/ Friday right now  
351 and if you know you will be bringing people one of those other days get hold of V and you can

352 get some work done I am sure. But I really don't want people out here those who have not been  
353 orientated. Couple of reasons, last we had an incident that some guys showed up onsite and  
354 didn't get orientated and went down to cafeteria for lunch...S (*referring to 2*) was ready to throw  
355 them off the job. And they didn't have the orientation so they didn't know...so you know I don't  
356 want to be playing the hard \*\*\* throwing people off the job for stupid stuff like that but those  
357 guys didn't know and so \*\*\*\* happens because of it. So we don't need to be dealing with that  
358 any more. And so everyone make sure for that reason alone that they come in and get the  
359 orientation, and the other thing is make sure all the paper works are in place. The other thing is  
360 orientation starts at 7 o'clock in the morning. It will start at 7, if your guys come at 10 after 7  
361 o'clock, they go home till the next day.

362 [3-0] I know we have bus to bring people in, but is 7 o'clock a good time?

363 [6-0] I will say 8 o'clock.

364 [1-0] Well you know...here it is that the bus coming in...

365 [1-3] You brought up another point...thank you very much.

366 [1-0] On the safety stuff right now is that we have got you guys coming in, let them come in to  
367 the parking lot here, do the orientation, get the parking pass thing and go off, Park and then come  
368 back. So the bus should not be an issue for the orientation. Shouldn't be. For the hour or so for  
369 the orientation or whatever have them park in the parking lot...and we will give them the parking  
370 pass and then they can go out.

371 [6-1] Where is the bus coming from? Which parking lot?

372 [3-6] Out of Juniper.

373 [1-3] Yeah, right.

374 [3-0] When they come in for the orientation I ask them pick them the parking permit and give  
375 them the direction which has a phone number on it for the bus service. Those permits cause us 80  
376 bucks a month. And I wan you guys to know that unless I get those parking passes back, it costs  
377 us money to cancel them. And guess where that cost is going.

378 [1-0] And the other thing I will encourage or ask you guys to encourage is that your guys can car  
379 pool so that I can keep the cost down. I have an idea what my manpower is going to be in the job  
380 each month and I figured that not every body is going to be driving. So I made my guestimate  
381 that way and had a lot of parking passes out there right now that I didn't expect to hand out so  
382 early. It is what it is, but I just want to ...you know...like to encourage you guys if your guys can  
383 car pool to cut down on the cost of the parking passes that will be highly appreciated. But lots of  
384 guys come from distances together, if it is happening already then I have screwed up my  
385 guestimate. It is what it is, but I just want to encourage those guys to car pool.

386 [1-0] And then the other thing is that if we are working on the weekends, depending on what size  
387 of the crew is we may have everybody parking here on Saturday, versus to pay the bus driver  
388 overtime to sit there waiting for 10 or 15 guys. So let S (*referring to 2*) know what the Saturday  
389 work is going to be we will make a determination whether we will have the parking lot open or  
390 we will let your guys park here. Because for a few guys there is not point having the parking lot  
391 open. So just to cut some cost down that way.

392 [1-0] Any other things?

393 [3-0] Real quick, I will want you to leave with this in your mind...uh...we had an incident where  
394 we had a back hoe flip over...if he didn't have his seat belt hooked up he probably would not  
395 have been working. Very experienced operator...he has been operating the hoe longer than I  
396 have been alive and I am 41 years old, but we have to use the proper tools for the job. In this  
397 particular incident the gentleman was attempting to lift a trench box without the lifting arm out

398 of the trench and set it to the side. He was not using the lifting arm, he just used his bucket, tried  
399 to pick it up and set it across the top of the trench. When he did that he exceeded the limit of the  
400 hoe, and this was a pretty big hoe and flipped it. So lets make sure your people don't get  
401 complacent in their jobs and make sure they have what they need to do the job correctly and  
402 safely.

403 [1-0] We are very lucky.

404 [3-0] That gentleman is very lucky. I am glad we only had one of those days like that. I was here  
405 till 10 pm. So make sure your guys are using the proper tool. And we have a tendency to get  
406 complacent...try to get over it. I am guilty of it myself sometimes. And lot of this planning for  
407 the schedule...the 6 weeks look-ahead make safety a big aspect of that as far as making sure you  
408 have what the guys need to perform the work safely. For those features of the works, which are  
409 not included in the JHA, for those who have submitted we might be asking for another JHA, if it  
410 is not included in the original JHA. So everyone look at the safety requirement package for the  
411 subcontractor, go down the list and make sure you send everything to us. And I will be honest  
412 with you where people have said they have submitted stuff that honestly I can find. So please  
413 make sure you remember how you have submitted it...I get across the board...fax, email, US  
414 mail...so it is very difficult to track.

415 [3-0] Also the new sheet that I have handed out that is the monthly project man-hour injury  
416 report log, and if you look at the required safety documentation it reports us about the injury  
417 log...that's what it is. So basically you put your name, you pout the month and the year, your  
418 phone number, put your job site safety representative's name, total man-hours for this month, if  
419 you guys have any reportable injuries fill them up, and you have the number of lost days for  
420 injuries. I just to make sure that my record correspond with your records. As you know the total  
421 man-hours is very key to the safety program, and that's what everything is based of. Basically is  
422 we have a reportable injury, I will multiply how many injuries we have times 200,000 man-hours  
423 and divide it by the total job site man-hours. And that's how we get a reportable injury rate. So  
424 these are very important that you get to me and as the form says hey are due by the 3<sup>rd</sup> of the  
425 month. And that means tomorrow.

426 [1-0] So that means these are due today?

427 *Everybody laughs.*

428 [3-0] So if you want to get with me for the documentation that we just passed out, we can do that  
429 after the meeting. And everybody has got my phone number, correct? If not it's on the meeting  
430 minutes. Thank you.

431 [1-0] Alright, thank you gentleman...8 o'clock next week.

432 *End*



## Appendix F: Transcript of Meeting B3

*Date of observation was December 9<sup>th</sup>, 2010. Venue of the meeting was a room in job site trailer of the GC set aside for meetings. The meeting started at 8:00am in the morning. There were 16 attendees in the meeting other than the observers. The Superintendent of the project is number 1; 2 and 3 were also employees of GC. Attendees started coming into the room 10 minutes prior to the start of the meeting. 3 and 6 were going through the schedule and identifying activities that could pose safety concerns; they were preparing the JHA for those activities. 1 and 7 were joking about something. Then 3 joined them. 3 and 7 exchanged business cards and they started to have fun about 7's business card (all in good mood). 1 and 11 discussing about dump trucks.*

1 [1-0] Alright, I guess we have everybody now. V (*referring to 3*) you want to start of with  
2 safety?  
3 [3-1] Sure.  
4 [3-0] Uh...first thing I want to do is to pass out this sheet here. It's the toolbox stuff. Co.-B  
5 requires every subcontractor to conduct toolbox talks and document the day of the week when  
6 you give the toolbox talks, the time you give them and the location. I mean if it is on the job site,  
7 then will I know where your guys are working at that day. You will be probably standing around  
8 and talking so and guide them to right direction. I just want to attend them and make sure that  
9 those are being completed. They have to be related to your work and everyone has to be  
10 enthusiastic about safety and they are having the toolbox talks.  
11 [3-0] I also want to make sure that we are doing the JHA, the key-haz plans...J (*referring to 1*) is  
12 going to talk more about the JHA in a minute. Once you perform your toolbox talks I need  
13 copies of those. Okay? Just to make sure that we are done. Okay? Another issue I have seen on  
14 the job site is people crossing the street wherever they want to cross the street. You are dealing  
15 with heavy vehicles that are moving pretty fast. We have signs up for cross walks...that's where  
16 we need to be crossing the streets. Jumping across barriers anywhere we want to can get  
17 someone killed or injured very badly. So make sure you have that discussion with your guys.  
18 [3-0] If you are a prime contractor with Co.-B and you have a tier sub, a representative of the  
19 prime contractor has to be onsite with the tier sub. Okay? If your prime is not onsite then the tier  
20 should not be working. Also make sure each contractor has a 30hr OSHA person and I need  
21 documentation of the 30hr OSHA person. Okay? Does anyone have any questions for me?  
22 [3-0] Just a reminder that the safety orientation is every week on Monday/ Wednesday/ Friday at  
23 7:00am. As I said, it does not start at 7:05am, but at 7:00am. 10 guys sitting and waiting for your  
24 guys that late cost us 50 minutes. If you need to make special arrangement give me a call well in  
25 advance. I don't mind doing it on Tuesday/ Thursday. But I need to know about it. Okay?  
26 [1-0] One other thing we are trying to do is the quality control program...uh...it falls of sort into  
27 safety schedule also, but we are going to setup in advance of when we are starting a specific  
28 activity or work that is going to require...you know some special considerations, initial  
29 coordination...we need to work ahead of time. And so if you guys are looking ahead of the work,  
30 and we know that there are issues that have been identified some of those issues and then we  
31 need to resolve those before you start with your work. What I don't want to do is I don't want to  
32 have this quality control meeting the day before you start. May be try to discipline ourselves, and  
33 I am going to setup so that we try to get it done a week or a week and a half before we actually  
34 start the work. And I don't want to put a lot of load, but may be it's a 15 or 20 minute sit down

35 with the effective partners. We can go through safety considerations...you know...for  
36 excavations if we have got all the proper trench boxes, ladder, whatever we need to be in that  
37 hole working, because we will be starting some excavations here...uhh...for duct banks. There  
38 will be more duct banks, and putting some foundations down. So just trying to highlight some of  
39 that stuff upfront. The other thing is that tomorrow morning for those who are interested we have  
40 a concrete preconstruction meeting. We are just going to go through a lot of stuff I have talked  
41 about concrete placement...uh...you know testing and everything else like that. This meeting is  
42 not a 15 minute meeting (*chuckles*). You know S (*referring to the concrete contractor*) is going  
43 to be there and the third party testing agency, structural engineer...uh...and concrete supplier  
44 will be here for that meeting. You are welcome to attend if you want or have somebody from  
45 your company to just sit in. It's not mandatory except for the ones who have got the invites, but I  
46 am going to offer the invitation. I know I have said something to B (*referring to 6*)...but you are  
47 more than welcome to attend. But right now I don't think it is necessary for you guys to be there.  
48 We are going to go through the concrete placement specs and everything else. So just a heads up  
49 on that.

50 [3-1] Is that on 8:00am?

51 [1-3] That's going to start 8 o'clock tomorrow morning.

52 [1-0] Second thing...uh...the work plans has been a bit irregular and I will take some of that  
53 blame in that last week and a half my inability to get the 6 weeks schedules out to everybody  
54 since my computer crashed. I am just starting to get back up to speed with everything. But I do  
55 want the 6 week plans...uh...sorry your weekly work plans. And then I can out it together and  
56 talk about it here. I have put that stuff together today so that we can have something to talk about  
57 but I really want you guys to be looking at your 2 week look-ahead when you are trying to do the  
58 6 week look-ahead. In order to catch up I have a 6 week look-ahead on the master schedule that I  
59 will give everybody here today. Before I start the next meeting I will send it out to everybody  
60 through email, so that everybody should have it...uh...I will get that off my plate right away  
61 because that has been one of my issues. The other thing is that...S (*referring to 2*) and I sat down  
62 yesterday...I got the site-work plan schedule put together. That was all the duct banks over on  
63 the west side of the transformer primary and stuff like that. So I have that...I will pass that out.  
64 (*the schedule was distributed*).

65 [1-0] Take a look at that and then we got to do some massaging. It has lot to do with you B  
66 (*referring to 6*). You need to do some massaging about how we are going to do that and then we  
67 will have that squared away. Then you can start working on that in your 2 week Look-ahead in  
68 your own plan.

69 [6-1] J (*referring to 1*) we have got the 6 week look-ahead right?

70 [1-6] Right.

71 [6-1] Uh...and that is pretty much will be based of I guess the activities on the schedule.

72 [1-6] Right.

73 [6-1] And then the 2 week look-ahead...is that what we are doing next week?

74 [1-6] Yeah...finishing up this week and then what you are doing next week. In really what we  
75 should probably do is that when you turn it in it should be the week of 12/13 (*December 13<sup>th</sup>*)  
76 then we go to 20<sup>th</sup>...so we area always trying to look one week ahead. The we are trying to hit  
77 the activities coming on the schedule within the 6 week time frame, so that we can start thinking  
78 about it. Uh...and then start outing your plans together for that.

79 [6-1] If for the next week look-ahead, are you okay if we put stuff on there that's not on  
80 schedule? Like crane, power...you know

81 [1-6] Yes. Absolutely. And what I will give you here in a little bit is that I did out some of those  
82 stuff on there because the whole purpose of the look-ahead is that we have 5 or 10 days activities  
83 on the schedule...okay...you may have broken down into 3 or 4 other activities all related to  
84 that...that's what we re trying to track because there may be at some point in their hand off to  
85 other subcontractors...

86 [6-1] Okay.

87 [1-6] So the only contractual hand offs are that way. So...you know the 2 week is intended to be  
88 more detailed. You know you break it down however you see the work going in place.

89 [1-0] So...that being said...

90 [12-1] I will make the updates. When do you want to get the schedules no later than?

91 [1-12] I will like to get it back by Tuesday afternoon. That gives me Wednesday to put together  
92 everything for Thursday morning (*the coordination meetings are scheduled every Thursday*  
93 *morning*).

94 [2-0] When you are done with your 6 week look-ahead...all we are trying to do is make sure the  
95 subs are looking in the schedule, seeing what they have got coming up so that they can project if  
96 they are going to need additional men, material, whatever else. It is some kind of a structured  
97 process and if you are seeing other activities in there, for example power crane...whatever you  
98 (*referring to 6*) need to do this we want to see that piece in your 2 week plan.

99 [2-6] If you are working on duct banks on the north loop you think you will be done Thursday,  
100 check out all those boxes on Thursday. We might want to track it on next Wednesday or  
101 something on the schedule. That way when he (*referring to 1*) starts plugging it in he will see 4  
102 days of gain, so we can let the next trade behind you know...hey B is 4 days ahead so we can let  
103 H (*referring to 13*) know they can move their crews up little bit coming behind you.

104 [6-2] Well duct banks will be kind of vague because I can't really accomplish all of that. I have  
105 got manhole 1 and 2, but this is...

106 [1-0] We can have the first thing on there as the...the last week before the 29<sup>th</sup>...then I got one  
107 behind there for the upcoming...this week and the next two weeks. I guess you know...the group  
108 starting to get bigger...we are going to start the crane pad this week...the auger cast pile starting  
109 here tomorrow, sheeting and shoring is going to continue, probably going to excavate...

110 [1-13] When do you think you will be ready for G (*subcontractor doing the excavation*) to come  
111 back in? You got some of those pours.

112 [13-1] We have...the auger cast is going to put in there stuff after they are done...we can start  
113 that. We have pile work on the top. But I will like to get some pile before we...

114 [1-13] Yes...you got to get there...

115 [13-1] There is no real game here. And then we get this stuff down at the bottom, get those  
116 in...that way we can start excavating if there is no rain. Probably there will be no rain.

117 [1-13] Okay. In the next few days.

118 [13-1] Well that also goes with the auger cast in...they are not going around

119 [1-13] Right ...right.

120 [13-1] Then I will be able to be in the same location. So they will be out of the way.

121 [1-13] Right.

122 [1-13] The first sheet is what we have in there from the week before. So you are not done with  
123 the elevator pit piles in?

124 [13-1] Well the elevator pit piles are all in. We are done.

125 [1-13] Okay. And then you are working on line 5 right now? Down low the mechanical pit will  
126 play around so you are not in the auger cast way.

