STUDY THE LIMITATIONS TO IMPLEMENT OHSAS 18001 AS A REGULATION IN SRI LANKAN CONSTRUCTION INDUSTRY: CONTRACTOR'S PERSPECTIVE

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Degree of Master of Science in Construction Law & Dispute Resolution

Department of Building Economics

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Declaration

I hereby declare that this report submission is my own work and to the best of my knowledge it does not contain any written material published previously by any other person or material which substantial extent has been accepted for the award of any degree or diploma of a university or other institution of higher education, except an acknowledgement is made in the text.

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

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Abstract

The Construction industry, being one of the fast-growing sectors in the world, contributes high percentages for gross domestic product (GDP) in most countries. However, as a high labour-intensive and hazardous industry, many accidents are reported annually both in developed and developing countries. Within the context of Sri Lanka, many fatal construction accidents happen each year, but most are not reported due to various reasons.

In the contractor's side in construction, numerous shortcomings prevail in Occupational health and safety (OHS) practices. The internationally recognised and best practising OHSAS 18001, known as an effective tool to enhance OHS, is still being a general standard under local context. Therefore, this research attempts to study the limitations to implement OHSAS 18001 as a regulation in Sri Lanka, aiming to improve OHS at the site level. A comprehensive literature survey was conducted to collect the existing knowledge regarding the subject matter, using sources such as OHSAS 18001, past research studies, and acts and policies in other countries.

An industry-wide questionnaire survey was performed to collect information on the current practice of Occupational Health & Safety with respect to the Contractor in Sri Lankan construction industry and to identify difficulties/possibilities to implement OHSAS 18001 standard as a regulation in the local construction industry, with special reference to Contractor party. The survey was limited to the construction professionals in the construction industry and consisted of Senior General Managers, Project Managers, Architects, Engineers, Quantity Surveyors, and Safety officers.

The results revealed that OHSAS 18001 could be implemented based on Contractor's perspective. However, top management commitment, Cost, Awareness, Training & Development, Cultural/Attitude barriers, Academic qualifications related to health and safety in Sri Lanka, and Expertise knowledge in the sector were initialised as the key factors that profoundly influence to a comprehensive OHS management system.

Key Words:*Occupational Health & Safety, Construction Industry, Safety Performance, Construction Accident, OHSAS 18001, Safety Regulations.*

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H.M.M.L.B Nedurana
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Abbreviations

GDP – Gross Domestic Product

OHS – Occupational Health & Safety

ILO – International Labour Organization

OHSAS 18001 – Occupational Health & Safety Assessment Series 18001

SLSI – Sri Lanka Standards Institution

UK – United Kingdom

OHSMS - Occupational Health & Safety Management System

CS2 – Construction Supra 02, a Standard Building & Civil Engineering Grading in Sri Lanka

CS1 - Construction Supra 01, a Standard Building & Civil Engineering Grading in Sri Lanka

C1–A Standard Building & Civil Engineering Grading in Sri Lanka

APAU - Accident Prevention Advisory Unit

HSE - Health and Safety Executive

WCSH - World Congress on Safety and Health at Work

CIDA – Construction Industry Development Authority

OH&S - Occupational Health & Safety

HSE-MS - Health, Safety, and Environment Management System

SMS - Safety Management System

Appendices

Chapter 01

INTRODUCTION

Study the limitations to implement OHSAS 18001 as a regulation in Sri Lankan Construction Industry: Contractor's Perspective

1.1 Background

The construction industry in most industrialised countries is one of the most significant regarding contribution to the gross domestic product (GDP). The construction industry has many stakeholders including client, consultant, contractor, sub-contractor, supplier, service provider, and many other external parties. The complexity of construction and its work practices causes significant impacts on Occupational Health and Safety (OHS) of the workers (Yoon, Lin, Chen, Yi, Choi and Rui 2013).

Many reported evidence for OSH issues in the past stated that "160 workers caused a work-related accident in every 15 seconds" (ILO, 2014). According to EASHW (2001), nearly 13 workers per 100,000 being killed in construction, as against five per 100,000 in all sectors on an average. Further, Saifullah and Ismail (2012) reported that unsatisfactory OHS in the construction industry has turned out to be an issue as it contributes to many incidents and fatality to the construction players and the public.

OSH issues are vital to the project process as it influences the quality of work and time. OSH issues are not limited to the construction stage of a construction project management but also arise throughout the project period. Many common health and safety problems encountered in construction and operation could be avoided if due consideration and effort were invested during the project brief and design phases.

"Project owners or clients can positively influence project safety and health performances since they are the ones who contribute by funding the project" (Mahyuddin & Sulaiman, 2005). As per Hung (2006), the industry now realises that to cope with the safety and health issues, it is important to begin at the top of the construction pyramid rather than only educating the bottom tier of erectors and

labourers. “When talking about the element of safety and health, it leads to being legal and moral responsibility” (Hinze & Huang, 2003). Consideration of safety and health requirements from the early stages is widely recognised as a beneficial approach for OSH management, since it is an effective way of either eliminating or reducing hazards at their sources.

Several standards, i.e., BS OHSAS 18001, has been introduced in the UK. Moreover, following the OHSAS standards, Occupational Safety and Health Act of 1970 was enacted in the USA. In regional countries such as Philippines, Occupational Safety and Health Standard 1989 has been ruled by the country’s department of labour and employment. In 2007, Occupational Health and Safety Scheme (OHSAS 18001) was introduced by Sri Lanka Standards Institution (SLSI), which is the National Standard body of Sri Lanka. However, to date, Sri Lanka lacks a mandatory standard.

1.2 Problem Statement

Occupational health and safety Sri Lanka has many lapses with special reference to the construction industry. Having admitted to the contractor’s side in construction, numerous shortcomings are being reported periodically. As an internationally recognised and best practising standard, OHSAS 18001 is a still the general standard in Sri Lanka. Thus, OHSAS 18001 continues to practice at a lesser percentage as an OHS management standard, and thus, the advantage of implementing the standard has not obtained its maximum benefit. Contractors may play a major role in taking the initiative to promote OHSAS 18001. However, a study to analyse the possibility of implementing OHSAS 18001 as a regulation in Sri Lankan construction industry is still not available.

1.3 Aim

The primary aim of this research is to study the feasibility to implement the OHSAS 18001 as a mandatory regulation for Sri Lankan construction industry.

1.4 Objectives

- Study the OHSAS 18001 standard process.
- Identify the current practice of Occupational Health & Safety in Sri Lankan Construction industry.
- Identify factors to implement OHSAS 18001 standard as a regulation in Sri Lankan construction industry regarding Contractor's perspective.

1.5 Methodology

Initially, a comprehensive literature survey was conducted to understand the current background in relation to occupational health and safety, and the importance level of health and safety factor for the construction industry. The sources were OHSAS 18001, past research studies, and acts and policies in other countries.

The survey approach was implemented via data collection from professionals in the construction industry, and the samples were extracted from ongoing construction projects. Data collection was based on a questionnaire survey, and the collected data were analysed statistically. The target of the questionnaire was to measure health and safety concerns in construction professionals and how it affects the project goals, and to identify the feasibility to implement OHSAS 18001 in local construction industry and recommendations on existing laws regarding occupational health and safety.

Extracting the industry legal requirements to amend the existing policies/acts is the major objective of this survey.

1.6 Scope and Limitations

The research was limited to construction professionals in the contractor's side in the Sri Lankan construction industry; the group consisted of Senior General Managers, Project Managers, Quantity Surveyors, Engineers, Safety officers, and Architects. The scope has been narrow down to study the limitations to implement OHSAS 18001 as a regulation in the Local Construction Industry: Contractor's Perspective.

1.7 Structure of the Study

Chapter One : Chapter one consists of the background to the study, aim and objectives, scope of the study, and organization of the report with a brief introduction to the research methodology and limits of the scope.

Chapter Two : Chapter two adds existing knowledge on Occupational Health & Safety to this study by explaining about accidents in the construction industry, current health and safety performance in the construction field, reasons to evade from following OSH rules by people in the construction sector, factors affecting poor safety performance, and a brief introduction on OHSAS 18001.

Chapter Three : Chapter three provides a brief introduction to the methodology of this research study including statistical data analysis methods.

Chapter Four : Chapter four presents the results of this study.

Chapter Five : Chapter five concludes the study with the findings, recommendations, and further research approaches.

