MANAGEMENT COMMITMENT TO ESTABLISH SAFETY CULTURE IN CONSTRUCTION INDUSTRY

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Degree of Master of Science

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Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Occupational Safety and Health Management

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DECLARATION

I declare that this submission is my own work and that to the best of my knowledge and belief, it contains neither materials published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma or university or other institute of higher studies, except where references are mentioned.

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A.Haleemdeen

The above candidate has carried out research for the Masters Dissertation under my supervision.

…… …….

Signature Date

Dr. Sachie Gunatilake

Dissertation Supervisor

ABSTRACT

The Management commitment to establish safety culture in construction industry.

The construction industry is the largest accident prone industry in the world. It is also one of the least safe industry with a high frequency of accidents resulting in financial loses, injuries, disabilities and deaths. Hence, it is clear from the construction industry's safety records that there is room for improvement through the implementation of the management commitment which is a part of the safety culture. In recent years, many construction companies have recognized this importance of the establishment of good safety culture through better management commitment can help in reducing the construction costs by controlling the safety risks, minimising workplace accidents and increasing the efficiency of enduring project operations in the long term.

A better safety culture with the strong management commitment provides significant benefits to the construction industry. The features of management commitment of the safety culture and its applicability have dynamic impact in construction industry. Establishing safety culture through management commitment elements in construction industry faced some barriers due to various reasons. The aim of this research is to investigate the elements of management commitment and its barriers to propose a framework in order to establish the safety culture in construction industry.

The safety culture through management commitment which could be implemented in the construction sites were identified through mixed methodology approach. The expert interview was carried out among twelve experts as semi-structured interview and a questionnaire survey was conducted among forty respondents. The outcome of this research has proposed a framework to establish safety culture through management commitment in construction industry. More over the RII was used for data analysis to prioritize the factors and one sample t-test was carried out to identify the significant management commitment elements and its barriers.

27 management commitment elements and 30 barriers were identified through the literature review. Out of these, 21 elements and 18 barriers were identified as significant following the semi-structured interviews and the questionnaire survey and was used in developing the framework. Accordingly this frame work has contributed to fulfill the aim of the research and subsidized to knowledge by adding up a developed guidelines which could be used in establishing safety culture in construction industry.

Keywords: Safety Culture, Management Commitment, Mixed Methodology Approach, Relative Importance Index, Framework

I dedicate this dissertation to my beloved family for their consistent support and love for me to accomplish my degree successfully with great Endeavour . . . !

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LIST OF ABBREVIATIONS

OSH	-Occupational Safety and Health
CASA	-Civil Aviation Safety Authority
NIOSH	-National Institute for Occupational Safety and Health
ILO	-International Labour Organization
HSE	-Health, Safety & Environment
OSHA	-Occupational Safety & Health Administration
ICTAD	-Institute for Construction Training and Development
CIDA	-Construction Industry Development Authority
NCR	-Non-Conformance Report
LTI	-Lost Time Injury
PPE	-Personal Protective Equipment
QHSE	-Quality, Health, Safety & Environment
ISO	-International Organization for Standardization
RII	-Relative Importance Index

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CHAPTER ONE

INTRODUCTION

1.0 BACKGROUND

The management commitment can be seen as a systematic solution in establishing safety culture and maintain zero accidents in the workplace (Dissanayake & Fernando, 2014). During the investigation of several notable disasters, the lack of corporate safety culture has been identified as a major contributing factor (Ruoyu & Qian, 2013). International Atomic Energy Agency (2014) has defined the safety culture of a project as the product of individual and group values, attitudes and skills that express the safety management system.

According to Civil Aviation Safety Authority (CASA) (2009), the effectiveness and efficiency of safety management system depends on the commitment of the management in an organization. Management commitment is one of the most salient features in the safety culture (Cooper, 2001). Company management has recognized that the visible guidance would assist a culture where senior managers could involve with their employees (Simon, 2010). In recent years, companies have recognized the importance of having the establishment of good safety culture that can help in controlling and reducing the construction costs and increases the efficiency of their ongoing operations in the long term (Hassan, Basha, & Hanafi, 2007).

For a successful implementation of safety culture in an organization, it must be driven by the senior management and their commitment for making decisions in terms of safety issues and requirement (Australian Government Comcare, 2005). It further indicates that the senior management is in the best position to demonstrate its commitment and provide leadership in development and implementation of OSH management programs to meet a better safety culture. Gallagher & Rimmer (2001) highlighted that the management commitment is essential to establish safety culture in any industry. Moreover they clarify within an organization, leaders promote the safety

culture by demonstrating a commitment among the workers using the safety management system.

Senior management should be aware on how the success of a project with respect to the safe operation in a continuously changing environment depends largely on the ability to monitor and improve the risk control measures (Benjamin, 2008). Further Benjamin stated if senior management does not express commitment to safety as a primary objective, the commitment for safety in the field can easily be shifted towards sometimes conflicting business objectives.

Management commitment implies the direct participation by the top management in all aspects and safety programs of an organisation (Aksorn & Bonaventura, 2008). No company can have a successful safety program if the commitment and support do not come from the top level to create a safe work environment (Cullen, 1990). Further Cullen states that every company has an obligation to ensure the safety of its employees.

Management commitment to safety can be provided in different ways according to the project. Management should be involved in the creating, communicating and executing its safety program (Gary & Dale, 2005). All the top management staff should be visible by proving their commitment to safety (Donald & Young, 1996). When an individual of management at any level visits to a job site, he or she must comply with all safety rules that impact that job site (Gary & Dale, 2005). Further he mentioned, if Personal Protective Equipment (PPE) are required, the management staff must wear it at all times while on the work site and if there are any restrictions for entering a particular area, the management representative cannot think that the rules are not applicable for them.

Establishing a successful safety culture in the project by leading from the top where the actions and attitudes send a message to the workers that are serious about safety. From this commitment, effective partnerships are formed with workers to create safer workplaces (Kenny, 2003).

Senior managers can show their commitment to safety by ensuring that safety requirements are fulfilled as the project progresses (Gary & Dale, 2005). Management commitment and employee involvement are complementary and provides the motivation to the workforce and the resources for organizing and controlling activities within the organization (Cameron & Duff, 2007). Further they specified, an effective program, management regards the worker's safety and health as a fundamental value.

1.1 RESEARCH PROBLEM

According to OSHA's report, 58.1% of the accidents are recorded in major construction project and 39.9% of accidents are due to falls from height. According to Benjamin (2008), most of the work related accidents are caused due to the unsafe acts and unsafe conditions. Further Benjamin stated, ineffective safety management system and poor safety culture due to lack of commitment from the management results in doing unsafe acts and unsafe conditions

As discussed in background, the factors are identified to improve management commitment elements of the safety culture but it was not elaborated in depth. The management commitment has been recognized as a significant factor of the safety culture. Due to this reason, there is a requirement to explore the management commitment factors and the key elements of it.

As stated in background, the companies are giving lesser concern on management commitment in establishing safety culture in construction industry. It is essential to find out why management commitment is essential and how it will be achieved in construction industry. As the outcome of this study, a framework will be proposed to achieve the management commitment in order to establish the safety culture in construction industry. A formalized frame work of the most significant management commitment elements will encourage the construction parties to pay more attention on safety and health to achieve better safety culture.

Developing such a framework will provide management commitment elements with practical guidelines for implementing a better safety culture. The critical study on barriers of management commitment to enhance the safety culture would show a new

direction and methods for contractors to overcome their desired goals simultaneously pertaining to good working conditions for their workforce and it will benefit for all the stakeholders in the construction industry

1.2 AIM OF THE STUDY

Aim of the research is to investigate the elements of management commitment and its barriers to propose a framework in order to establish the safety culture in construction industry.

To achieve the aim, following objectives are defined.

1.3 OBJECTIVES OF THE STUDY

i. Identify the importance of safety culture and the management commitment in construction industry
ii. Investigate the existing elements of management commitment and the barriers to be overcome in establishing the safety culture
iii. Identify the most significant management commitment elements and the barriers to establish safety culture.
iv. Propose a frame work to establish the safety culture through better management commitment in construction industry.

1.4 METHODOLOGY

Literature review: A literature review was carried out by referring books, journals, research papers, articles, other publications as well as e-books in order to be familiar with the research area to fulfill the aim of this research and to identify the importance of safety culture to construction industry.

Expert Interviews: The expert interviews were carried out to further investigate and refine the elements which were identified from literature review. Twelve experts are selected who have wide knowledge on safety culture in construction industry.

Questionnaire survey: The purpose of a survey is not to consider a specific project in depth but to capture the main characteristics of the population at any instant or monitor changes over time (Tan, 2002). A questionnaire survey was carried out among 40 respondents to identify the most significant barriers of the management commitment elements and to propose a framework in order to establish a better safety culture in construction industry.

1.5 SCOPE & LIMITATIONS

The research was targeted project managers, construction managers, commercial managers and planning managers which itself creates a limitation of not addressing the entire managerial persons in construction industry. Further this study focus on major building construction projects around Colombo area only. Moreover minor and small scale projects are omitted. Selecting only the building projects only in Colombo area is due to the limited resources and time constraints in doing this research. This study targets the contractors who have the big task to execute the project with risks, not the client or consultant. This is also encountered as a limitation.

1.6 CHAPTER BREAKDOWN

This dissertation has been structured into five chapters namely as introduction, literature review, research methodology, analysis and findings and conclusions, recommendations and further research. It was clearly shown in figure 1.1.

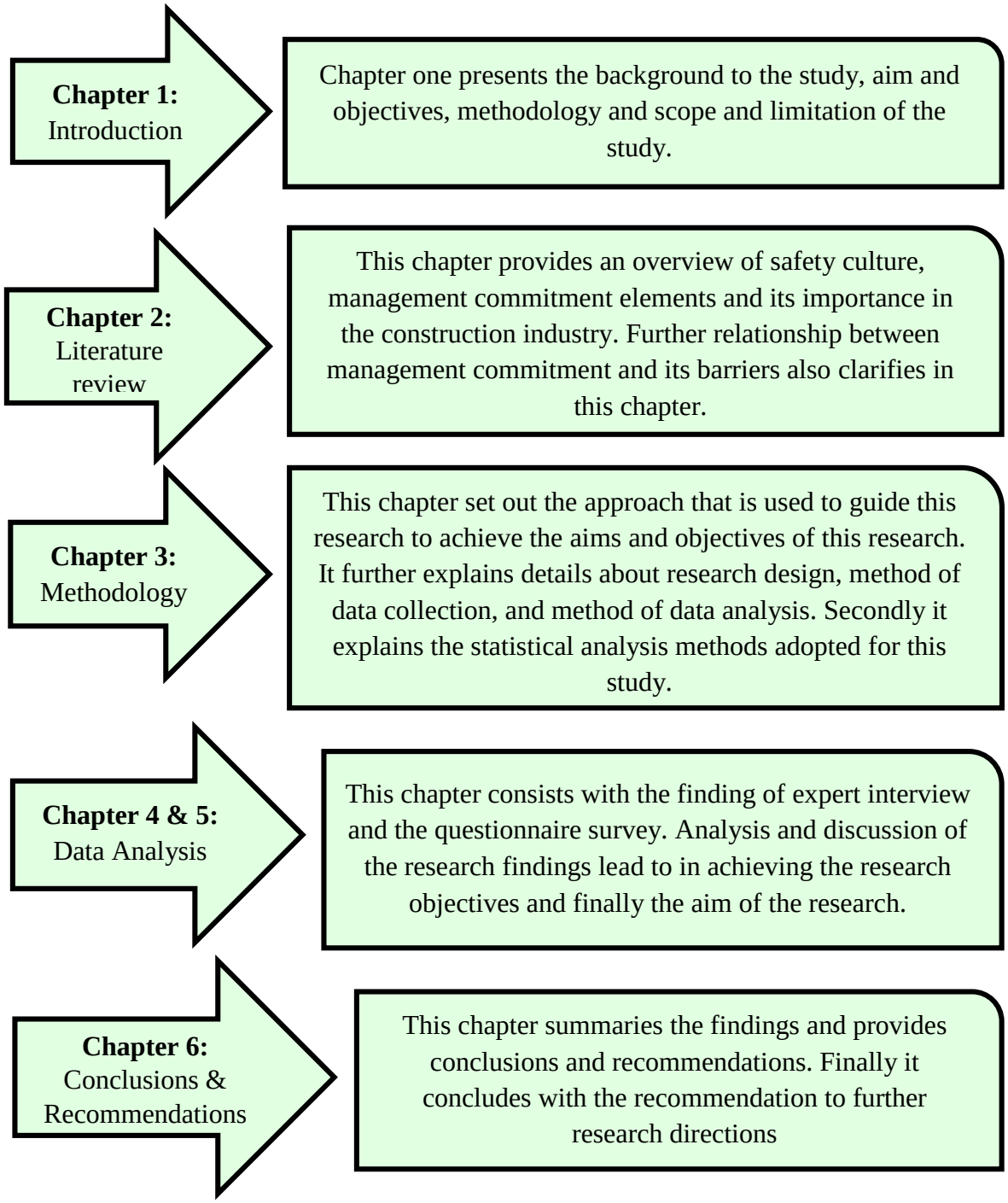

Figure 1.1 Chapter breakdown

CHAPTER TWO

LITERATURE SYNTHESIS

2.0 INTRODUCTION

The consequence of an accident in construction industry may be catastrophic. This sets high requirements on management commitment which has vital contribution in establishing the safety culture of the organizations. Due to this, the management commitment must be considered at high standard to ensure better safety environment at the project sites. The concept of safety culture and management commitment are identified through this literature synthesis. This chapter reviews importance of safety culture and the necessity of management commitment elements for its effective establishment in construction industry. Further it illustrates safety culture related factors and issues. It also discusses OSH practices that influence the safety culture at various sites in construction industry. Moreover it clarifies the limitations and constraints which have been encountered in establishing the safety culture. This chapter explores the safety culture and management commitment elements in order to achieve the first objective of this research.

2.1 SAFETY CULTURE

"Safety culture generally refers to the extent to which every individual and every group of the organization is aware of the risks and unknown hazards induced by its activities; is continuously behaving so as to preserve and enhance safety; is willing and able to adapt itself when facing safety issues; is willing to communicate safety issues; and consistently evaluates safety related behavior" (Cullen, 1990).

However, safety and health is an issue that can be managed and that profiling attitude can provide a useful tool for the development of management strategies (Donald & Young, 1996). Owing to this, having better safety culture with clear management commitments can help to create a safe working environment in the construction sites (Griffith & Howarth, 2000).

2.2 DEFINITIONS OF SAFETY CULTURE

Safety Culture is the product of individual and group values, attitudes, perceptions, competencies and patterns of behavior, organizational principles and commitments regarding safety issues, shared by every member of an organization in relation to ongoing health and safety performance and apparent degree of effort by which all organizational members directs their attention and actions toward improving safety on daily basis (Manjula & De Silva, 2013).

Table 2.1 Definitions of safety culture

Reference	**Definition**
Hale (2000)	Refers to the attitudes, beliefs and perceptions shared by natural groups as defining norms and values, which determine how they act and react in relation to risks and risk control systems
Glendon and Stanton (2000)	Comprises attitudes, behaviours, norms and values, personal responsibilities as well as human resources features such as training and development.
Guldenmund (2000)	Aspects of the organizational culture which will impact on attitudes and behavior related to increasing or decreasing risk
Cooper (2000)	The product of multiple goal directed interactions between people(psychological), jobs (behavioural), and the organization (Situational)
Mohamed (2003)	A sub facet of organizational culture, which affect workers' attitudes and behavior in relation to an organization's ongoing safety performance
Richter and Koch (2004)	Shared and learned meanings, experiences and interpretations of work and safety – expressed partially symbolically – which guide peoples actions towards risk, accidents and prevention
Fang et al. (2006)	A set of prevailing indicators, beliefs and values that the organization owns in safety
National Institute for Occupational Safety and Health(NIOSH) (2008)	Underlying organizational principles, norms, commitments and values related to the operation of safety and health, as well as its importance compared with other workplace goals

Source: Dissanayake and Fernando (2014)

Most of the definitions are given in table 2.1 relatively similar in the beliefs perspective with each focusing to varying degrees on the way people think and behave in relation to safety.

Glendon and Stanton (2000) have stated that the human factors contribute to 80% - 90% of all industrial accidents. Keil (1999) stated, each organization needs to consider all these aspects in developing and strengthening the safety culture that suits the organization and the individuals within it. Figure 2.1 depicts all the human factors including psychological and behavioural factors that affects safety culture.

Figure 2.1 Human factors contributing towards establishing the safety culture

Source: Keil (1999)

Hudson (2001) specified the safety culture must be implemented and developed step by step. Further he proposed a model called safety culture maturity model for the evolution of safety culture. Hudson's model extended to five stages in a sequence from the pathological first stage through an idealistic end-stage called Generative. Figure 2.2 shows the developmental stages of Hudson's model. The descriptions of safety culture maturity model according to Hudson (2001) are as follows;

- **Pathological:** safety is a problem caused by workers. The main drivers are the business and a desire not to get caught by the regulator
- **Reactive:** organizations start to take safety seriously but there is only action after incidents
- **Calculative:** safety is driven by management systems, with much collection of data. Safety is still primarily driven by management and imposed rather than looked for by the workforce.
- **Proactive:** with improved performance, the unexpected is a challenge. Workforce involvement starts to move the initiative away from a purely top down approach.
- **Generative:** there is active participation at all levels. Safety is perceived to be an inherent part of the business. Organizations are characterized by chronic unease as a counter to complacency.

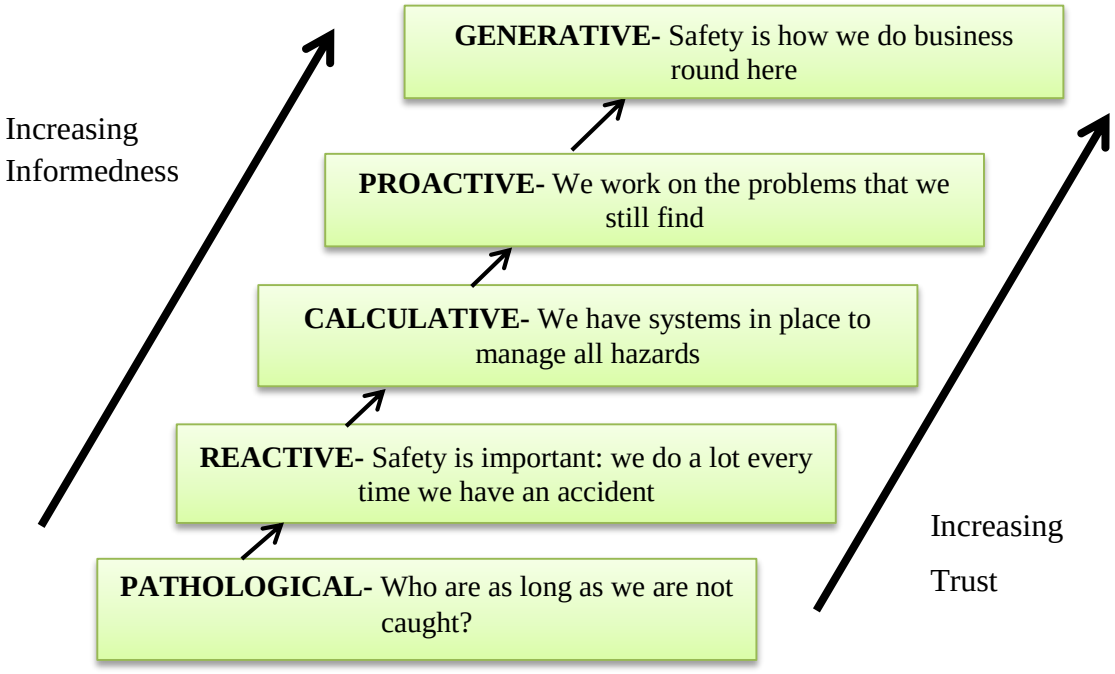

Figure 2.2: Safety culture model of Hudson

Source: Hudson (2001)

2.3 SAFETY CULTURE IN CONSTRUCTION INDUSTRY

The work environment in the construction industry is more hazardous than in other industry (Wimalarathne & De Silva, 2012). Further they mentioned, this is due to the potential nature for serious accidents and health hazards by heavy use of large equipment, dangerous tools, and hazardous materials. Moreover Wimalarathne & De Silva detailed that the degree of health hazards and risk exposure varies from one worker trade to another in the construction sites. Workers' vulnerability in some trades is a potential cause of accidents in the local construction sites (Palihawardane, 2009). Further Palihawardane cited, the most vulnerable construction worker trades in the building construction sites are masons, carpenters, plumbers, electricians, workers carrying out finishing work, painters, welders, steel workers, tillers and unskilled labours. This is identified as a common fact and is also compatible with the findings of other studies related to construction industry in USA, Europe, Singapore and Hong Kong (Wimalarathne & De Silva, 2012). However, the efforts made to address safety and health at sites have been far from satisfactory, as construction accidents continue to dominate (Taylor & Francis Group, 2004). The study of Lin, Miao, Wang and Wang (2008) highlighted that lots of accidents and hazards occur in the construction sites are avoidable through a proper adaptation of management commitment and safety culture. Furthermore some legal acts and ordinances made mandatory in provision of safe working environment for the workers (Greenberg & Tyler, 2007).

Inadequate or absence of safety management systems, regulations, policies, resources and commitment have been cited in many instances as reasons for poor OSH management performance in the construction industry (Wimalarathne & De Silva, 2012). Further they detailed that the practical efforts have been taken to improve OSH management strategies in the past and therefore these could be main considerations for an efficient OSH framework. In developed countries, the recent advancement in technology on one hand has contributed positively to industry's productivity but on the other hand it has created a more challenging and unsafe work environment (Rizwan, Farrukh, & Rafeeqi, 2008). Further they indicated, the chance of being disabled by injury or serious illness is much greater than in most other industrial fields

and every construction worker is likely to be temporarily unfit for work at some time as a result of a health problem after working on construction site. The most of the accidents 59.1% of accident are faced in major construction project and the statistic was provided in the basis of accidents types in construction industry Table 2.2 shows the comparison between significant hazards and reportable accidents such as fatalities, major injuries and minor injuries in construction sites.

Table 2.2 Comparison between significant hazards and reportable accidents

	fatalities %	*major injuries %*	*over 3day injuries %*	*sample (N=88) %*
Falls from a height	55	38	14	{ 24
Slips, trips and falls on same level	0	19	17	
Injured while handling, lifting or carrying	<1	8	34	19
Struck by moving (+ flying / falling) object	15	19	19	22
Struck by moving vehicle	9	3	2	2
Contact with electricity or electrical discharge	8	2	1	2
Trapped by something collapsing or overturning	5	1	<1	7
Strike against something fixed or stationary	<1	3	5	9
Contact with/by moving machinery	3	3	3	5
Other accident events types	4	4	5	10

Source: Rizwan, Farrukh and Rafeeqi (2008)

According to Rizwan, Farrukh and Rafeeqi (2008), major reasons for safety non-performance were;

- Lack of development of construction sector in the shape of mechanization and industrialization;
- Lack of professional construction management practices;
- inadequate safety provisions laid by the existing regulatory environment which has failed to establish safety as a major industry objective;
- Insufficient and incentive –less insurance mechanism which have failed to establish safety as a business survival issue;
- Unfavorable business environment which has led to adversarial business relationships among stakeholders resulting in, conflicts, claims and litigation.

2.4 OCCUPATIONAL SAFETY AND HEALTH (OSH) IN CONSTRUCTION INDUSTRY

Manjula and De Silva (2014) states, OSH encompasses the social, mental and physical well-being of workers that is the whole person. Further they specified, successful OSH practice requires the collaboration and participation of both employers and workers in health and safety programme, and involves the consideration of issues relating to occupational medicine, industrial hygiene, toxicology, education, engineering safety, ergonomics, psychology etc. The ultimate goal is an organization aiming to improve its OSH performance, so that accidents and ill health are eliminated and work forms part of a satisfying life to the benefit of both the individual and the organization (Manjula & De Silva, 2014)

International Labour Organization (ILO) (2005) has defined the term, "occupational accidents" as an occurrence arising out of or in the course of work which results in fatal injury or non –fatal injury. It further classified, these accidents under several categories based on the nature of the injury, bodily location of the injury, type of the accident and the agency. According to ILO (2005) report, the accidents are common for all industry but construction industry has recorded higher accident rates which result in absence from work, loss of productivity, permanent disabilities and even fatalities. The construction sites are often labeled as unsafe, dangerous or hazardous places to work and it is revealed that most of the severe construction accidents, injuries as well as economic losses have been occurred due to the negligence of safety in construction sites (Nawarathna & De Silva, 2014).