127 [13-1] I believe the slope is kind of...  
128 [7-1] It's changed in a whole way.  
129 [13-1] Right...the slope has changed there so now we have to get together and we will do what  
130 we can and then you have talk and see what you can dig out...so its kind of a collaboration thing  
131 we need here.  
132 [1-13] Then the underpinning...on the south side...if we can get started with that...  
133 [13-1] We have open pits all the way down through underneath that ties done till now.  
134 [1-13] So that's your sequence 1? Okay so we are going to see what going on right now. When  
135 do you think you will be done with that?  
136 [13-1] We will work tomorrow, Saturday and I am not sure we will be done by middle of next  
137 week, but I will try to get everything done by the end of next week or something.  
138 [1-13] Is this the first sequence?  
139 [13-1] No first sequence we should be done...Saturday, I am hoping.  
140 [1-13] Okay. So you will be starting sequence 2 next week. Okay.  
141 [1-11] Uh...just the other thing is that whatever thing going on with tower crane...they will start  
142 excavation for the crane mat today? Or Monday/Tuesday?  
143 [11-1] Tuesday.  
144 [1-0] Tuesday...and then the plan is to start get the mast up on...may be get the mast started on  
145 Friday...we will come in on Saturday and get the boom...without lot of people working  
146 underneath of that.  
147 [6-13] I am going to try slip in there tomorrow to get the conduit from the building out to  
148 the...roughly where the pad is going.  
149 [1-6] Okay.  
150 [1-0] I guess pulling stuff from your schedule like this is what I am looking for...you know. The  
151 level of detail I am looking for is now more from everybody. So everybody knows what  
152 everybody else is doing.  
153 [1-7] Now I don't know...you are going to be bouncing all over with the auger cast piles. You  
154 have a method for your madness?  
155 [7-1] Well we are starting that big pit...if I can mange those in a day and pick up couple more...  
156 [1-7] Yeah pick up couple of more around the  
157 [7-1] Yeah, in the back. I haven't seen the side, but that's the game plan. We will get that big pit  
158 done...you know whatever I can get in there today and come back and finish in another day.  
159 [1-7] Okay. Is your surveyor here today or is he going to be here today?  
160 [7-1] I think I am going to have him here tomorrow.  
161 [1-7] Alright...he needs to go through the orientation too. So tomorrow morning he is going to  
162 have to attend the session.  
163 [7-1] And I have got one \*\*\*\*\* (*observers could not understand*). Do we do that tomorrow?  
164 [3-7] Once you have the results.  
165 [7-3] We can get the results right away so...  
166 [3-7] It depends...sometimes they just select the specimen; other time they do the field-test  
167 themselves. I am not sure what they are going to do.  
168 [7-3] Okay. I will see what I can do.  
169 [1-0] The other item that we haven't really sort of danced around...S (*referring to 2*) had more  
170 conversation with B (*referring to 6*) and C (*referring to 7*) and anybody but...is the duct bank  
171 schedule up on that transformer. And uh...lets take a look at it real quick because a lot of it is

172 dependent upon...well some of it is when D (*referring to 13*) will get up there to finish up those  
173 upper piles...  
174 [1-13] I think the critical point for you is that I need you to update this week for me is that...you  
175 know...you will probably get done in the lower end before we start drilling for the auger cast.  
176 But then you move back up top.  
177 [13-1] We back up and then continue down that line?  
178 [1-13] Yes the building line is the critical thing for me...and then when you get back up there  
179 tomorrow, how long do you think you have to finish that line out and get back to for the  
180 transformer pad? Because that will kick of a lot of other stuffs...a lot of other guys.  
181 [13-1] I will say 3 or 4 days. I mean you know...we need to get in there, drill it and getting ready  
182 to be topped off...  
183 [1-13] So you will get everything to the building line in 3 or 4 days? Finish that up?  
184 [13-1] Yes.  
185 [1-13] Okay.  
186 [2-13] Do you see yourself finishing the line 5 today?  
187 [13-2] Uhh...I am really hoping to...  
188 [2-13] Almost?  
189 [13-2] Yeah...I mean as soon as you are done with me I will get back out and make sure that we  
190 kind of drive this little hard.  
191 [1-13] Yup.  
192 [1-0] This is the...now this will get incorporated in...but what I guess what we haven't really  
193 done...we haven't really sat down on this yet...I think they have got a manhole going in  
194 so...that's coming next week...we are going to talk on that...  
195 [1-6] B, do you know about the manhole # 2?  
196 [2-6] Is the manhole # 2 coming by Monday?  
197 [6-2] Coming on 13<sup>th</sup>.  
198 [1-2, 6] 13<sup>th</sup> is Monday.  
199 [2-6] You will have it on site by?  
200 [6-2] We will have it here by Tuesday.  
201 [2-6] Okay. They are going to spray it before you put it in the hole. When you have the manhole  
202 you will set S (*referring to 8*) they will go around it and spray it. If you set the manhole they  
203 have to go around it, excavate it out...they got to spray it out.  
204 [8-2] What we have is...we basically have a sheath that goes underneath and we turn up the  
205 sides. Then we have spray that ties into that.  
206 [8-6] So what we can do is we can get everything ready to go and I don't know what the means  
207 and methods are as far as getting it off the truck and putting it down...I am assuming its crane.  
208 But if we have out sheet laid down wherever the stage is set, set the manhole on the actual sheet  
209 membrane that way we can turn it up, spray it and then pick it up again to set it up. That was my  
210 thought.  
211 [1-8] You want to do it at one time. You don't have to unhook it.  
212 [8-1] Yes.  
213 [6-8] Hopefully there is enough area where the manhole is going with the asphalt still there. Can  
214 we do it there?  
215 [8-6] I will have to look.  
216 [6-8] Because otherwise we have to unload somewhere, do that, load back on the truck, bring it  
217 back up.



218 [2-6, 8] When we get done with this meeting lets three of us talk real quick over that whole plan  
219 of how we are going to do that. We have to talk about the existing and how to do the  
220 waterproofing as well.

221 [1-0] Take a look at this and get back with me if there is any comment. I tried putting the storm  
222 line and sanitary since they were all up in the air last night...again I didn't put anything in for  
223 that right now. But I got make some adjustments there because we found another bust on the  
224 drawing last night.

225 [2-0] As near as we can tell...its going back to...you guys are coming out of 69...the way we had  
226 looked at originally they came up 68, 69 and goes west...goes to the left back towards the atrium  
227 section of the building in the ground floor...is where its going to turn back again.

228 [6-2] So now its 69 over 70?

229 [2-6] Yes 70 is in front of the edge and 75. There was another revision, its put 70 back over  
230 going basement keeping the run straight for the most part towards the building.

231 [2-9] And sanitary...looks like the sanitary moved back to 30 feet deep. That's being conformed.  
232 There's another meeting taking place today with the design team.

233 [2-6] That said we are still going to be looking at this as far as...he has got an engineered shoring  
234 system going in there...you are not going to be able to cross the duct bank. You will have to  
235 work it how you are going to break up your work so that you are done prior to...

236 [6-2] Yeah, I mean we are going to...

237 [2-6] Back up and let the manhole.

238 [6-2] I think I am good till the end of next week with work and then I am pretty much out. I don't  
239 know...you know we are going just passed the manhole 2...next week I want to excavate and set  
240 that and it will take some time to tie in all the duct banks that are taking off from different  
241 directions getting together, tie them in...uh...and establish the duct banks coming to manhole 2  
242 from manhole 1 and then I am going to stop at level...I don't know...till they finish 30 feet deep.  
243 You know I looked on to may be I will go back towards the pad, but right now it's a major lay  
244 down area for somebody, concrete, rebar, everything...so I don't know.

245 [2-6] Transformer pad or generator pad? What pad?

246 [6-2] Well the generator pad.

247 [2-6] You...what we are looking for you is a work plan for you to pick back up on the other side  
248 of the line (*referring to the drawing*)...the only problem with that is he needs to get the electrical  
249 manholes, the cast in place manhole in...and then he is going to get the footer and the screen  
250 wall in for you doing things around the...

251 [1-2] Doing thing around the transformer?

252 [2-1, 6] Yeah...yeah.

253 [1-2] That's why I was asking D (*referring to 11*) about the soil property...that's really going to  
254 be the key at the transformer area.

255 [2-1] The other thing is on the work plan you have the EMH 1 for the week of the 20<sup>th</sup>, if you can  
256 do it...pull that up in the...hit it where you have got EMH...I mean if you pour the entire  
257 thing...you are looking to pour the crane base on Tuesday, right? I am wondering...see right  
258 here (*referring to the construction document*) where it says EMH 1, that's the manhole at the  
259 CCW lot, but he (*referring to 6*) has got pushed back in the week of 20<sup>th</sup>, I am wondering if we  
260 can get this pulled up in here...because that would be...I think in the schedule we have got it as a  
261 4 day activity for pouring it.

262 [11-2] I think I have 5 or 6 days on that.

263 [2-11] But if you can get that pulled up in next week that would atleast give him (*referring to 6*)  
264 a starting point from where he can carry on that duct bank...because he has got to step over the  
265 sanitary...there is no way around that one. The sanitary is so deep you wont be able to get any  
266 equipment and shoring system if you don't go passed. That would atleast give him a starting  
267 point that following week.  
268 [11-2] Okay.  
269 [2-6] So you can go from that point head it back towards the transformer...you are getting  
270 something to do.  
271 [6-2] We will figure out what we have got here.  
272 [6-11] Do your screen wall and footer is going in prior to us?  
273 [11-6] It has to go prior to you.  
274 [1-6] It has to.  
275 [2-6] Yeah, it has to go prior to you. The way the area is broken up we were looking at that  
276 corner in three levels...three layers basically...uh...I am assuming there is so much duct bank in  
277 there...so my assumption is you are probably going to do a mass excavation, pull it all out, do  
278 your lower level, fill it compact, then do your next level...because the tower...your primary 471  
279 and 475 are going deep as well as the tower feeds are going deep and the duct bank from the  
280 vault...forgot that vault number...is that MH1?  
281 [1-2] Yeah.  
282 [2-6] MH1 stop going at the STP at D, but then you come up to CCW...the level 2 is CCW  
283 layer...there is like 3 layers of duct bank going in there, and with is so much criss-cross I am  
284 assuming you are not going to cut trenches all over the place.  
285 [6-2] Well we are going to cut a general area down but when we get down to the deepest layer  
286 then we will cut trenches.  
287 [2-6] Okay.  
288 [6-2] So there are four of those, and we will start working our ways up.  
289 [2-6] Okay.  
290 [1-6] If you are done passing through those walls...you finally need to go through the wall and  
291 he is not going to be able to get the rebar in the wall that he needs to unless he makes a box out  
292 through the wall for you to shoot through. So you are going to have to...  
293 [6-1] Now currently I am not planning on all that...we will look at it.  
294 [1-6] Yeah let's take a look at it. I mean this is really the first shot out of the box. We will have  
295 several discussions on this. This is the first shot and getting it on paper. We need to have more  
296 discussions on it. When we go out we will start taking look at it.  
297 [3-0] I will like to interrupt with a safety note here. Make sure everyone is aware of the OSHA  
298 requirements that 20 feet or deeper your shoring system and excavation has to be engineered. So  
299 get the drawing to a suitable engineer and coordinate that.  
300 [1-0] Uh...take a look at that...uh...and then I have a 6 week here I will send that out and you  
301 can use these for your work plan for the next week as well as the site schedule that I have out up.  
302 If anybody doesn't have the excel spreadsheet, I will send them to you. I will like to keep this  
303 format what we are doing.  
304 [1-12] In addition to the meetings we have next week in between some time, I really need to get  
305 a detailed plan on tunnel bank.  
306 [12-1] Okay.  
307 [13-1] I need that welding. That's the biggest critical thing I have got right now.  
308 [1-13] We will get it back.

309 [2-13] We should have the tests this morning and the results this morning...all the containment  
310 you saw all the plastic thing...they will all come down and reinsulated by tomorrow.  
311 [13-2] Where is this thing going?  
312 [1-13] In the basement.  
313 [2—13] He did a portion with glove bag and stuff and its kind of...not full containment but just a  
314 demarcation line and then he went through the remainder phase 2 and phase 3.  
315 [1-0] Anything else we need to talk about. Resolution of the auger cast test piles...we will drill  
316 another 10 feet on each pile...so that covers all...get the rig changed out today and start doing  
317 them all.  
318 [7-1] There will be nothing in the way down there, is it? Because I haven't seen anything yet.  
319 [2-7] Probably.  
320 [1-7] Probably. Its not going to be any worse than the first bore.  
321 (*Everybody laughs*)  
322 [2-0] Well that was tight there.  
323 [1-2] That was tight.  
324 [2-7] Its such a small foot-print and we don't have a big area...everybody needs to work  
325 together.  
326 [7-2] Yeah that's it you know. Is there any way I can get my truck over there? Because I have all  
327 my tools, and everything in my truck.  
328 [2-7] Yeah (*hesitantly*)...we are trying to.  
329 [7-2] I am not going to work out of my truck but...  
330 [1-7] Well there is couple of things. Firstly, regarding vehicles on the site...you know the  
331 foreman, you can have vehicle on site, on site being down here. If you want to get your truck  
332 over there then we can work that out. I need to minimize the vehicles that are on site.  
333 [7-1] You know all my tools and...  
334 [1-7] Foremen only...operators aren't entitled to...as much as they think they are entitled to  
335 driving their trucks on site.  
336 [7-1] No, mine will be the only one for my crew.  
337 [1-7] Okay. Any operator thinks he is entitled to drive his vehicle and park it next to the  
338 machine. They park it down the road there...they think that's their entitlement. (*laughs*) It can't  
339 be. As you know there is very little space with even less having everything starting up right now.  
340 We have space down here for foremen to park. We realize you may run out and get stuffs  
341 number of times in a day...do this and do that you know. So you don't have to worry about the  
342 shuttle back to the parking lot. So 1 foreman will be able to park down here. And we are trying to  
343 stick to that because its going to get too messed up down the line. There's too many vehicles out  
344 there.  
345 [2-0] Yeah, we have trucks of subs pulling out equipment off the truck. We don't have much  
346 problem with that...uh...you know...we understand you are working off the trucks and we get  
347 that and be prepared to move them couple of times through out the day for trying to navigate that  
348 tight sight.  
349 [13-2] Yes yes.  
350 [2-0] We had an incident this past week Monday morning, the truck driver got an attitude  
351 because G (*referring to a subcontractor*) needs to move the truck in order to get some dump  
352 trucks and stuff in...well he didn't like that. I don't have any problem with that. If he doesn't like  
353 it he can take his \*\*\* off site. You can't have that attitude. Folks you got to work together.  
354 [13-2] We have to cooperate with each other.



355 [2-0] Yeah, you got to cooperate with each other. If you need to move your truck a little bit so  
356 that other fellow can work through, that's what you got to do. Just...no personal vehicles.  
357 [2-0] Couple of things I want to touch on. One was the parking. The shuttle bus starts at 5:00 or  
358 5:15 in the morning coming across he stops running typically about 7:30 or 8-ish...most of the  
359 crews are in. But if somebody gets over there, there's a phone number right there...the shuttle  
360 bus guys are inside. Just call that number and let him know.  
361 [7-2] Where's is the number?  
362 [2-7] There is a number on the placard and there is a number in there too.  
363 [13-0] Just take it down in your phone.  
364 [2-13] That's what I do.  
365 [3-0] And that's a safety measure...storing emergency numbers in your phone.  
366 [2-0] If they don't have a phone, that's okay...just come up and tell us. I have the number and I  
367 will call the bus and make sure the shuttle bus comes here. He makes a rotation and takes about  
368 15 or 20 minutes to travel the distance.  
369 [7-2] Is there only one bus?  
370 [2-7] Well they have more than that but typically it is one driver one bus just doing the rotations.  
371 [1-0] One other thing we got last week. We have got bunch of new people here and if we are  
372 planning on working on Saturday can you let S (*referring to 2*) know on Friday who they think  
373 will be working and how many guys because what we may do is on Saturday if there is just a few  
374 guys we will park down here because I have to pay overtime for that bus driver to work on  
375 Saturday. So if there is like 6 guys or whatever...  
376 [8-1] I will let the guys know. I know they are car pooling...you know  
377 [1-8] Right...on Saturdays if there is not a whole bunch of people working then we will make  
378 that call Friday afternoon to have people park down here vs paying the bus driver overtime to run  
379 the shuttle...because its like \$600 on Saturday. So for 6 guys \$600 is sort of too high.  
380 [8-1] Will let everybody know...will the gate be open.  
381 [1-8] Yes you will have to come to this parking lot. I want you to park in the compound here.  
382 [2-0] We will have a way to access this from now on.  
383 [8-2] Okay.  
384 [6-1] What's the bus hours for Monday through Friday?  
385 [2-6] Well right now they have told me 5:00 or 5:15. But if nobody is there yet he is not going to  
386 run...till about 7:30-ish. If you have got somebody who wants to catch a ride ...in the afternoon  
387 he starts running from 2 o'clock.  
388 [6-2] If we work late what then...is the bus still running?  
389 [2-6] If you have to stay and your crews stay past 5:00 let me know. I will make a phone call if  
390 we have got...if its only a handful guys you can drop them over at the car park. But if you have  
391 got full crew...there's no way they are going to fit in your truck and we need to keep a bus driver  
392 over a little bit let me know ahead of time. I will call them and say we are working till 7:00.  
393 [1-0] Yeah, we will work that out.  
394 [2-0] Okay the other thing is...uh...there is couple of things. Couple of things have come to our  
395 notice...the owners, the project management team for I (*referring to the owner*) has 4 or 5  
396 representatives. They walk around, they drive by all the time watching the site. They can see  
397 what's going around in the site seating in their offices. This is a no smoking, tobacco free  
398 campus. You have got thousand windows up there with all the folks and nurses and staff that  
399 can't smoke. So if they see you smoking, they are going t say how does he get to smoke when I  
400 don't. Don't be caught smoking or doing whatever. It's a tobacco free campus. If you got it,

401 better not anybody see it. That said because that has already come up. I have already heard about  
402 it.

403 [2-0] The next item...loop road. Do not block loop road. Don't block specially from 6:30 to 7:30  
404 in the morning. There's like over 4000 employees working in the day shift. Don't come in to  
405 work between those hours. Man we get a phone call quick. He (*referring to 1*) can tell you that  
406 for a fact. If you have any deliveries don't schedule them between those hours. Don't block loop  
407 road. If anything comes get them into the site or get them into the lower lay down.

408 [1-0] Get them in lower lot...lot 9 down there. Get them off the road.

409 [2-1] Right.

410 [2-0] If you have got large tractor trailer coming with equipment or tools or rigging or what ever,  
411 if you let us know ahead what we could do is pull couple of barriers back so that your truck can  
412 come in through the access and go right in the lower lay down.

413 [13-2] We have two trucks coming over tomorrow.

414 [2-13] We don't have room in the site. There is a way we can give you access so that you can  
415 bring your trailer to the lower lot.

416 [13-2] Can we discuss about that later in detail?

417 [2-13] Absolutely.

418 [1-0] We can't just block the road.

419 [2-0] The other thing is...one of the guy got the bright idea and he used lower parking lot, not the  
420 fenced in area but the area around it where all Metro buses go now to stage all the dump trucks.  
421 You cannot do that. That didn't work out very well.

422 [2-0] Don't block the temporary bus stop. We had to move it away from the front of the hospital  
423 and move it down to the lower lot. That's all the Metro buses area making that route now and we  
424 have to keep that open.

425 [2-0] Loop road clear, no smoking on site, parking for the foremen and work trucks only if you  
426 absolutely have to have it.

427 [3-0] There has to be back-up alarm on all vehicles in the job site.

428 [2-0] If I see any vehicle with out an alarm and seat belt, then that person is going home for the  
429 day. He can try it in the next day.

430 [2-0] 2 weeks ago a seat belt saved a guy's \*\*\*. I haven't seen an excavator turned over till then.

431 [3-0] Pretty scary sight.

432 [2-0] That was something silly. We don't see it again. But that seat belt kept his \*\*\* in that seat  
433 and saved his life.

434 [2-0] I want your holes covered up. When you drill them and go to the next one. Guys you must  
435 be careful. They (*referring to 13*) are drilling soldier beams on top. Pay attention and stay awake  
436 as much as possible. That's all.