Chapter 02

LITERATURE REVIEW

2.1 Introduction

Construction is an inherently dangerous industry. In 2012, there were 775 private sector construction fatalities in the U.S.I.; more than any other industry (Taylor, 2015). Nowadays, one of the most pressing concerns for the construction industry is the occupational safety & health which shows an increase in the accidents and health problems (Solicitors, 2010). Further, according to Mahmoudi, Ghasemi, Mohammadfam, and Soleimani (2014), studies indicate that construction industry is among the most hazardous industries. The safety and health requirements are considered in construction as well as in other industries since the early stages have been widely recognised as a beneficial approach for OSH management; this is an efficient way of either eliminating or reducing hazards at their sources (DOSH, 2008). According to Lai, Liu, and Ling (2011), as construction accidents may cause project delays, safety management plays an important role in the timely completion of a project.

2.2 Accidents in the Construction Industry

In accordance to the OHSAS 18001 (2007), the term ‘accident’ refers only to those events that lead to injury or damage, the term whereas ‘incident’ refers to events that may not cause injury or damage, but have the potential to do so.

However, it is also documented that the construction industry has the highest rate of accidents among all industries (Sawacha, Naoum & Fong, 1999) and the highest rate of disabling injuries and fatalities (Hinze, 1997). For example, as reported by Bomel (2001), up to 40% of accidents happen in the construction industry in Japan, 50% in Ireland, and 25% in the United Kingdom. Safety in developing countries, in particular, is often at much lower levels, mainly due to the absence of strict safety regulations. As per the CIDB (2009), accidents in the construction industry were extremely higher than other industries.

According to Rubio et al. (2005) cited in Priyadarshani, Karunasena, and Jayasuriya (2013), Workplace safety is a core consideration for all types of organisations that are accountable for protecting and optimising the functionality of human resources. Regarding construction, ensuring workplace safety is not an easy task. Occupational accidents in the construction industry cause economic and social problems in organisations, as well as in countries. "Among all industries, construction has the highest rate of accidents, including deaths and disabling injuries worldwide" (Koehn, Kothari, & Pan, 1995; Fang, Song, & Huang, 1999).

As per Lopez–Valcarcel (1996, cited in Priyadarshani et al., 2013), although it is difficult to quantify labour accidents on a global scale, a study by López-Valcárcel estimated that approximately 350,000 workers die every year due to labour accidents, among which, 60,000 accidents occur in the construction industry worldwide. In accordance to the accident statistics, the overall workplace fatality rates per 100,000 workers in the United States are 4.0 (2005), 4.0 (2006), and 3.8 (2007) (Bureau of Labour Statistics, 2005, 2009).

More workers are killed or injured each year in the construction industry than in any other industry. According to the National Safety Council reports, 8,993 people died during 2003-2011 at construction workplaces in the United States, which was the highest number of fatalities among deaths occurring in all types of industries over this period. "In the construction industry, there were many accidental deaths, or the workers had serious injuries. In the United States, the industry employs 5-6% of the labour force but has 15% of the fatal injuries, and well over 9% of all workdays are lost due to injuries. Construction workers who are disabled or killed each year by work-related injuries are believed to number in the tens of thousands." (Ringen, Seegal, & Englund, 1995, as cited in Yoon et al., 2013).

As per Yoon et al., (2013), unlike other industries, the construction industry is project-based, and the accident rates (work-related victims/100 workers) vary according to the project. Each project is unique, and each project type (e.g., housing and office, transportation, and plant) has its own characteristics, which may include methods of working, materials used, and techniques applied for construction. "Direct accident cost

which the insurance company pays out could cost the contractor between 5 to 50 times in indirect costs" (Sawacha, Naoum & Fong 1999).

According to Yustisia (2014), to avoid accidents and various dangers in the construction process that could lead to loss of property, objects, and human lives, the concept of constructability can be implemented to achieve the project objectives. The success rate of a construction project can be viewed (in terms of construction safety) as no accident if the construction (zero accident) is in the implementation of the project, or at least minimise the occurrence of accidents in the construction process. "Among industry sectors, workers in construction and manufacturing face the highest risk of occupational injuries and illnesses." (Abudayyeh, Feddricks, Butt, & Shaar, 2006).

2.3 Health and Safety performance in the Construction field

"Safety management in the construction industry is important because poor safety management leads to accidents which cause loss of lives and project delays, and accident-related costs may be incurred (Oborne, 1995). Ruth (2004, cited in Lai et al., 2011) found that site injuries often result from managerial issues, rather than engine defects. Thus, management practices are significant in helping to reduce accidents in the workplace. As per DOSH (2008), both in construction and other industries, the consideration of safety and health requirements from the early stages have been widely recognized as a beneficial approach for OSH management, since it is an effective way of either eliminating or reducing hazards at their sources.

Moreover, studies in this field have revealed that a lack of attention to occupational health and safety (OHS) issues results in irreversible costs, including costs associated with workplace accidents, reworking, delays, and loss of reputation of the organization and the contractor (Wang, Liu, & Chou, 2006, as cited in Mahmoudi et al., 2014). According to Ngacho and Das (2013), and Alzahrani and Emsley (2013), as a consequence, in recent years, in addition to the triangle of time, cost, and quality, OHS issues are increasingly being emphasized as an indicator of the success of a construction project.

The results indicated that the loss for companies from the work-related accident was 5-10% of the profit for all industries, and 8.5% of the tender price for the construction industry (Yoon et al., 2013). According to Davies and Teasdale (1993), the ratio of the direct cost to the indirect cost of work-related accidents is 1:11.

The indirect costs are product and material damage, loss of production time, legal costs, overtime and temporary labour, investigation time, supervisor's time, fines, loss of expertise and experience, loss of morale, and bad publicity (Yoon et al., 2013).

"The occupational health and safety management system (OHSMS) was first prepared by the HSE's APAU in the UK in 1991 as a practical guide for directors, managers, health and safety professionals, and employee representatives who wanted to improve health and safety in their organisations" (HSE, 1991). As per the explanation of the Occupational Health and Safety Advisory Services Project Group (2007), the OHSMS was placed to enable an organisation to control its OHS risks and to improve its OHS performance.

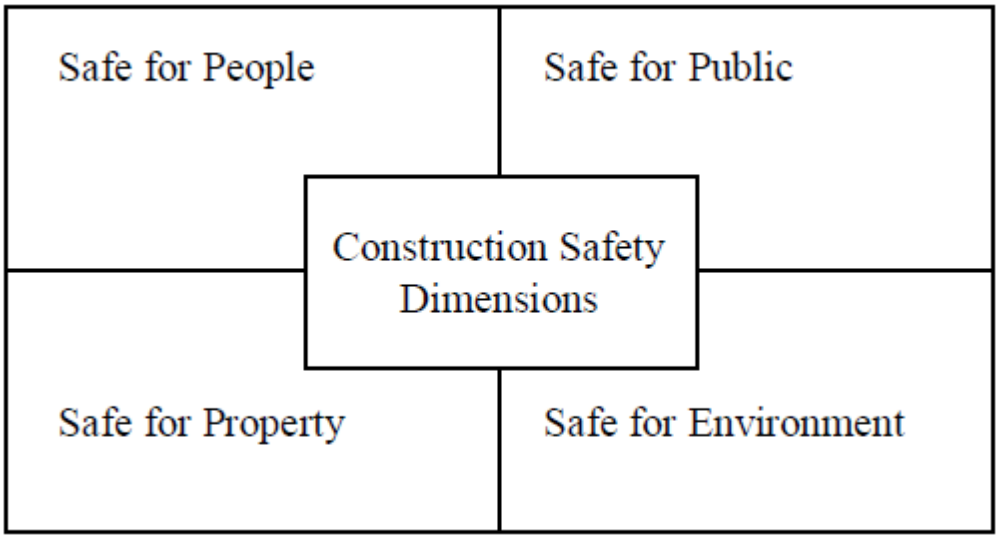

Fig. 2.1. Dimension Construction Safety

Source: Suraji and Widayatin (2010, as cited in Yustisia 2014)

Donald and Young (1996) stated that, "Safety and Health is an issue that can be managed and that profiling safety attitude can provide a useful tool for the development of management strategies."

Also, according to Davies and Thomasin (1990, as cited in Rameezdeen, Pathirage, & Weerasooriya, 2003) have highlighted some important reasons for this poor safety performance in the industry as, lack of controlled working environment, and complexity and diversity of the size of organisation within the industry.

Clients should be concerned about including OSH during objective identification and project brief. Project owners or clients can positively influence project safety and health performances since they are the ones who finance the project (Hinze & Huang, 2006; Mahyuddin & Sulaiman, 2005, as cited in Saifullah & Ismail, 2012).