It is vital that management commitment to be established in a company in order to manage OSH (Wimalarathne & De Silva, 2012). They further illustrated that the OSH management for implementing an effective OSH structure at the site level was necessary in establishing a safer environment. According to Wimamalarathne and De Silva (2012), the OSH management factors are identified such as management commitment, adequate resource, supporting devices, site management, educational awareness, policy, documentation and behaviors as explained below.

***Management commitment*:** Management plays a key role in promoting the safety culture (Manjula & De Silva, 2013). Filho, Celio and Marinho (2009) stated the support given by the organization for Health and Safety is important in planning, auditing, investment, execution and implementing procedures. According to Civil Aviation Safety Authority (CASA) (2009) the effectiveness and efficiency of safety management system depends on the commitment of each management in an organization.

***Adequate resources*:** Resources have major influence on better site safety and help to continue the construction process without an interruption (Weber, 2012). The provision of adequate resources facilitated through the budgeting process results in a well-functioning and effective health and safety management (Manuele, 2013). Leadership demonstrates its commitment to safety and health by providing and directing adequate resources (including time, funding, training, personnel etc.) to those responsible for safety and health and it will able them to carry out their responsibilities (Skellett, 2013).

***Supporting devices*:** Implementing appropriate supporting devices or using safe work practices on safety is essential for each organization (Chiarello, 2011). Assessment of risk and Permit to work system are act as key pillars of effective safety management system (Nieva & Sorra, 2003). Establishing site rules and regulations and the statutory actions against safety violators have significant impact on positive work environment (Philip & Hilder, 2011).

***Site environment*:** Dangerous locations and other significant areas need to be marked under the safety signs regulation to minimize the risk and create an enthusiastic working place (Health and Safety Executive (HSE), 2009). Sign and symbols have been used extensively in construction sites for safety awareness purpose (Tama, Ivan, Thomas, & Tunga, 2003). They further stated these signs convey different safety messages to construction personnel.

***Educational and awareness*:** A key element of this system will document that staff are trained in reducing the risks of being in unsafe situations and considering the

hazards that exist in the areas in which we routinely work (Robert, 2005). De Silva and Wimalarathne (2012) specified, site specific programs, induction, educations, orientation and specialized trainings are important tools to implement the safety culture.

***Management policies*:** Requirements of the safety and health policy reflect the management commitment towards the organization's safety and health (Bakri, Rosli, Misnan, & Hakim, 2006). Employers need to have a written safety policy signed by the senior management who has authority to allocate responsibilities (Biggs, Sheahan, & Dingsdag, 2005).

***Documentation*:** It is important to document health and safety activities and keep these records for the sake of; induction training records provide evidence of training activities and should include names of participants, the training content, who conducted the training and when it was provided (Attorney-General's Department, 2007). Employers should keep the records of the near miss incidents and accidents for the enforcement authority's requirements (Benjamin, 2008).

Behaviors: Health and Safety Executive (HSE) (2005) advocates that staff and employees must be encouraged to contribute to the improvement of health and safety and to provide input with regard to the most effective ways to achieve safety standards. Employer and supervisor have responsibilities to design the safe work place and environment (Brinton, 2010). He further stated all workers have the right to refuse the unsafe work.

Management commitment provides the motivating force and resources for organization and controlling activities within the organization (Kenny, 2003). Further he stated that the senior management including the top executive on site must act as a role model among all employees to create a safe work environment.

According to Bakri, Rosli, Misnan, & Hakim (2006), active leadership includes the following factors as;

- Implement the safety and health management system

- Provide appropriate financial, human, and organizational resources
- Have a written safety and health policy
- Define roles and assigning responsibilities
- Establishing accountability and delegating authority
- Integrate the safety and health objectives into business processes
- Discuss safety and health processes and improvements regularly during staff or employee meetings
- Encourage employees to take an active part in maintaining a safe and healthy workplace
- Follow established safety and health rules and procedures
- Discuss openly safety and health issues with employees during periodic tours or meetings
- Establish a system for effective communication, recognize employees for their safety and health efforts

Top management must provide visible ongoing commitment and leadership for implementing the safety and health management system covering all workers, including contract workers (Kenny, 2003).

2.5 RELATIONSHIP BETWEEN SAFETY CULTURE AND MANAGEMENT COMMITMENT

Stephanie (2011) states creating a safety culture requires a common vision and effort from everyone in an organisation and clear leadership is one of the top priorities for the establishment of safety culture. A safety culture is a broad organization-wide approach to safety management and the end result of combined individual and group efforts toward values, attitudes, goals and proficiency of an organization's health and safety program (Glendon & Stanton, 2000). Further he stated that in creating a safety culture at all levels of management are highly regarded on how they act towards workers and on a day-to-day basis. Top management commitment to workplace safety helps the workers to take it more seriously and translates into a safer work environment for everyone (Stephanie, 2011). Further he illustrated, responsibility for encouraging

the safety culture may start with management but it trickles down to each individual in the company.

Organizations with a safety culture show a deep concern for employee well-being and this is reflected in all levels and departments within the organization (Tim, 2011). Further he described that the rewards and incentives can still be in place if they are awarded for the right reasons such as reporting incidents, including near misses. Within a safety culture, leaders gain knowledge from all areas and use that to improve and promote safety at all levels (Grote, 2007).

Gary and Dale (2002) defined no company can have a successful safety program if the management of that company is not committed to the concept of a safe workplace. Further they mentioned every company has an obligation to ensure as much as possible and the safety of its employees. Keeping the number of injuries down will also help to maintain lost days, work injury indexes and experience modification rates for workers' compensation at a minimum level (Kenny, 2003).

According to Gary & Dale (2002), management should be involved in the formulation, communication and enforcement of its safety program. Further he described all levels of management should always be visibly demonstrating their commitment to safety. For example, when an individual from management at any level visits to site, that individual must comply with all safety rules that impact him and the job site. “If hard hats are required on the job site, the management representative absolutely must wear it at all times while on the job site and should not think that just because he is from management and the rules do not apply to him” (Gary & Dale, 2002).

The challenge for senior management is not only to improve safety and injury management but also to develop skills and qualities that build positive management and worker capabilities (Lin and Mills, 2001). There are a number of specific qualities and attributes that management commitment can contribute to a good health and safety culture are detailed in table 2.3.

Table 2.3 Qualities and attributes contributing for a good health and safety culture

Trust	Interpersonal trust between leaders and workers is important for many organisational variables such as quality of communication, performance and co-operation.
Communication style	Frequent and informal communications between workers and management on safety issues is critical for improved performance. These behaviours demonstrate a managers concern for safety and provide opportunities for early recognition of hazards
Involvement	Management commitment and involvement in safety programs has been found to be associated with good safety performance. Senior management involvement is a motivational force for both middle management to implement organisational guidelines.
Participative management	People work more safely when they are involved in the decision making process, have specific and reasonable responsibilities and have immediate feedback about their work. Management styles characterised by openness and encouragement of worker participation are likely to be the most effective in promoting the safety culture.
Locus of control	The degree that control over work organisation and task structure is centralised is an important consideration in the culture of safety, with greater decentralisation making for better health and safety outcomes
Flexibility and	Management styles that emphasise flexibility and adaptability to changing conditions, while maintaining organisational consistency and continuity, encourage worker commitment to organisational goals and values

Source: Lin and Mills (2001)

Sherman and Larry (2010) states few examples on how management commitment is delivered in practice through a series of safety aspects. They are; setting targets to improve or maintain safety and benchmarking performance, ensuring that all staff including the board are sufficiently trained and competent enough in their safety responsibilities, ensuring control at all levels of the organization, receiving regularly information about safety. Sherman and Larry (2010) further listed the organisation's risks should be assessed and appropriate control measures are established, bringing to the attention of the board of the changes in working arrangements that may have significant implications for safety and promoting safety culture.

A strong and a visible management commitment is crucial for good health and safety performance (Sherman & Larry, 2010). Further they specified "senior leaders must be

seen as actively interested and committed and need to show that health and safety is important by implementing it rather than saying verbally".

James (2007) mentioned the senior management should not ignore safety principles and to promote the safety culture are summarized in table 2.4.

Table 2.4 The principles to promote safety culture

The principles	Description
Safety as a top priority	In making every business decision there are a number of competing priorities. It is imperative that senior management should give safety a high status in the business objectives, and safety should be prioritised in all situations
Visible management and commitment to safety	It is important that senior management demonstrate visibility and repeat their commitment to safety throughout all areas of the organisation. For example, if senior management fail to challenge unsafe behaviours they reinforce the concept that this behaviour is acceptable to the organisation.
Increasing visibility around safety	It is good to develop a habit of personally conducting safety walkabouts. This demonstrates commitment and managers will become personally aware of the real safety conditions in work site. These walkabouts will also provide an opportunity to meet project teams in work areas and to have proactive discussions regarding safety
Safety reporting	A safety culture requires effective reporting from staff of frontline safety issues and problems e.g. accidents, near misses and safety concerns. The senior management should respond to all incidents in a positive and learning way.
Create a learning culture	All employees should be involved in learning by contributing ideas for improvement, and should be encouraged to become aware of what a good safety performance actually means in terms of their own jobs. The existence of a learning culture enables the organisation to identify, learn and change unsafe conditions and behaviours

Provide recognition	The senior management will give recognition to the delivery of good safety performance e.g. recognise the achievements of employees who improve safety in the organisation, including those who voluntarily contribute to safety
Open culture	Employees should feel that they are able to report issues or concerns without fear that they will be personally blamed or disciplined as a result. Senior managers should demonstrate care and concern towards employees and should have an open door policy in place to demonstrate this
Effective communication	Effective communication from management to staff is vital for the success of safety culture. This can be achieved by a visible safety policy, emphasis on safety related issues and policies via staff communication systems e.g. memos, newsletters, messages from top management, quarterly reports, annual reports, safety sheets and the communication of major accidents
Safety management system	Organisations should have effective systems in place for the management and co-ordination of safety. This should be led by the most senior person in the organisation, with the support of the senior management team and safety professionals (if required). Objectives should be set to monitor the performance of the system

Source: James (2007)

"Creating a safety culture takes time and it is a multi-year process. A series of continuous process improvement steps can be followed to create a safety culture" (Nieva & Sorra, 2003). Employer and employee commitment are hallmarks of a true safety culture where safety is an integral part of daily operations (Occupational Safety & Health Administration (OSHA), 2012). Further it stated a company at the beginning of the way towards developing a safety culture may exhibit a level of safety awareness, safety posters and warning signs. Top management support on safety culture results in providing resources for incident investigations and safety training. Safety is everyone's responsibility, not just the safety director's and it becomes a value of the organization (OSHA), 2012).

Benefits of establishing safety culture through management commitment

According to Richard (2012) the benefits of establishing safety culture can be described as follows;

- Lower absenteeism – if people are fit and healthy where they are at work and making the contribution that they are paid for.
- Lower wage bills – eliminate the doubled-up costs of sick pay for the absentees and overtime cover to fill the gaps and companies are saving money.
- Reduced repairs and re-working – when things get done right first time, less injury, damage or out of product means less costs for repairs, re-working and waste disposal.
- Happier workforce – it is a deep rooted desire in us all to feel safe. If employees feel safe and secure at work, they will be happy.
- Reduced risk of fines – fines and all of the associated legal costs come directly of the bottom line. Limiting these costs protects companies' profits.
- Reduced insurance claims – injury and illness claims, property damage and business interruption cost money. Investing money on safety to reduce claims will save money and benefit to the organization in long term.
- Reduced insurance premiums – insurers are increasingly using measures to assess the risks of insuring businesses and set premiums accordingly. The better the health and safety performance, the lower the premium.
- More satisfied clients and stakeholders – if quality, efficiency, staff relations are all exemplary, a business will have a reputation to reflect that.

2.6 IMPORTANCE OF MANAGEMENT COMMITMENT TO ESTABLISH SAFETY CULTURE

Management commitment is defined as the person or group of people who directs and controls an organization at the highest level (Simon, 2010). Direct participation by the highest level executives in a specific and critically important aspect or program of an organization (Abudayyeh, Butt, Fredericks, & Shaar, 2005).

Management support and their commitment have significant impact in implementing safety culture (Mullen and Kevin, 2009). Further he mentioned good leadership and management promote a safe work environment and the managers' involvement and their behaviors are also vital factors to follow the rules by everyone and support in establish the safety culture. Managers who authorize and direct work activities are responsible for ensuring good safety and health as part of their corporate governance role and must consider the following key elements when doing their task (James, 2007).

- The leadership role in establishing the correct safety and health directions
- The standards and objectives set for management on safety and health
- The level of managers' responsibility, accountability and their support for safety and health management
- How hold managers accountable for the safety and health responsibilities given to them
- How oversee internal control for safety and health

In accepting corporate responsibility for safety and health, managers need to be proactive in developing the safety and health culture for the workplace(s) they control (James, 2007). Occupational Safety and Health Administration (OSHA) (2013) recommends the following actions be taken to show management commitment to the health and safety programme:

- State the worksite safety and health policy clearly, so all personnel can understand its importance in relation to the organizational values.
- Establish and communicate the goals. Objectives should be clearly defined so all levels of personnel understand the desired results and the required measures to achieve those goals.
- Provide visible top management support. Visibility gives employees the sense that the top-level management cares and is truly committed to the safety of the employees.

- Assign and communicate responsibility to all personnel levels. Everyone should know what performance is expected and the consequences if performance levels are not achieved.
- Give those assigned responsibilities the authority to act on situations that affect the goals and objectives.
- Hold employees accountable to meet their responsibilities so that essential tasks will be performed.
- Review the safety program periodically to evaluate problems within the program and revise the objectives if the goals are not met.

According to European Commission (2004), working environment, preventive measures to make work safer and healthier, hazard identification and control measures, worker participation, documentation and review, objectives and targets, responsibility and accountability, provision of resources, training and health surveillances are the management commitment elements to establish safety culture. Pawlowska (2013) describes OSH policy, responsibility and accountability, competence and training, documentation, communication, hazardous prevention, performance monitoring, audit, management review, preventive and corrective actions and continual improvement are categorized under management commitment elements. Further International Labour Office (ILO) (2005) defines, leadership and visible commitments, generalized safety consciousness, government policy and commitment, information and training, awareness raising and promotion are the key elements of management commitment. Moreover Wimalarathne and De Silva (2012) indicated, management commitment, adequate resources, supporting devices, site environment, educational and awareness, management policies, documentation, behaviors, OSH committees and OSH training are the factors of management commitment.

According to Australian Government Comcare (2005), senior management leadership and commitment is achieved by:

Leadership and Accountability

- Demonstrating a commitment to establishing and meeting health and safety targets;
- Recognizing and acknowledging managers' responsibility and accountability for providing a safe and healthy workplace for their employees;
- Developing and promoting a vision of what is to be achieved in OSH performance;
- Providing the necessary resources, both human and financial, to achieve that vision; and
- Fostering a workplace safety culture that supports continuous OSH improvement.

Systems Review and Improvement

- Ensuring compliance with the organization's duty of care obligations in regard to workplace health and safety;
- Implementing regular internal audits of the agency's OSH program;
- Measuring and evaluating safety performance;
- Examining how risks have been managed in the organization, and comparing these to best practice approaches;
- Taking an active role in hazard identification, risk assessment and risk control within the workplace.

Information and Education

- Encouraging staff contribution to, and ownership of, OSH issues within the workplace;
- Educating managers on OSH issues and their impact on the organization and providing advice and direction.

Kent (2014) said that a safe workplace is important and demonstrate the management commitment to safety and ensure that everyone in the business is clear about their health and safety responsibilities. Further he specified, the workers are greatest assets at workplace and it makes good business sense to establish an effective safety management plan that protects valuable assets. The management commitment elements send the message that senior managers should be serious about safety (Tung, 2008). Further Tung said that from this commitment, the effective partnerships are formed with workers to achieve a safer workplace. Moreover he illustrated, the easiest ways to show the management commitment for safety is to develop and implement a health and safety policy and it is essential to establish a common and effective frame work to improve the safety culture. To satisfy this intention, this research target on management commitment and its elements.

For an effective health and safety management system, it is essential that management at all levels demonstrate their support for the health and safety and this can be accomplished by their participation in health and safety leadership training, health and safety meetings, inspection tours and incident investigations (Tung, 2008). According to above literature review eighteen management commitment elements for establishing safety culture are summarized and shown below in table 2.5

Table 2.5 Management commitment elements with reference

No	Management Commitment Elements / Reference	Manjula De Silva (2013)	De Silva & Wimalarathne (2012)	Mullen & Kevin (2009)	Filho, Celio & Marinho (2009)	Tung (2008)	James (2007)	Grabham & Jensen (2014)	Williamsen (2013)	Smith (2013)	Melanie & Gloeckner (2008)	Clissold & Sohal (2006)	HSE (2005)	Sherman & Larry (2010)	Michael (2005)	Sugiharto, Hampson & Sherif (2001)	Bakri, Rosli, Misnan & Hakim (2006)	Gallagher & Rimmer (2001)	Kenny (2003)	OSHA (2013)	Australian Government Comcare (2005)
1	Training programme on health and safety	√				√															
2	Health & safety meetings	√			√							√									
3	Leadership and support for health and safety						√											√	√	√	√
4	Pro-active performance measurement		√				√	√	√												
5	Establishing safety rules at the site		√																		
6	Safety policies and system review											√					√		√	√	
7	Compliance with regulations related to health and safety			√																	
8	Safety operational targets and proper time management			√																	
9	Safety inspection and risk identification		√						√												
10	Supervision and monitoring		√												√	√					
11	Budget allocation for health and safety implementation					√															
12	Safety committee meetings													√							
13	Clear line of authority and accountability						√			√			√							√	
14	Motivation from the management to encourage safety					√															
15	Proper communication with the different level of workers		√								√									√	
16	Involvement of management with the workers	√																			
17	Follow safety rules and lead by example	√						√													
18	The management's awareness on safety and health									√											√

2.7 BARRIERS IN ESTABLISHING MANAGEMENT COMMITMENT FOR SAFETY CULTURE

Melanie and Gloeckner (2008) states that lack of top management support; lack of understanding, communication and organizational structure are significant barriers in improving management commitment in safety culture. De Silva and Wimalarathne (2012) defines poor budget allocation, poor compliance of regulations, poor knowledge on safety requirements and lack of qualified safety officers are critical barriers to improve the management commitment. According to Tung (2008) trust and engagement, balance technical/ management skills, communication, organizational structure, understanding of safety, teamwork, clear lines of authority and accountability have remarkable influence in effective safety management involvement.

Smith (2013) clarifies lack of trust, the uncertainty of constant change, lack of demonstrated commitment from top leadership, resistance from any of the partners, failure to redefine the role of leadership, inadequate training, systems and structures not designed to support teams and lack of positive attention given to even the smallest improvements are significant barriers for health and safety improvement. Clissold and Sohal (2006), states of the weaknesses in the communication interface, characteristics of existing culture, organizational bureaucracy, management style and commitment and dedication of resource are have to overcome to achieve better safety management. Graham and Jensen (2014) describes management has a reactive focus rather than proactive, lack of understanding, risks and hazards are poorly communicated or ignored, safety is considered as a cost not an investment, cost/benefit analysis is rarely applied to justify the safety case and productivity takes precedent are significant barrier in improving safety management.

Williamsen (2013) refers, poor attitudes, a resistance to do anything different than what we have done in the past are important barriers for health and safety improvement. According to HSE (2005) a lack of understanding and awareness on the meaning of health and safety; the perceived complexity of health and safety legislation and regulations; attitudes held toward health and safety; the culture of organizations

are having impact in management commitment. The major causes of accidents are related to unique nature of the industry, human behavior, difficult work site conditions and poor safety management which result in unsafe work methods, equipment and procedures (Rizwan, Farrukh, & Rafeeqi, 2008).

The shortcomings in the present general level of health and safety education, lack of quality and commitment of site management, lack of sufficient resources to health and safety, over at site level on production objectives to obvious detriment of safe working practices and the lack of focus on the part of some construction professionals in the health and safety issues (Raja Prasad & Reghunath, 2011). The management commitment has been identified as the biggest problems as indicated in other studies, (Sawacha, Naoum, & Fong, 1999 and De Silva & Wimalarathne, 2012). The barriers faced by the management were found during the literature survey was summarized in table 2.6

Table 2.6 Barriers to implement the management commitment with reference

No	Barriers to implement the management commitment	De Silva & Wimalarathne (2012)	Melanie & Gloeckner (2008)	Tung (2008)	Smith (2013)	Clissold & Sohal (2006)	Raja Prasad & Reghunath (2011)	Rizwan, Farukh & Rafeeqi (2008)	Graham & Jensen (2014)	Williamsen (2013)	HSE (2005)
1	Management is reluctant to following the safety rules	√									
2	Poor Budget allocation for Health, Safety & Environmental (HSE)	√									
3	Poor compliance with health and safety regulations	√									
4	Lack of awareness of safety requirements		√				√		√		√
5	Provision of less qualified safety officers	√	√								
6	Poor senior management support	√	√		√	√	√	√			
7	Provision of inadequate resources					√	√				
8	Ineffective management policies			√						√	
9	Lack of proper organizational structure		√	√				√			
10	Lack of team work			√							
11	Lack of clear lines of authority and accountability			√							
12	Lack of Involvement with safety issues and late response				√						
13	Less support from any of the partners (such as client, public and government)				√					√	
14	Lack of positive attention				√		√				
15	Not adapting the innovations					√					
16	Weakness in the communication interface		√			√					
17	Reactive rather than proactive management								√		
18	Lack of a proper system to identify the hazards and risks								√		
19	Safety is considered as a cost not an investment								√		
20	Complexity in the safety legislation and regulations										√

2.8 DEVELOPING A CONCEPTUAL FRAMEWORK TO ESTABLISH SAFETY CULTURE THROUGH MANAGEMENT COMMITMENT IN CONSTRUCTION INDUSTRY

The elements of management commitment to establish safety culture and the barriers need to overcome in implementing management commitment was identified through the literature review. With that understanding a conceptual framework to establish the safety culture was developed as shown in Figure 2.3 below.