437 [1-0] Anything else?

438 [3-0] One last thing guys. There is actually 2 ramps in the job site, one of them is not really  
439 meant for the foot traffic.

440 [2-0] Its not just a lane guys.

441 [3-0] Yes there is hole in the bottom of it. So try to keep your men away from using it.

442 [13-3] All the guys want to take that route because that's the shortest way to the johnny (*referring*  
443 *to temporary restrooms*).

444 [1-0] Yeah the other is the long way...but that's the way.

445 [1-0] Here is the 6 week schedule. I will send it out electronically to every one of you and to all  
446 your offices. You can use it to make your work plans next week.

447 [2-7] Another thing when open up the green fence to bring in the steel, do me a favor...keep the  
448 corner open. We will put a tent and some picnic tables and chairs...so that the workers can have  
449 lunch under there. We just realized that its getting too cold pretty soon and the guys can have  
450 some rest during the lunch time under the tent.  
451 [1-0] You know we can't go in the building and take break and right now its not that big of an  
452 issue. But I don't want any food in the building. So we need a spot to go. Okay. Thank you  
453 gentlemen.  
454 *End*



## Appendix G: Transcript of Meeting B4

*Date of observation was February 17<sup>th</sup>, 2011. Venue of the meeting was a room in job site trailer of the GC set aside for meetings. The meeting started at 8:00am in the morning. There were 17 attendees in the meeting other than the observers. The Superintendent of the project is number 1. 2 and 3 were also employees of GC. Attendees started coming into the room 15 minutes prior to the start of the meeting. 7 acknowledged 8 for moving some equipment out of his way. 4 and 5 were engaged in banter and how one of them used two coffee filters to get more caffeine while making coffee. The discussion of 6 and 10 was inaudible, while 2, 4 and 9 were discussing about a task related to the project. 2 distributed the minutes of the last meeting, and the look-ahead schedule among the attendees.*

- 1 [1-0] Let's get started. Those are the meeting notes (*referring to the distributed meeting*  
2 *minutes*). We will go through those real quick, then I will go to the work plans and schedules.  
3 [1-0] We will start with safety. But before V (*referring to 3*) starts, I have couple of comments.  
4 Uh...we are looking for you guys to go fast, and also we are looking for you guys to go fast and  
5 safe. Two have to go hand in hand. And the excuses for anybody (*emphasizing*) in this room is  
6 that it is what it is, because we are going fast are unacceptable and will be taken of the job. Like I  
7 said...I know we are trying to push you a little bit here...trying to make up some time for the  
8 issues we had with the auger cast piles, but regardless of that we also need to safe. And we are  
9 getting little careless...we hadn't had any incidents yet, I don't want to have any incidents.  
10 Uh...so, V (*referring to 3*) can now go over the safety stuffs.  
11 [3-0] Just to expand on what J (*referring to 1*) is talking about...uh...I have got a couple of  
12 questions. How many of us here think that this entire job will go without having any incident?  
13 Zero incident in this whole job?  
14 [2-3] I mean, you are asking if we can do it?  
15 [3-2] Yes, can we do it?  
16 [2-3] Oh sure, absolutely.  
17 [3-2] Alright.  
18 [3-0] How can we do it guys? How can we go through this entire job without any incident?  
19 [8-3] Use your head.  
20 [3-0] Use you head, okay.  
21 [7-3] Planning.  
22 [3-0] Planning...right. Use your head. Plan ahead. In construction job sites you know things  
23 change...things may not go as planned. When it happens, take a step back, reassess the situation,  
24 rethink your plan and make sure all of your employees are informed about the plan. Training is  
25 another way to get there. Make sure your employees are trained to perform the tasks that you are  
26 asking them to do. Too often, we call back in our office and say...hey, I need three guys out here  
27 or I need five guys out here and we have no idea about the extent of their training. They show up  
28 and we don't know if they know how to use a sawzall (*reciprocating saw*) properly, or a circular  
29 saw properly. So, we have to make sure they are trained enough in every aspect on every task  
30 that we ask them to do. We are doing that thing by toolbox talks. You know if you find someone  
31 not using tool properly, they might need to be trained. The last but not least is enforcement. Are  
32 you enforcing not only your policies, but also Co.-B's policies?

33 [3-0] My goal here is not to be the enforcer. No way I want to be a policeman with a radar gun  
34 standing beside the road waiting for somebody to screw up. That's not my job. I can do that but  
35 that's not what I want to do. I am a tool. I love to put on my little vest, and love to change my  
36 title from safety-man to safety-tool. Use me...that's why I am here. I will rather plan it and  
37 discuss ahead of time than walk upon.

38 [3-0] Some of the means and methods we can use...first we want to engineer the hazard  
39 away...by handrail, guardrail, and things like that. Administrative way with their safety manuals,  
40 with their protocols, with their pre-planning. And last resort is PPE (*personal protective*  
41 *equipment*)...fall protection...make your guys wear harness and tied off to something. So that's  
42 the last resort we are sticking with. Uh...as J (*referring to I*) said we had a pretty tough week. I  
43 can go on and on about it, but I am not going to. Just know this, I am a tool...use me. Has  
44 everyone sitting in this table has been through the safety orientation? Those stickers on your hard  
45 hats. Because if you don't know what I expect from you, then probably you are going to fail that.  
46 And I don't want you to fail.

47 [3-0] How many of you have read the Co.-B's subcontractor safety manual? Do you know all the  
48 requirements? I don't want to beat you with requirements you don't know about. If you don't  
49 have a copy of it, let me know. I will send it to you electronically. I don't want us to fail. I want  
50 us to go whole duration of this entire job injury free. Everybody sitting on this table has my  
51 phone number. If don't it is xxx-xxx-xxxx.

52 [3-0] Going through the actual list (*referring to the meeting minutes*), we can take of  
53 002...inspections for excavations and JHA...give it to me ahead of time. If it is not included in  
54 the general JHA, make sure I get to review it. The DBO2 (*referring to the centralized system of*  
55 *maintaining records and outcomes of safety inspections of Co.-B*) summary...before I give it to  
56 you let me just tell you its too bad. Perform your own safety inspections. There is a sheet out  
57 there for you to do that. Uh...I am done.

58 [1-0] Uh...one other thing...it sort of relates to safety and the safety rules...uh...this is a great  
59 client for Co.B and they have set the bars sort of high for this project. So, what we have to be  
60 very sensitive about the conditions of the site and the surrounding areas. If there is trash getting  
61 out on the street, the wind screen on the fence starts blowing off, they get fizzy put them  
62 nicely...and you know what they are expecting is they want to have a clean look...it's the front  
63 door of the hospital and they don't want to look like a pig stall. So, you got to be aware of that  
64 you know...take that little bit of extra effort to track your stuff out of the road, get someone out  
65 there and get it cleaned up. Make the effort...and I will tell you that it's getting noticed. We have  
66 a weekly meeting with the chief operating officer, and we had a comment yesterday that...and  
67 you know he is pretty happy right now. So that's one person we want to keep happy. But one  
68 comment that he did make and they notice these things...is that he said a truck pulled up,  
69 whether it's a concrete truck or dump truck didn't say what it was and went in the wrong  
70 way...and he started to make phone calls and running out in the site and make the guy go in the  
71 right way so that the whole situation is under control. So, these are some of the little things that  
72 you may thing that...you know...we are being pain in the \*\*\* or being stupid \*\*\*\*\* about  
73 you know how trucks are coming in, how they are blocking the road, it's a big deal to this  
74 hospital. So, it needs to be a big deal for you guys. The little things have to be taken care of  
75 because we all want to be here for the next job.

76 [1-0] You think this is a big job, the next one is bigger (*referring to the future Women's*  
77 *Hospital*). We all want to be here for the next job. (*laughs*)

78 [1-0] So, I want everybody to pay attention to some of those things and if it is something  
79 that...you know...and I don't really care if it is your responsibility or not, if it is not your  
80 responsibility to fix something, let one of us know. We will take care of it. We don't see  
81 everything all the time...uh...but you know if you got a guy handy...look around...silt fence  
82 gets knocked down, pick it up. If you have knocked the silt fence down, you are responsible for  
83 picking it up. If you take the fence out, you are responsible for putting it back. It's not Co.-B the  
84 fence repair contractor or like that. Stuff happens and you knock it down, fix them. That's all I  
85 am asking.

86 [1-0] Okay...schedule. Already passed out the six week schedule and the work plans. Couple of  
87 things we are looking to make happen here. S (*referring to 2*) has already started conversation  
88 with some of you about...uh...getting some stuff done, may be working couple of extra hours in  
89 the evening or picking up a Saturday here and there to get wrapped up and get out of the ground.  
90 What I am looking for right now...we are looking to try to get...and I think on the work plans  
91 we are saying A to D and those are on schedule. We can get A to D, that's great. I will go for A  
92 to C line. We are looking to try to get slab on grade pour back here on the 4<sup>th</sup> of March.

93 [1-4] And you made some great progress with getting the duct banks in around the corner, so that  
94 you are almost out of that.

95 [4-1] Out of that corner.

96 [1-4] Right.

97 [2-4] You know...I know you have got a lot of work to do. Everybody understands that. I think  
98 D line will take you down here. That's the bulk of it. What we are looking to do is try to move  
99 this pour line from pour 1 to C line. That still gives him (*referring to 9*) a pretty decent sized  
100 pour. You still got a line, and then you have got to get out there and get little more time down  
101 here. Now you have got 15 days for all three levels in the underground. We are not really looking  
102 to cut that short, but just looking forward to kind of pull it up a little bit. Between now and 28<sup>th</sup>  
103 we want to see you complete atleast north of C line...that's like 12/13 days. And you still need  
104 additional 5 or 6 days down here. So actually, we are going to give you more time and pay  
105 premiums to work for some few extra hours or some Saturdays. So, we have not increased your  
106 work load, but we want to speed it up a little bit.

107 [4-2] Right now...tomorrow, I am done. I have gone as far as I can go until I have got more  
108 areas.

109 [1-4] That's...we will get there.

110 [2-1] Yeah.

111 [2-9] We are looking for, this all encompassing. I don't want to leave you out. What we are  
112 trying to do...we are trying to at least get out of 360 elevation. So we are hoping you will work  
113 Saturdays, and try to get us as much pour as possible. Atleast get...

114 [1-9] Backfilled.

115 [2-1] Yeah.

116 [1-9] So that B (*referring to 4*) can work.

117 [2-9] If he (*referring to 4*) can work...

118 [9-2] Those pourings are all ready to go. I just need to get approved.

119 [1-9] Right.

120 [9-4] What we are doing is we are pouring those columns...hopefully we will get all the columns  
121 in the C line...we are going back to that area today. Coming down three 3 line or 5 line right  
122 now. And we can be there really I think...tomorrow.

123 [2-9] That will be great.



124 [9-2] Not pouring all of it...done excavating. Then you still got another three days.  
125 [1-9] You need to get your as-builts.  
126 [9-2] You got to get as-builts...  
127 [2-9] We have to line up to get him (*referring to the surveyor who will prepare the as-built*  
128 *drawings*) in here because I can't keep loosing...what I can try to do is atleast get B (*referring to*  
129 *4*) done above this (*referring to line C*) by the 28<sup>th</sup> and S (*referring to 11*) done up here (*referring*  
130 *to the site plans*) by the 28<sup>th</sup>. But they can't get going until I get you out of the way...you know  
131 that.  
132 [1-2] They have to get those two footings back there as well.  
133 [2-0] I will like for S (*referring to 11*) to bring a small crew in, I know you have storm behind  
134 and side...work the way down. I want you to be kind of selectively get in here...there's a drain  
135 over here...some over here, and some over here (*referring to the site plans*).  
136 [11-2] No actually just the drain over there.  
137 [2-11] That's where you got to put the sump in?  
138 [11-2] No...everything else is...  
139 [2-11] Oh...this sump?  
140 [11-2] Yeah.  
141 [2-11] Okay. Well, we will be at a point when he (*referring to 4*) should be able to get into this  
142 corner...right? Come Monday morning do that little drain...that sump pump or something  
143 picking up that \*\*\*\* (*the observers were unable to understand because participants talked over*  
144 *one another*).  
145 [11-2] Yeah...there is a sump pit and another pipe there.  
146 [2-4] You will be essentially done here?  
147 [4-2] I will be done by 3<sup>rd</sup>...but part of the problem is how does he (*referring to 11*) get there?  
148 Uh...there is only one path about eight feet wide that cuts through there...  
149 [2-4] You know...you are just getting caught in a ton of details...(everybody laughs).  
150 [4-2] That's alright...but these details are a major pain in the \*\*\*.  
151 [2-0] We will get there...we will get him in there. You know...you guys have a point in  
152 there...you are close in and may be he can squeeze in there...may be get in there Friday or  
153 Saturday...so that he can dig it.  
154 [11-2] By the way, we are not coming Friday.  
155 [2-0] We will have to kind of work together and figure out how to squeeze them in and then  
156 figure out how to get them out...even if I have to fly them out. Everybody here...we want this  
157 piece from C line north by 28<sup>th</sup>.  
158 [2-9] I want the prep of the slab by 1<sup>st</sup> of March to pour Friday the 4<sup>th</sup>. It gives you three days to  
159 pour the concrete. We have made this pour smaller and we like you to work ten hours if you need  
160 to...I know you guys are good at working a little extra trying to get it ready. I don't think...do  
161 you see any problem to get it ready in three days from the C line pour?  
162 [9-2] No.  
163 [2-9] Okay. So, we are pouring on 4<sup>th</sup>. Pour-2, the second floor we are going to pour on the 11<sup>th</sup>.  
164 That pour is out almost two weeks from where we had it push out from auger cast piles. That did  
165 not make all the time but sure helps. And then we are hoping that...because we are losing time  
166 for rain and stuff during the spring...we got to gain ground now...I mean its beautiful weather  
167 out there...we got to try to make hey while the sun shines.



168 [1-9] Another thing I am concerned about is once we get into the structure, we start going up the  
169 structure, we have got that thing screwed down so tight that there is not a lot of room to make up  
170 days...  
171 [2-1] Right...right.  
172 [1-0] Because of the unknowns...I don't know...we assumed something...we just got to see  
173 what we can do to make time because it is not going to get any better.  
174 [2-1] Right.  
175 [2-9] Your schedule zeroed in pretty well...you did not build in any fluff.  
176 [9-2] No.  
177 [2-9] There is nothing there. So, when you lose a day we have to work Saturday to make up  
178 for...try to make sure...what we don't want to do is to come out of the other end of the structure  
179 late and then try to be making it up by accelerating interiors. So that just puts us already  
180 behind...so that's what we are looking to do.  
181 [1-9] That's what I am trying to get...you know...the six weeks schedule reflecting right now  
182 and in the work plans.  
183 [2-1] Right. We will be here Saturday, Sunday if you need it to make that date.  
184 [2-11] I need to know for multiple reasons about Saturday and Sunday for your workers in the  
185 tunnel as well as Saturday night shift.  
186 [11-2] We don't expect Saturday night. We will be here Saturday and Sunday.  
187 [2-11] Then I will be here with you...okay...because I have to go through the fire alarms and all  
188 those stuffs.  
189 [11-2] We have to be testing Sunday.  
190 [2-11] Do me a favor. Anything...anything that's in your way...that's a hold up...as-  
191 built...anything that you see keeping you from making...finishing the 360 elevation...when we  
192 finish up this meeting, I have list of everything...let's go through it.  
193 [1-2] Let's go through it right now. We have everybody here. So if we need to move something.  
194 [11-1] I can go through it pretty quick.  
195 [2-1] I think its pretty much L (*referring to 9*) and B (*referring to 13*)...I think are the two  
196 biggest culprits and they are here.  
197 [9-2] So...so, we get these (*referring to the site plan*) excavated today, then what left for  
198 tomorrow are these.  
199 [2-9] Right.  
200 [9-2] So really just keeping the dirt going, I think we will get out \*\*\*\* out first. We will keep  
201 doing that couple of times and then we are here (*referring to site plan*). There will be a lot of dirt  
202 coming out here as you said.  
203 [2-9] Right.  
204 [9-2] And a lot more dirt here. So, we are digging that also. So, if we get some...half of pile 1  
205 today, we should finish up with all these tomorrow...excavation.  
206 [2-9] Let me ask you a retarded question.  
207 [9-2] Yeah.  
208 [2-9] I am just...because...what exactly is the reason why we are not having D (*referring to the*  
209 *surveyor*) as-built the piles, the auger cast piles prior than being put down? Are we afraid that  
210 they are skewed so much that the five feet difference is going to make a difference? He is not  
211 shooting elevations, he is only shooting coordinates.  
212 [9-2] Well he said he is not going to hold the stick five feet up.  
213 [2-9] Well that sucks.