Furthermore, Ling, Ong, and Teo (2005) show that training is an important method to enable workers to work safely because they are equipped with the knowledge of safe working. Also, according to Cameron (2004), effective planning for safety and health is essential to a project to be delivered on time, without cost overrun and without experiencing accidents or damaging the health of the site personnel.

As per the Smallwood (2001), Ayyalasomoyajula, Grabowski, Harreld, Merrick, & Roberts, 2006), improving the knowledge on recognising signs and signals that express vital information related to site safety, careful selection of safe or low-risk building materials, and employee representation plays a crucial role in improving safety and health in construction organizations.

2.4 Factors affecting poor safety performances

As per Flemming (2006, as cited in Saifullah & Ismail, 2012), half of the occupational safety and health issues arise from inadequate design. "Major implication of poor safety performance makes death and disabling injuries" (Cheng, 2004). Smallwood (2001) indicated that careful selection of materials could trim down forthcoming health hazards, and according to Ling et al. (2005), many accidents and hazards in the construction sites are avoidable through proper adaptation of safety and health management.

Gambatese (1996) declared that "This may cause by the design professionals that distance themselves from responsibility due to lack of safety education and training, lack of safety design tools, and their attempt to limit their liability exposure."

Further, Mahalingam and Levitt (2007) stated that educating workers in developing countries to follow safe working practices is difficult and hence, changing safety behaviour has become a slow process.

> The need for changes in attitude does not stop at educating erectors to work more safely. It has to go back to the architect and engineer who should not only ask themselves if it can be built but can it be built safely? Therefore, it is clear that in creating a safer construction industry, the health and safety factors have to be included into the design; by doing so, it will create a ripple effect disseminating the safety and health throughout the industry players (Saifullah & Ismail, 2012).

In accordance to Gambatese (2000), prevention through design stands on the significance of design out the safety and health hazards, rather than protecting the workers or warning them from hazards. The Government body of the ILO (1990) (International Labour Organisation) has made a practice guide on the prevention of major hazards.

As explained by Flemming (2006, cited in Saifullah & Ismail, 2012),

> Therefore, parties that were involved with the tendering out of contractors have to play their parts in embracing safety and health. Starting from the client, it is their optimal responsibility in insisting on the safe performance of the construction's contractors in making their selection. Looking at the traditional procurement, it only focuses on tender cost, hence restricting the contractors to work in a more efficient manner.

According to WCSH (World Congress on Safety and Health at Work, 2008),

Table. 2.1. Essential Elements of a National OHS System

Essential Elements of a National OHS System
Legislation and any other relevant OHS instruments.
One or more authorities or bodies responsible for OHS.
Regulatory compliance mechanisms, including systems of inspection.
A national tripartite advisory mechanism addressing OHS issues.
Arrangements to promote at the enterprise level cooperation between Employers and Workers.
OHS information and advisory services.
A system for the provision of OHS training.
Occupational health services.
Research on OHS.
A mechanism for the collection and analysis of data on occupational injuries and diseases.
Provisions for collaboration with relevant insurance or social security schemes covering occupational injuries and diseases.
Support mechanism for a progressive improvement in micro, small, and medium-sized and the Informal Economy.

Site accidents are frequent when there are inadequate policies, poor management commitment, and sufficient safety knowledge and training of workers (Hassanein & Hanna, 2008).

2.4.1 Practical Difficulties to Implement an Effective OHS Management System

According to Sawacha et al. (1999, as cited in Priyadarshani et al., 2013), accidents at work occur either due to lack of knowledge, training or supervision, lack of means to carry out a task safely, errors in judgment, carelessness, and laziness or total irresponsibility.

Difficulty Factors to implement OSH Management System in Construction as stated in Aksorn and Hadikusumo (2008, as cited in Debestani, Karimvand, & Shirouyehzad, 2011):

Lack of Clear and realistic goals - Safety programmes can accomplish the desired results when safety goals have been established. The safety goals should give a clear picture, direction, and focus on performing day-to-day activities to reach desired results. When realistic and achievable goals are set up, the progress towards accomplishing such goals can be easily measured.

Lack of Good communication - When the lines of communications between management and workforce are open, workers can bring reports of unsafe working practices and hazardous environments to management's attention. Management, in turn, can also communicate their concerns and priorities of safety to gain employees' compliance and awareness.

Lack of Delegation of authority and responsibility – An individual cannot make a safety programme successful. Therefore, the responsibility of safe accomplishment of activities must be transferred to individuals at lower levels of authority. Effective delegation involves granting adequate authorities and assigning clear responsibilities to perform specific tasks with sufficient resources such as appropriate completion time, money, and cooperation of all involved parties.

Lack of Sufficient resource allocation - The safety programme goals cannot be accomplished without adequate resources. An effective safety programme results from the commitment of the top management to providing an appropriate level of resources. Management must consider and allocate sufficient resources to execute daily activities to accomplish both short-term and long-term goals. The resources required for an effective safety programme may include sufficient staff, time, money and information, methods used in safety works, facilities and tools, and machines.

Lack of Management support - It is evident that management plays a vital role in an efficient and effective safety programme. Management must fully and actively translate ideas into safety actions, including issuing a written comprehensive safety policy, allocating sufficient resources, promptly reacting to safety suggestions and

complaints, attending regular safety meetings and training, regularly visiting the workplace, and following the same safety rules as others.

Lack of Programme evaluation - Safety programmes should be periodically evaluated to determine its success in a meeting set out goals and objectives. When the implementation of a safety programme does not meet the defined goals, an evaluation process can facilitate identifying the shortcomings of the programme; afterwards, areas for improvements can be traced and reviewed accordingly.

Lack of continuing participation of employees - Successful safety programmes largely depend on employee involvement as workers tend to support the activities that they help to create. Workers should be given opportunities to provide input into the design and implementation of safety programmes such as being a member of the safety committee, reporting hazards and unsafe practices to supervisors, identifying training needs, and investigating accidents.

Lack of Personal motivation - Although workers have adequate knowledge and skills to accomplish their jobs safely, they will not, however, work in such manner unless they are motivated to do so. To ensure commendable safety records, all personnel in the workplace must be motivated to perform their job responsibilities safely, by the possibilities of achievement and recognition, the opportunity for additional responsibilities, rewards, and personal growth.

Lack of Personal competency - A successful safety programme also results from placing the right person on the right job. The right person is defined as the person(s) who are physically and mentally capable of carrying out the assigned tasks with the right knowledge, experience, and skills.

Lack of Teamwork - A safety programme succeeds when all concerned parties from top to bottom hierarchical levels realise that preventing accidents is everyone's responsibility. Every functional unit must cooperate in achieving the goals set by the

team, such as planning and controlling their works and handling day-to-day safety problems.

Negative group norms - Group norms are the accepted attitudes about various things amongst a group of people. In practice, members of a group conform to certain attitudes, simply to avoid sanctions. If positive attitudes towards safety can be built and embedded within a group, safety can then be managed successfully. This is the basis of good safety culture.

Negative Personal attitudes - Attitude is a tendency to respond positively and/or negatively to certain persons, objects, or situations, and is normally built up through experience. Individuals, however, differ in their perception of risks and willingness to take risks. Successful safety programmes can be achieved if the positive attitudes of employees toward safety are reinforced.

Lack of effective enforcement scheme - Not conforming to safety rules is known as a *violation*. Violation needs to be encountered with enforcement. Management must, therefore, provide the means of enforcing workers, especially the violators, to obey the safety rules and regulations. By providing an effective enforcing mechanism, management will face fewer cases of violations by employees.

Improper safety equipment acquisition and maintenance - The workplace must be carefully assessed to determine possible hazards for proper selection of safety equipment. An effective safety programme results in fewer injuries due to proper acquisition and maintenance of safety equipment. Managing a safety equipment programme takes up not only a large percentage of time for purchasing the correct equipment, maintain the good condition, and inventory control, but it also requires a good cooperation amongst the safety manager/head, purchasing, production, warehouse supervisor, and maintenance managers.

Inappropriate supervision - A sound safety programme requires employers to provide sufficient supervision in protecting workers from workplace hazards.

Successful supervision requires competent personnel to assign work in line with the workers' ability, appraise workers when they do jobs safely, communicate by listening and speaking, set a good example by following the same safety rules, and correct the arising safety problems.

Inappropriate safety education and training - A successful safety programme can be achieved if all employees are given periodic educational and training programmes to improve their knowledge and skills on safety at work.