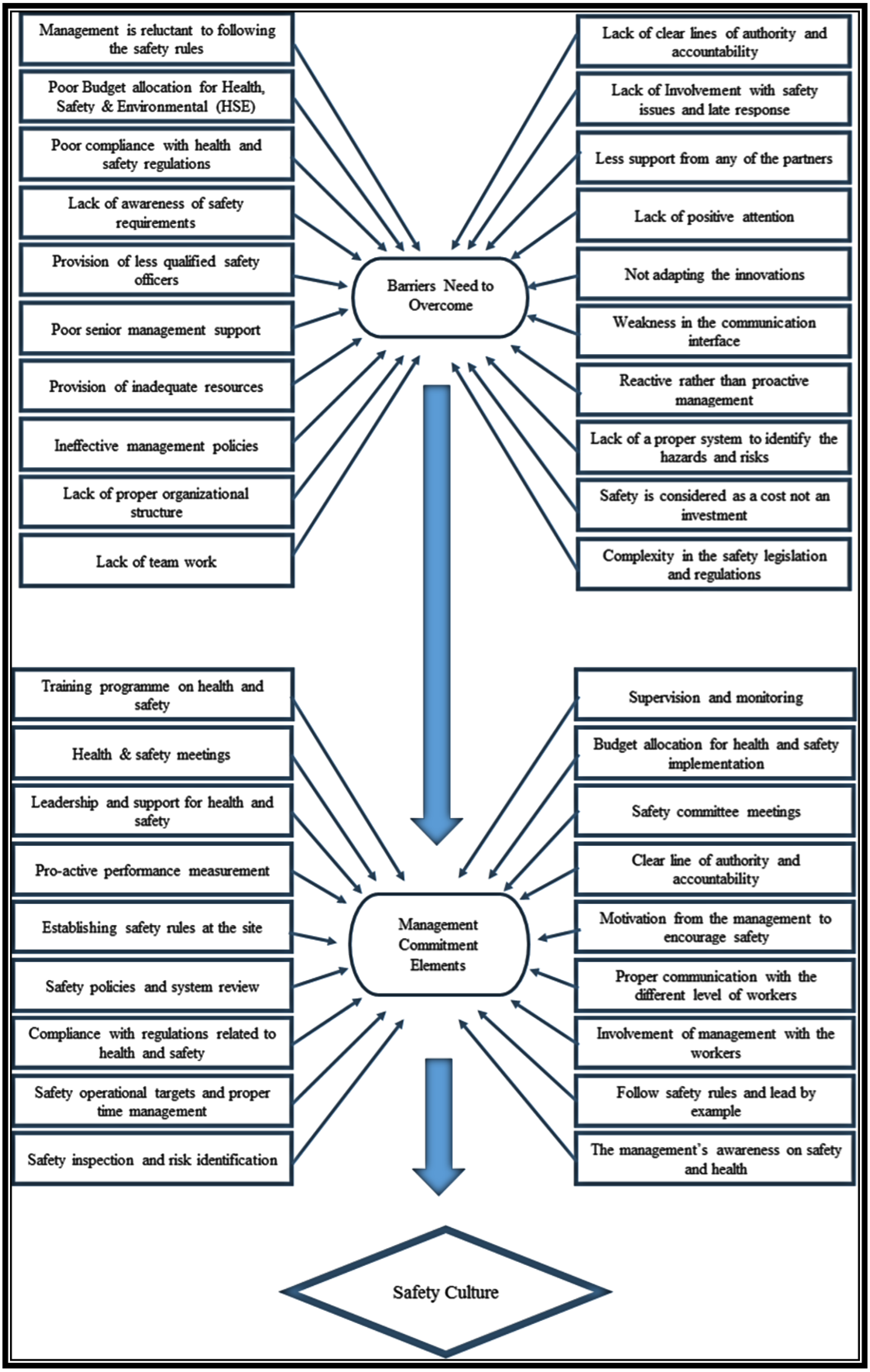

Figure 2.3 Conceptual framework

2.9 SUMMARY

As discussed in background, the management commitment has major impact on establishing the safety culture and the elements of management commitment as identified by researchers. The literature review brings out that there is an essential need to do a research in depth on management commitment and barriers to establish the safety culture in construction industry. In order to improve the safety culture, these eighteen elements and twenty barriers need to be considered and further it required to explore the additional elements which are visible in practical environment. This research is necessary to overcome these barriers and put forward a suitable framework in order to establish the better safety culture. Management should be aware of how the success of the organization with respect to the safe operation as per the OSH management system in a continuously changing internal and external environment. The effectiveness of safety culture largely depends on continuous implementation of management commitment elements and overcoming its barriers.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 INTRODUCTION

The key research issues were discussed in the previous chapter with a review and synthesis of the literature. This chapter discusses the methodological framework that was adopted in the study. In addition, this chapter describes the research process. The research process includes the development of research, research design, data collection and data analysis.

3.1 RESEARCH PHILOSOPHY

Researcher's assumptions in the way the researcher view the world is reflected by research philosophy. Philosophy contains important assumptions which will underpin the research strategy and the methods chosen as part of that strategy. Therefore it is important to clearly define the philosophical position of this research. In discussing the different research philosophies, it is important to have clear idea on ontological, axiological, epistemological was assumptions as described in table 3.1

Table 3.1 Summarized research philosophy

	Qualitative	Quantitative
Ontology	Subjectivism	Objectivism
Epistemology	Interpretivism	Positivism
Axiology	Value- Laden	Value -Free
Approach	Uses both qualitative and quantitative (Pragmatism)	
Method	Mixed method	

Pragmatism: According to Creswell & Clark (2011) it does not classify the research as purely quantitative or qualitative in nature with either a positivist or interpretive philosophy. Further he described, a pragmatic approach provides a balanced point between the deductive and inductive perspectives of thinking which offers practical answers for merging different paradigms. As a result, Creswell (2009) suggested that a pragmatic research approach seemed to be the most prominent paradigm with a

strong philosophical relationship for a mixed method approach. As a result, the philosophical perspective adopted by this research as in Table 3.1 is that a pragmatic approach is heavily suitable and reasoning.

3.2 RESEARCH APPROACH

After defining the research philosophy, a suitable research approach had to be selected to deal with the research problem. In approach, quantitative and qualitative approaches are the two main traditional methods, but today the mixed method approach also exists (Creswell & Clark, 2011).Quantitative approach tends to relate to positivism and seek to gather factual data. It studies relationships between facts and how such facts and relationships accord with theories and the findings of any research executed previously (Fellows & Lui, 2003). Survey researches and experimental researches are basically coming under quantitative approaches. By using a qualitative approach, identify beliefs, understandings, opinions and views of people and analyze them to find solutions (Fellows & Lui, 2003). Further Fellows and Lui stated, case study research, ethnography, action research and grounded theory approach can be considered as qualitative research approaches.

Mixed methods research involves both quantitative and qualitative methodologies (Creswell, 2009). Further Creswell stated, while quantitative method includes numerical values and measurement which help researchers to describe, predict, explain and determine social patterns, qualitative method deals with interpretation and exploration which guide the researchers towards understanding and changing social phenomena. The combination of these two methods is a foundation for developing mixed methods research which has been called as an "evolution of research methodology" (Creswell & Clark, 2011). Moreover they stated the choice of a particular method is influenced by certain factors such as: the topic to be researched; the objectives; and the specific proposed research questions. According to the context of this research study, mixed methodology was considered and as shown in figure 3.1

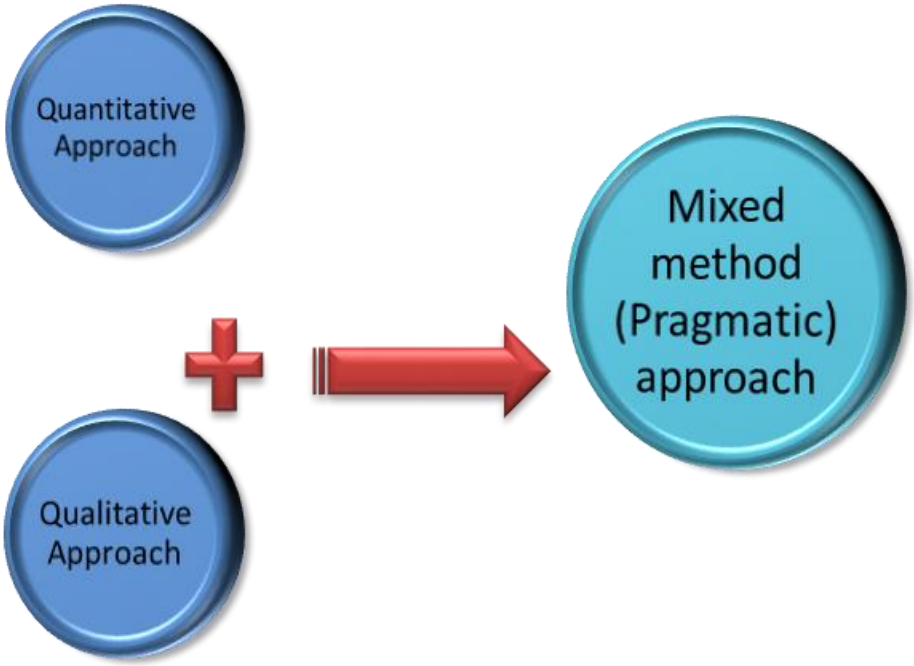

Figure 3.1 Research approach

3.3 RESEARCH DESIGN

The design of the study depends on the research aim and how much existing practices is within the area of interest. The aim of the research is identify the elements of management commitment and barriers in order to propose a frame work that can be used to establish a safety culture in construction industry.

Research was designed in a manner that research philosophy, approach and techniques are compatible with each other. Therefore, after identifying the underlying research philosophy, research approach was selected based on that. The research design is shown in figure 3.2.

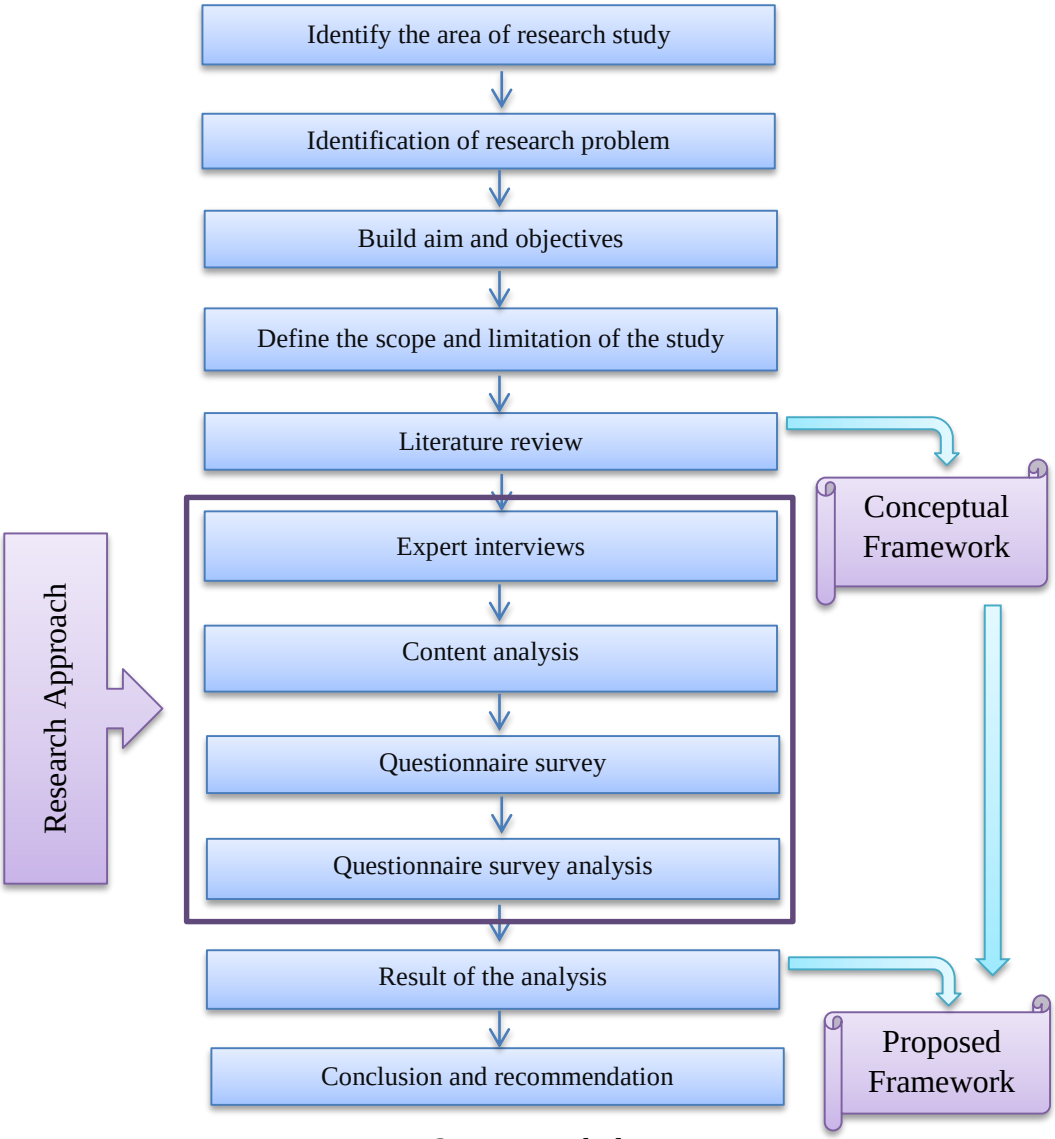

Figure 3.2 Research design

3.4 DATA COLLECTION TECHNIQUES

3.4.1 Expert interviews

Expert interviews were conducted to refine the list of management commitment elements and barriers identified through the literature review. The expert interviews comprised of twelve experts who are responsible and accountable in taking decision on health and safety in construction industry. Selected experts are from major building construction projects. The experts were selected from three projects from amongst those involved in health and safety concerns at sites on daily basis in order to collect required data. The following table 3.2 provides a description of selected interviews.

Table 3.2 Selection of interviewees

Projects			
Type	Residential Tower	Mixed development	Hotel
Stories	68	46 & 41	31
Project cost	8,000 million	9,000 million	5,000 million
Location	Colombo	Colombo	Colombo
Interviewees	Project Manager	Project Manager	Project Manager
	Planning Manager	Planning Manager	Planning Manager
	Construction Manager	Construction Manager	Construction Manager
	Commercial Manager	Commercial Manager	Commercial Manager

3.4.2 Questionnaire survey

The main findings and information gathered from expert interview is taken in to the preparation of questionnaire and developed according to likert scale. As the next step of data collection, detailed questionnaire survey has been carried out among forty respondents in order to identify the most significant elements of management commitment and the barriers need to overcome in establishing safety culture.

A survey is a systematic method of collecting primary data based on a sample (Tan, 2002). The purpose of a survey is not to consider a specific case in depth but to capture the main characteristics of the population at any instant or monitor changes over time. Further Kraemer (2002) identified that surveys conducted for research purposes have three distinct characteristics.

1. Survey research is a quantitative method, requiring standardized information from and/or about the subjects being studied.

2. Main way of collecting information is by asking people structured and predefined questions. Their answers, which might refer to themselves or some other unit of analysis, constitute the data to be analyzed.

3. Information is collected about only a fraction of the study population, a sample, but it is collected in such a way as to be able to generalize the findings to the population. Usually, the sample is large enough to allow extensive statistical analyses.

This research comprised with detailed questionnaire survey to identify the most significant management commitment elements and the barriers to improve the safety culture in construction industry.

3.5 SAMPLING TECHNIQUE

In survey approach selection of samples are important. A sample is "a smaller representative collection of units from a population used to determine truths about that population" (Janes, 2001).There are three types of sampling techniques as explained in below table 3.3.

Table 3.3 Sampling technique

Sampling Techniques	Description
Probability sampling	It is the one in which each sample has the same probability of being chosen and every unit in the population has a chance (greater than zero) of being selected in the sample, and this probability can be accurately determined.
Non-Probability sampling (Purposive sampling)	In this method some elements of population have no chance of selection and the probability of selection can't be accurately determined. It involves the selection of elements based on assumptions regarding the population of interest, which forms the criteria for selection.
No-rule sampling	Take a sample without any rule, being the sample representative if the population is homogeneous selection has no bias

Source: Janes (2001)

Non-probability or purposive sampling includes accidental sampling, quota sampling and purposive sampling (Janes, 2001). Further he mentioned, in purposive sampling the researcher makes the sample representative depending on his opinion or purpose, thus being the representation subjective. It is based on which sample would be appropriate for the study in researcher's view point. This is used primarily when there is a limited number of people that have expertise in the area being researched.

According to this research aim, the experts (senior management people) who have adequate knowledge and experience in occupational health and safety is limited. So the purposive sampling was suitable and selected to identify the management commitment to establish safety culture in construction industry.

3.6 DATA ANALYSIS

This research was designed to establish the safety culture in the construction industry and propose a frame work for that. The techniques which are used for data analysis are described as follow.

3.6.1 Analysis of expert interview data

Content analysis is the technique used for analysis of qualitative data obtained from expert interviews in order to derive patterns in the presentation and reporting of information (Guthrie et al., 2004).The content analysis enables to find similar cognitions under a particular concept and consider its significance rather than the actual content of the segment (Senarathne, 2005). Therefore content analysis was used in this study to capture significant findings from the transcripts and for effective analysis of those findings.

3.6.2 Analysis of questionnaire survey data

3.6.2.1 Relative Importance index (RII)

According to the objective of the questionnaire survey, the collected data were analysed using RII and the elements and barriers were ranked. Here, based on the data collected through the questionnaire survey, the management commitment elements and the barriers need to overcome were considered separately and the RII was applied separately for two sets of data. The relative importance index ranges from 0 to 1.

Relative Importance Index = $\sum$ (Wn) / AN

- Wn – Weighting to each factor by the respondent
- A – Highest weight (in this study =5)
- N – Total number of samples (in this study = 40)

3.6.2.2 Statistical one sample t-test

In order to achieve the objective "Identify the most significant management commitment element and the barriers to establish the safety culture in construction industry", a one sample t-test was carried out. One sample t-test is a statistical procedure often performed for testing the mean value of a distribution. In order to identify the level of impact of the each identified factors, statistical one sample t-test was used. Evaluation was carried out by Statistical Package for Social Science (SPSS) software. The hypothesis was tested as follows;

Null hypothesis; Ho: $\mu \leq \mu o$ & Alternative hypothesis; H1: $\mu > \mu o$

Here, μ is the sample mean & μo is the population mean (3.0 in this case)

To test the null hypothesis Ho: $\mu \leq \mu o$ against the alternative hypothesis H1: $\mu > \mu o$, where μo is the average population mean which was obtained from the results in SPSS. μo is the critical rating above which the issue was considered "significant" or "not significant". In this analysis, μo was fixed at 3.0 because; the average mean value of the data set was 3.0

3.7 SUMMARY

This chapter captures the method in which the research was conducted. Firstly, the philosophical position of the research was established and it was concluded to syndicate qualitative and quantitative approach simultaneously. Based on these assumptions mixed method (pragmatic) approach was decided for this research to address the research problem. Under this research approach expert interviews for qualitative method and questionnaires for quantitative method were chosen as data collection mechanisms. Data collected from expert interview and questionnaire survey were analysed using content analysis. By using RII the factors were ranked and the t-test was carried out to identify the significant factors. Further purposive sampling was selected to collect data in survey approach. In addition, this chapter outlines the research design depends on aim and objectives of this research study.

CHAPTER FOUR

FINDINGS AND DISCUSSION: EXPERT INTERVIEWS

4.0 INTRODUCTION

According to the research methodology adapted in this study, this chapter analyzes and discusses the results of the expert interviews in order to achieve second objectives.

4.1 CONTENT ANALYSIS

The findings are discussed for each expert separately under each heading along with a discussion of similarities and differences of each expert opinion at the end of each section. Findings are discussed under the major heading such as management commitment elements and barriers need to overcome.

4.2 MANAGEMENT COMMITMENT ELEMENTS: EXPERT INTERVIEW FINDINGS

There was an agreement across all interviewees for the existence of 18 management commitment elements identified through literature review. Nine additional elements were identified through the content analysis of expert interview data to establish safety culture. The refined list of management commitment elements are shown in table 4.1

Table 4.1 Management Commitment Elements to establish safety culture: Expert interview findings

Sr.No	Management Commitment Elements	Project.Mgr-A	Commercial.Mgr-A	Construction.Mgr-A	Planning.Mgr-A	Project.Mgr-B	Commercial.Mgr-B	Construction.Mgr-B	Planning.Mgr-B	Project.Mgr-C	Commercial.Mgr-C	Construction.Mgr-C	Planning.Mgr-C
	Existing Management Commitment												
1	Training programme on health and safety	√	√	√	√	√	√	√	√	√	√		√
2	Health & safety meetings	√	√	√	√	√		√	√	√	√	√	√
3	Leadership and support for health and safety	√	√	√	√	√	√	√	√	√	√		√
4	Pro-active performance measurement	√	√		√	√	√	√	√	√	√	√	
5	Establishing safety rules at the site	√	√	√	√	√	√	√	√	√		√	√
6	Safety policies and system review	√	√	√	√	√	√		√	√	√	√	√
7	Compliance with regulations related to health and safety	√	√	√	√	√	√	√	√	√	√	√	√
8	Safety operational targets and proper time management	√	√		√	√	√	√	√	√	√	√	√
9	Safety inspection and risk identification	√	√	√	√	√		√	√	√	√	√	√
10	Supervision and monitoring	√	√	√	√	√	√	√	√	√	√	√	√
11	Budget allocation for health and safety implementation	√		√	√	√	√		√	√	√		√
12	Safety committee meetings	√	√	√	√	√	√	√	√		√	√	√
13	Clear line of authority and accountability	√	√	√	√	√	√	√	√	√	√		√
14	Motivation from the management to encourage safety	√	√	√		√	√	√	√	√	√	√	√
15	Proper communication with the different level of workers	√	√	√	√	√	√	√	√	√	√	√	√
16	Involvement of management with the workers	√	√	√	√	√	√	√	√	√	√		√
17	Follow safety rules and lead by example	√	√	√	√	√		√	√	√	√	√	√
18	The management's awareness on safety and health	√	√	√	√	√	√	√	√	√	√		√
	Additional View Points - Management Commitment												
19	Safety requirements to be included in the planning stage of construction	√		√		√						√	
20	Implementation of safety practices rather than strict to the theoretical aspects			√								√	
21	Proper record keeping in ISO standards for future reviews		√	√									
22	Management needs to establish a system to respond safety issues without delay					√		√	√	√	√		√
23	Health, Safety & Environmental (HSE) personnel to be considered during the budget allocation	√					√						
24	Health and safety inspections of the senior management to be pre-planned				√						√		
25	Management needs to spend money reasonably on hygienic facilities		√					√					√
26	Review the close out actions of the regular safety and health inspections	√	√					√		√		√	
27	Management to consider the personal protective equipment as a last resort					√							

01. Training programme on health and safety

Training are helping people to learn how to do the job, telling people what they should or should not do, or simply giving them information. Regular trainings will contribute towards making employees competent in health and safety and can help the project to avoid the distress that accidents and ill health cause. Further, proper training can help to avoid the financial costs of accidents and occupational ill health. All the interviewees agreed, that they conduct internal and external trainings. According to project manager A, there is a balance between internal and external trainings. After the training programme they provide certificate of participation undersigned by facilitator. It will encourage the employees to participate in future programmes to enhance their

knowledge and skills. Project manager C stated “we planned to increase the number of training, improve the quality of safety induction and provide adequate fund to train the employees” in future years. It clearly displayed the importance of training on health and safety. (Refer: Appendix-G, & Appendix H, Item#09)

02. Health and safety meetings

Information passed in a safety meeting is intended to prevent workplace injuries. Any worker can lead a safety meeting, but the supervisor must ensure the meeting takes place and is documented. Safety or toolbox meetings are an opportunity to raise awareness about safe work practices. The frequency will depend upon the work environment. Managers can discuss safe practices within the specific area or worksite. Project manager A stated “Regularly we participate each and every meeting and discussions to identify the issues from site level people”. Without safety meetings, workers can be unaware by routines and slowly decrease their alertness and attention to safety as they perform the same tasks day after day. Project manager B noted “apart from tool box and site inspections we arrange meetings to discuss the site issues”. (Refer: Appendix-H, Item#02)

03. Leadership and support for HSE

Leadership is important in the creation of safety culture that supports and promotes a strong health and safety performance of an organisation. The senior managers are vital in inspiring employees to a higher level of safety and productivity, which means that they must apply good leadership attributes on a daily basis. Project manager C said “Our top management never compromise with safety, if the project is delay because of safety; it’s never mind”. (Refer: Appendix H, Item#01)

04. Pro-active performance measurement

Performance measurement provides the means of determining the effectiveness of the performance management system and the basis for making improvements that will enable objectives to be achieved. The main purpose in measuring safety performance is to develop strategies that will eliminate future incidents. Performance improvement

initiatives taken by individual work site will vary according to existing safety performance and maturity levels of the safety culture and processes.

All the interviewees are followed some procedure and methods as pro-active measures in their projects. Project manager B said, “We are pro-active and whenever we observed any unsafe operation; immediate action will be taken”. The issues which are arisen from daily observations and site inspections were considered and take appropriate actions in order to control the risk. (Refer: Appendix H, Item#06)

05. Establishing safety rules at the site

The development of safety rules or and regulations are the responsibility of the employer. However, for such a rules and regulation to be accepted and successful it will need the commitment and endorsement of the workers as well as top management too. Therefore, it is critical to involve the workers in the early stages when establishing safety rules and regulations. Construction manager B noted, “We have set of site rules and regulations which have to obey within the project site, if anybody violate the site rules we train them and advise them; but purposely they violate the rules we send out”. This would include, but not be limited to, the workers' health and safety representative or the occupational health and safety committee.