214 [9-2] Okay...tell him. I told him...  
215 [2-9] Are you serious? I will take care of that problem. You get it excavated; I will get him to  
216 hold the stick five feet up.  
217 [1-9] We will talk to him.  
218 [2-9] Because if he can get that shot, then he can populate it in the spreadsheet...  
219 [1-9] The other thing is if he can see the top before you start digging down he can do that.  
220 [9-1] Okay...we need to coordinate.  
221 [1-9] May be today we will look into it if he is coming down.  
222 [9-1] What if he lets me know exactly when he will be here, and I start scooping up around...and  
223 then say lets wait for three hours...  
224 [1-9] No..no..no...we will stop.  
225 [9-1] Then I have to move all my guys back...and say \*\*\*\* \* I can't get back there...  
226 [1-9] No.  
227 [9-1] Okay...he can use a six feet stepladder to get out of there.  
228 [2-9] Okay...we will have some chitchat with D (*referring to the surveyor*) later.  
229 [9-2] We need to get him up on a ladder or something...  
230 [2-9] We can put something across there to bridge it for him to go out there.  
231 [1-2] No...no. We do a stepladder.  
232 [2-1] Those are nice and level...firm.  
233 [1-2] No it's too big. No. Now we are being stupid.  
234 [2-1] Well can't we something to cover the hole?  
235 [1-2] No.  
236 [9-2] Really...a six feet stepladder should be good enough.  
237 [1-9] Did you talk with B (*referring to 13*) fro getting this (*referring to site plan*) around here?  
238 [9-1] He said he can't do it. He said he can't do it until...I just spoke with him yesterday...he  
239 said he can't do it until all of it is backfilled.  
240 [1-9] Well, let me ask a question. When are you going to pour this (*referring to site plan*)...right  
241 here...when are you pouring that?  
242 [9-1] Once this is backfilled...we can pour that.  
243 [1-9] Because what we need to do...we need to do...probably you need to get it backfilled up to  
244 the top of the pile cap.  
245 [9-1] That's what it is.  
246 [1-9] It is?  
247 [9-1] It's right against it. This big piece of concrete is poured right against the line of sheeting  
248 and shoring.  
249 [1-9] I will call J (*referring to somebody not present in the meeting*).  
250 [9-1] That's what I thought.  
251 [1-9] I will call J (*referring to somebody not present in the meeting*). That's not going anywhere.  
252 [9-1] Then what I am worried about is this wall here (*referring to the site plan*), that what we  
253 talked about yesterday.  
254 [2-9] Yeah...put a diagonal.  
255 [1-9] We got to do something. We got to get this thing going. I mean this is going to be next  
256 thing...I mean couple of things here is that you have got the backfill here...you are going to have  
257 backfills here since you have the walls poured.  
258 [1-13] Did you get anything yesterday? We are not doing any sheeting on the outside...are we?  
259 [13-1] I haven't heard.

260 [1-13] Okay.  
261 [13-1] There is a storm going down here (*referring to site plan*).  
262 [1-13] Down here (*referring to site plan*)?  
263 [13-1] And the lower pit...  
264 [1-13] Right...down here (*referring to site plan*).  
265 [13-1] Yeah.  
266 [1-13] Yeah...yeah...but no the stair wall. Uh...you don't have to do any \*\*\*\* (*the observers were unable to understand because participants talked over one another*)?  
267  
268 [13-1] No, just in this lower pit here.  
269 [9-1] Okay...so that's pretty big issue there...I mean couple of things we can do here as far as  
270 doing the backfill here, putting up the wall here...uh...and actually move to the back side and  
271 relieve pressure from the backside...  
272 [2-9] Yeah...sure.  
273 [9-2] And then you said you will get D (*referring to the surveyor*) to do the as-builts  
274 quick...that's critical and then we get that piece in...  
275 [4-9] Remember, we got a lot of pipe back in there. I am talking about in the back there is a  
276 telecom closet. I think your stuff back in there are getting screwed, but I think...  
277 [11-9] There is a drain...a drain  
278 [1-0] I will find out...I got to find out...I know we talked about using these pads on the inside  
279 and then came back, which is so stupid. It doesn't make any sense at all. So, I will make phone  
280 calls this morning and talk to them.  
281 [2-9] Hey, he (*referring to the surveyor*) is coming back at 11 o'clock. What don't you try to get  
282 everything...open up everything they possibly can and try to get everything as-builts.  
283 [1-0] But I will call...I will find out about this right away, because we can start backfilling this.  
284 The other thing is that trying to get B (*referring to 4*) and S (*referring to 13*) in there...we got to  
285 get level this up. We got to get this leveled up a little bit that what it is right now...it's a  
286 minefield just because the elevations of the pile caps...  
287 [1-9] So you got these columns poured...you got these except for these two right here...you will  
288 get these piles poured today and may be tomorrow you get the columns, and then we can...  
289 [9-1] Yeah.  
290 [1-9] May be Saturday we can work on some of the stuffs...getting it ready. My understanding is  
291 we are pushing B (*referring to 4*) and S (*referring to 13*) Monday morning here...they have a  
292 fairly decent shot versus you try to backfill and then all three of you in there...uh...it will be just  
293 a big fight.  
294 [11-1] Yeah it will be much better if he (*referring to 9*) backfills...  
295 [1-11] And yeah...and then you will start and getting it down to subgrade.  
296 [1-9] And then its half your prep fro your slab on grade.  
297 [11-1] Now, really we don't have much up in there.  
298 [4-1] What's your plan for the sheet and shoring? There are some areas you know right now  
299 about five feet above the grade...are you going to cut that off there?  
300 [1-4] Yeah.  
301 [4-1] I know that can be a problem...the problem here is none of the piles show up on the  
302 drawings...so we are already landing in the problem where conduits are shown there's  
303 piles...you know...which are driven.  
304 [2-4] What are you talking about?  
305 [4-2] Right here...you have got bunch of then right here (*referring to the site plan*).

306 [1-4] Those will be cut down...and we probably need to get those cut down now.  
307 [4-1] Okay.  
308 [1-4] Its probably time those are cut down and you get everything back.  
309 [4-1] Well if not, then we have stop until they cut down...  
310 [1-4] No...no...no. You are right because right around here out intent was to we will cut down  
311 below slab on grade. So you know...typically we cut them back four to five feet, but I don't want  
312 to do it right here. May be only three feet...enough just to get the mat poured and then that will  
313 help in the backfill too.  
314 [2-9] You have got the rebar standing up above the wall enough to hold on to the \*\*\*\* (*the*  
315 *observers were unable to understand because participants talked over one another*)?  
316 [9-2] Yeah.  
317 [2-9] Well take a close look at what you lack...C line north to be able to get that. North of D line  
318 everything you can...try to get this off your plate. See what you lack and try to get this off your  
319 plate so that we can make the site ready.  
320 [10-2] Now once it cleaned and backfilled, it wont take us long to run over it...there's not that  
321 much.  
322 [2-10] Right.  
323 [10-2] Couple of days and we will be done.  
324 [9-2] I think for that area...really its just pushing me up...for me...its pushing the survey and to  
325 get that information...to see if they inspects.  
326 [2-9] We will give you green light to go with it.  
327 [9-2] Yeah...if I got it then I can pour it.  
328 [1-9] All the stuff that he did yesterday, we should have this morning. We can check that.  
329 [2-9] You will be good up here. If you can get that...  
330 [9-2] Yeah.  
331 [2-9] If you are out of this spot by Saturday that's...  
332 [1-9] What do we have to do with as-builts?...he has to pour these here...  
333 [9-1] Yeah...yeah...those are real big...I have real big slabs...he has got waterproof, he has got  
334 stuff that run it to the pit. That grade beam right there...the one slopes down to 12 feet or what...  
335 [1-9] That's right through the center?  
336 [9-1] That's what I am saying...that's why I need that...as soon as I get the as-builts than I can  
337 pour. If we can get that...I can pour that tomorrow man. I will get that pushing and get it  
338 approved later today.  
339 [2-9] Why can't we hold off on that?  
340 [9-2] Because its holding up your slab on grade.  
341 [1-9] Yeah.  
342 [2-9] Yeah...but why cant we hold off and let B (*referring to 4*) and S (*referring to 13*) get their  
343 piece done?  
344 [4-2] We cant get in there.  
345 (*Everybody laughs*).  
346 [2-1] What I am saying...why cant we get everything else done at 360...let them get their  
347 underground done...get them out of the way.  
348 [1-2] Because he will start digging holes sloped down this (*referring to the site plan*) way.  
349 [2-5] What I am saying is...in order to pour you got to cut that soldier pile out...cut the soldier  
350 pile out and get it ready to be poured in this area...and then when you get the machinery in it is  
351 still stable with the support there...once they are out of this then may be around 27<sup>th</sup>...

352 [1-2] You got a pile right here...you have got something over here...he can throw something  
353 around here and cut that pile off. You got a lot of underground on the backside...  
354 [2-9] All I am saying is let try to get the utilities out first while still stable. Then around the week  
355 of 27<sup>th</sup>/28<sup>th</sup> do that grade beam before the pour.  
356 [9-2] See the problem is there is eight days of work in there for everybody...the waterproofer,  
357 mechanical guy, electrician, me, backfilling...there's a good eight days of work before the slab  
358 on grade...may be ten days.  
359 [2-9] That grade beam doesn't necessarily affect you in being able to do this wall?  
360 [9-2] Uh...no.  
361 [2-9] That grade beam doesn't affect you...doesn't keep you from having to do this wall?  
362 [9-2] It affects me from pouring slab on grade.  
363 [2-9] Here?...or here (*referring to the site plan*)?  
364 [9-2] Up there.  
365 [2-9] 360...correct. That grade beam plays no problem from you pouring this wall.  
366 [9-2] The tunnel wall.  
367 [2-9] Correct...all I am saying is before we go in and try cut this out, lets try to get these utilities  
368 out of this corner...head it out of there and then cut that piece out and get the dirt out of it. Lets  
369 look at it. I think we need to find alternative methods.  
370 [1-0] We have to take a look at it.  
371 [2-0] Because we don't want to destabilize it...do a bunch of rework and then they are on hold  
372 waiting...I need to try to get the men there...both these guys there as soon as I can...get it done.  
373 [4-2] Keep in mind once we go in there its just going to be us...if somebody is coming back to  
374 do some digging or anything else...this could be turn ups everywhere.  
375 [2-9] We will look at that. We will be all right.  
376 [9-2] Its only what like 20 feet by 20 feet? Not very big.  
377 [11-9] Yes.  
378 [1-9] Yes, it's not a big area.  
379 [1-0] That being said, D (*referring to 9*) finishing up there, this week we will be starting at the  
380 372 elevation. Uh...starting that work here. That's the next thing coming up. There's a lot of  
381 stuff going to happen up there too...so we will talk about that.  
382 [1-11] Do you know what's the deal with H (*referring to a subcontractor not present in the*  
383 *meeting*) yet?  
384 [11-1] They are supposed to get something back today. So, that we can finalize it today and that  
385 they can start tomorrow.  
386 [1-11] Okay.  
387 [11-1] The pipe is here since yesterday and we are ready to go. My understanding is that we are  
388 finishing it today, so the best thing they can do is start tomorrow. And right now that's what we  
389 are shooting for.  
390 [1-11] Okay. If you get going down here and D (*referring to 9*) gets off board early next week,  
391 you can probably start from right from the low side and go the higher...you go from both ends to  
392 the middle.  
393 [11-1] I will rather not...I mean I want to run across there and stub it into the basement.  
394 [1-11] Right. So, you will put this piece first and then...  
395 [11-1] Yeah, we have separate crews...and they (*referring to 13*) can excavate...the deal is we  
396 are going to put the pipe in. They will do all the work.  
397 [1-11] Right.



398 [11-1] So, you know I have separate guys doing that too. We will have both crews at once.  
399 [1-11] Alright. So, that will be another week for you guys to go over there?  
400 [11-1] We need about a week or week and a half.  
401 [1-9] Now with some of the stuff here...you have got whole bunch of dirt here...can we get this  
402 column poured?  
403 [9-1] Yeah...yeah.  
404 [1-9] If we get this column poured...may be I want to start looking at the wall...I want this wall  
405 prep and getting the waterproofing because this hole behind the wall that gets filled back  
406 in...that takes us to 372 elevation.  
407 [1-0] So what I like to do is start getting this...then we can move some of our dirt.  
408 [9-2] How about the details of the soldier piles? What is the waterproofing detail there?  
409 [6-2] The pile is part of the slab?  
410 [2-6] Yes.  
411 [6-2] Are we able to wrap the pile?  
412 [9-6] It's an edge pile.  
413 [1-6] It's an edge pile...they are going to pour...  
414 [6-1] We have to square that edge pile up, wash up so that there is nothing...you know...if we  
415 can possible form it with plywood form...we can fill with concrete and then waterproof it. We  
416 will build a square box.  
417 [9-6] So you are not putting concrete around the pile?  
418 [6-9] No we are...but  
419 [9-6] I understand that.  
420 [6-9] I guess what I am trying to say is that we have to form it first, fill the interior of the H  
421 beam...we are calling it H beam...  
422 [2-6] At the bottom? Because you will not be able to fit everything in the H.  
423 [6-2] Yes.  
424 [9-6] What waterproofs the H beam if I pour concrete around?  
425 [2-0] I think what we are saying is just plywood around it...clean it out...put plywood...infill it  
426 with concrete...dump some concrete on both side...  
427 [2-9] You box it up two feet up. Then he is going to take his waterproofing and turn it up the two  
428 feet and make the corners. He only has to run up two feet.  
429 [9-2] When he is outside...  
430 [2-9] When he is outside and then you go on to take it and pour and then he is going to pour that  
431 and encase that it completely.  
432 [6-2] Right.  
433 [1-0] Okay...great...with all the screams and squaks...so I guess on March 4<sup>th</sup> our first slab on  
434 grade poured? March 11<sup>th</sup> second one.  
435 [9-1] I think the two pits are the real hold up.  
436 [1-0] When I get out of here...I will call J (*referring to somebody not present in the meeting*) and  
437 get his \*\*\* down here and see what we can do.  
438 [2-0] We are going to try find work around a little bit to some degree on the slope...  
439 [9-1] Give me ten minutes...  
440 [1-9] I will meet you in ten minutes over there.  
441 [9-1] And then there is work for you and work for me...we also need to find out how deep that  
442 sump pit is. If I need to dig out two feet.  
443 [2-9] I will call as soon as I am out of this meeting and get the dimensions.

444 [9-2] Hopefully it is only a little six inches...or whatever.  
445 [2-9] I don't think its that shallow.  
446 [1-9] Yeah...I don't think its that shallow.  
447 [2-9] Its just for then to drop a pump in there...its all for a low spot...that's it all for.  
448 [9-2] If I don't have to dig anything...if its just a depression.  
449 [2-9] Okay...we will figure it out.  
450 [1-0] Anything else? Okay...thank you gentlemen.  
451 *End*

## Appendix H: Transcript of Meeting B5

*Date of observation was February 24<sup>th</sup>, 2011. Venue of the meeting was a room in job site trailer of the GC set aside for meetings. The meeting started at 8:05am in the morning. There were 15 attendees in the meeting other than the observers. 1 and 2 were employees of GC. Attendees started coming into the room 10 minutes prior to the start of the meeting. 1, 4, and 6 were discussing about the heavy traffic they had to face while coming to the job site. 5 and 8 were discussing about tasks related to the project. 1 distributed the minutes of the last meeting among the attendees.*

1 [1-0] V (referring to 2) will go over the safety stuff. We have the first injury. A guy subjected to  
2 arcflash from welder got in the left eye. Let me quickly talk about schedule. Co.-B started  
3 reviewing for percent complete for schedule activities, and the expected percent of completion  
4 for subs is atleast 70%. We actually got to put this into spreadsheet...uh...we  
5 started...but...uh...there is little trouble comparing apples to apples. Some of the stuffs do not  
6 jive with the previous weeks. That's why we are kind of having the issue of nailing down how to  
7 compare...uh...some of things. Make sure that...that everybody is turning in the work  
8 plans...and we need it complete. We need activities based on the schedule...activity ID coming  
9 of the schedule preferably...where you are at, where you are going, when will you be there.  
10 [2-9] The only thing I have in common with yours...let me see your work plan for a  
11 sec...yeah...the only...I couldn't figure out why you said about the item number...trying to go  
12 through the list...you kept saying item 18 and 20. Instead of putting that item numbers...put the  
13 activity IDs...right here...SPT7110, SPT7140 or whatever.  
14 [9-2] Okay.  
15 [2-9] And that way we know where it matched up with the schedule. Otherwise there is no way  
16 for me to figure out which is what.  
17 [9-2] Okay...okay.  
18 [2-9] Okay.  
19 [2-0] That will help us track and compare the current status versus what we are looking  
20 for...percentage completion. For those activities, we will be able to compare apples to apples. If  
21 you have an activity that needs to take place that is not in the schedule, pencil it in. Write it in so  
22 we...flag it...so we know where it is. Because you could come across a piece of work that  
23 affects you that we did not see it on the schedule...that's affecting you...okay. Uh...make sure  
24 you are doing the six week and the two week schedule. If you need the electronic format let me  
25 know, I can give it to you.  
26 [2-0] I am not going to hand out the work plans. I am going to talk about it in a minute. And I am  
27 not going to hand out the schedule...there is a problem with the schedule. I found it just before  
28 handing it out. H (referring to 7) mobilized for sanitary and storm on January 3rd. They have  
29 already completed that work. They have completed the fire hydrant line. That's inspected and  
30 backfilled.  
31 [2-5] But they are going to hold on the fire hydrant till you get across and tucked under line.  
32 Because you are deeper than them. So, they are going to hold off. As far as the new curb line that  
33 has been installed, when...right now your plan for the duct bank, especially from the curb  
34 line...I know you are working...is there any part of your intention is to pick up anything down  
35 here? Have you work in two areas at once?



36 [5-2] Holding up that as the last resort. If that dries up...

37 [2-5] That's fine...that's fine. I just wanted to know mainly because it's higher from the duct

38 bank. The telephone that heads toward the \*\*\*\* (*the observers were unable to understand*

39 *because participants talked over one another*)...the one we were talking about yesterday...

40 [5-2] The one that coming from this (*referring to the site plan*) side?

41 [2-5] Yeah...I didn't know if it makes sense to separate that piece of work to get that tunnel from

42 across there.

43 [5-2] I mean...I can get it all in, but I want to get out of that back corner. Because that's going to

44 be a mess soon.

45 [2-5] That telephone line is on critical path and it pushes H (*referring to 7*) back from finishing

46 the water line and fire hydrant. You know...it will be better of to just get out of the way...get out

47 of the underground and then focus on trying to finish of the front. I don't see a problem with that.

48 [5-2] If there is any way I can go in there...if there is room available and fire hydrant work

49 stopped at that corner, I want that corner done.