Moreover, as per Sawacha et al. (1999), the lack of a controlled working environment and the complexity and diversity of the sizes of organisations influence safety performance in the industry. Quinlan and Mayhew (2000, as cited in Gallagher, Underhill, & Rimmer 2001) state that the growth of precarious employment is liable to undermine the effectiveness of existing regulatory apparatuses, make it more difficult to manage OHS in their workplaces, and inhibit employee and union involvement in OHS. This may erode the basis for developing more systematic approaches to OHS management, including the most elaborate expression of this in OSHMS.

As per the explanation of Gallagher, Underhill, and Rimmer (2001), difficulty factors to implement an OHS management system are:

Small Business

· Lacks familiarity with the systems generally

· Lacks an understanding of occupational health & safety management system (OHSMS)

· Cost pressures divert attention to other business needs

· Pilot projects adopting alternative approaches to OHS occupational health & safety management in small business are yet to be fully evaluated

Part-time and Casual Employees

· OHSMS assume a stable workforce – the opposite to casual and some part-time employment

· OHSMS do not facilitate the involvement of part-time and casual employees in OHS issues

· Casual employees are least well-equipped to participate in OHS issues and systems

Contractors

· Encounter small business constraints identified above

· May adopt OSHMS for tendering purposes without implementation

· May encounter difficulties arising from inconsistencies between the subcontract or/and principal contractor's OSHMS

· May have the principal contractor's OSHMS imposed without accommodation or explanation

· The 'disorganization of work' associated with contracting may weaken existing OSHMS

· A change in contractors' attitudes towards OHS may develop from their exposure to OSHMS through tendering requirements.

Labour-Hire Firms

· OHSMS assume employees' familiarity with their workplace, but labour hire employees are regularly exposed to new workplaces

· OHSMS appear to be implemented only in large labour-hire firms – arguably for a little real benefit

· Intense competition amongst labour-hire firms discourages labour-hire firms from prioritising their own and their client's OSH practices

· Labour hire employees are generally excluded from the client's OSHMS

· The 'disorganisation of work' associated with labour hire employees may weaken the client's OSHMS

2.4.2 Strategies to Overcome Those Difficulties

According to Anton (1989), and Rowlinson (2004) safety programmes contain many elements such as safety policies, safety committees, safety training, accident investigations, in-house safety rules, safety incentives programmes, control of subcontractors, personal attitude and perception, personal protection equipment, emergency planning, safety promotions, safety record keeping, and the job hazard analysis.

Feng (2013) and Teo and Feng (2011) concluded that the stakeholders' attitude towards safety management systems, safety training, and incidence reporting had been recognised as critical success factors to cultivate a positive safety culture on construction sites. Also, according to De Silva, Rajakaruna, and Bandara (2008), inadequate safety precautions, non-implementation of rules, limited funds, insufficient knowledge, and unqualified officers cause unexpected accidents in the construction industry in Sri Lanka.

As per Haadir and Panuwatwanich (2011):

Table 2.2: Worker Participation

Factors	Description	References
Personal Attitude	Better safety attitudes mean better perception of the work atmosphere that leads to better safety performance.	As cited in Tam et al., (2001) and Fang (2006)
Personal Motivation	To guarantee good safety records, all workers in work places should be motivated toward performing their jobs safely.	As cited in Johnson (2003)
Safety Meeting	To improve safety performance at the project, formal safety meetings must	EI-Mashaleh et al., (2009)

	regularly be held to review the safety records.	

Table 2.3: Safety Prevention and Control System

Factors	Description	References
Efficient Enforcement System	Efficient enforcement scheme should be developed and implemented to ensure workers follow the safety rules and regulations.	As cited in Fang (2004)
Suitable Supervision	Supervisors capable of allocating work that matches workers' skill, identifying hazard conditions and making the environment safe by communicating with workers and listening to them, and ensure all workers follow the safety rules and find solutions for the safety problems occurred.	As cited in Fang (2004)
Safety Training	Training programmes develop employees' knowledge and skills on safety at work that leads to improving their safety behaviours and attitudes.	As cited in Toole (2002); Tam (2004)
Equipment and Maintenance	Regular maintenance of equipment to ensure that they are in safe working condition.	As cited in Toole (2002); Tam (2004)
Personal Competency	Ability of an individual to carry out the right thing at the right time by using his/her sense, experience, and skills to evaluate the hazard condition and make a proper decision.	Tam (2004), and Fang (2006)
Programme Evaluation	A safety programme must be monitored and reviewed to ensure its safety goals are met.	As cited in Abudayyeh et al. (2006)

Table 2.4: Safety Arrangement

Factors	Description	References
Communication	Open communication between management and the middle level and bottom-level staff to facilitate prompt report and response to unsafe conditions.	As cited in Fang (2004) and Abudayyeh et al. (2006)
Allocation of Authority and Responsibility	Appropriate authority and responsibility assigned to workers to deal with safety incidents and carry out appropriate actions.	As cited in Abudayyeh et al. (2006)
Adequate Resource Allocation	Sufficient resources (e.g. staff, time, money, information, facilities, tools, machines) to carry out day-to-day activities to accomplish both short-term and long-term goals.	As cited in Abudayyeh et al. (2006)

Table 2.5: Safety Commitment

Factors	Description	References
Management Support	Management should ensure that sufficient resource is allocated for safety activities and that regular safety meetings and training are in place.	Abudayyeh et al. (2006)
Teamwork	All levels of staff in the company must be engaged in the safety programmes; improving safety should be seen as a collective effort which requires cooperation from everyone involved.	Abudayyeh et al. (2006)
Clear and Reasonable Objectives	Clear and reasonable safety goals should be established to provide a clear direction for staff to work toward, and to serve as the target against which overall safety performance can be measured.	Abudayyeh et al. (2006)

Moreover, in Tam and Fung (1998, as cited in Yung, 2009), post-accident investigations, safety campaigns, and incentive schemes are management measures that can be implemented to improve construction safety performance.

2.4.3 OHS Regulations and Policies

As per Smallwood and Haupt (2007), implementation of construction regulations (2003) in Republic of South Africa has increased the health, safety, and welfare awareness of all stakeholders, improved site conditions, and reduced accidents in South African Construction Industry. Also, following Yung (2009), gradual implementation of construction safety laws has gradually improved construction safety in China over the years.

Laws and regulations in some developed countries are stronger than that of developing countries. As an example, under the provisions of Health and Safety at work Act of 1976 in English common law, some offences at the workplace are considered as crime (Abeynayake, 2010). Also, UK, France, and Japan include the possibility of interruption of business and shutdown of public bid in penalties, while in the USA, one judicial decision ordered the defendant to pay ten million dollars as compensation (Hino, Ohdo, Takanashi, & Takahashi, 2011).

Koehn et al. (1995) stipulate that comprehensive and universal safety regulations are yet to be established in developing countries. Kheni, Dainty, and Gibb (2008) further argued that enforcement of health and safety regulations in developing countries is disturbed by the lack of adequate resources available to government institutions responsible for occupational health and safety administration. In India, construction safety has not given the due attention by most construction organisations. One primary reason for this is the limitations of the legal framework to enforce the issue (Shenoy & Kalidindi, 2005).

As per the FIDIC (1999), Sub Clause No. 4.8,

The Contractor shall:

(a) Comply with all applicable safety regulations,

(b) Take care for the safety of all persons entitled to be on the Site,

(c) Use reasonable efforts to keep the Site and Works clear of unnecessary obstructions to avoid danger to these persons,

(d) Provide fencing, lighting, guarding, and watching of the Works until completion and taking over under Clause 10 [Employer's Taking Over], and

(e) Provide any Temporary Works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the Works, for the use and protection of the public, and of owners and the occupiers of adjacent land.

Also, Occupational Safety and Health Act No. 514, Malaysia (1994) stipulates following as the objectives of the Act:

(a) To secure the safety, health, and welfare of persons at work against risks to safety or health arising out of the activities of persons at work;

(b) To promote an occupational environment for persons at work, which is adapted to their physiological and psychological needs;

(c) To provide the means whereby the associated occupational safety and health legislations may be progressively replaced by a system of regulations.

Additionally, in accordance with Occupational Safety and Health Act No. 107, Victoria (2004);

The objects of this Act are,

(a) To secure the health, safety, and welfare of employees and other persons at work; and

(b) To eliminate at the source, risks to the health, safety or welfare of employees and other persons at work; and

(c) To ensure that the health and safety of members of the public.

(d) To provide for the involvement of employees, employers, and organisations representing those persons, in the formulation and implementation of health, safety, and welfare standards.