06. Safety policies and system review

Health and safety policies form the foundation of managing safety, so getting them right is absolutely fundamental. The health and safety policy is unique to each project site and must be legally compliant. Furthermore, in order to keep pace with changes, health and safety policies must be regularly reviewed. Every project has separate safety policies and regularly reviewed to ensure that the existing health and safety policy is up to date and compliant with best practice and current legislation and guidelines. Construction manager A said, “we have our company policy and Quality Health Safety and Environment Policy (QHSE) also we have”. There the management combined health and safety with quality to enhance their performance and culture. In addition to this, construction manager C stated, “We have separate safety policy and OHSAS 18001:2007 certification but, it should be implemented in practical environment”.

07. Compliance with regulations related to health and safety

The regulations sets out the key principles, duties and rights in relation to occupational health and safety. It is specified the ways duties imposed by regulations must be performed, or prescribe procedural or administrative matters to support, such as requiring licenses for specific activities, keeping records, or notifying certain matters. Planning manager B said "our project complies with local regulations and some local authority personnel come to site and enforce to comply with their regulations". The effective regulation requires that work place provides clear, accessible advice and guidance about what constitutes compliance with regulations. This can be achieved through proper compliance and non-statutory guidance. Commercial manager A mentioned, "We follow local regulation. For example; factories ordinance".

08. Safety operational targets and proper time management

To create effective goals and objectives for construction projects, the targets need to be safe to operate and adequate time duration. The best goals are those that motivate the employees without discouraging them from trying. Planning manager A said, "we have safety targets and achieved 0.5 million man hours without reportable lost time injuries". When create objectives for the workplace, following proper time management and safety operational targets allows to create achievable and clear goals, otherwise employees will feel that trying is pointless. Planning manager C noted, "We got 80-85% success in achieving targets". Moreover, inadequate time and unrealistic targets lead to financial and human losses.

09. Safety inspection and risk identification

Inspections are a vital element of any safety management system. They should be used to determine whether the standards are met which were set for the workplace and work activities. If they are carried out effectively, they allow to identify and remedy problems before they become more serious or result in an incident or accident. Construction manager C denoted, "apart from method statement and risk assessment, the observations and site inspection also used to identify the hazards. If it is critical activity like tower crane erection or something, the do risk assessment and work on

it". Safety inspections should identify hazards and introduce measures to improve conditions. They can be formal, informal, recorded or unrecorded, but what is important is that they are carried out to a set standard at an appropriate frequency. (Refer: Appendix-G, & Appendix H, Item#03)

10. Supervision and monitoring

Safety supervision plays a key role in reducing injuries and fatalities associated with maintenance and non-production tasks. However, the work environment can impact on its effectiveness. Project manager B concluded, "We provide instruction, training and continuous supervision to workers and advices to make them aware on safety". Supervisors will need to make sure the control measures to protect against risk are up to date and are being properly used, maintained and monitored. In order to effectively supervise workplace health and safety, the supervisor needs to be competent and trained to do so. They must also know how to manage workers and contractors, as well as workers with specialist knowledge.

11. Budget allocation for health and safety implementation

The budget should be reasonable enough to fulfil the requirements of health and safety. The training needs, allocation for PPE and safety implementations have to be considered while budgeting. Among selected interviewees most of the people accepted that it need to be improved. Project manager A defined, "it's reasonably adequate but, our management ready to provide adequate level of budget. Planning manager C mentioned, "Normally it's adequate but we plan to increase in future".

12. Safety committee meetings

A committee meeting gives the opportunity to the workers and representatives to discuss the issues with their management. Ideally, the committee should have representation from both management and labour, as well as from all departments and shifts as applicable. As long as employee input is solicited in committee meetings and it is an opportunity for the free discussion of health and safety problems and to come up with possible solutions. The importance of safety committee meeting was proved

through the expert interviews. They hope, if their project has a safety committee or is thinking about developing one is a great first step towards achieving the goal of providing a workplace environment that is safe for employees and the general public. Planning manager B noted "we are doing committee meetings and from that safety committee meeting we close out the issues and get comments from bottom line workers also". In construction projects, it may be as effective to have all employees attend a monthly or quarterly (at a minimum) safety committee meeting during which safety issues and concerns are discussed and recent incidents and injuries are reviewed. As well, committee meetings should be improved to help ensure compliance with local regulations and health and safety standards. (Refer: Appendix-G, & Appendix H, Item#07)

13. Clear line of authority and accountability

The link between top management to bottom line worker is called line authority. Organizational charts show this link by connecting a supervisor/manager and employee with a solid line. All the members should know who is responsible for what in the project. This structure provides accountability, clarity, and coherence to the work of the group. To ensure clear lines of authority within a project, most of the interviewees suggest that the roles and responsibilities of each partner should be clearly defined. Moreover, construction manager A said, "we have special hierarchy to define each personnel's responsibility and accountability within the project" and planning manager B noted, "We have separate organization chart and hierarchy with proper responsibility". As well, planning manager C defined, "we have a responsibility matrix and it explains the accountability". Likewise, in every project, it should establish authority lines that facilitate the work of an employee rather than complicate it, implement participatory leadership, and institute a middle-level authority structure to ease operations.

14. Motivation from the management to encourage safety

Motivation is not the main goal of a safety program, but it is a tool without which the highest levels of excellent safety performance are not possible. Workplace safety is an

aspect that correlates directly to productivity. When employees feel safe at work, they can then perform to their fullest potential. As such, the key to employee productivity is to keep them motivated through the aspect of safety. The necessity of motivation from the management to encourage safety is agreed by all the interviewees and each of them followed some key actions to motivate their employees. Commercial manager B agreed, "Through the safety awarding ceremonies and apart from that project director's walk through time if he recognizes anybody who works safely and well; he gives some gifts and appreciation words to motivate them". (Refer: Appendix-G)

15. Proper communication with the different level of workers

Communication between a manager and his employees is fundamental to the operation of all project activities. Managers who habitually fail to communicate effectively with their employees create an atmosphere of uncertainty and indecisiveness in the workplace. Communication helps to build relationships, promotes mutual understanding, and enables employees to contribute to organizational success. Project manager A said, "We have healthy and strong communication with workers". Further, commercial manager C said, "It is very good and we have radio set to communicate".

16. Involvement of management with the workers

Management's involvement is an essential ingredient for construction project. It is based on Human Relations approach to management which brought about a new set of values to labour and management. Commercial manager B described, "Through work base discussions, formal meetings, direct communication through phone calls and toolbox talks we involve". Involvement of management should be based on mutual trust, information sharing and mutual problem solving. Further it helps to establish and encourage good communication system at all levels. Planning manager A said, "HSE department involving in these tool box talk and trainings but total management's involvement is poor. Further every supervisor, foreman and engineers have to communicate with workers about the task and risk of it. Talking to people, more individual interaction between management and workforce and sharing information

with the employees about the challenges the project faces can help clarify many things. And it can also lead to a better understanding of worker concerns.

17. Follow safety rules and lead by example

Safety rules should be followed to prevent injuries. Most safety rules have developed as a result of accidents by others in the past, so this is a way of learning from their mistakes. There is responsibilities to all staff that any breach site rules and regulation could result in legal action against them as an individual, resulting in heavy fines. Managers should lead by example and they should carefully follow the safety rules themselves. All the interviewees agreed that they follow the site rules. Project manager B pointed out, ", the Deputy General Manager of the company also used to stay as stand by in this project to monitor and provide necessary advices. It's a simple example for visible leadership". The managers should be a leader for his workers and be as role model. The project director or any top management people entered to the site with proper PPE and involved with workers directly to understand their problems and requirement. The construction manager C, remarked "Leadership is there but its visibility is poor, it should be improved". When the leadership is visible, then only it possible to increase the enthusiasm and goodwill among the employees.

18. The management's awareness on safety and health

Awareness of management on safety and health systems also one of important things to be consider to make sure that the project can be done successful without any problem such as accidents and injuries at construction site. Construction manager A agreed, "Our management including senior people have enough awareness on safety requirement and support to implement it more". Many workers are unaware of potential hazards present in their working environment, which let them more vulnerable to injury. The awareness should be on potential and actual dangers to worker health and safety.

In addition to the above elements 09 management commitment elements were identified during project study analysis and that were discussed below.

19. Safety requirements to be included in the planning stage of construction

The construction phase plan is prepared by the principal contractor, for notifiable projects, to outline the arrangements for managing health and safety on site during construction work. The health and safety requirements to be considered and revised by top management. It included the information necessary for future construction, maintenance, refurbishment or demolition to be carried out safely, and is retained by the client or any future owner of the property. Project manager B remarked, "Safety is necessary to complete the project without any human losses or financial losses. This concern need to develop from planning stage". The project process map establishing key actions for promoting health and safety management throughout the lifecycle of a construction project, from the planning stage to completion. Project manager A also proposed, "Safety requirements to be included in the planning stage of construction and it was to be implemented". During the planning stage, the alternative options for the project are narrowed until a best solution is agreed. The project brief, with associated provisional approvals, is usually produced in this stage.

20. Implementation of safety practices rather than strict to the theoretical aspects

Competency is a collection of theory and technical knowledge. Theoretical knowledge is the base of doing anything practically but, without practical knowledge, it will be ineffective. Practical knowledge assists us to attain the exact techniques that become the tools of our job. It is much closer to our actual daily tasks. Construction manager C point out, "The site personnel have to increase their practical knowledge apart from their theory knowledge and taking responsibility also needs to implement". It is the tool of deeper understanding of the concepts through the act of doing and personal experience. It is helpful in demonstrating the actual way of working and way of handling. Especially in construction industry practical knowledge helps in the deep understanding of the concepts along with the origin and the importance of the facts learned through theoretical knowledge. Sometimes there are some critical situations which are not easy to communicate at that point, so practically demonstrating the things will be helpful in proper understanding. (Refer: Appendix G & H)

21. Proper record keeping in ISO standards for future reviews

ISO was designed to meet the ongoing generic needs for record keeping in a build environment. The standard supports to maintenance of full and accurate business records. It sets out the minimum requirements for project's corporate information to remain accessible, reliable and useable as part of good practice. Construction manager A and commercial manager B stated, "We have and go through it and keep records in ISO levels for quick and future review". This standard sets out a systematic approach to ensure the information can be managed efficiently; that it can be found when needed; and it can be relied upon to support informed decision making and effective service delivery. (Refer: Appendix G & H)

22. Management needs to establish a system to respond safety issues without delay

Issues of health and safety should be dealt with on a consensus basis. It is expected that the majority of issues will be dealt with through the normal process of risk assessment and other issues which are arise through site inspection. Construction manager B noted, "Management needs to establish a system to respond safety issues without delay". It is essential to provide a mechanism for dealing with issues of immediate concern over safety, particularly where an employee is allocated a task and has a genuine belief that the method of carrying out that task or the task itself may be unsafe. (Refer: Appendix G & H)

23. Health, Safety and Environmental (HSE) personnel to be considered during the budget allocation

Estimation of expenditure should reasonably and accurately represent the amount that it is expected on each of the HSE related requirements. Further, HSE expert or representative's involvement in budget estimation process is essential to ensure that the amount of allocation is much adequate to fulfil the requirements of HSE. Project manager A said, "Health, Safety and Environmental (HSE) personnel to be considered during the budget allocation to identify their needs and year plan". The budget estimation stage is much important and management should be focus on safety matters as well as construction objectives.

24. Health and safety inspections of the senior management to be pre-planned

Senior management people regularly conduct safety inspections as part of their job responsibilities. Such inspections identify hazardous conditions and either correct them immediately or report them for corrective action. Through the planned inspection senior management can listen to the concerns of workers, determine underlying causes of hazards and recommend corrective action. Planning manager C proposed, "Health and safety inspections of the senior management to be pre-planned and middle level managers/site personnel also need to accompany". This pre-planned inspection tends to ignore the causes of incidents, such as unsafe actions and personal factors. In addition, workers and supervisors are generally well aware of the inspection team's arrival a day or two before. This warning system sometimes creates a preparatory atmosphere before the inspectors arrive. (Refer: Appendix G & Appendix H)

25. Management needs to spend money reasonably on hygienic facilities

Proper hygienic facilities helps to prevent or minimize disease and the spreading of disease among workers. It includes procedures used in a variety of situations such as hand hygiene, respiratory hygiene, food and water hygiene and general hygiene. The main sources of infection in the project site are people, foods and water. Additionally, sites that accumulate stagnant water such as man holes, toilets, waste pipes and sewerage tanks readily support microbial growth. Planning C defined, "take some strict rules and procedures to implement the hygienic standard and welfare facilities as well as take some controls as fogging for dengue prevention".

26. Review the close out actions of the regular safety and health inspections

The health and safety inspection should be carried out in regular basis and the close out actions need to be taken within a reasonable period of time for the hazards which are point out in that inspection reports. The management should review the inspection report properly before it leads to major incidents. Effective resolution of issues requires a formal process to ensure that appropriate close out actions are developed to address problem root causes. Commercial manager A recommended, "Review the close out actions of the regular safety and health inspections was need to be done and

improved". The HSE issues, identified problems, and suggestions need review to ensure that associated close out actions for root causes are addressed throughout the organization wherever applicable, action owners are identified and due dates are established. (Refer: Appendix E, Item#04 & 14)

27. Management to consider the personal protective equipment as a last resort

The use of PPE must be considered as a last resort for the control of risks, to be used only after all other practicable measures have been taken. The PPE only protects the wearer and no one else in the workplace; and that PPE gives maximum protection only if correctly chosen, fitted and used. Project manager B point out, "Management to consider the personal protective equipment as a last resort of control measure hierarchy". According to the hazardous control hierarchy, the personal protective equipment is a last option where other options such as; elimination and prevention are not applicable for the particular risk. The management should be given priority to engineering controls to reduce the risk.

4.3 BARRIERS TO BE OVERCOME IN IMPLEMENTING MANAGEMENT COMMITMENT: EXPERT INTERVIEW FINDINGS

There are twenty barriers identified through literature review and those barriers were agreed and ten additional barriers that were suggested by interviewees in implementing management commitment were identified through the content analysis. (Refer table 4.2.)

Table 4.2 Barriers to be overcome in implementing management commitment: Expert interview findings

	Barriers to be overcome	Project.Mgr-A	Commercial.Mgr-A	Construction.Mgr-A	Planning.Mgr-A	Project.Mgr-B	Commercial.Mgr-B	Construction.Mgr-B	Planning.Mgr-B	Project.Mgr-C	Commercial.Mgr-C	Construction.Mgr-C	Planning.Mgr-C
	Existing Barriers												
1	Management is reluctant to following the safety rules											√	
2	Poor Budget allocation for Health, Safety & Environmental (HSE)										√	√	
3	Poor compliance with health and safety regulations									√			
4	Lack of awareness of safety requirements						√					√	
5	Provision of less qualified safety officers			√									
6	Poor senior management support											√	
7	Provision of inadequate resources			√				√					
8	Ineffective management policies												√
9	Lack of proper organizational structure		√										
10	Lack of team work	√							√				
11	Lack of clear lines of authority and accountability											√	
12	Lack of Involvement with safety issues and late response				√								
13	Less support from any of the partners (such as client, public and government)					√							
14	Lack of positive attention							√					
15	Not adapting the innovations										√		
16	Weakness in the communication interface												√
17	Reactive rather than proactive management									√			
18	Lack of a proper system to identify the hazards and risks											√	
19	Safety is considered as a cost not an investment										√		
20	Complexity in the safety legislation and regulations	√											
	Additional View Points - Barriers												
21	Management hesitant to take on safety responsibilities									√			
22	Management does not provide realistic targets to the workers									√		√	
23	Use of unskilled labour without considering safety requirements	√			√						√	√	
24	Purchasing of low quality materials and equipment												√
25	Lack of a proper control system for sub-contractors							√					
26	Lack of required guidance provided from the enforcement bodies												√
27	Negative mind set of the management towards demonstrating safety leadership		√				√						
28	Lack of management support in making the training needs			√									
29	Inadequate time to prepare method statements and risk assessments				√								
30	Management always be as production oriented										√		

01. Management is reluctant to following the safety rules

All the site people do have a responsibility to comply with safety rules and not endanger themselves or others including senior managers. There is no any special permission for managers not to follow or reluctant to the safety rules, just because of they are managers. Construction manager C said “The site rules which are established need to be reviewed and the management’s reluctance in following safety rules to be resolved”. Senior managers are the people who have to follow the rules properly and should reviewed it according to the site safety requirement. Commercial manager A

noted “Even the project director goes the site wearing proper PPE and lead as a model for others”. This statement emphasis, that the senior managers’ reluctance in following safety rules possible to be a negative example for others.

02. Poor budget allocation for HSE

The budget should be reasonably enough to fulfil the requirements of health and safety. The training needs, allocation for PPE and safety implementations have to consider while budgeting time. Among all interviewees, construction manager C stated, “the allocation of budget was not 100% adequate to fulfil the HSE needs but it is reasonable enough and we planned to increase it in next year”. As a result of the less budget cuts that have been allocated, training programmes, toolbox meeting, induction programmes, motivation, welfare and hygienic facilities are difficult to fulfil as required. The management should allocate and spend adequate budget in implementing health and safety.

03. Poor compliance with safety regulations

There are safety regulations and acts which was created by government and enforcement bodies to ensure the work place safe. Any construction project need to comply with these regulations otherwise it will face lot of problems and litigation costs. Further the poor compliance cause to some short cuts and unsafe conditions. Project manager C said “we follow few regulations, not all”.

04. Lack of awareness on safety requirements

Everybody in the site should have safety awareness, it is learned, not instinctive. Anyone who has not aware on safety requirement, doing unsafe things constantly. Before begin a job, consider how to do it more safely and make sure the compliance of personal protective equipment and other safety requirements. While working time, each worker should aware of any changes in the area. The senior management should ensure and train the workers to make awareness. Commercial manager B pointed “we have enough awareness on safety. Sometimes it is not possible to take immediate consideration on safety issues and compromised”.

05. Provision of less qualified safety officers

The safety officers have vital part in maintaining the site safe by continuous monitoring and advice. To perform this task effectively, they should qualified and have competency on safety concerns. If they are less qualified, it is not possible to control the risk and the salary allocated for his duty will become as a cost or waste of money. During the recruitment of safety officers, management should be consider their knowledge and experience rather than the less salary view. Construction manager A stated "we are satisfied in competency level of our site personnel except few safety officers. Qualified safety officers are expecting higher salaries".

06. Poor senior management support

Management support and their commitment have significant impact in implementing safety culture. The senior management are the person who execute the project and facing risk. Construction manager C point out, "Lack of top management support was always one of my big bug and it's just poor stakeholder management". Their adequate support is necessary to establish health and safety and improve their level of commitment

07. Provision of inadequate resources

Adequate resources must be allocated by top-management to ensure that the plan is implemented effectively. Such resources include time, finance, support systems and functions, equipment and external services need to be identified and reviewed regularly in each area where the objectives and targets are to be achieved. A lack of resources can cause initiatives to fail and sometimes end up doing more harm. Construction manager B mentioned "we provide resource to carry out the task and close supervision also; in some circumstances the resources are not adequate. We plan to rectify this issue in future as soon as possible". Providing adequate resources is one of the most important contributions of senior management to the process.

08. Ineffective management policies

Each and every project or organization should have management policies which was signed by senior management that they are fulfill all the requirement of health and safety. The management policies should be reviewed regularly, otherwise it becomes ineffective. Further the statements of the policies should be incorporate and fit with the project requirements. Planning manager C noted "normally, we review only if it is required not regularly"

09. Lack of proper organizational structure

The organization structure clearly show the roles and responsibility of each and every person who are worked in a project, including sub-contractors. The lack of or unclear organization structures can leads to faulty actions and short cuts. Further, the responsibility can transfer to another person's head easily. It creates a risky, confused and stressful work environment. Commercial manager A mentioned "we have organization chart but only top level and middle level management people are concluded, not the whole company"

10. Lack of team work

The success of a project relies on the effective teamwork and collaboration of employees at all levels of the organization. When employees fail to work together as a team, business initiatives and goals become more difficult to attain and the surrounding workplace environment can become negative and disruptive. Poor teamwork can create an atmosphere of confusion within the team, the department and the corporation. Further it cause to failure in sharing appropriate information in a timely manner and the inability to coordinate each other's needs and visions. Senior management should realize the importance of teamwork to establish safety culture. Project manager A note "we conduct common meetings to improve the teamwork. Further we planned some sort of team building programs, get-togethers and parties in future if it is required".

11. Lack of clear line of authority and accountability

Organizational charts show the line of authority by connecting manager and employee with a solid line. All the members should know who is responsible for what in the project. Construction manager C defined, "few management level people simply escaped or passed the responsibility to somebodies head, because there is no clear line of authority". Every project should establish authority lines that facilitate the work of an employee rather than complicate it.

12. Lack of involvement with safety issues and late response

The safety issues are raised through site inspections, committee meetings, and non-conformance reports (NCR). These issues should be rectified as soon as possible, sometimes immediately. The late response leads to major incidents. Senior management should involve with safety issues without delay whenever it requires. Planning manager A said "The unsafe acts and other issues are closed out as soon as possible, not immediately because we have to get approval and support from management. So the corrective action get little delay".

13. Less support from any of the partners (such as client, public and government)

A project was executed by a construction company as a contractor. The success of the project depends on the support of the senior management of the contractor and apart from this client, public and government also influenced. The barriers or less support from any of the partner results in safety issues and drawbacks of the project. Project manager B pointed "we provide instruction and training to workers and advices to make them aware on safety. Same time client, consultant and labour department also need to support. Their commitment for safety is very less"

14. Lack of positive attention

The management should think the best is going to happen, not the worst and be prove their commitment towards positive attention. If any issues point out, the management handle it in positive way. Construction manager B noted "The issues and non-

compliances which was raised through inspection take in negative way. So the positive consideration required to resolve the problem".

15. Not adapting the innovations

The work environment continuously change with new innovations, technologies and standards. Development in health and safety management is not limited to any boundary and should focused on the goal of prevent accidents and high-risk situations completely with maximum possible level of safety. There are a number of factors that prevent innovation from occurring. The most common barrier to innovation in organisations is the manager that is not open to new ideas. Commercial manager C "Nowadays technologies and standards are changed, still we are in old versions, and we have to update us to move on smoothly"

16. Weakness in the communication interface

Effective communication is an essential component of a safe workplace, allowing employees to work together cohesively and professionally. Words that are too long or complex for the receiver to understand, inappropriate facial expressions, poor body language, bad grammar or sloppy spelling are the common weakness in communication interface. Planning manager C said "we maintain good relationship but the thing is there are some foreign workers also such as India and china. So the language is a biggest problem and most of the sign boards are displayed in English"

17. Reactive rather than proactive management

Being reactive means that you respond to problems after they occur. Being proactive means thinking ahead and planning how to head off or deal with problems before they arise. The senior management should strive to be proactive rather than reactive, or responding to them after the fact. This approach can ultimately save the lost time and major lost. Project manager C mentioned "Not often, in some circumstances we are reactive, because we cannot predict all the issue"

18. Lack of system to identify the hazards and risk

Hazard identification and risk analysis is a collective term that encompasses all activities involved in identifying hazards and evaluating risk at work place, throughout project process, to make certain that risks to employees, the public, or the environment are consistently controlled within the project risk tolerance range. Construction manager C noted, "There should be a proper system to identify hazards and control as soon as possible". Hazards should be identified, either formal (part of safety assessment) or informal based on discussions, interviews, observations and brainstorming.