50 [2-0] Okay...uh...I am going to skip the work plans...we will do the work plans in a minute with

51 the construction issues...uh...as everybody knows we are trying to get out of 360 elevation. 360

52 is where we had all the issues with auger cast piles going deeper...then the auger cast brace did

53 not come up so it delayed pile caps and concrete...hence the reason we are picking up some of

54 the premium time we lost...we have to pick up some premium time of 360. Correct me if I am

55 wrong, I don't know that it would be a lot premium time for necessarily T's (*referring to 5*)

56 crews so much as it would be extra time for S (*referring to 8*) to be opening it up and closing it in

57 the afternoon...working in the little bit over. Working some of the weekends. We will be here

58 Saturday and Sunday both if we need to. If we need a Sunday, especially with rain tomorrow and

59 rain Monday...if you are going to need Sunday...if it is going to be productive, then we have

60 look it as an option.

61 [2-0] Right now pour 1, we are trying to stay on track to pour on the 4<sup>th</sup>, which means he is going

62 to have it on 1<sup>st</sup>, which is going to be tough. F (*referring to a subcontractor*) is there at the

63 bottom trying to get pieces of sanitary stuff and storm he has got...he has got...looking to break

64 it at C4...cuts off at the east of the elevator, which helps not completely, but helps some.

65 [2-5] Are you aware of that we are going to cut that pour of?

66 [5-2] M (*referring to somebody not present in the meeting*) told me about it yesterday,

67 but...anything east of 3 we got work. I am coming out of the telecom room heading...uh...north

68 into the elevator pit.

69 [2-5] When you got the dirt out of that...

70 [5-2] There's not much dirt around. It's only four inches. It's all about 1' 10" down top of slab.

71 [2-5] Are your crews back there this morning?

72 [5-2] No.

73 [2-5] Are they going to be?

74 [5-2] Probably not.

75 [2-5] Why?

76 [5-2] We talked about it yesterday. I can't put them in until S (*referring to a subcontractor*)

77 finishes the underground.

78 [2-5] But you are talking about...you are talking about the piece over here (*referring to the site*

79 *plan*).

80 [5-2] No...no...no...no.

81 [2-5] Down here?

82 [5-2] Yeah. I have pipes coming out of top of the \*\*\*\* (*the observers were unable to understand*  
83 *because participants talked over one another*) and straight into the elevator pit.  
84 [2-5] I guess six, four inches from right here to across here?  
85 [5-2] Yup.  
86 [2-5] That's (*referring to the site plan*) where you need to be. You need to be...you need to get  
87 that...was there a piece that goes across here? is it underground?  
88 [5-2] Yes, but it has a 'Y' and one of it turns this way (*referring to the site plan*) and the other  
89 turns toward the telecom room.  
90 [2-10] You should let them know. That's what they need to focus.  
91 [10-2] We will be done today.  
92 [6-10] If you are today, will you back tomorrow?  
93 [2-10] Yeah he will be back in here tomorrow...but it's supposed to rain tomorrow.  
94 [9-10] You know...you see A5 back in that corner too...between A and A5...one month...soldier  
95 pile sticking out...looks like might be higher than the slab on grade.  
96 [10-9] If you want to put an elevation on it...it will be good. That's outside the first pour  
97 anyways...  
98 [9-10] No, its in the first pour.  
99 [10-9] A5?  
100 [9-10] Yeah.  
101 [1-9] Over here (*referring to the site plan*)?  
102 [9-1] Yeah...yeah. Right there.  
103 [1-5] If you start tomorrow...you will need till Saturday for the slab...may be Saturday and  
104 Sunday.  
105 [9-5] How much work do you have in there?  
106 [5-9] I don't have that much. I mean, I have got six, four inches pipe and two, two inches coming  
107 into the slab. You left the interior formwork on the elevator pit for your slab?  
108 [9-5] Yeah...yeah.  
109 [5-9] I have to penetrate that when I bring these pipes in there. So, I need to drill holes in the  
110 formwork.  
111 [9-5] Its plywood.  
112 [5-9] Okay, lets see.  
113 [1-5] If you just punch in to stub in, can you just do that without the time needed to wreck it up?  
114 [5-2] Yes that what I will do.  
115 [1-5,9] If it rains Monday, we will end up using another day. Can we...uh...they are working to  
116 open up the ditch on Saturday. Can something be done Saturday? Lets say S (*referring to 8*)  
117 comes in and brings couple of guys on Sunday, get some digging and open up done...then  
118 Tuesday...Wednesday, Thursday...it's a small pour.  
119 [9-1] It needs two long days to get done.  
120 [1-9] Because you have only got this piece here.  
121 [9-1] Two long days...I can get it done.  
122 [1-9] So, that's pour 4 and 5. That's good. That's what I want. Then we are looking at this pour  
123 (*referring to the site plan*) to get it in.  
124 [5-1] I told you yesterday...I don't see that.  
125 [1-5] I know...I heard you.  
126 [1-9] What do we need to make this happen?

127 [9-1] We need to get a lot of work done in the stairway right there (*referring to the site plan*).  
128 Which brings me back to the other pit...we will get that gravel leveled up today. Weather  
129 permitting I will get this \*\*\*\* down and pour on Monday. Maybe Saturday if we can get all that  
130 underground done. May be Monday.  
131 [1-5] Am I correct if I say, that you have a whole lot down this side? You got these emergency  
132 feeders, the normal feeders for the fire pump. They come around on this side?  
133 [5-1] Yeah, they come down that side. I have got five inch conduits coming down from the gear  
134 room to this pump...I have got two inches...  
135 [1-5] They are coming here (*referring to the site plan*) ...correct? I thought those were coming  
136 down here to the fire pump controller.  
137 [9-1] I have no slab on there...that can wait another two months.  
138 [6-1] Yeah, that's all gravel.  
139 [9-1] I can wait four months probably.  
140 [6-1] Up against the pile caps are gravel.  
141 [9-6] I have got the slab on grade form here to over there (*referring to site plan*).  
142 [6-9] Okay.  
143 [1-9] So we are breaking 4 right there.  
144 [9-1] So, as I told yesterday we are starting on the slope right now...get gravel or whatever for  
145 him (*referring to 6*) so that he can get there and waterproof it. May be Saturday.  
146 [6-9] Well not before Monday. There's piping that goes under there.  
147 [9-6] Okay.  
148 [9-1] Pour that slab Monday...start on the walls Tuesday. Hopefully in two days, I will get the  
149 walls poured as Wednesday and Thursday. Same thing here Thursday...strip it Friday so that we  
150 get the backfill done. We will get the backfill on Friday and Saturday.  
151 [9-6] The other problem is he got that soldier pile yesterday...right?  
152 [6-9] Yeah.  
153 [9-6] Then I have got another big problem...there's so much \*\*\*\*\* work there...the footers  
154 step down to the exterior wall...there's more work there than I have got everywhere else.  
155 [1-10] Just try to get back here tomorrow. We will get you out of the way today. Get back here  
156 tomorrow and see how have we made.  
157 [9-1] We have to push back till the 11<sup>th</sup>.  
158 [1-9] It is what it is. We will try to make it. If you need Saturday, we will work Saturday.  
159 [10-1] When is the first pour?  
160 [1-10] March 4<sup>th</sup>. If you can get to come on Sunday, it will be good. We are not talking about  
161 months, we are talking about one week. We will try to get this...get this slab on grade on 360.  
162 [1-0] Lets talk about ground level for a second, 372 elevation.  
163 [1-10] I have more than conveyed it to you that the deep sanitary has got to go in. Okay?  
164 [1-5] Uh...the 15<sup>th</sup> of March...by the 15<sup>th</sup> of March anything your under-slab electrical for 372  
165 needs to be complete. There's not a whole lot of things you got here...just some generator feeds  
166 underneath.  
167 [5-1] I have got that. I have got the one by four telephone...there's been an issue.  
168 [1-5] Why that one's an issue?  
169 [5-1] You have to backfill that wall to get through.  
170 [1-5] Uh...I am with you. Make sure you make an easy pipe run...we may have to put it in and  
171 then backfill to bring it up where it needs to be...but at the moment we atleast need to get the  
172 wall, we cannot pour the slab. But at the moment think about whatever else you got besides those

173 and the generator feeder that needs to under the 372 slab. We need to make sure you are heading  
174 towards all wrapped by 15<sup>th</sup> and hand off to him (*referring to 9*) at least the first pour.  
175 [1-9] Pour 1 is C to G?  
176 [9-1] No...on ground?  
177 [1-9] At 372 elevation.  
178 [9-1] Oh...the slab on grade...is  
179 [1-9] This piece up here (*referring to the drawing*).  
180 [9-1] Yeah...its C and G.  
181 [1-9] Its C and G. So, right there is the first pour. The second pour is from G around to J.5. First  
182 pour slab on grade is on 21<sup>st</sup>. The second is on 25<sup>th</sup>.  
183 [9-1] There we need another week because we are not going up there to start the footers until  
184 week after what I have in schedule.  
185 [1-9] Oh...we need to get pile caps...yeah...yeah...yeah. So, you have got 15<sup>th</sup> for MEP, where  
186 we will keep you guys completely out of there until you (*referring to 6*) guys are done.  
187 [9-1] Right.  
188 [6-9] For another week, because we will keep you out of there through the end of the next week.  
189 [9-6] Yeah...I am going to start on 7<sup>th</sup>.  
190 [1-6] So we are starting pile caps on 7<sup>th</sup>.  
191 [6-1] That's the plan.  
192 [10-1] You got a storm line back there too.  
193 [6-5] You are not going to need all your dirt, right? We need some of it for backfill.  
194 [5-6] We need some for the duct bank. I don't know what you are going to do with it.  
195 [1-5] We got a lot of backfill to do at a lot of places.  
196 [1-9] By the way, don't you have to backfill the strait wall?  
197 [9-1] On the outside?...yes.  
198 [1-9] You got to put dirt on the outside of the basement wall...well some of it.  
199 [9-1] We can get that to four or five feet.  
200 [11-9] When do you think you will be done there (*referring to the drawing*)?  
201 [9-11] Right here? Well we are backfilling right there right now.  
202 [1-11] He is right here trying to get his columns poured. What do you thinking of getting more  
203 further?  
204 [11-1] If I can get that on Monday, we can set it up...as far as I can do.  
205 [9-11] So you are all the way backfilling it up till the sub-grade...that will take week and a half.  
206 [1-11] Get this backfilled before it rains so that we can get in and you have some stuff going  
207 down through this.  
208 [11-1] Okay.  
209 [11-1] We have broken it up in three areas anyway. So, I am in area 2.  
210 [1-11] And I was just talking about 372 elevation...we need to try to get our utilities in by the  
211 15<sup>th</sup>.  
212 [1-9] That means you will be focusing on getting this (*referring to drawing*) done and you shift  
213 the gear and your focus should be at the end of the tunnel. Now at the end of the tunnel, you are  
214 pouring that slab and the two spread footers today?  
215 [9-1] Yes.  
216 [1-9] Then you will be forming and pouring the wall...you are thinking Tuesday?  
217 [9-1] Yes.  
218 [1-9] For this?

219 [9-1] Yes...yes.  
220 [1-9] And then you will be forming to get that...  
221 [9-1] Get the mat in.  
222 [1-9] To get the mat in and be able to get these two walls...atleast get out of the...get the angle  
223 right.  
224 [9-1] Right.  
225 [1-9] If you can get that piece, it allows us to get the backfill and here and slope it of...  
226 [9-1] The problem...we are trying to work from both ends is lot more man powers, lot more  
227 forms...  
228 [1-9] Okay...just get your forms done...and get W (*referring to 4*) to inspect the  
229 waterproofing...  
230 [4-9] Are you blowing before putting the waterproofing?  
231 [9-4] That's not dirty...right now...I mean it can get dirty. But its not dirty right now.  
232 [1-4] But we will blow down and all.  
233 [9-4] Yeah...if it is dirty we will blow away the dirt.  
234 [1-9] Yeah, little bit of dirt is fine but big clumps of \*\*\*\* should go away.  
235 [4-1] I don't see any problem as long as the inspector doesn't say anything about it.  
236 [9-4] The answer is yes. If we get that dirty we will blow of the dirt.  
237 [1-9] Good.  
238 [1-0] Our biggest concern is we don't want to go in the structure of the building running late,  
239 running behind. We want to make sure we hit our substantial completion mark on the structure  
240 itself. We probably have done plenty of jobs where we fell behind in the structure, and then  
241 during fit out we have got only MEP trades and drywall, and everybody else running behind their  
242 \*\*\*...everybody will be crazy out trying to finish. We are not doing that. If we need to put some  
243 extra now to keep the structure on track...that's work one or two weekend now or work few  
244 extra hours every day...lets keep the structure where it needs to be to finish of on time. So that  
245 we are not jamming up the interior crews later on for build out crews. I will rather see us  
246 working Saturdays or few extra hours now and not killing ourselves later. That's the reason for  
247 the push.  
248 [1-0] It's not your fault that we lost...nobody in this room is at fault that we lost four weeks of  
249 \*\*\*\*\* 360 elevation.  
250 [5-1] I understand you telling us to work Saturdays and Sundays, but there's not a lot \*\*\*\* to do.  
251 I can't do a damn thing so that I can use these days.  
252 [1-5] I can understand. But we think we have got it, mainly because he (*referring to 9*) is going  
253 as hard as he can so that he can give up the space. He is getting his people out of the way and we  
254 are trying to hold you in your window...but I understand and if the rain comes, makes it even  
255 worse. That's why when I say we need to hit on Sunday, we need to look at Sunday. I can't  
256 wait...we loose tomorrow, we loose Monday. Man we don't have any...there's no fluff, there's  
257 no contingency time built in the next few days...next few weeks or two. So we might have to  
258 take advantage if the Sundays as good days. You know we need to make the hey while the sun  
259 shines...we got to do it.  
260 [1-5] If you need to look at where we are supposed to be feel free to use the schedule on the  
261 wall...where we ain't but we were supposed to be.  
262 [1-2] We will come back to you.  
263 [2-1] That's fine.



264 [1-0] We will get back to everybody on work plan review. I curious to see how it meshes up with  
265 the last week's...I have got those in there. Please make sure you are filling out the work plans as  
266 I asked you with the activity numbers, what you got coming up, where you see yourself, what  
267 dates are you seeing the work to be done.  
268 [1-9] The backfill of the elevator pit is complete now...correct? Is it backfilled completely?  
269 [9-1] Yes.  
270 [1-9] I think the only issue was there was a roller...  
271 [9-1] We got rid of that.  
272 [1-9] That's a big thing because that doesn't help to get the space and still got \*\*\*\* all over the  
273 place.  
274 [11-1] There is still a little bit of backfill...the little wedge between the existing building and this  
275 ground. Actually I am planning to get that today.  
276 [1-11] That will be filled 57.  
277 [11-1] Yeah. What we are going to do is we got to use of some of the 57 we dig up from back  
278 there and then we will fill it.  
279 [11-1] We will backfill some and then T (*referring to 5*) is coming in.  
280 [9-6] Is there anything to do for you there?  
281 [6-9] Nothing, it gets filled up. There's no waterproofing back there.  
282 [9-6] No waterproofing. Is the slab on grade poured back there?  
283 [6-9] I don't think so.  
284 [5-9] If the slab on grade is not poured then I cannot get my pipes in until I run completely  
285 through the elevator pit upfront of the wall.  
286 [6-1] I think there is a chase all the way up.  
287 [1-9] Look at the shaft wall. The way we built it. It is a chase all the way up. I don't know there  
288 is a slab or not.  
289 [9-1] Yeah, I won't pour for now and we will look at it. It showed in one of the drawings. I  
290 don't know if you have seen it or not.  
291 [1-9] We will discuss it. We will see.  
292 [1-0] Now, we will go over the safety. Before we go over safety, anybody has anything about the  
293 schedule? Any issues you want to discuss?  
294 [1-0] Part of the lean process, which honestly saying I am not 100% up to speed on...as I have  
295 not sat in one meeting...otherwise I have learnt about the lean scheduling process. Part of the  
296 process is to get everybody talking...there is morning huddle. Every morning the supervisors  
297 meet all the crews in the field to make sure everybody is in the same page for the day. Uh...this  
298 has been pretty effective in the other jobs we have used it. It makes the work smoother. It a short  
299 ten to 15 minutes get together to make sure everybody is in the same page. So if you (*referring to*  
300 *5*) need something from H (*referring to 11*) you can tell him right there...I need this by this time  
301 or I need this thing out of my way. We will be all there to make sure we are doing as also the  
302 other trades doing what need to be done and so forth.  
303 [6-1] Deliveries.  
304 [1-6] Yeah...what you have coming in for the day, activities you have going over the day,  
305 anything we need a heads up on.  
306 [6-0] Please be on time. I don't want it to be a 30 minute meeting waiting for people.  
307 [1-0] Yeah, 7 o'clock on top of the ramp. What else?  
308 [1-2] Safety...can you go over the safety?  
309 [2-1] Sure.

310 [2-0] Uh...expect a site evacuation very shortly. So, make sure your guys know where to go,  
311 which is up here to Co.-B's trailer. Make sure you guys understand process of how to get a head  
312 count on your guys that are working that day and report that to Co.-B. Right now its going to be  
313 three horn blasts of the air horn. I don't know when it's going to be, or what time of day it is, but  
314 expect it very shortly.

315 [5-2] What happens if my guys are working inside?

316 [2-5] That's something that we are going to coordinate internally. Uh...during the huddle  
317 meetings, we should know where you are working at that day, and we will assign Co.-B  
318 personnel that we could contact over radio and go and get your guys.

319 [1-0] The building is designed for fire conditions...fire situations. If you got your guys inside,  
320 we expect you to know who your guys are, how many. So, if you have a 12 man crew, you have  
321 got seven out here, you could say about five inside working at the plant. When five men are out,  
322 you could say all men are accounted for.

323 [11-2] So, when we have men in the tunnel we not have to evacuate to the side?

324 [1-11] With the tunnel now cut over and exposed in the side, you can move to the side. If you  
325 have a gas leak, the gas is heading to the hole and fills the tunnel. All you men should be out.