According to Occupational Safety and Health Act. 514, Malaysia (1994), there shall be an established council called the 'National Council for Occupational Safety and Health'. It contended that:

> The Council shall consist of not less than twelve and not more than fifteen members, who shall be appointed by the Minister, of whom,
>
> (a) Three persons shall be from organisations representing employers;
>
> (b) Three persons shall be from organisations representing employees;
>
> (c) Three or more persons shall be from Ministries or Departments whose responsibility is related to occupational safety and health; and
>
> (d) Three or more persons, of whom at least one shall be a woman, shall be from organisations or professional bodies, the activities of whose members are related to occupational safety and health.
>
> Additionally, the Council is also responsible for,
>
> *(a)* Changes it considers desirable to occupational safety and health legislation;
>
> *(b)* The improvement of the administration and enforcement of occupational safety and health legislation;
>
> *(c)* The fostering of a co-operative consultative relationship between management and labour on the safety, health, and welfare of persons at work;
>
> *(d)* The establishment of adequate methods of control for industrial chemicals at a place of work;
>
> *(e)* The statistical analysis of occupationally related deaths and injuries;
>
> *(f)* The provision of healthcare facilities at a place of work;

(g) The fostering of the development and adoption by law of industry codes of practice related to occupational safety, health, and welfare.

Occupational Safety and Health Act No. 107, Victoria (2004) initiated following facts as their main principles of health and safety protection:

(1) The importance of health and safety requires that employees, other persons at work, and members of the public be given the highest level of protection against risks to their health and safety.

(2) Persons who control or manage matters that give rise or may give rise to risks to health or safety are responsible for eliminating or reducing those risks.

(3) Employers and self-employed persons should be proactive, and take all reasonably practicable measures, to ensure health and safety at workplaces and in the conduct of undertakings.

(4) Employers and employees should exchange information and ideas about risks to health and safety and measures that can be taken to eliminate or reduce those risks.

(5) Employees are entitled and should be encouraged, to be represented concerning health and safety issues.

Occupational Safety and Health Act No. 85, South Africa (1993) contended their purpose as to provide for the health and safety of persons at work and the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety; and to provide for matters connected therewith.

The regulation applicable to Sri Lanka, Factories Ordinance (1942), is the only applicable OHS regulation. It covers the following:

Part I – Registration

All Factories and Factory Buildings shall be registered. Approval will be granted by the Chief Factory Inspecting Engineer or District Factory Inspecting Engineer.

Part II - Health

This section makes the rules on cleanliness and sanitary condition in all premises of the factories. Additionally, it states the basic requirements in factories, such as cubic space allowance for each person, cubic space in a room, workroom temperature, ventilation and lighting

Part III – Safety

It discusses mandatory minimum safety requirement in factory complexes, such as prime movers, transmission machinery, other un-fenced machinery, vessels containing dangerous substances, steam boilers, hoists, and lifts.

Part IV – Welfare

Part IV of the factories ordinance declares the matters regarding welfare of the facilities amended to legal system. Mainly, it involves outlines on supply of drinking water, washing facilities, accommodation for clothing, resting facilities for female workers, and first aid.

Part V – Health, Safety, and Welfare

The section prepares the rules to protect workers from inhalation of fumes, gases, and other impurities. Also, it states about special regulations for safety and health.

Part VI – Notification and Investigation of Accidents and Industrial Diseases

This section clarifies notification of accidents, notification of industrial diseases, etc.

Part VII – Employment of Women and Young Persons, Hours and Holidays

This section discusses about hours of employment for women and young persons, employment of women at night in a factory or an industrial undertaking, overtime employment of women and young persons over sixteen.

Part VIII – Special applications and extensions in premises of which the owner is liable.

Moving into the Workmen's Compensation Ordinance, Sri Lanka (1934),

Part II – Liability Pay Compensation

If a personal injury is caused to a workman by an accident arising out of and in the course of his employment, the workman's employer shall be liable to pay compensation per the provisions of this ordinance. Additionally, it regulates the employer's liability to pay compensation for certain occupational diseases contracted by a workman and circumstances in which compensation is payable in respect of any disease.

Part III – Amount of Compensation

This section separates the levels of compensation as death results from the injury, permanent and total disablement results from the injury, and permanent partial disablement results from the injury.

Part IV – Payment Distribution and Recovery of Compensation

The section discusses the distribution of compensation for an injury or a disease.

Comparatively, the OHS acts in other countries and admitting to the context in Sri Lanka, existing laws [Factories Ordinance (1942) and Workmen Compensation Ordinance (1934)) seems insufficient with the current industry requirements. Also, occupational health and safety standard OHSAS 18001 is still not a compulsory regulation to date and followed by a very few local construction companies. However,

the standard of occupational health and safety is comparatively higher in compare with others countries which do not follow OHSAS 18001.

2.5 An overview of OHSAS 18001

American Petroleum Institute (1998) and Azardeh, Fam, Nouri, and Azardeh (2008, as cited in Mahmoudi et al., 2014) constitutes that,

> Various models and standards are available that address occupational health & safety (OH&S) assessment and improvement in various kinds of industries; Health, Safety, and Environment Management System (HSE-MS) and Occupational Health and Safety Assessment Series (OHSAS) 18001 are among the most popular ones. The HSE-MS, based on the plan-do-check-act methodology, is a cyclical process intending to achieve continuous improvement in health, safety, and environment at workplaces. A correctly implemented HSE-MS can result in declined accident rates, reduced number of injuries, lower waste generation, and more productivity. It is worth pointing out that various elements for HSE-MS may be expressed by different companies or guidelines; however, the key elements are the same (plan-do-check-act).

Moreover, the OHSAS 18001 is also a risk management system that is widely used to identify and manage unacceptable risks at workplaces. It is very similar to HSE-MS regarding both basis and purpose. The British Standard occupational health and safety management systems-Guide (BS 8800: 2004) is another useful tool to meet these objectives. Although the standard was basically developed for the United Kingdom, it has been adopted by other countries such as Finland (Mahmoudi et al., 2014).

OHSAS 18001 is suitable for any organisation, regardless of its size, sector, or geographical location in any sector such as waste and recycling, manufacturing, and construction and engineering to establish a good OHSMS. While the standard sets out a best practice framework for health and safety management, it is written in such a way that gives the flexibility to adapt it to meet any individual business objective (BSI Group, 2013).

As per the BS OHSAS 18001 and Drupsteen (2014), the key elements of OHSAS 18001 are:

Occupational Health and Safety policy, including risk and hazards assessment – To use the processes of OHSAS 18001 to form the basis of OHS management system. The flexibility of the BS OHSAS 18001 standard allows managing the complexity of these processes relative to the size of the business as per the own workplace situations and the nature and significance of specific hazards.

Implementation and operation – By the identified risks and hazards, it requires to develop and evaluate procedures that enable to identify the legal and other health and safety requirements relating to an organisation. The organisation should be able to identify, store, protect, retrieve, retain, and dispose of records by the standard and ensure they remain legible.

Checking and corrective action – Internal procedures are required for the handling, investigation, and analysis of accidents, incidents, and non-conformities to eliminate the actual or potential cause. It needs putting in place a procedure to address non-conformities and for taking corrective and preventative actions. These are required at regular intervals to assess a system's suitability and on-going effectiveness. Audits should provide evidence that the health and safety system is working under control environment; it is important to ensure that audits are impartial and objective.

Management review of the safety management system (SMS), to ensure its continuing suitability, adequacy, and effectiveness - Top management should meet periodically to ensure that the management system is still suitable and effective. These meeting should be used to review the organisation's policy and performance against its objectives, bearing in mind the changing business environment and the future management programme.

Continual improvement of the SMS - A process for monitoring and measuring is required, to give the confidence in control of health and safety risks, and should provide a mechanism to determine progress towards achieving the objectives. Where equipment is required to monitor or measure performance, this equipment should be

calibrated, and records must be maintained. Meeting and keeping in line with legal requirements is essential, as is the evaluation and documentation of organization's performance against these criteria.

2.5.1 Practical Challenges in Implementing OHSAS 18001

As described in OHSAS 18001 online consultation centre:

Establishing a culture of health and safety - Most organizations that have not had a formal OH&SMS may tend to underestimate the importance of health and safety to the workplace, and it may seems that many employees do not consider health and safety to be a priority, as any present risks or dangers may not yet have resulted in incidents or accidents. This will need to be overcome to prevent any future accidents. OHSAS 18001 basically needs competence, training, and awareness. It requires that employees and stakeholders are trained; made aware regarding objectives, targets, and information to assist good health and safety performance. It is important to listen to the team by valuing their opinions, and they will tend to believe in the OH&SMS that they help to create themselves to overcome the cultural barriers.