19. Safety is consider as a cost not an investment

Spending on workplace health and safety should be seen as an investment and not a cost. Safety's return on investment is dependent on knowing one important thing "how much does an injury actually cost". Knowing how much workplace injuries cost could help convince managers to invest more in safety requirement. This is a situation in which many occupational safety and health professionals face obstacles when trying to convince upper management that investing in safety requirements which will lead to safer workplaces. Commercial manager C suggested "it should be reasonable and sometimes safety requirements are higher cost than the cost for the task. On that kind of situation we cannot consider safety as an investment"

20. Complexity in the safety legislation and regulations

In general, compliance means conforming to a rule, such as a specification, policy, standard or law. Regulatory compliance describes the goal that organisations aspire to achieve in their efforts to ensure that they are aware of and take steps to comply with relevant laws and regulations. Due to the increasing number of regulations and its complexity organizations are failed to comply with safety legislation and regulation. Project manager A said "our project comply with local regulations but there also some difficulties to follow. Some regulations and acts are not cleared to understand"

In addition to the above 10 barriers were identified during content analysis and these are discussed below.

21. Management hesitant to take safety responsibilities

The senior management persons have the responsibility and accountability in any kind of issues which are arisen related to their task. They cannot simply pass the risk or issue to another person's head instead of taking action. The management should have clear idea on their responsibilities and need to stick on that to demonstrate their commitment. Project manager C said, "In some circumstances, the management hesitant to take responsibilities on safety issues". People duck responsibility for reasons ranging from simple laziness or a fear of failure, through to a sense of feeling overwhelmed by the scale of a problem or a situation. Whatever the reason, if people fail to take responsibility, they will fail in their jobs, they will fail their teams, and they will fail to grow as individuals. All of this makes it important to address the issue.

22. Management does not provide realistic targets to workers

An unrealistic demand is one that simply cannot be accomplished with normal or even exceptional effort. The setting of unreasonable and unrealistic targets can also be construed as bullying or harassment. Moreover, unrealistic targets lead to financial and human losses. Project manager C noted, "We got 80-85% success in achieving targets and few targets are considered as unrealistic". When create objectives for the workplace, following proper time management and safety operational targets allows to create achievable and clear goals, otherwise employees will feel that trying is pointless.

23. Use of unskilled labour without considering safety requirement

Hiring unskilled labourers with limited training and education may initially save the business money in the form of lower starting wages. However, hiring unskilled workers, particularly for skilled positions, can have disadvantages related to production and overall project performance. Planning manager A suggested, "it's not in acceptable level; need to improve it and we have to train them more". Moreover,

commercial manager C point out, “workers are not fully competent, but have a chance to improve their skills”. Workers who are not skilled in operating specific types of equipment or machinery in construction site can present a costly safety hazard. Accidents caused by unskilled workers can potentially result in legal claims or fines or penalties from health and safety regulators. This can translate to lost money and increased insurance rates.

24. Purchasing of low quality materials and equipment

Purchasing of poor quality material causes several undesirable effects throughout the entire construction project process. It leads to costly rework and may lead to structural failures which can have terrible consequences including delay, cost overruns, severe injuries and even fatalities. Planning manager C denoted, “purchasing of low quality materials be a significant barrier in achieving the success of targets”. In addition, purchasing of poor quality materials can negatively influence the profitability, performance and reputation of the company.

25. Lack of proper control system for sub-contractors

As construction methods and techniques/projects became more and more complex, the persons performing the hands-on construction work were required to possess more and more expertise and greater levels of sophistication. The use and employment of subcontractors for the undertaking of the actual construction work is undoubtedly important. But to manage and control sub-contractors, a proper control system is required. Construction manager B mentioned, “The controlling of sub-contractor and we deduct some amount as a fine, from sub-contractor if they breach the safety procedures or any delay in project”. In order to control them, an appropriate system and procedures required.

26. Lack of guidance provided from enforcement bodies

The ultimate purpose of the enforcing authorities is to ensure that senior management manage and control risks effectively, thus preventing harm. They should monitor that duty holders who breach health and safety requirements, and directors or managers

who fail in their responsibilities and take legal action against violators. Project manager C said, “The enforcement agencies and government need to establish and improve proper a system to manage and guide the people who are involve with construction industry. The standards should be update to international guidance”. The appropriate use of enforcement powers, including prosecution, is important, both to secure compliance with the law and to ensure that those who have duties under it may be held to account for failures to safeguard health, safety and welfare

27. Negative mind-set of the management

Negative thinking means that approach unpleasantness and less productive way. The management should think the best is going to happen, not the worst and be prove their commitment towards demonstrating safety leadership. If any issues point out, the management handle it in positive way not through the negative mind. Commercial manager B stated, “Negative mind set of the management is also a barrier and need to overcome towards demonstrating safety leadership”. The continuous advice and visible demonstration on safety is to be required by senior management to ensure their contribution.

28. Lack of management support in making training needs

Regular trainings will contribute towards making employees competent in health and safety and can help the project to avoid the distress that accidents and ill health cause. Further, proper training can help to avoid the financial costs of accidents and occupational ill health. Construction manager A suggested, “Lack of management support in making training needs was a problem and now we planned to increase the number of special trainings”. In the absence of training, employees become unsure of what’s expected of them and may end up doing their work tasks inefficiently. Misunderstandings may ensue because employees aren't clear about the requirement.

29. Inadequate time to prepare method statements and risk assessments

For all tasks, the method statement and risk assessments are prepared and clearly explained to the crew who are involving in particular tasks before they initiate. If not,

they will face lot of difficulties in controlling hazards. Planning manager A said, “There is no adequate time to prepare method statement and doing risk assessment on particular task”. Adequate time need to be allocate by the management to prepare and review them properly and accurately.

30. Management always be as production oriented

The progress of production is required, same time, safety procedures also need to comply as per the organization rules and regulations. Commercial manager C said, “The management given more priority to progress of the project than the safety concerns”. The management should ensure adequate level of safety concerns to get back from project oriented way and maintain a balance between both.

4.4 SUMMARY

The data collected from twelve interviewees through expert interviews was analyzed using content analysis. As the outcome of the content analysis, nine additional management commitment elements and ten barriers need to overcome was found out.

Table 4.3 Additional elements of management commitment and barriers: content analysis findings

No	Management commitment elements	Barriers
1	Safety requirements to be included in the planning stage of construction	Management hesitant to take on safety responsibilities
2	Implementation of safety practices rather than strict to the theoretical aspects	Management does not provide realistic targets to the workers
3	Proper record keeping in ISO standards for future reviews	Use of unskilled labour without considering safety requirements
4	Management needs to establish a system to respond safety issues without delay	Purchasing of low quality materials and equipment
5	Health, Safety & Environmental (HSE) personnel to be considered during the budget allocation	Lack of a proper control system for sub-contractors

6	Health and safety inspections of the senior management to be pre-planned	Lack of required guidance provided from the enforcement bodies
7	Management needs to spend money reasonably on hygienic facilities	Negative mind set of the management towards demonstrating safety leadership
8	Review the close out actions of the regular safety and health inspections	Lack of management support in making the training needs
9	Management to consider the personal protective equipment as a last resort	Inadequate time to prepare method statements and risk assessments
10	-	Management always be as production oriented

Further the respondents provided their opinion positively on existence of eighteen management commitment elements and twenty barriers which was identified through the literature review. The commonalities and difference between each interviewees clearly analyzed with the help of interview transcripts. The results are discussed and justified evidently. The nine surplus elements of management commitment and ten barriers which are extracted from each expert illustrated using table 4.3. Moreover these findings are considered in developing the detailed questionnaire survey to identify the most significant factors.

CHAPTER FIVE

FINDINGS & DISCUSSION: QUESTIONNAIRE SURVEY

5.0 INTRODUCTION

There were various types of management commitment elements and barriers to be overcome in implementing management commitment identified by the literature review which were broadly illustrated in the chapter two. However, content analysis was carried out to investigate the existing management commitment elements and barriers to be overcome in implementing management commitment. Furthermore content analysis helped to prepare the detailed questionnaire which was used in the detailed survey

This chapter presents the main findings of the research which in turn leads to the achievement of the fourth objective (Refer Section 1.3). Initially this chapter focuses on the questionnaire survey and then to elaborate on the findings using the relative importance index (RII) tool which was used by Doloi, (2008), Iyer and Jha (2005) in similar type of research. Finally one sample t-test was carried out to identify the most significant factors.

5.1 QUESTIONNAIRE SURVEY

The Questionnaire survey was designed through the findings of literature review and the content analysis. Totally 46 respondents were asked to voluntarily complete their particular questionnaire using a 5 point likert scale and the questionnaire survey form was distributed among the respondents. 40 responses were returned out of 46 questionnaire and the results from respondents statistically analysed to determine the 'most significant' elements of management commitment and the barriers.

5.1.1 Comparison of respondents' details

A total of 46 questionnaires were distributed, but 40 responses were returned out of 46 questionnaire. It represented 87% response rate was achieved in the survey and also 13% of them were non- response.

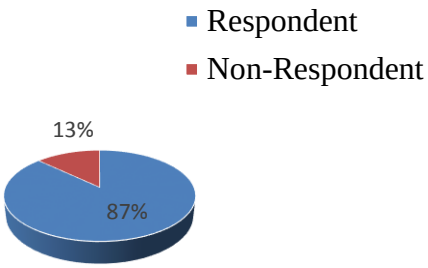

Figure 5. 1 Composition of respondents

As the target outcome of this research entirely relies on the representative population sample and a purposive sampling was adopted. The response rate for completed questionnaire is shown in figure 5.1.

5.1.2 Structure of the questionnaire

Through the questionnaire, first it was discussed the respondents' details such as experience and their type of organizations. Thereafter, it was focused on existing level of management commitment and barriers to implement the management commitment to establish safety culture in construction industry.

The structure of the questionnaire contained three sections as follows;

- Respondents' details
- Focus on existing level of management commitment
- Focus on barriers to implement the management commitment

5.2 DEVELOPING THE QUESTIONNAIRE

The questionnaire guide was prepared comprising a list of 27 management commitment elements and 30 barriers, which were identified through literature review and expert interviews.

5.2.1 Identification of Management commitment elements

The Management commitment elements to establish the safety culture were identified through the literature review and expert interviews. It had listed 27 elements are to be implemented in establishing safety culture and shown in table 5.1.

Table 5.1 Management commitment elements

Management Commitment Elements	
1. Training programme on health and safety	2. Follow safety rules and lead by example
3. Health & safety meetings	4. Safety committee meetings
5. Leadership and support for health and safety	6. Clear line of authority and accountability
7. Pro-active performance measurement	8. Establishing safety rules at the site
9. Motivation from the management to encourage safety	10. Proper communication with the different level of workers
11. Safety policies and system review	12. Involvement of management with the workers
13. Compliance with regulations related to health and safety	14. Budget allocation for health and safety implementation
15. Safety operational targets and proper time management	16. Implementation of safety practices rather than strict to the theoretical aspects
17. Management needs to spend money reasonably on hygienic facilities	18. Safety requirements to be included in the planning stage of construction
19. Supervision and monitoring	20. The management's awareness on safety and health
21. Management needs to establish a system to respond safety issues without delay	22. Proper record keeping in ISO standards for future reviews
23. Health, Safety & Environmental (HSE) personnel to be considered during the budget allocation	24. Review the close out actions of the regular safety and health inspections
25. Health and safety inspections of the senior management to be pre-planned	26. Management to consider the personal protective equipment as a last resort
27. Safety inspection and risk identification	

5.2.2 Identification of barriers need to overcome in implementing management commitment

The barriers need to overcome in implementing management commitment were identified through the literature review and expert interviews. It had listed 30 barriers

are to be overcome in implementing management commitment to establish safety culture and shown in table 5.2.

Table 5.2 Barriers need to overcome in implementing management commitment

Barriers need to overcome	
1. Ineffective management policies	2. Complexity in the safety legislation and regulations
3. Poor Budget allocation for Health, Safety & Environmental (HSE)	4. Management hesitant to take on safety responsibilities
5. Poor compliance with health and safety regulations	6. Lack of a proper system to identify the hazards and risks
7. Lack of awareness of safety requirements	8. Safety is considered as a cost not an investment
9. Provision of less qualified safety officers	10. Weakness in the communication interface
11. Poor senior management support	12. Reactive rather than proactive management
13. Provision of inadequate resources	14. Lack of positive attention
15. Management is reluctant to following the safety rules	16. Use of unskilled labour without considering safety requirements
17. Lack of proper organizational structure	18. Lack of team work
19. Purchasing of low quality materials and equipment	20. Lack of a proper control system for sub-contractors
21. Lack of clear lines of authority and accountability	22. Lack of required guidance provided from the enforcement bodies
23. Lack of Involvement with safety issues and late response	24. Negative mind set of the management towards demonstrating safety leadership
25. Less support from any of the partners (such as client, public and government)	26. Lack of management support in making the training needs
27. Management does not provide realistic targets to the workers	28. Inadequate time to prepare method statements and risk assessments
29. Not adapting the innovations	30. Management always be as production oriented.

5.3 OUTCOME OF THE QUESTIONNAIRE SURVEY

Detailed questionnaire survey was conducted in order to identify the significant elements of management commitment and the barriers to implement it in construction industry. The respondents were asked to select the degree of agreement according to their importance level. Relative importance index (RII) test was used as a tool to prioritize the factors and in order to fulfill the third objective of this research study a

one sample t-test was carried out. The results were presented to identify the 'most significant elements and barriers' based on the t-test.

5.3.1 Analysis of Management commitment elements using RII

The following table shows the RII values and the ranking position of each element according to their level of importance in establishing safety culture. The management commitment elements are listed in table 5.3.

Table 5.3 Prioritized management commitment elements

	Management Commitment Elements	RII	Rank
1	Training programme on health and safety	0.845	9
2	Health & safety meetings	0.625	23
3	Leadership and support for health and safety	0.875	6
4	Pro-active performance measurement	0.83	12
5	Establishing safety rules at the site	0.5	25
6	Safety policies and system review	0.475	26
7	Compliance with regulations related to health and safety	0.47	27
8	Safety operational targets and proper time management	0.835	11
9	Safety inspection and risk identification	0.745	13
10	Supervision and monitoring	0.74	14
11	Budget allocation for health and safety implementation	0.84	10
12	Safety committee meetings	0.85	8
13	Clear line of authority and accountability	0.725	15
14	Motivation from the management to encourage safety	0.7	18
15	Proper communication with the different level of workers	0.72	16
16	Involvement of management with the workers	0.68	20
17	Follow safety rules and lead by example	0.69	19
18	The management's awareness on safety and health	0.71	17
19	Safety requirements to be included in the planning stage of construction	0.91	2
20	Implementation of safety practices rather than strict to the theoretical aspects	0.865	7
21	Proper record keeping in ISO standards for future reviews	0.505	24

22	Management needs to establish a system to respond safety issues without delay	0.925	1
23	Health, Safety & Environmental (HSE) personnel to be considered during the budget allocation	0.88	5
24	Health and safety inspections of the senior management to be pre-planned	0.665	21
25	Management needs to spend money reasonably on hygienic facilities	0.63	22
26	Review the close out actions of the regular safety and health inspections	0.895	3
27	Management to consider the personal protective equipment as a last resort	0.89	4

5.3.2 Analysis of Management commitment elements using t-test

The significant elements were selected by using t-test and the elements which have the t-value greater than critical t-value (1.684 which was calculated using t-table) were identified as significant elements and shown in table 5.4.

Table 5.4 one sample t-test for management commitment

One sample t-test		Test value - 3.0		
		Critical t-value : 1.684		
No	Management commitment elements	t	Mean	Significant factors
1	Training programme on health and safety	10.564	1.225	√
2	Health & safety meetings	.615	.125	
3	Leadership and support for health and safety	11.747	1.375	√
4	Pro-active performance measurement	9.066	1.150	√
5	Establishing safety rules at the site	-2.550	-.500	
6	Safety policies and system review	-3.204	-.625	
7	Compliance with regulations related to health and safety	-3.284	-.650	
8	Safety operational targets and proper time management	7.895	1.150	√
9	Safety inspection and risk identification	4.318	.725	√
10	Supervision and monitoring	4.246	.700	√
11	Budget allocation for health and safety implementation	10.494	1.200	√
12	Safety committee meetings	10.184	1.250	√
13	Clear line of authority and accountability	3.748	.625	√

14	Motivation from the management to encourage safety	2.687	.500	√
15	Proper communication with the different level of workers	3.509	.600	√
16	Involvement of management with the workers	2.199	.400	√
17	Follow safety rules and lead by example	2.336	.450	√
18	The management's awareness on safety and health	2.959	.550	√
19	Safety requirements to be included in the planning stage of construction	14.470	1.550	√
20	Implementation of safety practices rather than strict to the theoretical aspects	11.482	1.325	√
21	Proper record keeping in ISO standards for future reviews	-2.464	-.475	
22	Management needs to establish a system to respond safety issues without delay	16.368	1.625	√
23	Health, Safety & Environmental (HSE) personnel to be considered during the budget allocation	11.898	1.400	√
24	Health and safety inspections of the senior management to be pre-planned	1.704	.325	√
25	Management needs to spend money reasonably on hygienic facilities	.703	.150	
26	Review the close out actions of the regular safety and health inspections	12.428	1.475	√
27	Management to consider the personal protective equipment as a last resort	12.838	1.450	√

There are twenty one number of management commitment elements were identified as significant by following the t-test. Identified significant elements can be further explained as follows;

1. Management needs to establish a system to respond safety issues without delay

This was ranked number one as the most important management commitment element through RII (Refer table 5.3). In construction industry, there are several kinds of issues arise every day. To rectify the issues the management should distribute the responsibility and establish a system to follow up and immediate response.

2. Safety requirements to be included in the planning stage of construction

This was ranked number two as the most important management commitment element through RII (Refer table 5.3). In pre-construction stage, the safety requirements need to be included to avoid and control the risk. The risk can be transferred from planning stage to post-construction stage and end of the day, it becomes as a major risk. The control measures are ineffective if the safety requirements not included in planning stage.

3. Review the close out actions of the regular safety and health inspections

This was ranked number three as the most important management commitment element through RII (Refer table 5.3). The health and safety inspection should be carried out in regular basis and the close out actions need to be taken within a reasonable period of time for the hazards which are point out in that inspection reports. The management should be review the inspection report properly before it leads to major incidents.

4. Management to consider the personal protective equipment as a last resort

This was ranked number four as the most important management commitment element through RII (Refer table 5.3). According to the hazardous control hierarchy, the personal protective equipment is a last option where other options such as; elimination and prevention are not applicable for the particular risk. The management should be given priority to engineering controls to reduce the risk.

5. Health, Safety and Environmental (HSE) personnel to be considered during the budget allocation

This was ranked number five as the most important management commitment element through RII (Refer table 5.3). The budget to be reasonably adequate to fulfil the safety requirement. To estimate the requirement, HSE personnel need to be consider and discuss during the budget allocation time. The management should be focus on safety matters as well as construction objectives.

6. Leadership and support for health and safety

This was ranked number six as the most important management commitment element through RII (Refer table 5.3). The management should be act as leader not like boss. At the start of each shift, proper task briefing with considering safety to be conducted by related site personnel. The senior management are the person who execute the project. Their adequate support is necessary to establish and improve health and safety.

7. Implementation of safety practices rather than strict to the theoretical aspects

This was ranked number seven as the most important management commitment element through RII (Refer table 5.3). The theoretical aspects and knowledge is important to comply with standards and regulations. At the same time, the site personnel and the management should be consider and implement the safety practices which are reasonably applicable in practical environment. Sticking to the theoretical aspects only, will lead to issues and delays in achieving the progress at site. It is important that the safety practices to be implemented as reasonably possible.

8. Safety committee meetings

This was ranked number eight as the most important management commitment element through RII (Refer table 5.3). The safety committee meeting should be held regularly and the personnel from top management to bottom line workers need to participate to discuss the site issues, difficulties and other welfare problems. The workers also suggest their ideas and comments to sort-out the problems. The management have to take rectify actions before next committee meeting.

9. Training programme on health and safety

This was ranked number nine as the most important management commitment element through RII (Refer table 5.3). In construction industry, the people and activities are changing day to day. The management should provide continues training to make aware the site level personnel and improve their skills and knowledge to control hazards, unsafe acts and unsafe conditions that lead to accidents.

10. Budget allocation for health and safety implementation

This was ranked number ten as the most important management commitment element through RII (Refer table 5.3). The training programs, toolbox meeting, induction programs, motivation, welfare and hygienic facilities are necessary for health and safety implementation. The management should allocate and spend adequate budget in implementing health and safety.

11. Safety operational targets and proper time management

This was ranked number eleven as the important management commitment element through RII (Refer table 5.3). The management should plan and schedule their targets considering with required/adequate time. Limited time to complete the task lead to failures as well as accidents also. The senior management people should ensure that the time allocated for the task is reasonably sufficient to complete (the time to utilize materials, equipment and manpower need to consider).

12. Pro-active performance measurement

This was ranked number eleven twelve as the important management commitment element through RII (Refer table 5.3). The management/ relevant personnel have to inspect unsafe conditions continuously and review it to take proper control measure. Even, small hazards should take into consideration which are arise through daily site observations. The laps should be rectified without delay before its lead to major issues.

13. Safety inspection and risk identification

This was ranked number thirteen as the important management commitment element through RII (Refer table 5.3). Through the safety inspection the management can identify the major hazards and risk. It helps to take necessary preventive action on those issues.

14. Supervision and monitoring

This was ranked number fourteen as the important management commitment element through RII (Refer table 5.3). Continuous monitoring and supervision is the key to identify, control and prevent the risk.

15. Clear line of authority and accountability

This was ranked number fifteen as the important management commitment element through RII (Refer table 5.3). The risk, accidents, near-misses should be reported according to line of authority and accountability for proper review and required action.

16. Proper communication with the different level of workers

This was ranked number sixteen as the important management commitment element through RII (Refer table 5.3). Management should keep proper and clear interface communication with all workers. Otherwise, the actual problem and risk cannot be eliminated.

17. The management's awareness on safety and health

This was ranked number seventeen as the least important management commitment element through RII (Refer table 5.3). The management level staff should have adequate awareness on safety and support to implement it.

18. Motivation from the management to encourage safety

This was ranked number eighteen as the least important management commitment element through RII (Refer table 5.3). The management should provide adequate motivation to encourage safety.

19. Follow safety rules and lead by example

This was ranked number nineteen as the least important management commitment element through RII (Refer table 5.3). The management should follow the rules

without by passing it and they must lead by example for all workers in following the safety rules.

20. Involvement of management with the workers

This was ranked number twenty as the least important management commitment element through RII (Refer table 5.3). Regularly management should investigate and identify the issues from workers and rectify it as much as possible.

21. Health and safety inspections of the senior management to be pre-planned

This was ranked number twenty one as the least important management commitment element through RII (Refer table 5.3). The senior management should visit to the site regularly and to be pre-planned their safety inspection.

5.3.3 Analysis of Barriers to overcome in implementing management commitment using RII

The following table shows the RII values and the ranking position of each barrier according to their level of importance in establishing safety culture. The barriers are listed in table 5.5.

Table 5.5 Prioritized barriers

	Barriers Need to Overcome	RII	Rank
1	Management is reluctant to following the safety rules	0.8	14
2	Poor Budget allocation for Health, Safety & Environmental (HSE)	0.85	7
3	Poor compliance with health and safety regulations	0.665	18
4	Lack of awareness of safety requirements	0.835	9
5	Provision of less qualified safety officers	0.62	21
6	Poor senior management support	0.88	4
7	Provision of inadequate resources	0.875	5
8	Ineffective management policies	0.715	15
9	Lack of proper organizational structure	0.535	26

10	Lack of team work	0.855	6
11	Lack of clear lines of authority and accountability	0.63	19
12	Lack of Involvement with safety issues and late response	0.615	22
13	Less support from any of the partners (such as client, public and government)	0.515	29
14	Lack of positive attention	0.625	20
15	Not adapting the innovations	0.525	27
16	Weakness in the communication interface	0.605	24
17	Reactive rather than proactive management	0.61	23
18	Lack of a proper system to identify the hazards and risks	0.705	16
19	Safety is considered as a cost not an investment	0.83	10
20	Complexity in the safety legislation and regulations	0.555	25
21	Management hesitant to take on safety responsibilities	0.825	11
22	Management does not provide realistic targets to the workers	0.91	1
23	Use of unskilled labour without considering safety requirements	0.695	17
24	Purchasing of low quality materials and equipment	0.81	12
25	Lack of a proper control system for sub-contractors	0.52	28
26	Lack of required guidance provided from the enforcement bodies	0.495	30
27	Negative mind set of the management towards demonstrating safety leadership	0.89	2
28	Lack of management support in making the training needs	0.84	8
29	Inadequate time to prepare method statements and risk assessments	0.805	13
30	Management always be as production oriented.	0.885	3

5.3.4 Analysis of Barriers using t-test

The significant barriers were identified using one sample t-test and the barriers which have the t-value greater than critical t-value (1.684 which was calculated using t-table) were selected and shown in table 5.6.