326 [2-0] Just reviewing the DBO2 safety summaries, uh...I will run through real quick, but there is  
327 not many...uh...thankfully. Scaffold...we had a scaffold that wasn't inspected. It did not have  
328 any plates or wheels installed. Proper storage of acetylene and oxygen as ell as propane...keep in  
329 mind that they need to be separated by a five feet fire barrier with a 30 minute fire rating and or  
330 separated by 25 feet. And there needs to a fire extinguisher...a 20 lbs fire extinguisher within the  
331 area.

332 [2-0] Uh...safety latches...

333 [1-2] Wait a minute.

334 [1-0] Does everybody understand what we mean by storage? Tank storage room?

335 [5-1] Yes.

336 [6-1] Yes.

337 [1-0] Okay.

338 [6-2] was it in the tunnel?

339 [2-6] No actually it is outside.

340 [2-0] Safety latches...anytime you are using any type of rigging that has a hook, it has to have a  
341 safety latch. If the safety latch is broken, you have to take that to service to get a new safety  
342 latch. Uh...slip, trip and fall hazards...uh...H (*referring to 11*) if you can, I know are still  
343 loading down in there, but if we can move the cords and stuff away from the major walkway....

344 [11-2] I spoke with them this morning to move away all the cords you know...

345 [2-11] Alright.

346 [11-2] I will follow up on that when I go down there.

347 [2-0] And we had a discussion about safety glasses and hard hats required in the tunnel. I know  
348 its hot down there, but the guys still need to wear the PPE.

349 [11-2] Yes I had a talk with them.

350 [2-11] All right.

351 [2-0] Flash arresters...cylinders as well as torch...okay...you have to have flash arresters on  
352 both ends. Its something that most of you might not be accustomed to but it is a Co.-B's policy.  
353 We have been in the business more than 100 years, so we have a vast history of incidents and  
354 injuries to build up these policies. So that's why we have crated the policy.

355 [2-0] If you are lifting anything, you need tag line. I don't want to see any people's hands  
356 touching a suspended load. So, you need a tagline to maneuver when it is up. Fall protection on  
357 open excavations...let me try to explain this...everyone know Co.-B has a six feet fall policy. So  
358 if it six feet or deeper, you need a tie off. Now I know its difficult when we are outside, but we  
359 talked about arrangements and also protections of those excavations or openings...uh...snow  
360 fence. Also, the OSHA standard states that if you have a difference of 18 inches or more, from  
361 one level to the next, there has to be a means to access the egress, or has to be protected or shut  
362 off. So there needs to be a walkway, or a step, or something of that nature so that we don't have  
363 guys jumping for trying to step up or jump down twisting their ankles or so forth. So its 18  
364 inches.

365 [2-0] Fire extinguishers need to have monthly inspection tag on them. Buy the inspection  
366 stickers. That way it stick right to it and you got a black marker to check it monthly and it also  
367 has to have one yearly inspection. And that should be some type of tag or sticker. I am seeing a  
368 lot of fire extinguishers with pins missing, or the pin keepers missing, or in need of being  
369 recharged.

370 [2-0] Ladders three feet above the landing...so if we are using ladder to get down into  
371 excavations or holes or confined spaces, they need to stick out three feet. And proper labels on  
372 containers. That was OSHA's top ten citation last year...hazard communication. So, make sure  
373 everything you bring out there has a label on it. I know that red in a can typically means  
374 gasoline, but I don't know. So, make sure everything has a label on it.

375 [2-0] Any questions?

376 [1-2] Is it a report?

377 [2-0] This is a report from the last week's observation.

378 [1-2] That's what I am asking. Is that a DBO2 report.

379 [2-1] Yes.

380 [1-2] Okay.

381 [1-0] So what I want you to know that those came of the safety inspections of the site. That's  
382 what you guys should know. Things were observed, things were corrected. There are now three  
383 sets of inspection...V (*referring to 2*), the insurance inspector, plus your safety folks have started  
384 to show up and walk the sites with V. They keep bringing their own comments.

385 [1-2] Anything else?

386 [2-1] Last but not least, the personnel from the insurance carrier will be walking the job site  
387 tomorrow...time unknown, but it will be tomorrow.

388 [6-9] Can you backfill by tomorrow?

389 (*Everybody laugh*)

390 [1-11] Make sure you have got harnesses and retractable lanyard. That's the way to get in to the  
391 hole.

392 [2-11] Actually I was talking with the supplier of attachable handrails, you can put on that thing.  
393 I don't know.

394 [1-11] You need to look into it. That makes it lot safer.

395 [2-11] It might be a good option. They may make attachable handrails that go in with trench  
396 boxes.

397 [1-11] Just slide them in.

398 [1-0] Okay. Anything else?

399 [4-5] Can you look into the camera on the tower crane? It keeps coming out. Can you look into  
400 that for me?



401 [5-4] We have already tested it this week. Its fine. I don't know what you got going upstairs up  
402 on that crane.  
403 [4-5] Okay.  
404 [5-4] I don't know if you have faulty lights...wind blowing up against...you know...may be the  
405 cord.  
406 [4-5] Okay.  
407 [1-4] What else is plugged in there? Just the camera and the light?  
408 [2-1] That's what I am saying. The cord should not be a problem.  
409 [5-2] I have checked the connection. I will still take a look at it.  
410 [1-0] Okay. Thank you everybody...appreciated.  
411 *End*

# Appendix I: Open-ended Interview Guide

## Procedure

This interview will last for about 15 minutes. I will be recording it and also taking some notes. The recording will be kept in strict confidence and not heard by anyone but me. Results of this interview will be combined, anonymously, with all of the interviews I'll be conducting, when I publish the results.

Our conversation is completely confidential and your identity will not be disclosed at any point of time. Please feel free to talk openly. There are no right or wrong answers; I am seeking your opinion as a participant of this construction project. You may end the interview at any time.

## Questions for Open-ended Interview

The following is a list of interview prompts to be used to gather insights from the participants about interaction during the coordination meetings:

1. According to you, how important are the 'coordination meetings' for the progress of the project?
2. What percentage of time in these meetings is spent on discussing issues related to the project?
3. Other than issues related to project, what are other topics of discussion in the meetings?
4. Do you find enough opportunity to express your thoughts and concerns in the meetings?
5. Over past 6 months, how many meetings addressed your scope of work?
6. Of these meetings, how many addressed safety issues related to your scope of work?
7. What percentage of those meetings requires performance commitment from another party?
8. What percentage of those commitments do you think were fulfilled?

Along with the interview questions, follow up questions may be used to probe for more information:

- How often do you interact with the other attendees outside the meetings?
- How?
- Can you give me an (another) example?
- Can you list...
- Why/why not?
- Can you tell me more about \_\_\_\_\_?

## Appendix J: Transcript of Interview 1 (Project A)

*The interviewer is denoted by I and the respondent is denoted by R.*

- 1 I: Have you worked with Co.-A before?  
2 R: Yes. We have worked with Co.-A may be 8 years, or 10 years. We have been working with  
3 these guys for a while.  
4 *(Pause)*  
5 R: Probably 90% of my work is with J (*referring to the project manager of Co.-A*) and J  
6 (*referring to the superintendent of Co.-A*). I mean 90% of the work we do with Co.-A is with J  
7 and J. It's all with the C group (*referring to a regional division of Co.-A*).  
8 I: According to you, how important are the coordination meetings for the progress of the project?  
9 R: Uhh...you want to ask how purposeful are those?  
10 I: Yes. For example if these meetings do not take place what problem will you face?  
11 R: They are good in that they shine light on where one needs to be. You know what I mean...so  
12 that you as a subcontractor only tend to follow your own work. When you go to the meeting you  
13 see everything. Where is everyone...how your work is impacting other people's work. You  
14 know what I mean.  
15 I: Is it only during the coordination meetings you interact with other subcontractors?  
16 R: We try to talk all the time. You know it's a way everyone can out what their problems are on  
17 the table. May be like early in the job these meetings once every two weeks is good. But when  
18 you have got as much going on right now, once every week is probably what it needs to be.  
19 I: What percentage of time in these meetings is spent on discussing issue related to the project?  
20 R: Everything is about this project. There is no informal talk, we come and talk about the project  
21 only.  
22 I: Do you find enough opportunity to express your thoughts and concerns in the meetings?  
23 R: Yeah...they give you time to...if you have got problems they give you time to...at the end of  
24 each meeting I go around each sub and say, 'you have anything else?' You know what I mean.  
25 I: Of these meetings, how many addressed your scope of work?  
26 R: All of them. We have out here since this time last year...we started a year ago. We have  
27 been...you know...we have had in the pot for a long time.  
28 I: Of these meetings, how many addressed safety issues related to your scope of work?  
29 R: They have a safety guy who was here this morning. He brings up the safety issues, or  
30 regulations, or whatever...they don't usually single anybody out in these meetings. If you got  
31 safety issues they will pull you in...they don't wait for the meeting. What they discuss in the  
32 meeting is overall general safety thing for the job. You know what I mean. If there a lot of  
33 violations or something, they will say. But typically they don't single out any one person in the  
34 meeting. We don't discuss the imminent safety issues in these meetings...these meetings run  
35 long enough as they are. So we discuss those...uhh...all the companies have safety programs.  
36 We have our own individual safety programs that we have to follow. But as far as they going  
37 over preplan everyday for your specific job...that's out duty. They do go over it, but not in these  
38 meetings.  
39 I: How workers you have working under you?  
40 R: 140. We started with 2, then went to 4, and then...you know what I mean. Towards the end it  
41 will again taper down.

42 I: What percentage of the meetings requires performance commitment from another party?  
43 R: I mean usually...sometimes dates are given and they are met. Or there be another time when  
44 dates are given and they slip another day or two. You know what I mean...unforeseen things can  
45 happen. So most of the time people give date they try to hold them. But sometimes it doesn't  
46 work out.  
47 I: What percentage of these commitments do you think were fulfilled?  
48 R: Probably 85%. We have also fulfilled 80% to 85% of the commitments. We try to make  
49 educated commitments. Once we make commitments, we try to...atleast I do...think rest of them  
50 do too. Once they give dates they try to stick to them as far as they can. Lot of things people  
51 commit about is really small items.  
52 *(Pause)*  
53 R: people are not just throwing stuff out there. They usually try to stick to them.  
54 I: How to do transfer the information you gain in these meetings to your workers?  
55 R: I dont sit with guys and go over the whole thing. But I meet some of the lead guys...I have 4  
56 or 5 lead guys...I will go over with them so that we can make it work. What we got to do to  
57 make it work. You know what I mean. I talk to them on Fridays and get to know pretty much  
58 what's going on...and now I will go and sit with them...just so they know where we are trying to  
59 be at by a certain period of time.  
60 *End*

## Appendix K: Transcript of Interview 2 (Project A)

*The interviewer is denoted by I and the respondent is denoted by R.*

- 1 I: Have you worked with Co.-A before?  
2 R: I have been in this business for 30 years. I have done a few projects with Co.-A. But I haven't  
3 worked with this group.  
4 I: According to you, how important are the coordination meetings for the progress of the project?  
5 R: The most important part of the meeting is the schedule...where we are in the schedule. Is  
6 there any item that is holding the contractors? This is all schedule driven. For example the tile  
7 guy brought today that he is waiting for the floor drains to be lowered. So talking about tile,  
8 something coming back to us. May it is the sheetrock guys and something back to us. So it is  
9 very important that you get everybody together atleast once a week and have an opportunity to  
10 discuss those issues. I am sure you have seen this schedule (*referring to the schedule*), it s pretty  
11 in depth. I think they have got about 9000 activities. But it still can't cover. There is something  
12 that are not covered, there are some mistakes, and that's what you got to work out in these  
13 meetings.  
14 I: What percentage of time in these meetings is spent on discussing issue related to the project?  
15 R: Just the project.  
16 I: Do you find enough opportunity to express your thoughts and concerns in the meetings?  
17 R: Yes, that's not a problem. Whatever issues and concerns we have we get an opportunity to  
18 bring up.  
19 I: Of these meetings, how many addressed your scope of work?  
20 R: Well there is different phases of the project...starts out its concrete, it digging, its steel. Then  
21 we come in as the steel is finishing up. We are at a point now when the rough in of our work is  
22 finishing up. Then in the last six months it's been very intense mechanical, plumbing and piping.  
23 But right now we are a point when we are starting to fade out. And that's the way it is with each  
24 trade. They have their point where they have got the majority...the electrician is typically a  
25 month or two behind us. So he will start winding down in about a month.  
26 I: Of these meetings, how many addressed safety issues related to your scope of work?  
27 R: To everybody's work. We hit in the highlights. Those things we need to emphasize as far our  
28 safety goes.  
29 I: What percentage of the meetings requires performance commitment from another party?  
30 R: Absolutely. You are committed to your dates. You have to perform, you have to live upto  
31 those dates that Co.-A holds you accountable for.  
32 I: What percentage of these commitments do you think were fulfilled?  
33 R: I will say most of it. Sometimes it varies within a few days. But that's going to happen, and  
34 something you disagree on. But for the most part they have been taken care of.  
35 I: How to do transfer the information you gain in these meetings to your workers?  
36 R: Typically I will go back...I am taking my notes, I will go back and I will call for a field  
37 meeting at 1o'clock today with all the superintendents and foremen. I will go over the highlights  
38 with them, the things they need to know like the VOSHA is coming on 18<sup>th</sup> and everything I  
39 have written down here. So the superintendents and the foremen will know, and then they will  
40 have to go back and tell their people. We are about 70 self-performed craft, then we have 47  
41 sheet metal workers, and 19 insulators. Superintendents we have 3 and foremen we have 5. The

42 superintendents and foremen need to distribute the information. On Fridays we have our  
43 schedule meeting where we get together at our office and go over where we at. Then on Monday  
44 mornings we go over the last week's meeting minutes, and we fill in all the information and  
45 stuffs they get into some of the specifics here. Instead of bringing or entire office, there are just  
46 two of us from the office and we rely on taking notes and inputs from different superintendents  
47 to relay the information to Co.-A.  
48 *End*

## Appendix L: Transcript of Group Interview (Project A)

*The interviewer is denoted by I and the respondents are denoted by R1, R2, R3, and R4.*

- 1 I: Have you worked with Co.-A before?  
2 R1: I have worked with them before. Not with this group. I haven't worked with this group, but I  
3 have worked with the company before.  
4 R2: Not with this team...no. But yes with Co.-A.  
5 R3: Yes. We have worked with this team before...in couple of projects.  
6 R4: We have worked with the company, but not this group.  
7 I: According to you, how important are the coordination meetings for the progress of the project?  
8 R1: I think it's the time to bring out the trades together. If there are issues, try to work them out.  
9 Uh...by the time I get involved in a job, the schedule blown out of order and everybody making  
10 up time. I don't really have anything to do about as far as the original schedule. I have to get  
11 about these meetings to figure out when I have to show up. So I think it works for the schedule  
12 and for coordination issues.  
13 R2: Yes, the meetings are important for schedule and coordination. You know the schedule has  
14 only been once from the original, the weekly...or biweekly updates we get as project managers  
15 keeps pretty much on track. And give Co.-A the opportunity to beat us up. As you can very well  
16 see.  
17 I: What percentage of time in these meetings is spent on discussing issue related to the project?  
18 R2: Well 100% is on the project.  
19 R3: Yeah...I agree.  
20 I: Of these meetings, how many addressed your scope of work?  
21 R4: 1%.  
22 R1: I get my 5 minute thing in each meeting so...  
23 R2: I get beat up more regularly than that. Its usually on a daily basis, sometimes as much as on  
24 hourly basis. And it all depends on where the emails are coming from. So, for me, being the  
25 bigger contractor here, we get beat up quite bad.  
26 R1: And that's common not just here. Most of the projects that I go to...you know...the five big  
27 trades...electrical, plumbing, fire protection, HVAC, and the drywall guys. They are running the  
28 show. My finish trade just kind of...I get to come in whenever those issues are worked out  
29 whatever they may be.  
30 R2: Its usually an oddity for us to be behind schedule. We normally push the schedule. We  
31 normally push the project. Because we were so late in getting this project, probably four  
32 months...  
33 R4: Before you got a contract?  
34 R2: Yes, before we got a contract. Before we set foot on the job, steel was up and they already  
35 made three pours. When you hit a fairly good sized project...and I don't know what the overall  
36 project is...but it got to be somewhere in the \$400-\$500 million dollar range...actually the two  
37 last contracts that were left were the mechanical and the electrical. The two most important ones  
38 on the project. And those were the two last contracts that were left in this project. So you are  
39 already four months behind schedule when you get the job. For us to be where we are right now,  
40 I have never worked like a job like this. And I have been doing this for the past 39 years.