Meeting legislations - The success of the OH&SMS will depend, in the first instance, on the ability to meet the legislation in any part of the world the company operates. Therefore, it is essential that the organisation has a specialist in this field, whether internal or externally hired, to make sure that OH&SMS rules and initiatives meet the required legislation when setting up. If the organisation chooses to use an internal candidate, it must ensure that he/she has the knowledge and ability. Likewise, if they hire externally, it is advisable to ask for references to ensure the candidate can deliver the legislation compliance details that match the internal requirements.

Support of top management - This is critical in establishing an effective OH&SMS. From commitment to the project, and emphasis on the importance of health and safety through leading by example to the criticality of communication, the company will undoubtedly have a more difficult job implementing an OH&SMS without this vital ingredient. Section 4.4.1 of OHSAS 18001 deals with resources, roles, responsibilities, authority, and accountability. This leaves us in no doubts as to the onus on top

management to show its commitment to the OH&SMS, how these management members must be known to all employees, and how they must play a part in defining authority and responsibility within the OH&SMS. As the implementation manager can use this element of the standard to ensure the top team lead by example, communicate effectively, and demonstrate the importance of an effective OH&SMS to the employees. This behaviour from the top team can make an implementation much smoother than otherwise.

Support of the team - One person will have a mammoth task of establishing an OH&SMS in all but the smallest of micro businesses; therefore, having the assistance of other like-minded employees and team members is critical. Whether it is through delivering formal roles and responsibilities, or seeking help more informally, the implementation project will be much more difficult without the support and expertise of team members, who may have more expertise and knowledge of the company and its products than you do yourself.

Section 4.4.3.2, OHSAS 18001 of the standard deals with participation and consultation. Ensuring that communicate and consult with team members not only builds knowledge, but it builds relationship and trust between the implementation manager and the team. This can make implementation much less troublesome than otherwise.

Organisational setup - The organisation may have multiple sites performing different functions, or even in different global locations. If one of the locations is an office and a call centre, and the other a manufacturing plant, they will each have different health and safety requirements. The challenge may be made more difficult by this, and the organisation may need to decide whether it needs a 'one-size-fits-all' approach, or separate provision needs to be made for different sites. Section 4.4.6 of OHSAS 18001 deals with operation control, it can assess an organisation's activities, processes, and controls, even across multiple sites. Then the organisation could shape the OH&SMS controls to meet the needs of the sites, even if the sites produce diverse outputs regarding goods and services.

Chapter 03

RESEARCH METHODOLOGY

3.1 Introduction

The primary objective of Chapter three is to present the research methodological outline used to steer this study. However, to gain a reliable result and accomplish the aims and objectives, the research methodology must be systematic throughout the study.

The design of this research runs in a logical manner, taking into account the research problem and its importance. Chapter 01 of this report describes the research problem by exposing the background of this research significantly. Past literature reviews regarding the captioned research problem are presented in Chapter two, and the present chapter points out the research approach by explaining the relevance and appropriateness of the research design. The chapter further describes the method of data collection and analysis criteria.

3.2 Research Approach

The end user of any research study may find out the core details, data collection, and analysis by the research design.

The final result of any research study critically depends on the research design. A well-established design is an essential requirement for a successive outcome. According to Kraemer (2002), research approaches are classified mainly into two as *Quantitative* and *Qualitative*. Quantitative approach relates to positivism and seeks to gather factual data and to study relationships between facts and how such facts and relationships accord with theories and the findings of any research executed previously.

In accordance with Fellows and Lui (2003), survey research and experimental research are basically grouped under quantitative approaches. By using a qualitative approach,

the researcher can study a whole population as individuals or groups and could identify beliefs, understandings, opinions, and views of people.

For this research, the **survey method (*quantitative*)** has been identified as the most appropriate approach. A survey was conducted through a questionnaire survey, and the research design comprises the following steps:

1. Identification of the research problem.

2. Literature review.

3. Questionnaire design.

4. Pilot survey.

5. Questionnaire survey and data collection.

6. Analysis.

7. Conclusion and recommendations.

The research design structure is presented in Fig. 3.1.

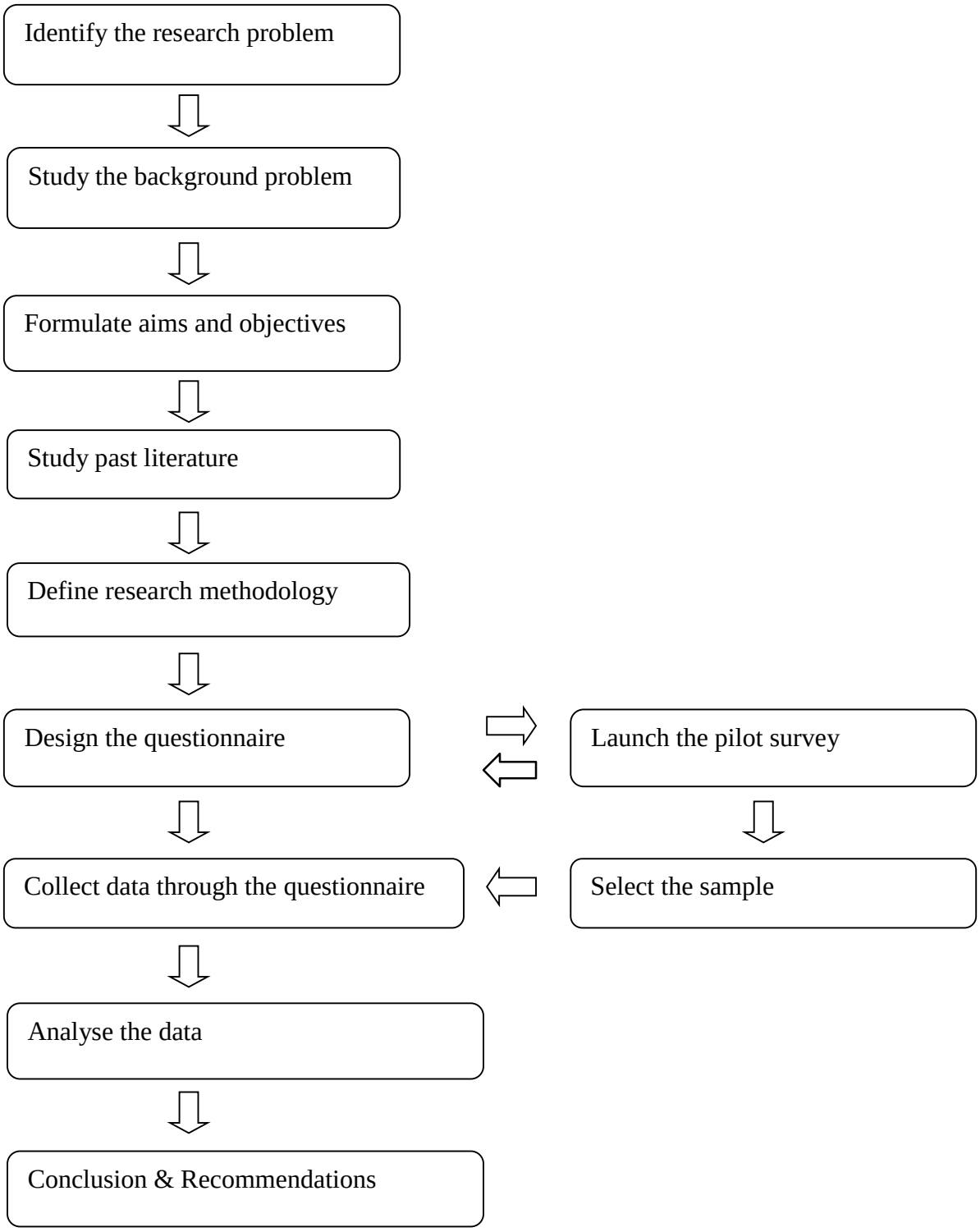

Figure 3.1: Research Design

3.2.1 Identification of the Research Problem

Numerous researchers have performed various research studies relevant to the safety practices previously. Nevertheless, a gap of safety performances in construction sites still exists due to the non-compliance of safety rules, indicating a significant requirement of an effective mechanism for a successful health and safety management system. Therefore, when admitted to the local context in this regard, a recognised management standard for occupational health & safety needs to mandate as a government policy.