Table 5.6 one sample t-test for Barriers

One sample t-test		Test value – 3.0		
		Critical t-value : 1.684		
No	Barriers	t	Mean	Significant factors
1	Management is reluctant to following the safety rules	6.583	1.000	√
2	Poor Budget allocation for Health, Safety & Environmental (HSE)	11.180	1.250	√
3	Poor compliance with health and safety regulations	1.801	.325	√
4	Lack of awareness on safety requirements	11.008	1.175	√
5	Provision of less qualified safety officers	.572	.100	
6	Poor senior management support	14.994	1.400	√
7	Provision of inadequate resources	13.029	1.375	√
8	Ineffective management policies	3.797	.575	√
9	Lack of proper organizational structure	-2.010	-.325	
10	Lack of team work	13.471	1.275	√
11	Lack of clear lines of authority and accountability	.902	.150	
12	Lack of Involvement with safety issues and late response	.443	.075	
13	Less support from any of the partners (such as client, public and government)	-2.888	-.425	
14	Lack of positive attention	.710	.125	
15	Not adapting the innovations	-2.360	-.375	
16	Weakness in the communication interface	.162	.025	
17	Reactive rather than proactive management	.291	.050	
18	Lack of a proper system to identify the hazards and risks	3.127	.525	√
19	Safety is considered as a cost not an investment	8.145	1.150	√
20	Complexity in the safety legislation and regulations	-1.854	-.225	

21	Management hesitant to take on safety responsibilities	9.844	1.125	√
22	Management does not provide realistic targets to the workers	16.421	1.550	√
23	Use of unskilled labour without considering safety requirements	2.602	.475	√
24	Purchasing of low quality materials and equipment	7.851	1.050	√
25	Lack of a proper control system for sub-contractors	-3.252	-.400	
26	Lack of required guidance provided from the enforcement bodies	-3.920	-.525	
27	Negative mind set of the management towards demonstrating safety leadership	13.536	1.450	√
28	Lack of management support in making the training needs	11.049	1.200	√
29	Inadequate time to prepare method statements and risk assessments	8.101	1.025	√
30	Management always be as production oriented.	13.350	1.425	√

There are eighteen number of barriers were identified as significant by following the t-test. Identified significant barriers can be further explained as follows;

1. Management does not provide realistic targets to the workers

This was ranked number one as the most important barrier through RII (Refer table 5.5). The targets are important to achieve mile stones and prove the progress of the project. Those targets should be realistic. The safety requirements, level of resources and proper planning are to be consider while providing targets. The management should provide realistic targets to overcome this barrier in implementing their commitment.

2. Negative mind set of the management towards demonstrating safety leadership

This was ranked number two as the most important barrier through RII (Refer table 5.5). The management should be prove their commitment towards demonstrating

safety leadership. If any issues are pointed out, the management needs to handle it in a positive way not through the negative mind. The continuous advice and visible demonstration on safety is to be required by senior management to ensure their contribution.

3. Management always be as production oriented

This was ranked number three as the most important barrier through RII (Refer table 5.5). The progress of production is required, same time, safety procedures also need to comply as per the organization rules and regulations. The management should ensure adequate level of safety concerns to get back from project oriented way and maintain a balance between both.

4. Poor senior management support

This was ranked number four as the most important barrier through RII (Refer table 5.5). The senior management are the person who manage and execute the project and facing risk. Their adequate support is necessary to establish health and safety and improve their level of commitment.

5. Provision of inadequate resources

This was ranked number five as the most important barrier through RII (Refer table 5.5). Resources are the vital part of the project progress. In adequate level of resources are affect in construction delay and unrealistic targets. Further it leads to dangerous occurrence and accidents. The management have to make sure the availability of resource to avoid and control these problems.

6. Lack of team work

This was ranked number six as the most important barrier through RII (Refer table 5.5). Health and safety is not a one person or particular department's responsibility, each and every person from top to bottom line have to think and aware on that. The management need to arrange programmes or meetings to build-up the team work to solve this barrier and ensure their involvement.

7. Poor Budget allocation for Health, Safety and Environmental (HSE)

This was ranked number seven as the most important barrier through RII (Refer table 5.5). The allocation of the budget is to be adequate to fulfil the requirement of HSE such as; trainings, PPE, welfare facilities and etc. If there is any lack in budget allocation it indicate that the management is not considering the HSE and their commitment is difficult to safeguard.

8. Lack of management support in making the training needs

This was ranked number eight as the most important barrier through RII (Refer table 5.5). Proper and regular training is required to run the site safely. The management has to support in making training need. Job related and special training from internal and external parties helps to make aware on particular task as well as in implementing the management's provision.

9. Lack of awareness on safety requirements

This was ranked number nine as the most important barrier through RII (Refer table 5.5). Most of the senior management personnel have adequate knowledge about safety but less awareness in safety requirement. The committee meetings and tool box talks create a chance to increase the awareness on safety. Further regular review on incidents and accident report also emphasis the importance of awareness.

10. Safety is considered as a cost not an investment

This was ranked number ten as the most important barrier through RII (Refer table 5.5). In general view, safety is a cost, but it's an investment in short and long run. The cost for PPE and training needs are less, on the other hand, the outcomes are remarkable. It leads to safeguard valuable work force, financial losses and reputation of the company. The management has to focus on safety as an investment to sort-out the barrier.

11. Management hesitant to take on safety responsibilities

This was ranked number eleven as the important barrier through RII (Refer table 5.5). The senior management persons have the responsibility and accountability in any kind of issues which are arisen related to their task. They cannot simply pass the risk or issue to another person's head instead of taking action. The management should have clear idea on their responsibilities and need to stick on that to demonstrate their commitment.

12. Purchasing of low quality materials and equipment

This was ranked number twelve as the important barrier through RII (Refer table 5.5). The quality of materials and equipment have impact on controlling of hazards. The management should consider the quality instead of cost saving while purchasing time. Otherwise the management will fail in implementing their level of commitment on health and safety.

13. Inadequate time to prepare method statements and risk assessments

This was ranked number thirteen as the important barrier through RII (Refer table 5.5). For all task, the method statement and risk assessments are prepared and clearly explained to the crew who are involving in particular tasks before they initiate. Adequate time need to be allocate by the management to prepare and review them properly and accurately. If not, they will face lot of difficulties in controlling hazards.

14. Management is reluctant to following the safety rules

This was ranked number fourteen as the important barrier through RII (Refer table 5.5). The rules and regulations are established by senior management people to manage and control the site from fraud and malfunctioning activities. Those rules should be followed by them who are in top level and lead by example for middle and shop level people. If the senior management reluctant to follow their rules, others also will do the same.

15. Poor compliance with health and safety regulations

This was ranked number fifteen as the important barrier through RII (Refer table 5.5). The safety rules and regulations should be followed by every employer and employee.

16. Ineffective management policies

This was ranked number sixteen as the important barrier through RII (Refer table 5.5). Every project or company should have a proper management policies and it must be signed by top management. They have to consider all health and safety aspects in that policy.

17. Lack of a proper system to identify the hazards and risks

This was ranked number seventeen as the important barrier through RII (Refer table 5.5). The hazards and risks should be identified before any accident happen and there should be a proper system.

18. Use of unskilled labour without considering safety requirements

This was ranked number eighteen as the least important barrier through RII (Refer table 5.5). To do a task with safely and quality, the manpower should be skilled. Otherwise have to face many defects, failures and accidents.

5.4 PROPOSED FRAMEWORK TO ESTABLISH SAFETY CULTURE

Following framework is developed using the 21 significant elements of management commitment and 18 significant barriers which are discussed in section 5.3 in order to achieve the objective four of this study. The Figure 5.2 shows the proposed framework to establish the safety culture through management commitment in construction industry.

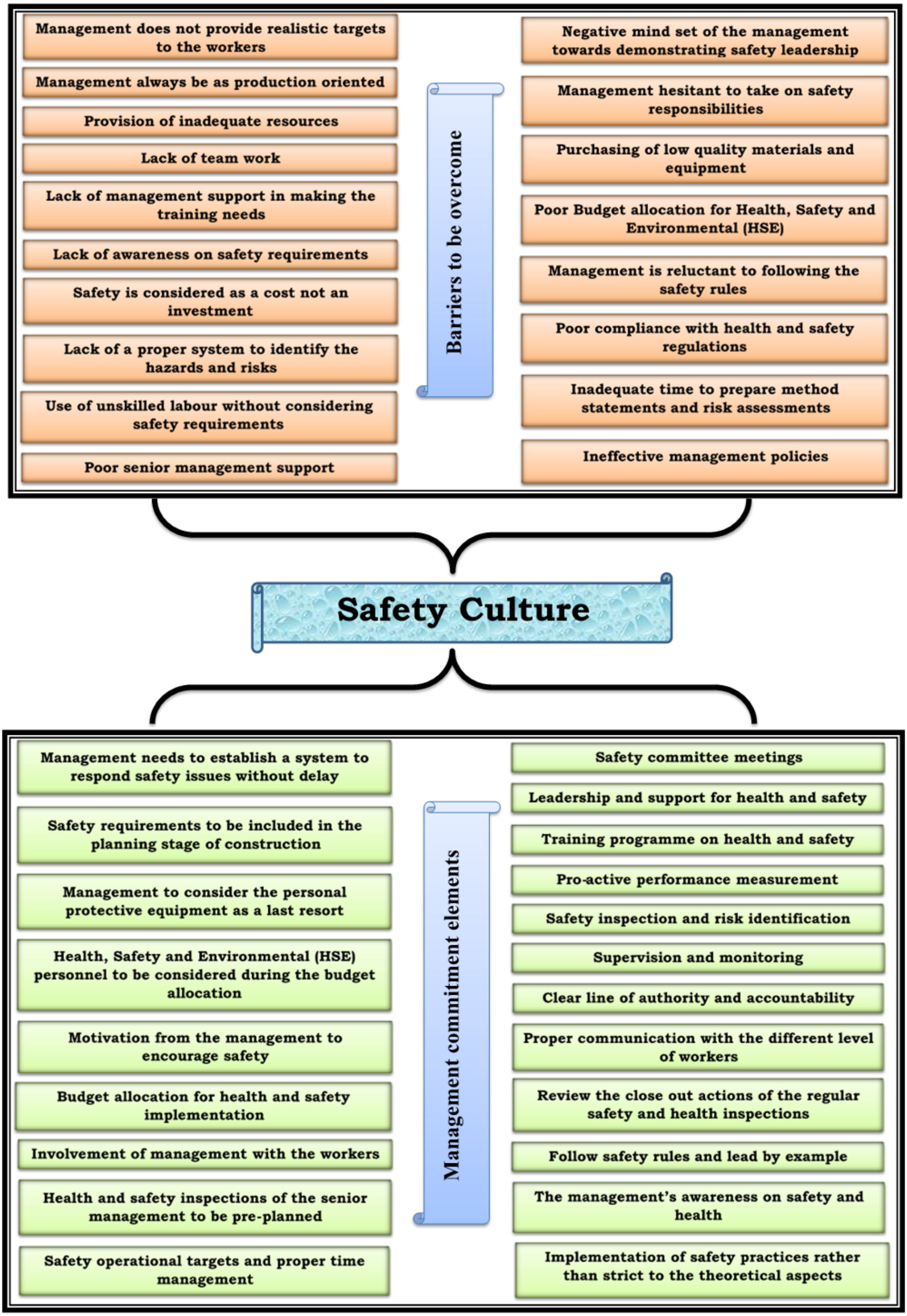

Figure 5.2 Proposed frameworks to establish safety culture in construction industry

The safety culture is to be established in construction industry to minimize, control or avoid unsafe acts and unsafe conditions. The management commitment is a vital factor and should be achieved in establishing safety culture. But, there are some barriers in achieving management commitment. By overcoming these barriers an organization or project can achieve a better management commitment and safety culture respectively.

The frame work will help to the industry practitioners and the construction professionals to establish safety culture through management commitment in an appropriate and effective manner. In such situations, practitioners possible to benchmark the efficiency of safety culture and if it is not in desirable or acceptable level, can improve it by following the proposed framework. Moreover it provides a holistic idea about management commitment with magnitude of benefits that can be achieved.

5.5 SUMMARY

This chapter analyzed and discussed the results obtained from the questionnaire survey and expert interview. Firstly, it discussed about the proposition of respondents and non-respondents to identify the return rate of questionnaires. The questionnaire survey obtained a total response rate of 87%. Further it described on how the questionnaire was developed.

As the next section it was discussed about the outcome of questionnaire survey. Relative importance index (RII) tool was used to prioritize the result. Further, one sample t-test was carried out to identify the most significant elements of management commitment and the barriers. As the outcome twenty one significant elements and eighteen barriers were identified and discussed using one sample t-test. To fulfill the aim of the research, framework was proposed to establish safety culture in construction industry.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.0 INTRODUCTION

This chapter draw conclusions arising from discussions in previous chapters relating to analysed data and literature. Following conclusive considerations of the study, framework was developed to establish the safety culture through management commitment which is the aim of the study. Subsequently, recommendations are provided based on research findings and the proposed guidelines. Eventually, limitations of the research and further research avenues are discussed.

6.1 CONCLUSIONS

The purpose of this study was to explore the existing management commitment elements and the barriers need to overcome in order to establish safety culture in construction industry. The first objective of this research was to identify the importance of safety culture and management commitment to establish the same in construction industry. The chapter two stands for achievement of first objective and a comprehensive knowledge on safety culture; occupational safety and health (OSH) in construction industry; construction accident trend; importance of management commitment; barriers to implement the commitment of management to establish the safety culture that were presented.

The second objective of the research was to investigate the elements of management commitment to establish the safety culture. This objective was achieved in chapter four section 4.1.1. In the first instance, eighteen management commitment elements and twenty barriers were identified in literature review. 09 additional elements and 10 additional barriers were identified and additionally suggested by interview respondents. The elements which are listed in table 4.2were investigated and the additional elements such as; safety requirements to be included in the planning stage of construction, implementation of safety practices rather than strict to the theoretical aspects; proper record keeping in ISO standards for future reviews; management needs

to establish a system to respond safety issues without delay; HSE personnel to be considered during the budget allocation; health and safety inspections of the senior management to be pre-planned, management needs to spend money reasonably on hygienic facilities, review the close out actions of the regular safety and health inspections and management to consider the personal protective equipment as a last resort were find out through content analysis in chapter four. The barriers which are listed in table 4.3 were investigated and additional barriers were suggested such as; management hesitant to take on safety responsibilities; management does not provide realistic targets to the worker; use of unskilled labour without considering safety requirements; purchasing of low quality materials and equipment; lack of a proper control system for sub-contractors; lack of required guidance provided from the enforcement bodies; negative mind set of the management towards demonstrating safety leadership; lack of management support in making the training needs, inadequate time to prepare method statements and risk assessments and management always be as production oriented were find out through content analysis.

Moreover identification of most significant elements and barriers were the third objectives of this study and it was achieved in chapter five. In the research findings under this objective, management needs to establish a system to respond safety issues without delay; safety requirements to be included in the planning stage of construction; review the close out actions of the regular safety and health inspections; management to consider the personal protective equipment as a last resort; HSE personnel to be considered during the budget allocation; safety committee meetings; budget allocation for health and safety implementation; pro-active performance measurement, leadership and support for health and safety and proper time management for operational targets hold the top prioritization among management commitment elements and management does not provide realistic targets to the workers; negative mind set of the management towards demonstrating safety leadership; management always be as production oriented; poor senior management support; provision of inadequate resources; lack of team work; poor Budget allocation for Health, Safety and Environmental (HSE); lack of management support for training needs; lack of awareness of safety requirements; purchasing of low quality materials, equipment and

inadequate time to prepare risk assessments and management reluctance in following safety rules are identified as significant barriers.

As the final objective, the significant elements and barriers were summarized and a framework was developed as shown in section 5.4 and it was undertaken through the analysis of relative importance index calculation. This framework will help industry practitioners to establish safety culture through management commitment in an appropriate and effective manner. Further practitioners possible to measure the adeptness of safety culture and if it is not in desirable or acceptable level, can improve by following the proposed framework. Moreover it provides a holistic idea about management commitment with magnitude of benefits that can be achieved.

Finally, it is possible to conclude that the aim of this research was successfully achieved and the results of this research will be useful for industrial practitioners when establishing safety culture through management commitment in construction industry.

6.2 RECOMMENDATIONS

Considering the conclusions of this research discussed in section 6.1 it is possible to make some useful recommendations for industry practitioners. The prioritization of significant elements and barriers, it is viable that management needs to establish a system to respond safety issues without delay; safety requirements to be included in the planning stage of construction, review the close out actions of the regular safety and health inspections and management to consider the personal protective equipment as a last resort have remarkable impact in establishing safety culture. The other elements, such as safety committee meetings; budget allocation for health and safety implementation; leadership and support for health and safety; training programme on health and safety; implementation of safety practices rather than theoretical aspects, proper time management for operational targets and pro-active performance measurement were also identified as significant elements.

Management does not provide realistic targets to the workers; negative mind set of the management towards demonstrating safety leadership; management always be as production oriented; poor senior management support, provision of inadequate

resources and reluctance of management in following safety rules were ranked as most significant barriers which are need to overcome in implementing management commitment. So it is recommended that 21 management commitment elements and 18 barriers which are mentioned in proposed framework should be considered in establishing safety culture through management commitment in construction industry.

Considering the proposed framework of significant elements and barriers, it can be recommended that industry practitioners to use it as a guide to establish safety culture in their industry. This research output 'Proposed framework to establish safety culture' provides a holistic idea about management commitment with magnitude of benefits. It can also be recommended to use the findings discussed in chapter 4 and 5 as a supplement for decision making. It will provide the comparative information about specific beneficial features of management commitment and safety culture.

6.2.1 Recommendations for construction project managers

The construction project managers should work with most effective safety management strategies before a project begins and while it is being built. This framework reveals a wide range of management commitment elements which requires to maintain in project sites. The project manager who has the accountability for the successful initiation, planning, design, execution, monitoring, controlling and closure of a project and he should recognize that risk directly impacts the likelihood of success is measured throughout the lifetime of the project. The proposed framework guides to identify what are the commitments that the project management should provide to control the risk as well as improve the safety culture. Further the support from project management view to overcome the barriers which are mentioned in the framework also can be improved.

6.2.2 Recommendations for government agencies and policy makers

The government agencies are in authority for set safety rules and regulations, conducting inspections, ensuring that standards are met, and maintaining a strong enforcement programme to deal with those who are not compliance with safety standards and procedures. Through this frame work it is possible to identify the non-

compliances and barriers in implementing management commitment. Further the government agencies can take necessary actions to ensure the standards and required support in establishing safety culture with the help of developed frame work in this research.

6.3 FURTHER RESEARCH

This research enclosed the management commitment elements to establish safety culture. Therefore, following research directions are suggested to take this study forward into new horizons.

1. This research focused only in construction industry, same study can be carried out for other industry such as; manufacturing industry, hospital and chemical industry.

2. This research focused only one factor (management commitment) of safety culture; further it can be carried out by considering other significant factors also such as; educational and awareness, documentation; supporting devices, site environment and behaviors.

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APPENDIX A: - CALCULATION OF RII VALUE FOR MANAGEMENT COMMITMENT ELEMENTS AND BARRIERS

	Management Commitment Elements	5	4	3	2	1	$\sum(W \times n)$	Mean $\frac{\sum(W \times n)}{N}$	RII $\frac{\sum(Wn)}{AN}$	Rank
1	Training programme on health and safety	16	17	7			169	4.23	0.845	9
2	Health & safety meetings	7	9	11	8	5	125	3.13	0.625	23
3	Leadership and support for health and safety	21	13	6			175	4.38	0.875	6
4	Pro-active performance measurement	16	14	10			166	4.15	0.830	12
5	Establishing safety rules at the site	2	9	6	13	10	100	2.50	0.500	25
6	Safety policies and system review	2	8	4	15	11	95	2.38	0.475	26
7	Compliance with regulations related to health and safety	2	7	7	11	13	94	2.35	0.470	27
8	Safety operational targets and proper time management	17	14	8	1		167	4.18	0.835	11
9	Safety inspection and risk identification	12	11	11	6		149	3.73	0.745	13
10	Supervision and monitoring	12	9	14	5		148	3.70	0.740	14
11	Budget allocation for health and safety implementation	15	18	7			168	4.20	0.840	10
12	Safety committee meetings	18	14	8			170	4.25	0.850	8
13	Clear line of authority and accountability	10	12	11	7		145	3.63	0.725	15
14	Motivation from the management to encourage safety	11	9	9	11		140	3.50	0.700	18
15	Proper communication with the different level of workers	10	11	13	5	1	144	3.60	0.720	16
16	Involvement of management with the workers	10	7	12	11		136	3.40	0.680	20
17	Follow safety rules and lead by example	12	6	10	12		138	3.45	0.690	19
18	The management's awareness on safety and health	11	10	10	8	1	142	3.55	0.710	17
19	Safety requirements to be included in the planning stage of construction	26	10	4			182	4.55	0.910	2
20	Implementation of safety practices rather than strict to the theoretical aspects	19	15	6			173	4.33	0.865	7
21	Proper record keeping in ISO standards for future reviews	2	8	9	11	10	101	2.53	0.505	24
22	Management needs to establish a system to respond safety issues without delay	28	9	3			185	4.63	0.925	1
23	Health, Safety & Environmental (HSE) personnel to be considered during the budget allocation	22	12	6			176	4.40	0.880	5
24	Health and safety inspections of the senior management to be pre-planned	9	8	12	9	2	133	3.33	0.665	21
25	Management needs to spend money reasonably on hygienic facilities	8	10	7	10	5	126	3.15	0.630	22
26	Review the close out actions of the regular safety and health inspections	25	9	6			179	4.48	0.895	3
27	Management to consider the personal protective equipment as a last resort	23	12	5			178	4.45	0.890	4

	Barriers Need to Overcome	5	4	3	2	1	$\sum(W \times n)$	Mean $\frac{\sum(W \times n)}{N}$	RII $\frac{\sum(W}{A}$	Rank
1	Management is reluctant to following the safety rules	16	10	12	2		160	4.00	0.800	14
2	Poor Budget allocation for Health, Safety & Environmental (HSE)	16	18	6			170	4.25	0.850	7
3	Poor compliance with health and safety regulations	7	12	9	11	1	133	3.33	0.665	18
4	Lack of awareness of safety requirements	13	21	6			167	4.18	0.835	9
5	Provision of less qualified safety officers	5	9	13	11	2	124	3.10	0.620	21
6	Poor senior management support	18	20	2			176	4.40	0.880	4
7	Provision of inadequate resources	19	17	4			175	4.38	0.875	5
8	Ineffective management policies	7	15	12	6		143	3.58	0.715	15
9	Lack of proper organizational structure		11	10	14	5	107	2.68	0.535	26
10	Lack of team work	14	23	3			171	4.28	0.855	6
11	Lack of clear lines of authority and accountability	6	7	14	13		126	3.15	0.630	19
12	Lack of Involvement with safety issues and late response	6	6	13	15		123	3.08	0.615	22
13	Less support from any of the partners (such as client, public and government)		6	17	11	6	103	2.58	0.515	29
14	Lack of positive attention	5	12	6	17		125	3.13	0.625	20
15	Not adapting the innovations		9	13	12	6	105	2.63	0.525	27
16	Weakness in the communication interface	3	10	12	15		121	3.03	0.605	24
17	Reactive rather than proactive management	4	11	9	15	1	122	3.05	0.610	23
18	Lack of a proper system to identify the hazards and risks	10	8	15	7		141	3.53	0.705	16
19	Safety is considered as a cost not an investment	16	17	4	3		166	4.15	0.830	10
20	Complexity in the safety legislation and regulations		7	18	14	1	111	2.78	0.555	25
21	Management hesitant to take on safety responsibilities	12	22	5	1		165	4.13	0.825	11
22	Management does not provide realistic targets to the workers	24	14	2			182	4.55	0.910	1
23	Use of unskilled labour without considering safety requirements	10	10	9	11		139	3.48	0.695	17
24	Purchasing of low quality materials and equipment	14	15	10	1		162	4.05	0.810	12
25	Lack of a proper control system for sub-contractors		5	16	17	2	104	2.60	0.520	28
26	Lack of required guidance provided from the enforcement bodies		5	13	18	4	99	2.48	0.495	30
27	Negative mind set of the management towards demonstrating safety leadership	22	14	4			178	4.45	0.890	2
28	Lack of management support in making the training needs	14	20	6			168	4.20	0.840	8
29	Inadequate time to prepare method statements and risk assessments	11	21	6	2		161	4.03	0.805	13
30	Management always be as production oriented.	21	15	4			177	4.43	0.885	3