41 I: Do you get enough opportunity to express your thoughts and concerns during the coordination  
42 meetings?  
43 R2: Not if you value your contract.  
44 I: What do you mean?  
45 R2: You just take the beating, and do what you need to do in order to get the portion of your job  
46 done.  
47 R4: You can't voice your concern so much.  
48 R2: And I think he just said it perfectly clear what I was trying to say. It doesn't make any  
49 difference. It doesn't make any difference for the simple fact that, if you are wrong you are  
50 wrong, if you are right you are wrong. So, if you want to read into that however you want to, you  
51 go right ahead.  
52 I: In your 30+ years of experience have you found majority of the projects like this?  
53 R2: They are all pretty much like this.  
54 R4: The thing is...I have been working for 50 years...years ago whenever they built a building  
55 they would give you enough time to go and get a quality job. But with the fast track building, it  
56 killed the industry. It killed the industry as far as craftsmanship.  
57 R1: Well, what happens in my views, whenever our estimators are bidding a job, they have a set  
58 of document that say something...probably has some type of schedule with it that has some type  
59 of duration set for whatever is expected. If we get that job, then I start looking through it, and I  
60 say to myself...man I don't get enough time to get my job on the schedule and I need to talk to  
61 him (*referring to the GC/CM*) about this. Well before we sign the contract, we call them up and  
62 try to start breaking things up like that. Uh...sometimes they listen a little bit, and I am talking  
63 about in general, not about Co.-A. Sometimes they listen a little bit, but after you get answers to  
64 your questions...we will get the...look, you have got the same opportunity to bid this as  
65 everybody else did...are you going to stick by it or not going to stick by it? You want this  
66 contract, or you do not want this contract? And whenever we come in, the jobs are always  
67 running behind the time.  
68 R4: It's always the steel that drives all the finishes, but the finishes pays their due to get the  
69 building. The steel is the first one on the job. They can do whatever they want. They have got all  
70 the time in the world, but it's the finishes that pays the dues to get the buildings done.  
71 I: What percentage of the commitments made in these meetings do you think were fulfilled?  
72 R2: I am going to say...when some of the guys make commitments here, they probably follow  
73 through about 90% of the time. The commitments that I make, we try to follow through a 100%  
74 of the time. But in some cases because of the other 10% is going to hold you back, like for  
75 instance I am holding him up right now from doing grout (*referring to R3*) in bathrooms. I have  
76 got permanent light in there but I can't heat it up. But I will. Some how or other, I will get those  
77 for him.  
78 R3: But I am willing to bet, not even knowing what is going on with those lights, somewhere  
79 along the line there was something else that prevented those lights from going in.  
80 R2: Exactly.  
81 R4: There is always a point where something stops, and everybody behind it is mad about it.  
82 R2: And that's the problem that happens in all these jobs. But in the contract that Co.-A has, they  
83 have the right to change the timeline however it matches to where the progress of the job is  
84 going. So in other words, they hit an area...lets say the third floor and because they ran out of  
85 brick they could not do outside of the building, they have the other side of the building done,  
86 they can just take and move everybody on the other side. Even this part of the schedule, we are



87 here to start at this one, which wasn't supposed to start for two months. So, consequently you  
88 have moved all over the building.

89 I: While making all these changes, were you consulted?

90 R2: Uh...as long as the durations are kept according to the original schedule, that's what Co.-A  
91 goes by. They will give you the same duration. But the thing is they don't understand that out of  
92 sequence work...when you do something like that affects other areas. So, I have done enough  
93 out of sequence work to know that it is no the way for work to happen. They should not have that  
94 right. But unfortunately, we signed off on the bottom line.

95 R4: What comes down to is money. They (*referring to the owner*) borrowed money to build this  
96 building and they want to build this building as fast as they can, so that they can start making the  
97 dollars. But that's not it is all about.

98 R1: Well its all about money time and money. It's based on duration. If you have ten days to do  
99 an area, you have five days to half of it. But then have to back over here to another area in ten  
100 days and come back...you have got the five days left. It will take you longer than five days to get  
101 it.

102 R3: Out of sequence work kills you every time.

103 R1: Sometimes you can't help it. I mean, if you run out of an area you can't just say...I mean  
104 you can't stop the job for that one area. You got to keep going. I can understand why they want  
105 to keep going. That's what these coordination meetings are all about to coordinate all those and  
106 control. But the thing is they are going to sit there with their thumb on you and the durations and  
107 make sure that we are all getting. For instance, fifth floor elevator lobbies...we got to put some  
108 granite on the front of the fifth floor elevator lobbies. According to the original schedule, that  
109 was supposed to get started on June 7<sup>th</sup>. Now presently, the update says you are zero percent  
110 complete and you were supposed to start on June. What it does not say is that until two weeks  
111 ago there was big hole in front of that. You see what I am seeing. We haven't started that  
112 yet...we have to document it all. Probably at the end of the job, they will have all the  
113 documentations and I will send them this stuff...every week it says you are zero percent  
114 complete...you were supposed to be done. All it does is trigger in my mind is that...okay they  
115 have said about liquidated damages, so I will spend my time and superintendent's time not only  
116 doing work but also document something to make sure we have got something to carry to the  
117 bottom. And the way this one is going, I would say there is better than average chance that there  
118 will be some sort of fight at the end of it.

119 R2: Its called global settlement.

120 I: Of these meetings, how many addressed safety issues related to your scope of work?

121 R2: Safety is addressed every hour of every day. And what they address here is nothing more  
122 than informal. The formal stuff takes place all day long. There is a safety man that walks the job,  
123 we have our own safety people. People get written off, people get thrown off the job, they get  
124 sent home for three days. I mean for as big a job as this one and for as many people we have  
125 working here, the accidents have been fairly controlled. I don't think any more safety needs to be  
126 addressed in these meetings...we get safety pounded in our head all day long. That's my feeling  
127 on it.

128 R1: The way jobs are running these days, they look at your EMR ratings and if you get accidents  
129 then you will get dumped. So just for doing business, you can't help but to focus on safety.

130 R3: Our company is rather large just like their (*referring to R2*). We have our own safety  
131 division, we have rules and regulations that we are bound to go by and are stricter than Co.-A.  
132 But do they find people standing on the wrong rung of the ladder? Sure. But as far as major

133 infractions are concerned, they feel that a major infraction to send somebody home for is  
134 carrying tobacco products, as this is a 100% tobacco free workplace. I can understand this, but  
135 still there are guys who are smoking or using snuff and everything else. They don't do it on the  
136 job. So, to me it's kind of ridiculous that they will do something like that to somebody.  
137 R4: The accidents occur because the guys are working 16 to 18 hours a day. That's how hard  
138 they push everybody.  
139 R2: You know...I know you know the rules...Saturday/Sunday unlimited overtime...I  
140 mean...they say that there are 168 hours to work in a week, how come you are not working? I  
141 mean we have as many 130 electricians out here and working overtime on top of that...working  
142 Saturdays/Sundays, working five ten hour shifts and two, eight hour shifts. You know when you  
143 start working 66 hours work weeks its tough. I know because I work 66-70 hour work week  
144 every week and have since I have first set foot down here over a year ago. It's no fun. But that's  
145 what we were asked to do as we were given the job so \*\*\*\* late. If you want to get a  
146 subcontractor a job, you want to give him the opportunity to go ahead and do his buyouts, get his  
147 design done. BIM coordination was a must here, and we had people that were working 80 and 90  
148 hours a week doing BIM coordination in the beginning, so we had something to start. Not a good  
149 atmosphere...not a good way to start a job. When you come to the job the first day and get  
150 yourself introduced, the superintendent says...well you have missed the first two concrete pours,  
151 what are you going to do with the third one that's happening tomorrow.  
152 I: How to do transfer the information you gain in these meetings to your workers?  
153 R2: We have one overall superintendent and we have a general foreman. I get the information to  
154 them and they get it to the guys as needed.  
155 R1: I come to the meetings and get emails. Most of the time, I coordinate with my foreman over  
156 the phone. If there is some new plans or something, I print them out at the office, mark them up  
157 with just the information he will need. Give a copy it to him and our lead installer a copy. IF they  
158 have any question about that...and then we go from there.  
159 R3: I meet some of the lead guys...and go over with them the changes or anything I need to tell  
160 them. If there are any changes, I print it out and give them a copy.  
161 *End*

## Appendix M: Transcript of Interview 1 (Project B)

*The interviewer is denoted by I and the respondent is denoted by R.*

- 1 I: Have you worked with Co.-B before?  
2 R: We have worked with Co.-B. Not with the same group.  
3 I: According to you, how important are the coordination meetings for the progress of the project?  
4 R: Coordination meetings are important because get people the kind of opportunity to get the  
5 concerns out on the table that the other people are not aware of.  
6 I: Do you find enough opportunity to express your thoughts and concerns in the meetings?  
7 R: There is enough time and opportunity. If it is not an issue that is somebody else's  
8 concern...then it is an issue. May be an issue with me or somebody else. If it is an issue with  
9 anybody, it is addressed in the coordination meetings. So, kind of bringing up things in front of  
10 everybody before it becomes too late. Then they want to address it during the meetings. If things  
11 are raised in a coordination meeting, they should be addressed...if they are going to slow the job  
12 down, or affect the job. Yes, some people do have some minor concerns, but I don't think the  
13 concerns that are brought up are minor. They are going to affect the electrical productivity of the  
14 job at some point. They are always addressed as soon as they are identified. If you wait till the  
15 last minute and try to address something in a panic, usually leads to lost productivity, taking  
16 more time to do tasks, costing money, excessive money, and possibly somebody getting hurt. So,  
17 it is important to have the meetings and address the questions.  
18 I: What percentage of these commitments do you think were fulfilled?  
19 R: Uh...hard to tell a number. Starting from September, I think all of them. It is very important  
20 to fulfill the commitments. Its like a domino...for the next domino to fall the one before it has to  
21 fall. Same thing, if some trade do not fulfill their commitment, we coming behind them  
22 trade...and I have geared up with a large crew...is the task ahead of me is not completed it will  
23 cost me a fortune.  
24 I: What percentage of the commitments you made were fulfilled?  
25 R: I don't know of any that we haven't. We hooked up power for other subcontractors. The other  
26 commitments will fall back into coordination...you know I can't finish by duct bank if the guy in  
27 front of me is not finished. We are not solely dependent on ourselves. So, have to continually  
28 make and fulfill commitments to go forward.  
29 I: Of these meetings, how many addressed safety issues related to your scope of work?  
30 R: They have policies. This particular job is very stringent on safety requirement to the point that  
31 it is almost choking us down. Construction works, just due to the nature of business are  
32 dangerous...the environment that you work in. Even after you put on PPE, engineering work  
33 practices, you still is in an environment where something could happen. But they try to...and the  
34 only way to minimize danger is to plan ahead. Plan ahead and inform everybody about your plan.  
35 I: How do you transfer the information you gain in these meetings to your workers?  
36 R: We meet every morning. I meet with the sub-foremen...right now I have two sub-foremen. If  
37 something changes out of these meetings, I get with them after the meeting...and we will wither  
38 prepare to speed up an operation or cancel that upcoming operation and do something else with  
39 the manpower. I probably have 50-60 guys out here. And when you have that many guys out  
40 here keeping them rolling is very important. As soon as I see in these meetings that it is going to  
41 affect our work, I have to immediately take it out of here and discuss with my sub-foremen and

42 let them know about the change of plan...hey we are going here instead of going over here. The  
43 bottom line is the end date of the job does not change.  
44 *End*

## Appendix N: Transcript of Interview 2 (Project B)

*The interviewer is denoted by I and the respondent is denoted by R.*

- 1 I: Have you worked with Co.-B before?  
2 R: Yes. I have worked with Co.-B before...*(Pause)*  
3 I have worked with J (*referring to the superintendent of GC*) in the Heart Center.  
4 I: According to you, how important are the coordination meetings for the progress of the project?  
5 R: The meetings are very important. This is my first experience of working with this pull  
6 schedule. I worked with them in the Heart Center, but we didn't do it like this. I tell you what,  
7 from what I understand there is a lot of front end work that will help you make money at the end.  
8 Because if you get all these together now, then there will be none of those mess that goes on  
9 usually in the trades. The way it is setup is that the general contractor and the subs with them and  
10 they make a group...and everybody is held liable for their stuff. So, at the back end everybody is  
11 going to make more money as well. So, it not like that the general contractor is holding  
12 everybody. The meetings give you chance to get the schedule together...you know how many  
13 times you are handed a schedule by the general contractor and it is insane? So, this is chance to  
14 have your input.  
15 I: What percentage of time in these meetings is spent on discussing issue related to the project?  
16 R: We spend the whole time talking about the project. That's why we are here.  
17 I: Do you find enough opportunity to express your thoughts and concerns in the meetings?  
18 R: We all get more than enough opportunity to have our input...at least I do. It's a whole team-  
19 work thing. It will be so much easier, the way it is supposed to go for guys in the field. We can  
20 coordinate all the issues in these meetings, and the guys can just go and install the pipes and I  
21 don't have to think. And everybody will make a lot of money.  
22 I: Of these meetings, how many addressed your scope of work?  
23 R: All the ones in which I am part of it. As with all other subcontractors my scope is dependent  
24 on some others and somebody else is dependent on me. So whenever we do the pull scheduling  
25 thing, we have to consider all the trades working in there. That's how it works...so scopes of all  
26 the related trades are discussed.  
27 I: Of these meetings, how many addressed safety issues related to your scope of work?  
28 R: Safety is one of the most important things in this job...you know, as with all the jobs. They  
29 have a safety supervisor who walks the site and also sits in these meetings. When we go through  
30 the weekly plan he brings up the safety issues, or regulations, or whatever... gives his inputs to  
31 make sure we are not missing anything from safety perspective. Then we have the weekly safety  
32 meeting, toolbox talks...yes, the daily huddle meetings. Those are something new to us...but, so  
33 far have been helpful.  
34 I: What percentage of the meetings requires performance commitment from another party?  
35 R: I mean almost all of it. Here we do a lot of coordination upfront and so there is a lot of  
36 promises made. And we try to deliver those promises. Because, what we see with our company is  
37 that lot of our losses are in labor. Because of the late, because of project delays...things we  
38 cannot do because certain things are not done. But here things go smooth...most of the people  
39 sticking to their commitments.  
40 I: What percentage of these commitments do you think were fulfilled?  
41 R: Well hard to tell...but as I said most of it. Probably 95% so far I will say.

42 I: How do you transfer the information you gain in these meetings to your workers?  
43 R: Once I get out of this meeting, I will get together with my lead guys and go over with them.  
44 They update me and I know what's going on in the site. So, I take all the information from these  
45 meetings and we discuss what we got to do to make it work. We also do this...very quickly  
46 during the morning meetings (*referring to the daily huddle meetings*).  
47 *End*

## Appendix O: Transcript of Group Interview (Project B)

*The interviewer is denoted by I and the respondents are denoted by R1, R2, R3, and R4.*

- 1 I: Have you worked with Co.-B before?  
2 R1: Yes, I have worked with Co.-B. Not with this team though...  
3 R2: Yes, same with me. I haven't worked with this team, but with Co.-B...yes.  
4 R3: I have worked with them before. I have worked with two of these guys in other projects.  
5 I: According to you, how important are the coordination meetings for the progress of the project?  
6 R2: Absolute necessity. The weekly coordination meetings provide a platform where we, all the  
7 subs can come together and discuss our concerns and issues. It helps in solving issues as well as  
8 coordinating.  
9 R3: I think the meetings mainly help in coordinating the trades. We go over the look-ahead  
10 schedule...the schedule is continually changing as each week we add new tasks...tasks not  
11 completed from the last week are also pushed into the look-ahead schedule. There's a lot of  
12 things going on...it is really not possible to get an overall idea of the whole thing without these  
13 meetings. It's not only me...there are 15 or 20 other subcontractors working in this job.  
14 Everybody gets an opportunity to put their thoughts and concerns in front of everybody.  
15 R1: The weekly coordination meetings are good. The weekly frequency is also good. You really  
16 don't want them to do more than that. It takes...it changes...some of the things will change  
17 tomorrow. So if you are meeting everyday, all you will be doing is changing stuffs. The thing  
18 that is different in the meetings of this project is the use of the post it stickies that we put on the  
19 wall. Have never done that before.  
20 R3: Right...neither me.  
21 R1: It actually helps all the subs. It makes them more committed to the tasks...they are not  
22 surprised later on...you know...they can see on the board right now that I start...six days later I  
23 am pouring. So they can see it instead of waiting till we get up there and all be prepared.  
24 Hopefully this is getting the other subs prepared for what I am getting ready to do. Similarly, I  
25 can also get acquainted with what others are doing or trying to do. We also get to know if  
26 somebody is going to get any bigger delivery in the next week...we try to schedule our deliveries  
27 in such a way that we don't block the entrance of the hospital...it's a big no no...we can't block  
28 the traffic coming and going to the hospital.  
29 R4: I agree...last week coordination meeting I let everyone know that I will be getting some  
30 equipment on Wednesday, so that I can get the road to lot number nine free of any work trucks or  
31 any other equipment. It worked so well...otherwise, if my guy was stuck in the middle of the  
32 road with that \*\*\*\*piece of machine, I can tell you...that would have been a big mess. The  
33 coordination meetings are really important.  
34 I: What percentage of time in these meetings is spent on discussing issue related to the project?  
35 R3: We always discuss work.  
36 R4: Yes...all the time...100%.  
37 I: Of these meetings, how many addressed your scope of work?  
38 R1: Almost all of them, after the first couple of ones.  
39 R4: I have been heavily involved from the beginning of the project. So all of the meetings so far  
40 addressed by work. We had been held up for the sheeting and shoring permit. That pushed a



41 bit...but the permit came in earlier than expected. Then we were back in full swing. Mostly  
42 me...and the rigging for the auger cast piles are pushing the job right now.

43 R2: About 60% of those. I have lot of work to do...most of it has a lot to do with coordinating  
44 with other subs. So my scope of work comes up in almost all of the meetings.

45 I: Do you get enough opportunity to express your thoughts and concerns during the coordination  
46 meetings?

47 R4: Absolutely...we have both time and opportunity to express our concerns and thoughts. It  
48 makes a lot of difference to get the opportunity to express your concerns in front of other  
49 subs...or in that sense just to discuss your plan of action...somebody else may have issue due to  
50 your plan of action. Everything gets exposed when we put the stickies...that's the whole point of  
51 these meetings. And I think this is for Co.-B's benefit also more than ours...they can get back  
52 and look at all the trades and where they need to be. I am not going to be here everyday and look  
53 at those stickies...you see what I am saying. So they take that and make the schedule and that's  
54 what we look at to...they try to address our concerns before putting the tasks on the schedule.

55 R2: Lets face the reality...the schedule reflects what we think is achievable. We try to make the  
56 schedule as realistic and constraint free as possible. Still we face problems...we need to put them  
57 in front of others so that they get addressed. So we need time to do so...and we get plenty of it  
58 during the coordination meetings. And my concern is not only my concern...it will affect him,  
59 him...him...everybody. So, my duty is to identify the concern in the path of my tasks...and then  
60 the whole group try to resolve it in a manner it has minimum impact on the progress of the  
61 overall project.