Hence, the research problem was initiated as a study to find the limitations to implement OHSAS 18001 as a regulation in Sri Lankan construction industry, from a contractor's perspective.

3.2.2 Literature Survey

In accordance with the Mongan – Rallis (2014),

> A literature review is not an annotated bibliography in which is summarised briefly each article that has reviewed. While a summary of that read is contained in the literature review, it goes well beyond merely summarising professional literature. It focuses on a specific topic of interest to the subject and includes a critical analysis of the relationship among different works, and relating this research to your work. It may be written as a stand-alone paper or to provide a theoretical framework and rationale for a research study (such as a thesis or dissertation)."

Further, Holt (1998, as cited in Thanurjan, 2007) mentioned that literature review as the compilation and assimilation of as much information as can be discovered for the given topic, and a thorough literature review was done on the research subject.

A substantial literature review was performed relevant to construction health and safety, to understand the current knowledge regarding the subject matter. The study was helped the researcher to have a profound awareness of minor issues, the extent of which past research had been done, and compare the ideas and set out the research

structure. As depicted in the previous chapter, the literature survey was conducted, relevant to this study.

3.2.3 Questionnaire Design

As per Bugess (2001),

> Design of the questionnaire can be split into three elements:
>
> a) Determine the questions to be asked,
>
> b) Select the question type for each question and specify the wording, and
>
> c) Design the question sequence and overall questionnaire layout.

Besides, a questionnaire is 'a group or sequence of questions designed to elicit information upon a subject, or sequence of subjects, from an informant' (Lurry & Casley, 1986).

The questionnaire for this research study was designed by four sub-sections as follows:

a) **General Information**

   This sub-section collects the data on the profile of respondents' capacity, experience in similar capacity, and education. Further, this section collects the data regarding the nature of the business and employee capacity of the organisation. It is important to identify the competency level of the respondents, whose results were evaluated.

b) **Organisational Occupational Health & Safety Management Practice**

   With the intention to be aware of the current practice in Occupational Health & Safety Management Practice, this sub-section is also included in the questionnaire. The existing internal management system for OHS, safety meetings, availability of written policies on OHS, training, top management commitment on organisational OHS, and legal compliances were the main questioning areas under this section; since it is essential to know about the current occupational health and safety practices before discussing the

difficulties/possibilities to implement OHSAS 18001 as a mandatory regulation in the local construction industry.

c) Accidents and Health Hazards

A sub-section named as Accidents & Health Hazards has been amalgamated with the above section (b) having the objective to get to understand the accident situation comparatively to their existing internal OHS system. Key areas were fatal accident rate, legal compliance, post investigation, preventive/corrective actions, and costs related to accidents.

d) Awareness of OHSAS 18001 and Expert's Views

This was the main important sub-section of the questionnaire, which directly collects data regarding OHSAS 18001 management system. Main data gather points of this sub-section were OHSAS 18001 certification, constraints on OHSAS 18001, factors that affects to successive OHS management system, and direct comments for the question which is check that should OHSAS 18001 system be mandate referring the local construction industry. From the literature survey, following factors were initialised for the questionnaire as key factors for successive OHS management system to check their importance:

- ✓ Top management commitment
- ✓ Cost
- ✓ Awareness
- ✓ Training & Development
- ✓ Cultural / Attitude barriers
- ✓ Academic qualifications related to health and safety in Sri Lanka
- ✓ Expertise knowledge in the sector

Majority of questions were incorporated into the questionnaire covering the above sub-sections by without directly asking about OHASAS 18001 standard from the very first questions, since the poor knowledge on OHSAS 18001 among the local contractors.

3.2.4 Pilot Survey

A Pilot survey was performed with the intention of shaping the drafted questionnaire based on comments/advice of external industrial experts. Two individual resource persons were selected for the pilot survey, and face-to-face interviews were conducted. One expert is a well-known senior industrial expert having over fifty years of experience (since the British government era) in a similar capacity in the government sector. More than two hours were spent with him to discuss the questionnaire and other related matters.

The other expert is a reputed senior top managerial person having experience in the government system accreditation body, and as same as the previous survey, a face-to-face interview for about an hour was held with this expert. Both experts provided valuable comments and emphasised on the industrial safety requirements to be fulfilled, shortcomings in the current context, and the importance of regularising OHSAS 18001 in the construction industry. Subsequently, the drafted questionnaire was adjusted as per their guidance, based on experience.

3.2.5 Questionnaire Survey and Data Collection

In accordance to the grading system of contractors, Construction Industry Development Authority – Sri Lanka, 67-numbers of contractors registered to top-most three highest grading (*visited the official website on 29th of January 2017*) are as follows:

Table. 3.1. Contractors Grading (CIDA, 2016)

No.	Grading	Financial limit (Rs. Million)	Number of Registered Contractors
01	CS2	X > 3000	10
02	CS1	3000 ≥ X > 1500	03
03	C1	1500 ≥ X > 600	54

As presented in Table 3.1, from the total population sample panel, 45 individual experts were selected from 45 individual sites of the above contractors using a random

sample method. Forty-five questionnaires were distributed between them, and 40 experts responded on time. Data collection was based on the following approaches:

- Sending the questionnaire by post
- Hand-over the questionnaire
- E-mailing the questionnaire

In this event, the questionnaire hand-over was the most successful method, but it was hard to reach the respondents. Several attempts were needed to make appointments, which expended over a month to complete. Sending the questionnaire by post and E-mailing the questionnaire to the respondents were the other reliable methods. E-mailing was not an easier method to collect data, but was the most prominent contributor to data collection. Many e-mail and telephone reminders to them for a two-month period were needed to complete the work under this procedure. With the above three techniques, two-and-a-half months were required to complete data collection.

3.2.6 Method of Data Analysis

Data analysis was conducted by dividing the questionnaire into three main sections.

3.2.6.1 Overview of the Analysis

The main objective of this section is to obtain some basic knowledge of the respondents' background. The capacity of the respondents in the industry, experience in similar capacity, academic and professional qualifications, business background, the total number of employees, and especially, whether they follow an OHS management system, are the areas that are planned to scrutinise under this section. Pie charts, Content analysis, and other required tabulated models of data were the basic statistical tools used for analysis. Question number 01 to Question number 07 analysed the respondents' profiles.

3.2.6.2 Current Practice of Occupational Health and Safety, and accidents in Sri Lankan Construction Industry

Question numbers 08 to 29, and question numbers 31 to 34 that were designed to critically analyse the existing practice of occupational health and safety relating to the

field of construction were carefully assessed using data tables, pie charts, and content analysis in open-ended descriptive answers. Mean weighted rating was used as adopted by Asaaf et al. (1995, cited in Cheng, Skitmore, & Thomas, 2005) for question number 30 having following assigned weights for the factors.

Table. 3.2. Weighted rates for the factors of Question No. 30

Factor	Below 05	06 to 10	11 to 15	16 to 20	Above 20
Rate	01	02	03	04	05

Mean Weighted Rating Method:

$$Mean\,Weighted\,Rating = \frac{\sum(V_i x F_i)}{n}$$

Where,

V_i - Rating of each Factor

F_i - Frequency of Responses

n - Total number of responses

3.2.6.3 Factors affecting the OHS management system and Awareness on OHSAS 18001

Question number 35 to 40 that are focused on identifying the requirement of OHSAS 18001 as a legislation of Sri Lanka were followed up through this section. Mean weighted rating method has been applied to question number 39 by rating the response as follows:

Table 3.3. Weighted rates for the factors of Question No. 39

Factor	Very Important	Important	Neutral	Unimportant	Not Applicable
Rate	05	04	03	02	01

Question number 35 and 36 were scrutinised using pie-charts. For the descriptive answers to question numbers 37, 38, and 40, the Content analysis method was used to analyse the data.

Chapter 04

DATA ANALYSIS AND DISCUSSION

4.1 Introduction

As explained in the above chapter, results of the divided sections are as follows:

4.1.1 Profile of Respondents

Having admitted to question numbers 01 to 07, respondents can be categorised as follows according to their designation, experience, education, business, the scope of work, number of employees, and the availability of internal OHS system.