APPENDIX B: MANAGEMENT COMMITMENT ELEMENTS:

T- TEST OUTPUT

One-Sample Test					
	Test Value = 3				
	t	df	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Training programme on health and safety	10.564	39	1.225	.99	1.46
Health & safety meetings	.615	39	.125	-.29	.54
Leadership and support for health and safety	11.747	39	1.375	1.14	1.61
Pro-active performance measurement	9.066	39	1.150	.89	1.41
Establishing safety rules at the site	-2.550	39	-.500	-.90	-.10
Safety policies and system review	-3.204	39	-.625	-1.02	-.23
Compliance with regulations related to health and safety	-3.284	39	-.650	-1.05	-.25
Safety operational targets and proper time management	7.895	39	1.150	.86	1.44
Safety inspection and risk identification	4.318	39	.725	.39	1.06
Supervision and monitoring	4.246	39	.700	.37	1.03
Budget allocation for health and safety implementation	10.494	39	1.200	.97	1.43
Safety committee meetings	10.184	39	1.250	1.00	1.50
Clear line of authority and accountability	3.748	39	.625	.29	.96

Motivation from the management to encourage safety	2.687	39	.500	.12	.88
Proper communication with the different level of workers	3.509	39	.600	.25	.95
Involvement of management with the workers	2.199	39	.400	.03	.77
Follow safety rules and lead by example	2.336	39	.450	.06	.84
The management's awareness on safety and health	2.959	39	.550	.17	.93
Safety requirements to be included in the planning stage of construction	14.470	39	1.550	1.33	1.77
Implementation of safety practices rather than strict to the theoretical aspects	11.482	39	1.325	1.09	1.56
Proper record keeping in ISO standards for future reviews	-2.464	39	-.475	-.86	-.09
Management needs to establish a system to respond safety issues without delay	16.368	39	1.625	1.42	1.83
Health, Safety & Environmental (HSE) personnel to be considered during the budget allocation	11.898	39	1.400	1.16	1.64
Health and safety inspections of the senior management to be pre-planned	1.704	39	.325	-.06	.71
Management needs to spend money reasonably on hygienic facilities	.703	39	.150	-.28	.58
Review the close out actions of the regular safety and health inspections	12.428	39	1.475	1.23	1.72
Management to consider the personal protective equipment as a last resort	12.838	39	1.450	1.22	1.68

APPENDIX C: BARRIERS TO BE OVERCOME:

T- TEST OUTPUT

One-Sample Test					
	Test Value = 3				
	t	df	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Management is reluctant to following the safety rules	6.583	39	1.000	.69	1.31
Poor Budget allocation for Health, Safety & Environmental (HSE)	11.180	39	1.250	1.02	1.48
Poor compliance with health and safety regulations	1.801	39	.325	-.04	.69
Lack of awareness of safety requirements	11.008	39	1.175	.96	1.39
Provision of less qualified safety officers	.572	39	.100	-.25	.45
Poor senior management support	14.994	39	1.400	1.21	1.59
Provision of inadequate resources	13.029	39	1.375	1.16	1.59
Ineffective management policies	3.797	39	.575	.27	.88
Lack of proper organizational structure	-2.010	39	-.325	-.65	.00
Lack of team work	13.471	39	1.275	1.08	1.47
Lack of clear lines of authority and accountability	.902	39	.150	-.19	.49
Lack of Involvement with safety issues and late response	.443	39	.075	-.27	.42
Less support from any of the partners (such as client, public and government)	-2.888	39	-.425	-.72	-.13

Lack of positive attention	.710	39	.125	-.23	.48
Not adapting the innovations	-2.360	39	-.375	-.70	-.05
Weakness in the communication interface	.162	39	.025	-.29	.34
Reactive rather than proactive management	.291	39	.050	-.30	.40
Lack of a proper system to identify the hazards and risks	3.127	39	.525	.19	.86
Safety is considered as a cost not an investment	8.145	39	1.150	.86	1.44
Complexity in the safety legislation and regulations	-1.854	39	-.225	-.47	.02
Management hesitant to take on safety responsibilities	9.844	39	1.125	.89	1.36
Management does not provide realistic targets to the workers	16.421	39	1.550	1.36	1.74
Use of unskilled labour without considering safety requirements	2.602	39	.475	.11	.84
Purchasing of low quality materials and equipment	7.851	39	1.050	.78	1.32
Lack of a proper control system for sub-contractors	-3.252	39	-.400	-.65	-.15
Lack of required guidance provided from the enforcement bodies	-3.920	39	-.525	-.80	-.25
Negative mind set of the management towards demonstrating safety leadership	13.536	39	1.450	1.23	1.67
Lack of management support in making the training needs	11.049	39	1.200	.98	1.42
Inadequate time to prepare method statements and risk assessments	8.101	39	1.025	.77	1.28
Management always be as production oriented.	13.350	39	1.425	1.21	1.64

APPENDIX D: T- TABLE AND CRITICAL T-VALUE

t Table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$	$t_{.999}$	$t_{.9995}$
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416
100	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390
1000	0.000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581	3.098	3.300
z	0.000	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.090	3.291
	0%	50%	60%	70%	80%	90%	95%	98%	99%	99.8%	99.9%
	Confidence Level										

APPENDIX E: - INTERVIEW GUIDELINE

The information draws together from this interview will only be used in accomplishing the dissertation for the award of Master of Science Honors degree in Occupational Health and Safety Management. To maintain confidentiality, the actual names of the organizations and the interviewees will not be revealed in this report or any other document related to this study.

BACKGROUND INFORMATION

Project Name :

Respondent Name :

Designation :

Date :

INTRODUCTION

1. Do you have safety staff to monitor, guide and make aware the safety aspects?
2. What are the factors that motivate you to consider/comply health and safety management at your project?

ABOUT MANAGEMENT COMMITMENT

1. Do you think that your project has implemented the positive safety culture?
2. Do you have a safety policy?
3. Do you have safety targets fixed? How much you get success in achieving those targets?
4. Has the management committed and provide adequate support in the safety requirements in order to fulfill the requirements of safe system of work?
5. What are the few actions of the senior management does towards visible leadership and commitment among the employees?
6. What are the ways that the management involves with the workers?
7. Do you have any methods to identify the hazard of work place?
8. Do you have a system to follow up the health and safety functions regularly?

9. Is your project in compliance with the local regulations?
10. Are the documents and records are maintained in a manner so that it could be used as an evidence as required?
11. Do you participate in safety meetings, trainings and safety inspections?
12. What are the proactive actions taken by the senior management in order to control the accidents, incidents or near misses?
13. Do you think that the employee's including senior management is having enough awareness in health and safety?
14. Are you satisfied with the competency level of the site personnel?
15. Does the senior management support towards provision of information, instruction and training to the employees.
16. Do you feel that the current budget allocation for HSE is adequate?
17. How is your communication levels and relationship with employees in relation to HSE?
18. Is there any clear line of authority and accountability or distribution of responsibility within the project site?
19. Does the management motivate/encourage safety improvements? Examples?
20. Does your project have any procedure to take action against those who do not follow the safety rules at site? State briefly.
21. Do you think that the senior management has provided the required resources to carry out the tasks smoothly and safely in order to comply with the health and safety requirement?
22. How often you review the safety policies, safety management system and site procedures and rules?
23. What are the control measures you follow whenever the hazards are ignored?
24. Have you implemented any program to build-up team work?

25. What are the difficulties you faced in addressing the HSE issues that came across in your project?
26. What are the actions you took in the past in order to overcome the laps and barriers in regards to health and safety?
27. Is that true that the senior management staffs are reactive rather than proactive in health and safety actions?
28. Do you have any suggestions to overcome the barriers and/or improve the HSE at your project?
29. "Safety is an investment not a cost" Do you agree with this statement?
30. Any other comments you would like to make?

I would like to thank you for the information given and time you have dedicated to this research. If you are interested to know the outcome of this research, it would be my pleasure to share it with you.

APPENDIX F: - QUESTIONNAIRE GUIDELINE

Developing a Framework to Establish the Safety Culture in Construction Industry through Management Commitment

Questionnaire brief

The aim of this research is identify the elements of management commitment and to propose a framework to establish the safety culture in Construction industry. Results of this questionnaire are expected to accomplish the following objectives of the research;

- Identify the existing level of management commitmenttowards establishing the safety culture in construction projects
- Identify the barriers to overcome in implementing the management commitment

The questionnaire contains two sections as follows;

- Section A: Focuses on establishing the existing levels of management commitment
- Section B: Focuses on establishing the barriers to implement management commitment

Confidentiality statement

The information drawn from this questionnaire will be anonymously used in accomplishing the dissertation for the award of Master of Science in Occupational Safety and Health Management. All collected data will be handled with strict confidentiality. The actual names of the organisations and the respondent details will not be revealed in the report or any other document related to this study.

Thank you in advance for your participation. Your valuable time and expert opinion is highly appreciated.

Researcher;
A.Haleemdeen
Post Graduate Student
M.Sc. in Occupational Safety and Health Management
Department of Building Economics,
University of Moratuwa.
E-mail – oshas13@hotmail.com
Tel – 075 3510149

Respondent details (Optional)

Name of the respondent : - ……

Designation : - …….

Years of experience : - ……

Organization details

1. Name of the Organization : - ……

2. What is the approximate number of employees in your organization?

☐ Less than 100 ☐ 100-300 ☐ More than 300

3. Type of the organization

☐ Building construction

☐ Infrastructure construction

☐ Others. Please specify) ……..

4. Do you have a separate department for health and safety management?

☐ Yes ☐ No

5. What are the factors encouraged you to consider on the health and safety management implementation?

☐ Moral interest ☐ Social reasons

☐ Financial interest ☐ Legal requirements

☐ To keep the accident rate at zero level

☐ Others (Please Specify) ……..

6. Does your organization have a safety policy?

☐ Yes ☐ No

7. Are you satisfied with the current health and safety management of your project?

☐ Satisfied ☐ Not Satisfied ☐ Need to Implement

SECTION A - EXISTING ELEMENTS OF MANAGEMENT COMMITMENT

This section attempts to determine the level of existing management commitment from the senior management in construction industry. Please tick (√) your degree of agreement, if the same is applicable/implemented currently at the construction projects.

Note: *You are required to consider a construction project that you are currently involved in indicating your answers. Please use the following scale in indicating your degree of agreement:*

Very Low	Low	Moderate	High	Very High
1	2	3	4	5

No	MANAGEMENT COMMITMENT ELEMENTS	Degree of agreement				
		Very Low	Low	Moderate	High	Very High
1	Training programme on health and safety	1	2	3	4	5
2	Health & safety meetings	1	2	3	4	5
3	Leadership and support for health and safety	1	2	3	4	5
4	Pro-active performance measurement	1	2	3	4	5
5	Establishing safety rules at the site	1	2	3	4	5
6	Safety policies and system review	1	2	3	4	5
7	Compliance with regulations related to health and safety	1	2	3	4	5
8	Safety operational targets and proper time management	1	2	3	4	5
9	Safety inspection and risk identification	1	2	3	4	5
10	Supervision and monitoring	1	2	3	4	5
11	Budget allocation for health and safety implementation	1	2	3	4	5
12	Safety committee meetings	1	2	3	4	5
13	Clear line of authority and accountability	1	2	3	4	5

No	MANAGEMENT COMMITMENT ELEMENTS	Degree of agreement				
		Very Low	Low	Moderate	High	Very High
15	Proper communication with the different level of workers	1	2	3	4	5
16	Involvement of management with the workers	1	2	3	4	5
17	Follow safety rules and lead by example	1	2	3	4	5
18	The management's awareness on safety and health	1	2	3	4	5
19	Safety requirements to be included in the planning stage of construction	1	2	3	4	5
20	Implementation of safety practices rather than strict to the theoretical aspects	1	2	3	4	5
21	Proper record keeping in ISO standards for future reviews	1	2	3	4	5
22	Management needs to establish a system to respond safety issues without delay	1	2	3	4	5
23	Health, Safety & Environmental (HSE) personnel to be considered during the budget allocation	1	2	3	4	5
24	Health and safety inspections of the senior management to be pre-planned	1	2	3	4	5
25	Management needs to spend money reasonably on hygienic facilities	1	2	3	4	5
26	Review the close out actions of the regular safety and health inspections	1	2	3	4	5
27	Management to consider the personal protective equipment as a last resort	1	2	3	4	5

SECTION B – BARRIERS TO OVERCOME IN IMPLEMENTING MANAGEMENT COMMITMENT

This section determines the barriers that affect the implementation of the management commitment in construction industry. Please tick (√) your degree of agreement.

Note: You are required to consider a construction project that you are currently involved in indicating your answers. Please use the following scale in indicating your degree of agreement:

Very Low	Low	Moderate	High	Very High
1	2	3	4	5

No	BARRIERS NEED TO OVERCOME	Degree of agreement				
		Very Low	Low	Moderate	High	Very High
1	Management is reluctant to following the safety rules	1	2	3	4	5
2	Poor Budget allocation for Health, Safety & Environmental (HSE)	1	2	3	4	5
3	Poor compliance with health and safety regulations	1	2	3	4	5
4	Lack of awareness of safety requirements	1	2	3	4	5
5	Provision of less qualified safety officers	1	2	3	4	5
6	Poor senior management support	1	2	3	4	5
7	Provision of inadequate resources	1	2	3	4	5
8	Ineffective management policies	1	2	3	4	5
9	Lack of proper organizational structure	1	2	3	4	5
10	Lack of team work	1	2	3	4	5
11	Lack of clear lines of authority and accountability	1	2	3	4	5
12	Lack of Involvement with safety issues and late response	1	2	3	4	5
13	Less support from any of the partners (such as client, public and government)	1	2	3	4	5

No	BARRIERS NEED TO OVERCOME	Degree of agreement				
		Very Low	Low	Moderate	High	Very High
15	Not adapting the innovations	1	2	3	4	5
16	Weakness in the communication interface	1	2	3	4	5
17	Reactive rather than proactive management	1	2	3	4	5
18	Lack of a proper system to identify the hazards and risks	1	2	3	4	5
19	Safety is considered as a cost not an investment	1	2	3	4	5
20	Complexity in the safety legislation and regulations	1	2	3	4	5
21	Management hesitant to take on safety responsibilities	1	2	3	4	5
22	Management does not provide realistic targets to the workers	1	2	3	4	5
23	Use of unskilled labour without considering safety requirements	1	2	3	4	5
24	Purchasing of low quality materials and equipment	1	2	3	4	5
25	Lack of a proper control system for sub-contractors	1	2	3	4	5
26	Lack of required guidance provided from the enforcement bodies	1	2	3	4	5
27	Negative mind set of the management towards demonstrating safety leadership	1	2	3	4	5
28	Lack of management support in making the training needs	1	2	3	4	5
29	Inadequate time to prepare method statements and risk assessments	1	2	3	4	5
30	Management always be as production oriented.	1	2	3	4	5

I would like to thank you for the information given and time you have dedicated to this research. If you are interested to know the outcome of this research, it would be my pleasure to share it with you

APPENDIX –G: MANAGEMENT COMMITMENT'S INVOLMENT IN CONSTRUCTION PROJECTS

Project director, project manager, safety manager and other site personnel involving in safety award ceremony, toolbox talk, committee meeting and encouraging training programs

PROJECT – A

Safety awarding ceremony

PD's safety inspection

Training Programme

Morning tool box talk

Morning Task briefing

HSE committee meeting

PROJECT B

Senior Management Site Inspection

Monthly Safety Awarding Ceremony

Morning Toolbox Talk

Morning Exercise

HSE Committee Meeting

Morning Task Briefing

PROJECT C

Morning Toolbox Talk

Spot Training

APPENDIX H: - MANAGEMENT COMMITMENT TOOLS ARE PRACTICED IN COMPLIANCE WITH HSE SYSTEM

Item #01 - HSE promotional activities

Monthly Safety and Environment Report No. 06
Jan 2015

H/

-house rules were translated in two languages, English, Sinhalese.

5. Safety Promotion

5.1 Promotional Activities Conducted

- Safety Signboards were displayed on the site.
- OHSE posters were displayed on the site.
- Safety Induction Courses for all workers, supervisory staff and WHI staff were conducted.
- PPE inspections were conducted.
- Mass Toolbox meeting was conducted.
- Safety Talk on selected topic was conducted.

Safety Banners Displayed

Daily Tool Box Meeting & Safety award

6. Safety Inspections

Item #02 – HSE meeting

Health, Safety & Environmental Meeting # 04 (Monthly Meeting)			
Date	: 18/03/2015	Time	: 03.15 pm
Location	: TRAINING CENTER	Distribution: To: All Attendees & the Action	

Agenda:

1) Health, Safety and Environmental Management System
2) Accident and Incident
3) Safe System of Work
4) Welfare Provision

Item No	Di	Action By	Date
The Project Director chaired the meeting and said that this is an important meeting and all the nominated members need to attend without fail. All the policy decisions in HSE are made in this meeting.			
1.1	The canteen agreement need to review – The price revision will be done and the agreement will be ready within the next two weeks and the time schedule for tea and lunch should be displayed. The server have to	Mr. Gamunu	
1.2	Subcontractor/Man power supply – Supervisors to be always at site with their workers monitoring their activities. If there is any problem in labour	Subcontractor/Man power	info
1.3	The people who are enter into the site under influence of drugs and alcohol, severely punished through the site violation system	All	Info
1.4	First aider should be check the patient thoroughly and find out the actual reason for the disease or injury before send him to the hospital unless it is emergency.		
CURRENT MATTERS / ISSUES			
2.1	HSE Manager briefed on the importancy having the HSE meeting quoted the Local Legislation- the Factories Ordinance No 45 of 1942 requirements to have the same regularly at site as scheduled. Further he mentioned the top management, middle management	ALL	Info

2.2	Personal protective equipment issue: the person who use the PPE including full body harness need to store the items in a proper way. The fine system will apply against the violator who misuse the PPE and store it	All	Info
2.3	The task briefing should be done every day morning 8.00am to 8.15am by each foreman and supervisor among their team. HSE officer also need to attend to support and point out unsafe conditions and unsafe acts which they forgot to mention. The summary of the	All	Info
2.4	Changing room for labours should be arranged and the damaged plywood of the canteen floor have to replace	Mr. Gamunu	
2.5	Immediate response person is foreman/ supervisor. If any task continued to another shift (after 6.30 pm) they should be available until the completion. All the workers also have to be aware "what is the task and	All	Info
2.6	All the lifting accessories should be handle and stored properly. Riggers must consider this issue and they are the responsible person to the lifting accessories.	Mr. Praveen	Info
2.7	Power tools and circular saw should be use according to the manufacture guidance and make sure the size of	Mr. Praveen	Info
2.8	Housekeeping was improved very much and it has to be maintain. Do the housekeeping 10-30 minutes before handover to next shift people. Good housekeeping	Mr. Viney, Mr.Prabakaran &All	Info
2.9	Scaffolding materials brought and placed here and there all over the site premise. Those materials should kept properly without obstructing the access and other	Mr. Manjula	
3.0	Improper lighting in slope tower B-2 and B-1 slabs. Provide adequate lighting for people moving and also control the mosquito spreading and urination.	Mr. Praveen	

Prepared by : HSE Officer

Next Meeting will be held on 09.04.2015 @ 3pm.

Item #03 – HSE Inspection report

HEALTH, SAFETY & ENVIRONMENTAL INSPECTION

LOCATION	**COLOMBO-02**	**INSPECTED BY:**	**DATE :20.04.2015 TO 25.04.2015**	**TIME: SHIFT**
SECTION:	**ALL**	**ACCOMPANIED BY:**		REPORT NO : **19**

CHECK LIST

1. HOUSE KEEPING	√	7. FIRE		13. EXCAVATION	√	19. ACCESS ROAD/ACCESS STAIRS	√
2. MATERIALS STORAGE	√	8. WORKING PLATFORMS	√	14. FILLING PROCESS		20. CYLINDER HANDLING	
3. SANITARY FACILITIES		9. LADDERS/STAIRS	√	15. P.P.E.	√	21. WELFARE	
4. KITCHEN/HYGIENE		10. EMERGENCY VEHICLES		16. COSHH		22. HAND TOOLS	
5. DISPOSAL OF WASTE	√	11.PLANT ENTRANCE	√	17. LOADING/UNLOADING		23. COMMUNICATION	
6. ELECTRICITY	√	12. SIGNAGE	√	18.STORES	√	24. SCAFFOLDING	√

OBSERVATIONS:	**ACTIONS REQUIRED, PARTICULARLY UNDERLYING MANAGEMENT OR SYSTEM INADEQUACIES:**	**CLOSE OUT (NAME/DATE)**
01 Working at height without safety harness, platform and access	Proper working platform and life-line with access is required to carry out this kind of activities Risk of fall from height and fatal injuries To control this kind of risk relevant site engineers commitment needed. Ensure that the work area is safe with adequate resource to do the task Statues **High risk**	Mr. Suresh Mr. Rampravesh yadav
02 Unsafe chipping (water tank area)	Proper working platform with access is required Risk of fall injuries Ensure that the work area is safe to do the task Statues **Medium risk**	Mr. Marvin

03	Improper placement and use of ladder	Ladder should be place in safe angle (70°-75°). Hand rail is required for steel travel way ladders Risk of slip and fall injuries		Mr. Rampravesh yadav Mr. Anil
		Statues	**Medium risk**	
04	Concrete pouring activity without safe working platform	Safe working platform with edge protection should be provided for concrete pouring activity Risk of personnel falling from height and fatal injuries		Mr. Gayan G K Mr. Marvin Mr. Suresh
		Statues	**High risk**	

FAILURE TO 'CLOSE OUT'WITHIN THE STIPULATED PERIOD WILL RESULT IN CALLING INQUIRY.

INSPECTOR:	**RECIPIENT:**	**DISTRIBUTION:**			
Print Name:	Print Name:			CLIENT	
HSE Oficer			√	CONSULTANT	
			√		
					√
Signature:			√		
Date:					
			√		
Reviewed by:			√		
			√		
HSE Manager			√		
			√		
Signature:					
	Signature:		√		
Date:					
	Date:				
				HSE File	√

Item #04 – Corrective/ closeout action report

*[Appendix 6.4]

[redacted]

Corrective Action Request	CAR No.	2015-003
	Date	20.04.2015
☐ Internal ☐ Supplier ☒ Subcontractor	Page	01 OF 02

You are hereby informed that the following unsafe act/condition was observed and rectification for corrective actions shall be implemented by

(A) Detail to be completed by originator

Description of Non-conformity	☐ Accident(Minor, Significant, Major) ☐ Near Miss ☐Safety Violations ☐ Work Stop ☒ Others : HSE -2015 Audit Finding(16.04.2015)	
Responsible Company : [redacted]	Area : BD # 06	Supervisor Name & ID No. [redacted]

Findings:

Improper Access management
Refer to attachment #01
Proper access Should be provided.