62 R4: Right...this is reality. There has been couple of times that he has picked up four weeks...and  
63 I am like how the hell did you pick up four weeks. Then I go through it...you know...see what  
64 he is trying to do. Sometime its right, sometime its wrong. He did not have a slab poured  
65 underneath before pouring this (*referring to drawing*). So, you know you...its easier to take them  
66 off the schedule...all you have to do is crunch everything...but make sure it works. I mean, I can  
67 move all these together, but then all of a sudden I have got to a certain point and then four deck  
68 works...I am decking at four different places at a time which is nit going to happen because, first  
69 of all you will not have enough space for the materials, or the man power and one crane cannot  
70 supply materials and support for crews at four different places. Two crews will be standing  
71 around half a day waiting for the material. So I tell people you have to keep in mind that...say  
72 you have got one crane, and he can make seven picks an hour. So, you are working a ten hour  
73 day...at seventy picks. Seventy things he can move in a day. And that's really...that's about  
74 what it is...about seven, sometimes eight...depends on what we are doing. So, that's as fast the  
75 job is going to go. It's not going to go at 200 picks in a day. The crane can't do it. It can only  
76 move 70 things in one day. That's all you will get done. So, if it cannot be completed in four  
77 weeks...then it can't be.

78 I: What percentage of the commitments made in these meetings do you think were fulfilled?

79 R2: I will say most of it. Some of the commitments cannot be delivered due to some issues. Then  
80 we go up to the other sub and explain the issue of not fulfilling the commitment. Construction  
81 has a lot of uncertainties...so there have been incidents when I could not meet a deadline. I walk  
82 up to the next trade, which is supposed to follow me...talk with their foreman...talk with J and S  
83 (*referring to the representatives of GC*) and let everyone one the current status. I think it is as  
84 important as fulfilling commitment, to communicate in case of not fulfilling the commitment. At  
85 least it provide some information for the other trades...so that they don't come up with huge  
86 crew and have nothing to do.



87 R1: About 95% of the commitments are fulfilled. The commitments we make...we try to fulfill  
88 those 100% except some few odd ones. I thought I will be done putting conduits in the rebar  
89 cage within half a day, and then he (*referring to R4*) can follow me. Ultimately it turned to be a  
90 whole day task...now his guys were sitting on me. Fortunately, on communicating the issue, he  
91 could put his guys to some other things. Now these are unavoidable issues...and in construction,  
92 you continuously come across those.

93 R3: Everybody try to make a sincere effort in fulfilling the commitments. And most the time we  
94 have successful in doing that...I will say more than 90%.

95 I: Of these meetings, how many addressed safety issues related to your scope of work?  
96 R1: Safety is one of the most important aspects of this job...its very stringent. There are various  
97 avenues to pound safety on us...and they do that constantly. We have the weekly safety  
98 meetings, toolbox talks...we have to do a bunch of documentations. When I talk about safety,  
99 it's pretty much same for everybody. Everybody has to follow the same policy. I guess you got  
100 the list for what we need to do...its pretty much documentation and paperwork they are looking  
101 for. These are all my guys out here...they have all been drug screened, not every body has to be  
102 CPR trained...but we do have five individuals CPR trained currently. We have got five  
103 individuals first aid trained currently...two individuals have OSHA ten...uh...these are ones who  
104 have operators licenses current. These are the one who have fall protection training...actually all  
105 of them. And then these are the people with the excavation and trench safety certifications. So  
106 there are certain things that apply to certain trades.

107 R2: Safety is addressed all the time. And they not only address safety, they make you think how  
108 your work can pose safety hazard to your workers and also workers of other trades. To me this is  
109 absolutely critical. They have a safety manager who walks the site frequently...works with  
110 us...helps us with everything...attends the toolbox talks. He is on top of everything. Most  
111 importantly, he is always present in the coordination meetings and brings up the relevant safety  
112 regulations when we are preparing production plans. All of the subs have their own safety rules  
113 and regulations, which are pretty well structured. In some instances, Co.-B's rules are more  
114 stringent...the safety manager reminds us of those.

115 R4: Every day you got to watch the guys out there...you know. You just pay attention to people  
116 out there. Best thing I have seen work for safety is send somebody home. If they do something  
117 wrong...you know...if they have been trained. If you just give them warning...then they thing it's  
118 just warning and they do it time after time. You send a guy home for three days, it all stops. But  
119 if you just warn everybody...they don't care. They think it's a joke.

120 I: How to do transfer the information you gain in these meetings to your workers?  
121 R2: Once I am out of the meeting, I get together with my lead guys and update them about any  
122 changes from the previous course of action. We talk all the time.

123 R4: I have a large crew...we have four sub-foremen. We usually get together everyday before  
124 start of work and once during afternoon...other than that we meet as needed. If there is any  
125 immediate action to be taken based on the outcome of the meeting, I tell them the same day...or  
126 wait till the next day morning meeting.

127 R3: I have a weekly meeting with my sub-foremen and the project manager. I update them about  
128 the meetings and discuss all the issues that can impact our work. Also before coming to meeting  
129 I get all the information from them.

130 *End*

# Appendix P: Excerpt of GC/Subcontractor Contract

## (Project B)

### A. SCHEDULING

XXXX will be implementing Lean Construction scheduling techniques on this project.

#### GENERAL INFORMATION FOR LEAN CONSTRUCTION – How We will Plan and Manage Work Flow

##### SCOPE

1. The attached Construction Schedule with various milestone dates is to be used by each contractor and their subcontractors for bidding purposes and for development of their own detailed schedule. The end date for each milestone date activity will not be extended!
2. The Last Planner® System will be utilized for developing additional coordination details over the life of the project this process is part of the Bid Packages as described per the following:

##### FORM OF SCHEDULES

##### **Construction Schedule with various milestone dates:**

3. The project schedule is included in this project manual and shows the sequence of construction by activity with milestone dates that are incorporated into the overall duration of **681 Calendar** days.
4. At time of award, each Contractor and their subcontractors should inform the CM of any activity not listed on the schedule that they feel is critical.
5. The additional coordination and details for the construction schedule within various milestone dates will be further developed in various reverse phase pull planning meetings as defined below.

##### **Submittal: Schedule / Log:**

6. This submittal schedule / log with various milestone dates will include Shop Drawings, Product Data and Samples as referenced in section **01330, Submittal Procedures** with dates that these items are required to be submitted. This will be discussed and provided at the pre-award meeting.

##### **Last Planner™ System – Production System Planning and Control Process:**

##### **Overview:**

7. Lean Construction provides principles to improve coordination and smooth flow between milestone dates. When production planning becomes reliable and people fulfill their commitments, performance and workflow are improved, and ultimately so are the overall results of the project.

##### **Concept:**

8. Lean Construction traces its roots to production improvements utilized by the USA and USA's allies during World War II. The US Military shared these concepts to help re-build Japan after WWII and the Japanese industries continued to improve and develop new concepts. Called "lean" by a research study by at the Massachusetts Institute of Technology, (MIT) lean most often refers to the holistic management principles embodied in the Toyota Production System. The system aimed to eliminate the inventory between each assembly station and the frequent rework of traditional mass production in favor of a reliable production system that could both work and change quickly to meet a customer's specific requirements without wasteful processes. In traditional construction processes, the project is a series of activities and the goal is to reduce cost and increase the speed of each activity with consistent high quality.

##### **Application:**

9. Lean Construction involves a systematic approach aiming for more efficient overall workflow. It attempts to understand how value is delivered, making workflow as consistent and reliable as possible, and then reviewing the results to determine how to improve the planning process.
10. Lean differs from traditional construction methods because it decentralizes hierarchical decision-making. With Lean Construction, those closest to the work (the "Last Planners") must have the authority to make the decisions and plan the work. Contractors and their subcontractors agree as a group to meet their deadlines, and each is held responsible to improve the reliability of their promises for work completion not only to the Construction Manager

but also to fellow contractors and their subcontractors.

11. The project will utilize six key procedures in the implementation of Lean Construction / Last Planner Methods. Many of these steps require the input of the actual Foremen for the contractors and their subcontractors that will perform the work. These steps are as follows:

12. **Last Planner® System Planning Bootcamp** – This initial planning meeting helps the trade foremen and their respective project managers to collaborate with **XXX**, designers, and owners to develop their collaborative plan adding detail and coordinating specific durations and hand-offs for reaching the initial milestones on the Master Schedule referenced in the Bid Documents. The Boot Camp also allows the trades to meet each other before mobilizing on the project, and to better understand the planning and production management system used on this project. This bootcamp is held in a large conference room near the project, and is approximately 16 hours spread over 2 days or one week.

13. **Phase Pull Planning (PPP's)** – This represents the team's specific plan for how they intend to reach the milestone dates in Master Schedule. Contractors and their subcontractors plan the milestone phases of a project starting with the last work activity and working backwards. This ensures that all contractors and their subcontractors consider what work must be done prior to any schedule activity, and ensures that adequate durations are in place for late activities. This PPS is thought of as "What Should Be Done." A pull phase scheduling (PPS) will be done for each milestone date during stages of the project.

14. **Rolling Six-Week Look Ahead Plans** – this is simply a "print filter showing 6 future weeks of the Phase pull plan. Activities drop off the PPS onto the Six-Week Look Ahead Schedules and are expanded upon. All possible constraints for preventing these activities are identified. This six-week look ahead is the work that "Can Be Done" in the next six-week period.

15. **Weekly Work Plans (WWP)** – The weekly work plan is filled out by each trade foremen to plan next weeks work. WWP's are due each Wednesday at noon for the work to be performed the following week. These individual trade plans are consolidated by the CM and brought to Weekly Work Planning Meetings held on Thursday's by all contractors and their subcontractor foremen and are very specific in regards to the work they "Will Be Doing" in the upcoming week. In order for work activities to be on the WWP, there cannot be any known constraints, like a request for information RFI that would prevent the work from occurring.

16. **Percent Plan Complete (PPC)** – This is a calculation of the team's production plan reliability. **This** is done to identify trends for failure that may be improved in future planning. We will measure how reliable our team's planning is. If 10 items were planned for 1 week and 8 items were completed according to the plan, the reliability is 80% or the percent plan complete (PPC) is 80%. We will work to achieve 85% or higher PPC in the first 2 months of the job and continue to improve to 100% over the course of the project to ensure predictable, reliable handoffs, and therefore efficient use of your resources.

17. **15 minute daily huddle** – Contractors and their subcontractors superintendent and foreman will meet for a 15 minute standup meeting in the field (time to be determined) with their peers from other subs and the construction manager's superintendent/PM to quickly assess the days performance and discuss any new issues discovered.

### **Summary:**

18. Ultimately, Last Planner / Lean Construction tools aim to optimize performance through improved processes and systems by creating reliability, decentralizing decision-making and managing flow and consistency of work rather than the speed of any single aspect of the job.

### **Implementation:**

19. All Contractors and their subcontractors will be involved with creating the Phase Pull Plans for each milestone which they are involved in during the various stages of the project. These meetings are where the work is planned and coordinated, and is done in small phases over the time you are on site.

20. **XXX** will provide and update the Six-Week Look- Ahead Plans from information developed in the PPS, from Contractors and their subcontractors input, and will review the same at the weekly jobsite coordination meetings to be held on Thursday.

21. Each Contractor and their subcontractor must complete a Weekly Work Plan (WWP) and provide to CM by noon of the day before the weekly jobsite coordination meeting held on Thursday. Each Contractor and their subcontractors will coordinate their work and discuss briefly their activities at the weekly meeting.

22. **XXX** will calculate the percent plan complete to help determine why the teams plan may have failed (less than 100% PPC could be area of concern). Contractors and their subcontractors will be required to take action to prevent recurring problems and continually improve their plan reliability.

23. Contractors and their subcontractors will be required to inform T/D/T on a daily basis the status of the work that was committed to be complete.

24. PPS's may require updating as the project progresses and contractor and subcontractor personnel will be required to participate in meetings to accomplish this.

### **PROGRESS REVISIONS**

#### **Lean Construction Updates:**

25. Six-Week Look-Ahead Plans will be updated weekly.

26. The Phase Pull Plans (PPP's) will be updated periodically as required (Contractor and their subcontractors participation is mandatory).

#### **Construction Schedule with Various Milestone Updates:**

27. The schedule with various milestones will be updated to reflect the PPS and updated weekly.

### **SUBMISSION**

#### **Bidders must submit a schedule upon request with the following information:**

28. More specific schedule timelines that meet or exceed the schedule with various milestone dates.

29. Manpower utilization defined for each activity

30. Production Rates for activities

### **DISTRIBUTION**

#### **XXX will distribute copies of the schedules with various milestone dates to:**

31. All Contractors and their subcontractors.

32. Architect

33. Engineers

34. CPS Project Manager

### **RECORDS**

35. Phase Pull Plans, and updates to the same, shall become the revised Project Schedule with various milestone dates and shall be binding on the contractors and their subcontractors. Manpower, equipment and material adjustments as necessary to meet the PPP's as created by the project team members is the responsibility of each Contractor and their subcontractor.

## Appendix Q: Reportable Incidents of Project A

Date of incident	Cum. project incidents	Injured part	Injury cause	Post incident outcome	Monthly labor hour	Cum. labor hour
August 2010	0	Right ring finger	Laceration from sharp edge of stud hanging from ceiling	Resumed full duty next day	120,830	120,830
	0	Heat exhaustion	Felt dizzy while working in outside temperature of high 90 degrees	Resumed full duty next day		
	0	Hand	Job box lid closed on hand	Resumed full duty same day		
	1	Back pain	Moving 80-100 lbs beams with three other workers	Restricted duty for seven days		
	1	Left fore arm	Unknown	Resumed full duty same day		
	1	Right elbow	Unknown	Resumed full duty same day		
	1	Right fore arm	Unknown	Resumed full duty same day		
	1	Right fore arm	Unknown	Resumed full duty same day		
	2	Left little finger	Finger caught between cast iron pipe while unloading and stacking	Restricted duty for 14 days		
September 2010	3	Left elbow	Fractured when fell from ladder	Restricted duty for 133 days and lost time of 48 days	100,178	221,008
	3	Shoulder	Electric shock from exposed	Resumed full duty same day		

<b>Date of incident</b>	<b>Cum. project incidents</b>	<b>Injured part</b>	<b>Injury cause</b>	<b>Post incident outcome</b>	<b>Monthly labor hour</b>	<b>Cum. labor hour</b>
			live wire near head wall			
	3	Right hand	Puncture wound from improper use of knife	First aid on site. Resumed full duty same day		
	4	Left ring finger	Laceration from sharp edge of metal box for fire alarm	Restricted duty for two days		
	4	Right middle finger	Abrasion from sharp edge of door frame	First aid on site. Resumed full duty same day		
	4	Right eye	Corneal abrasion from metal shavings	Resumed full duty same day		
	5	Right hand	Drywall slid of cart and crushed hand	Restricted duty for three days		
October 2010	6	Back	Fell off from delivery truck	Restricted duty for 21 days	96,035	317,043
	7	Finger	Finger crushed between trash cart handle and dumpster	Restricted duty for 37 days		
	8	Right thumb	Dislocated thumb while exiting a ladder	Restricted duty for more than 120 days		
	8	Right eye	Concrete splashed in eye	First aid on site. Resumed full duty same day		
	8	Right index finger	Superficial laceration while cutting with hacksaw	Resumed full duty same day		
	8	Back	Strain while lifting Swing stage equipment	Resumed full duty same day		

<b>Date of incident</b>	<b>Cum. project incidents</b>	<b>Injured part</b>	<b>Injury cause</b>	<b>Post incident outcome</b>	<b>Monthly labor hour</b>	<b>Cum. labor hour</b>
November 2010	8	Upper lip	Abrasion on upper lip from kick back of foreign object using Hilti gun	First aid on site. Resumed full duty same day	83,700	400,843
	8	Upper back	Twisted while passing tools down to coworker while on a ladder	Resumed full duty next day		
	8	Back	Hit in the back by Excavator Bucket (37,000 lb. machine)	Unknown		
	8	Right foot	Cart rolled over foot	Resumed full duty same day		
	9	Right ribs	Strained while leaning into a pipe to bend	Restricted duty for eight days		
	9	Left knee	Twisted	First aid on site. Resumed full duty next day		
	9	Right mid-back	Twisted	First aid on site. Resumed full duty next day		
	9	Left elbow	Unknown	First aid on site. Resumed full duty next day		
	9	Right fore arm	Punctured from nail	First aid on site. Resumed full duty next day		
	9	Right shank	Tripped over 2" pipe sticking out of concrete	First aid on site. Resumed full duty same day		
December 2010	9	Above left eye and right fore arm	Tripped over heavy gage metal studs lying on concrete floor	Visited medical center. Resumed full duty same day	87,313	488,156

<b>Date of incident</b>	<b>Cum. project incidents</b>	<b>Injured part</b>	<b>Injury cause</b>	<b>Post incident outcome</b>	<b>Monthly labor hour</b>	<b>Cum. labor hour</b>
	10	Left ring finger	Laceration from sharp metal (corner bead)	Restricted duty for ten days		
	10	Left arm and finger	Exposed live wire	Resumed full duty next day		
	10	Lip	Taking pipe apart snapped back.	Resumed full duty next day		
	10	Back	Unknown	First aid on site. Resumed full duty same day		
January 2011	10	Right forearm	Bruise from grinder	Visited medical center. Resumed full duty same day. Removed from site due to drug screen findings	68,620	556,776
	10	Back	Strained while unloading stone to loading dock	Restricted duty. Removed from site due to drug screen findings		
	10	Left index finger	Improper use of utility knife	Visited medical center. Resumed full duty same day		



## Appendix R: Reportable Incidents of Project B

Date of incident	Cum. project incidents	Injured part	Injury cause	Post incident outcome	Monthly labor hour	Cumulative labor hour
October 2010	0	-	-	-	11,024	11,024
November 2010	0	None	Back hoe rolled over with the operator inside	Resumed work the same day	10,664	21,688
December 2010	0	-	-	-	16,395	38,083
January 2011	0	-	-	-	12,707	50,790
February 2011	1	Eye	Suffered corneal abrasion while welding	Medical treatment beyond first aid	14,754	65,544
March 2011	1	Ear	Burn from hot metal while torching	First aid on site. Resumed full duty same day	19,500	85,044