Prepared by: (Issuer/Originator)	Checked by	Approved by
[redacted]	[redacted]	[redacted]

(B) Details to be completed by responsible function

Root Cause Analysis is required ☐ Yes ☐ **No**

Root Cause of Problem ☐ Design ☐ Material ☐ Human ☐ Machine ☐ Method / Process ☐ Others

Summary of the Root Cause Analysis

Participants of Root Cause Analysis

Action taken to prevent recurrence

We removed the ladder to the foundation for T/C #6 immediately. So as to avoid similar findings will manage care. Backfilling also has been completed by now.

Prepared by (Subcontractor Site Manager)	Checked by (HKN JV Discipline Manager)	Approved by (HKN JV HSE Manager)
[redacted]	[redacted]	[redacted]

(C) Detail to be completed by verification and [redacted]

Verified Close-out by Originator	Name/Signatory/Designation/Department
☑Accept ☐ Reject	

Reason for Rejection:

Item #05 – HSE training

Main Contract

Prepared by:	Reviewed by:	Approved by:
SYDNEY		

HSE TRAINING REPORT

(2015.04.02) rev.0

DATE	04/04/2015 ✓	TIME	1.30 PM
Trainer	MR TERRANCE SYDNEY	Issued company	[redacted]

Training Agenda

1. PROPER ACCESS/EGRESS SHALL BE PROVIDED FOR PERSONNEL TO WORK AREA.
2. ALL PERSONNEL SHALL WEAR THE MANDATORY P P E
3. KEEP ONLY REQUIRED MATERIAL AT WORK SITE
4. KEEP THE ACCESS CLEAR/IS) STOCK EXTRA MATERIAL AWAY FRO WORK PLACE

Attendence

NAME	I D NO.	SIGN	NAME	I D NO.	SIGN
Dilrasha	916025770V				
R.P. Ajith	882471268V				
M J P Perera	650494350V				
B.A.J Soya	603120857X				
K.A.L. Thabrew	663310127V				
D.D.Sa.Pathiraja	680740763V				
S.M. Newman. D.S					
T.D.M.Buddika	920601014V	HSE office			

Item #06- Work area check list

ISSUE: 00	DATE: 16.02.2014	REV.: 00	-HSE-F-015

Project: Date :

Sl. #	Item Description	STATUS														REMARKS
		YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	
1	Proper **house keeping** is maintained and general condition of walk way areas is acceptable.															
2	Regular clearing of generated rubbish															
3	sing boards are properly installed															
4	properly removed cables / obstracle in the walk way area															
5	access / egress to work areas are always maintained clear and unostructed.															
6	Passages / walkways / stairways are always kept clear and well lit.															
7																
8	Adequate lighting provided for the work areas/walkways															
9	fogging programe done internal/Abans															
10	All cables and water boilers are properly installed															
Any other items:																

Comments / Observations if any:

Inspected by:

Item #07- HSE Commitment meeting

MINUTES OF MONTHLY HSE COMMITMENT MEETING			
PROJECT:			
SUBJECT:	Agenda NO. 08	Ref No:	**Minute of HSE Comm. Meeting #08**
Purpose:	Co-ordinate on-site H&S issues with the Management.		
Venue:			
Date:	8th May 2015.	Time:	10:30am – 11:30am
Distribution:	Project Director, Sr. Project Manager. All Attendees.	Issue Date:	8th May 2015.

ATTENDEES:

Management team to include where possible Departmental heads, Subcontractors, Site Manager & HSE Manager

No	Name	Position	No	Name	Position
				Sub-Contractor : Sam Ku Lanka	
01		Project manager	07		Project Manager
02		QA/QC Coordinator	08		Safety manager
03		HSE Manager	09		HSE Officer
04		Deputy Manager-HSE			
	Sub-Contractor : Nawaloka				
05		Project Manager			
06		HSE Engineer			

Previous MOM	Previous MOM accepted as a true record by all present. If no, state comments here.	Yes o	No

No.	Item	Action by
1.0	has discussed these topics during the meeting through the presentation, (Presentation Attached) **Safety Moment,HSE Statistics,HSE Findings, Near Miss, Medical Treatment Cases, First Aid Cases,Other Business** 1. **Safety Moment-** **Hierarchy of hazard control system-**It is a system used to minimize or eliminate exposure to hazards. The "Hierarchy of Controls" should be used at all times when implementing controls to eliminate the hazard or reduce the risk of a hazard causing loss / damage / injuries. The hierarchy of hazard controls is a list which emphasises controlling a hazard at the source. 2. **HSE Statistics, Findings & Trend analysis** HSE Accident Statistics, Joint Inspection Finding, Joint inspection Finding Trend-Company wise & unsafe condition/act wise, Near miss cases, Medical treatment	

Item #08 – Daily co-ordination meeting

Main Contract

HSE Daily coodination Meeting

(2015.03.30) rev.0

DATE	04/05/2015	TIME	4:30 pm

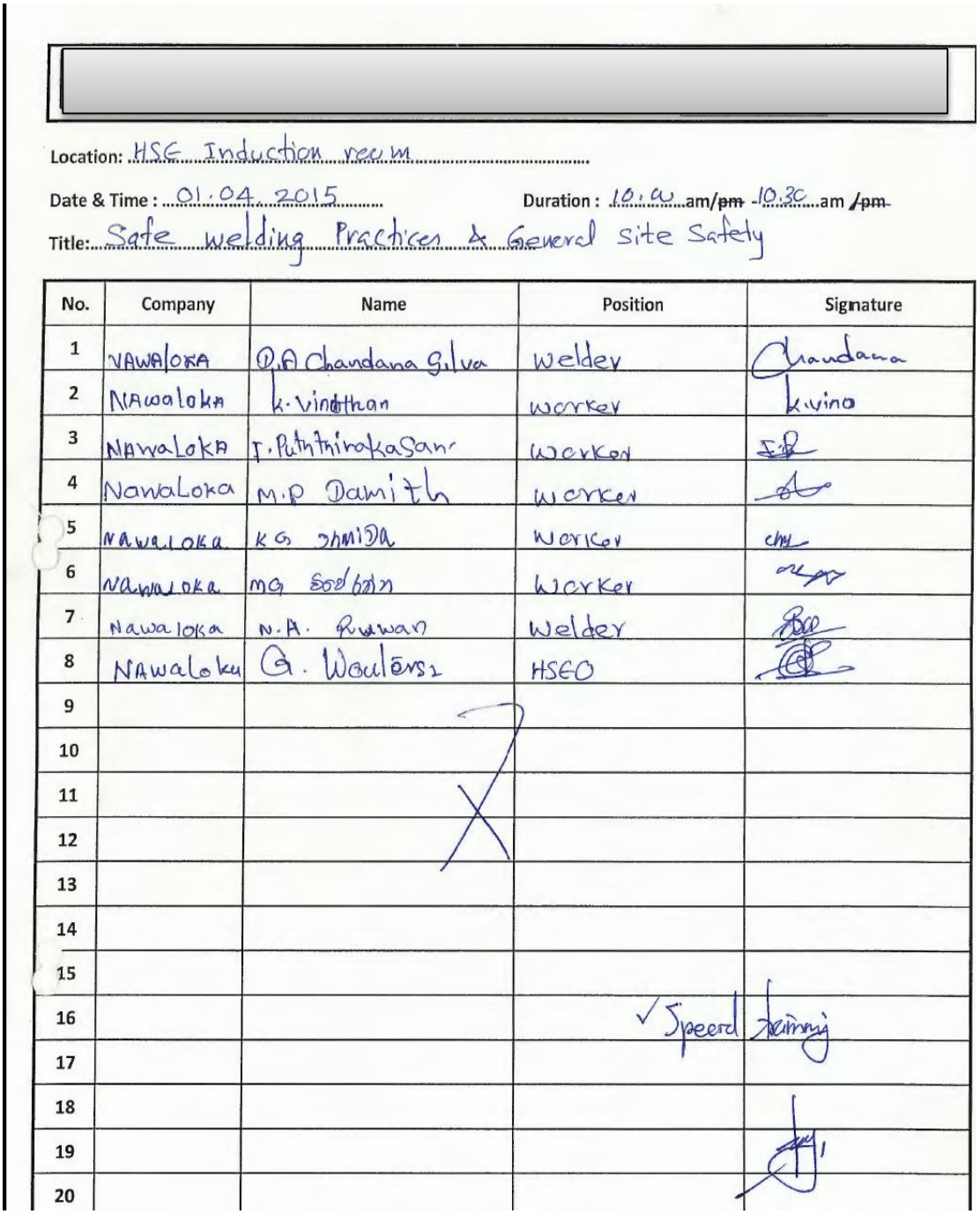
ATTENDEE

NAME	COMPANY	SIGNITURE	NAME	COMPANY	SIGNITURE
[redacted]					

Meeting agenda

Issure	Finding / Request	Corrective action	Remark
SYDNEY	WORKERS ARE REQUESTING TO NAWALOKA. FEMALE - OFFICE Requesting provide toilet facilities	I.H.N safety engineer send. I will Discussed with K.H.N	VERY SOON
		Safety manager Regarding toilet facilities - portable or sweet water which they should provided to Hot.	MR LOSS THIS AFTERNOON
Sydney	Maintain & continuously go through with Training for the workers.	- Daily Training Program Every day will be conducted	By Sydney
NAWALOKA MR. WALTER	MR REQUISITED FOR NAWALOKA MANAGEMENT TO PROVIDE WATER ISSUES FOR WORKERS	WAITING for	By WALTERS NAWALOKA
	AREA NOT TOILET WORKS NOT OPEN	TO BE DISCUSSED MR LOSS : EXTRA TOILETS TO PROVIDE	MR LOSS
SYDNEY SRILANKA MR WALTERS SYDNEY	Drilling ATTACHMENT FOR Building # 1 TOILET IS AVAILABLE BUT NO any proper ACCESS of	meeting proper ACCESS should of Army immediately by proper walkway TO BE PROVIDE. immediately	Daily informed But NOT Respect Actions Required immediately K.H.N

Item #09 –Special trainings



Location: HSE Induction room

Date & Time : 01.04.2015 Duration : 10.00 am/~~pm~~ - 10.30 am /~~pm~~

Title: Safe welding Practices & General site Safety

No.	Company	Name	Position	Signature
1	NAWALOKA	D.A Chandana Silva	Welder	Chandana
2	NAWaloka	k. vinothan	worker	k.vino
3	NAWaLoKA	I. Puthithirakasan	Worker	
4	NawaLoka	M.P Damith	Worker	
5	NAWaLoKa	KG [illegible]	Worker	
6	NAWaLoKa	MG [illegible]	Worker	
7	Nawaloka	N.A. Ruwan	Welder	
8	NAWaLoKa	G. Woulers1	HSEO	
9				
10				
11				
12				
13				
14				
15				
16			✓Speed	
17				
18				
19				
20				

Item #10- Site Safety Inspection Report

[redacted]

SITE SAFETY INSPECTION

[redacted]

DATE 17 - 06 - 2014

Construction Manager: [redacted]
HSE Manager :

Contract : [redacted]
Report No: (form / initial / month / sl. No)

This report follows a safety inspection of the above contract on the date stated, the items indicated by a (X) are commented upon.

1. Excavation		4. Plant & Equipment		7. Housekeeping	
Adequate access provided?		Safe working condition?		Project site tidy?	
Barrier in place?		Safety guard in place?		Materials storage area tidy?	
Shoring /benching provided?		Reverse alarm working and audible?		Material stacked securely?	
Underground utilities made safe?		Any leaks or spillage spotted?		Timber de-nailed?	
Spoil stored clear of edge?		Signal man provided?		Waste containers emptied?	X
Warning signs provided?		Valid TPC for the operator/eqpnt?		Passages clear of tripping hazard?	
2. Working at height		**5. Lifting operations**		**8. Welfare facilities**	
Working platform provided/fully boarded?		Lifting gear in good condition?		Toilets/washing area clean?	
G/rails & toe boards in place?	X	SWL displayed?		Drinking water hygienic?	
Access /egress ladders provided /secured?		Banks man present?		First aid stock adequate?	
Scaffolding stable and vertical?	X	Tag lines provided?		Rest shed provided/clean?	
Bracing or ties in place?		Load not raised over people?		Smoking areas clean?	
Safety harness provided & used?		Tackles color coded?		Water filter clean?	
Scaffolding checked and Scafftaged?	X	Outriggers fully extended?		No Surface Water?	
		Out rigger pads used?		No Fungi growth?	
3. Electric tools & supply		**6. PPE.**		**9. Other**	
Safe working condition?		Hard hats worn at all times?		Flammables correct storage?	
Correct socket in use?		Eye protection in use?		Adequate fire prevention?	
Proper grounding provided?		Ear protection in use?	X	Cylinders capped/stored in shade?	
Condition of cables?		Safety harness in use?		Adequate warnings in place?	
Grinders fitted with guard?		Hand gloves provided & used?		Flashback arrestors fitted?	
Work permit system in place?		Respiratory protection (mask)?		Work Permits valid?	
				Dust suppression adequate?	

#	Observation & Comments, Corrective Action Required	Action by	When	Status
(02)	-> The Scaffolding that has built by Engineering Innovators it has not allowed to work by the HSE Team. Because it has not built safely to work men at hight. Hand-rails not made correctly. Action:- Today works at height has stopped. :- Advised to Bring a HSE officer for the site :- Additionally Bring a Rigger to make the scaffolding. Time:- 10:45am, 01:30pm. Location:- Building-G Area.	HSE officer.	Immediately	Not Allowed to work today

Safety inspection by	Name: [redacted]	Signature: [redacted]
Location : All area in site.		Time : 18:53

CC: Project Manager | Construction Manager | HSE Manager | Area Superintendant/Engineer

Item #11 – Incident/Accident Notification report

Project :	
Type of Incident : ☐ **Fire** ☒ **Injury** ☐ **Vehicle Accident** ☐ **Dangerous Occurrence** ☐ **Environmental**	
Date of Incident :	Time of Occurrence :
Location of Incident :	
Name of the injured :	Injury Classification :
Name of Operator :	
Name of Witness :	
Name of Supervisor In-Charge of activity :	

Description of the Incident :
Activity being performed prior to the Incident :
Brief description of Immediate follow-up done :
Reported by: Name & Signature:
Function :HSE (OFFICER)
Date and time of report:

Note: This Report should be initiated for reportable lost time injuries / dangerous occurrences/ Environmental incidents and shall be send within **24 hrs** to all concerned

Item #12- HSE Evaluation Check List for Sub-Contractors

Name of the Contractor :……				
Legal Registration :……				
Scope of Work :……				
1.	Depending on the size of their scope of work, all major sub-contractors shall (*Yes No N/A)*			
	Submit their specific HSE plan for review and approval.	☐	☐	☐
2.	SPLL ultimately responsible for all sub-contractors' safety system and			
	Compliance. Therefore, sub-contractors are required to give a written			
	Understanding to comply with the SPLL HSE policy and Plan.	☐	☐	☐
3.	Once approved, sub-contractor's HSE plan will be considered as part of the site			
	Overall HSE plan and must be complied with.	☐	☐	☐
4.	SPLL will review and approve all sub-contractor method statements.	☐	☐	☐
5.	Regular weekly inspection will be conducted on all subcontractors, their HSE			
	Performance will be evaluated regularly. All issues will be addressed in the sub-contractors coordination meetings.	☐	☐	☐
6.	Depending on the size of their scope of work and/or labor force, the			
	Sub-contractor shall be requested to provide their own HSE Officer			
	(Full time for 150 workers or more and Part Time if less than 150) and shall co-ordinate on a daily basis with SPLL site HSE Officer.	☐	☐	☐
7.	All Sub-contractors shall ensure that adequate supervision is available	☐	☐	☐
	for all tasks and that all operatives are following safe work practices.			
8.	All workers shall be inducted upon arrival to the site by as per the induction			
	programme. Tool Box Talks (TBT) shall be conducted on regular bases	☐	☐	☐
	and / or whenever necessary. Records must be available for all such trainings			
9.	Smoking is strictly prohibited at workplace except at designated areas	☐	☐	☐
10.	Nobody is allowed to enter the site without wearing safety helmet,			

	Safety boots, safety jackets with reflective bands and all other needed personal protective equipment (PPE) to perform the task safely.	☐	☐	☐
11.	No one is allowed to work at or more than two metres height without wearing Full body harness and anchoring its lanyard to a firm support preferably at shoulder level.	☐	☐	☐
12.	Usage of eye protection equipment shall be ensured when operatives are engaged for grinding, chipping, welding and gas cutting or any other jobs as and when Site Safety team instruct to do so.	☐	☐	☐
13.	All PPE like boots, helmet, safety jackets with reflective bands, safety harnesses etc. shall be arranged before starting the job as per recommendation of Site Safety Engineer/Co-coordinator.	☐	☐	☐
14.	Adequate illumination at workplace shall be ensured before starting the job.	☐	☐	☐
15.	All rotating / moving parts of the portable / fixed machinery being used shall be adequately guarded.	☐	☐	☐
16.	Ladders being used at site shall be adequately secured at bottom and top & must extend 1 metre above the upper level. Ladders shall not be used as working-platforms. Site built ladders will not be allowed.	☐	☐	☐
	allowed to stand under suspended loads.	☐	☐	☐
18.	Horseplay is completely prohibited at workplace. Running at the site is completely prohibited, except in case of emergency.	☐	☐	☐
19.	Material shall not be thrown from height. If required the area shall be barricaded and one person shall be posted outside the cordoned off area	☐	☐	☐
20.	No one (other than qualified electricians) is allowed to carry out electrical connections, repairs on electrical equipment or other jobs related thereto.	☐	☐	☐
21.	Inserting of bare wires for tapping power from electrical sockets is completely prohibited.	☐	☐	☐
22.	All incidents and near misses to be reported to Site in-charge / Site HSE			

	team to enable the management to take necessary steps to avoid the recurrence.	☐ ☐ ☐
23.	All scaffoldings / working-platforms shall be strong enough to take	
	the expected load. The width of the working platform and fall protection	
	arrangements shall be maintained as per recommendation of Site HSE team.	☐ ☐ ☐
24.	All tools and tackles shall be inspected before use. Defects to be reported	
	immediately. No lifting tackle to be used unless it is certified by the	
	concerned competent person on site such as Plant and Machinery supervisor	☐ ☐ ☐
	or the Safety Engineer/ Co-ordinator.	
25.	Good housekeeping to be maintained. Passages shall not be blocked	
	with materials. Materials shall not be stacked in unstable condition	☐ ☐ ☐
	and dangerously high.	
26.	Debris, scrap and other materials to be cleared regularly from the workplace	
	and at the time of closing of work every day.	☐ ☐ ☐
27.	All Sub-Contractors shall ensure that all their staff & workmen are following	
	SPLL and Client's HSE Guidelines in addition their own specific HSE plan	
	and ensure full compliance to all Health, Safety & Environment (HSE) Regulations	
	of all the local authorities concerned.	☐ ☐ ☐
28.	Adequate firefighting equipment shall be made available at workplace and	
	persons are to be trained in firefighting techniques.	☐ ☐ ☐
29.	Main contractor's HSE team will treat sub-contractor's personnel	
30.	All the unsafe conditions / unsafe acts identified by contractors, reported by	
	Site Supervisors and / or HSE Personnel to be corrected on priority basis.	☐ ☐ ☐
I agreed to comply with the above conditions/SPLL requirements.		
Authorized person		
Signature of sub-contractor		

Item #13- Disciplinary Action Report

			Description:
			Disciplinary action Report.
Issue : 02	**Date:01.11.2012**	**Rev: 01**	**Form #** [redacted]

Project :	**Date of Issue**	**Report # :**
Bloom Central Project		

Details of employee / company to whom the notice is issued:

Name & Roll :

Occupation :

Company :

Details of violation committed

☐ **1st Warning** ☐ **2nd Warning** ☐ **3rd Warning** ☐ **Dismissal**

"The employee is hereby warned that he could be dismissed if the violation is repeated after 3rd warning."

Description of violation:

Therefore, the following disciplinary action will be taken against you:

Type of disciplinary action taken:

☐ **Written warning**

☐ **Wage deduction:** ☐ 2 hrs. ☐ 4 hrs. ☐ 1 day ☐ 2 days

☐ **Suspended for the period from** _____ **to** _____ (Total _____ days)

☐ **Dismissal from location / Site / company**

Originator:	**Approved by: PM/PD/ DGM-Safety**
Name :	**Name**
Designation :	Designation
Signature	Signature

Note: Dismissal from site has to be approved by PD and from company by VP.

Item #14 – Safety Non-conformance report

			Description: ***Safety N C R***	
ISSUE: 00	**DATE: 16.02.2014**	**REV.: 00**	**FORM #.**	**-018**

Project : **NCR # :**

Location : **Date :**

Issued to :

THE FOLLOWING BREACH OF SAFETY FOR WORK UNDER YOUR CONTROL HAS BEEN RECORDED:-

YOUR OPERATIVE/S WAS/WERE IMMEDIATELY GIVEN THE FOLLOWING INSTRUCTIONS:-

Name:

Date : **Time:** **Signature:**

CC: ☐ Task Supervisor ☐ Site Engineer ☐ CM ☐ File

To be Completed by the Task incharge / Site Engineer	**Corrective Action Undertaken and Completed :-** **Name:** **Date:** **Time:** **Signature:**

Corrective Action Verified : -

Name:

Date : **Time:** **Signature:**

Remarks (if any) :

Item #15- Risk Assessment

ACTIVITY	HAZARD	CAUSES OF HAZARD	CONSEQUENCES/ IMPACT	RISK EVALUATION		RISK LEVEL	IMPLEMENTED CONTROL MEASURES	ADDITIONAL CONTROL MEASURES	RESIDUAL RISK			ACCEPT Y/N?
				L	S	H/M/L			L	S	H/M/L	

Persons in danger
•
•
Personal protective equipment
•
Information, instruction and training
•
Emergency procedures
•
•
Monitoring and review
•

Signature:	

RISK MATRIX

Risk Rating (RR) – Severity x Likelihood

SEVERITY (IMPACT) S / LIKELIHOOD L		**Rare** Remote possibility (once every 3 years or more) **1**	**Unlikely** Could happen but rare (typically once in a year) **2**	**Possible** Could happen occasionally (on average quarterly) **3**	**Likely** Could happen often (on average once a month or more) **4**	**Almost certain** Could happen frequently (once a week or more) **5**
Insignificant	**1**	**Low 1**	**Low 2**	**Low 3**	**Low 4**	**Medium 5**
Minor	**2**	**Low 2**	**Low 4**	**Medium 6**	**Medium 8**	**Medium 10**
Moderate	**3**	**Low 3**	**Medium 6**	**Medium 9**	**Medium 12**	**High 15**
Significant	**4**	**Low 4**	**Medium 8**	**Medium 12**	**High 16**	**High 20**
Major	**5**	**Medium 5**	**Medium 10**	**High 15**	**High 20**	**High 25**

RISK BASED CONTROL PLAN

RISK LEVEL	ACTION AND TIMESCALE
1-4 Low	Quick, easy controls should be implemented immediately and further action planned for when resources permit. Monitoring required ensuring controls are maintained. Manage through routine procedures. Go for economic improvements where possible. Incident report must be completed.
5-12 Medium	Aim to reduce risks but costs of prevention may be limited. Undertake a risk assessment of the situation / task and implement the appropriate actions. Actions should have a timescale and should be monitored. Where the risk involves work in progress undertake a risk assessment as soon as possible to ensure the safety of the situation or task. **Work should not start until the risk is reduced to an acceptable level.** Considerable resources may have to be allocated. Contact your Manager and Risk Manager by telephone about the actions that should be taken to reduce the risk/s. incident report must be completed. Incident must be added to service risk register.
15-25 High	**Do not commence the activity until** a risk assessment has been completed to ensure the safety of the situation or task. If it is not possible to reduce or eliminate the risk even with unlimited resources, work must remain prohibited. Inform your relevant Director, your Manager and the Risk Manager immediately by telephone. Incident report must be completed. Incident must be added to service risk register.