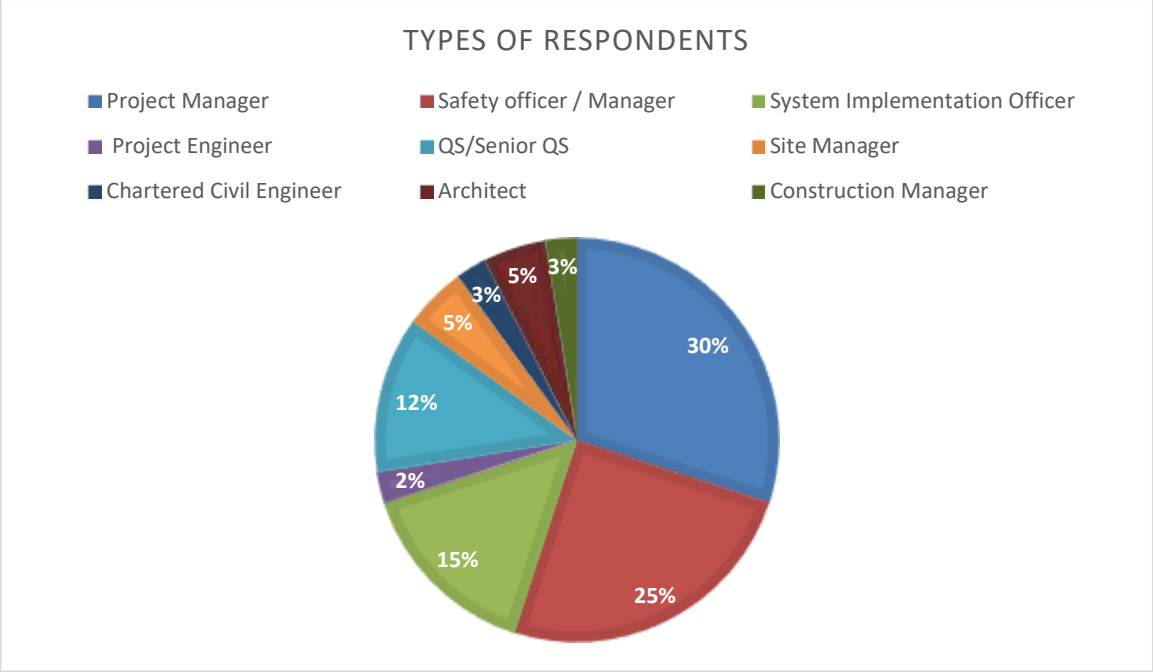

Figure 4.1: Types of Respondents

As per Fig. 4.1, over 50% responses were from Project Managers (30%), Safety Officer / Managers (25%), and System Implementation Officers (15%). Replies from Quantity Surveyors is also noteworthy as it is marked as 12.5%. That means the majority of respondents dealing with occupational health and safety issues directly as key construction are staff members. Therefore, above 70% of total response was from reliable professional ends.

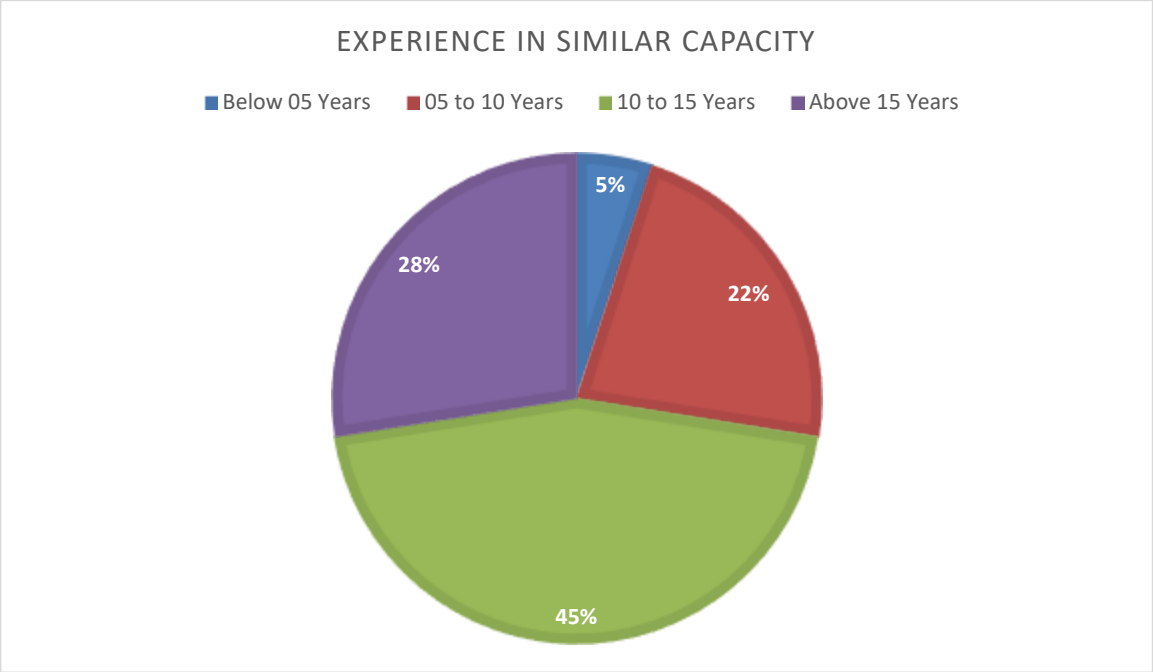

Figure 4.2: Experience of the Respondents

As per the Fig. 4.2, 73% of respondents had more than 10-years of experience. This is acceptable as a favourable percentage since most of them having beyond a decade of experience relating to the occupational health and safety in the construction industry were Senior Project Managers, Safety Managers, and System Implementation Officers. Preparation of system manuals compatible with the international accreditation standard requirements and maintenance are the main responsibilities of System Implementation Officers, and in most construction organisations, they are directly responsible for ISO 14001 and OHSAS 18001. Most of them were accredited under foreign accreditation bodies than the local institute (SLSI).

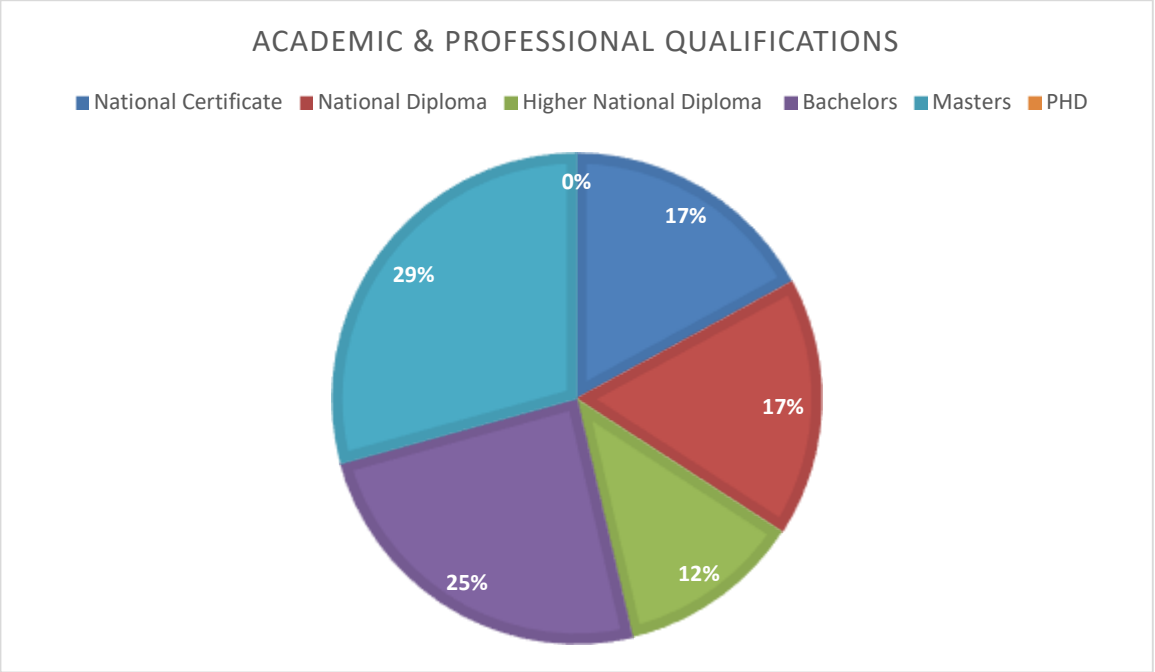

Figure 4.3: Distribution of Academic and Professional Qualifications

Having admitted the academic and professional qualifications of the selected sample, 54% of respondents possessed a degree or above, whereas 29% were diploma holders in construction technical areas such as Civil Engineering, Architecture, Quantity Surveying, and Occupational Health & Safety. Majority of certificate holders were Safety Officers/Managers who directly handles site safety in construction sites, high rise buildings, roads, and water supply. There was no degree holder in the field of Occupational Health & Safety, other than masters with different basic degree qualifications in the selected sample.

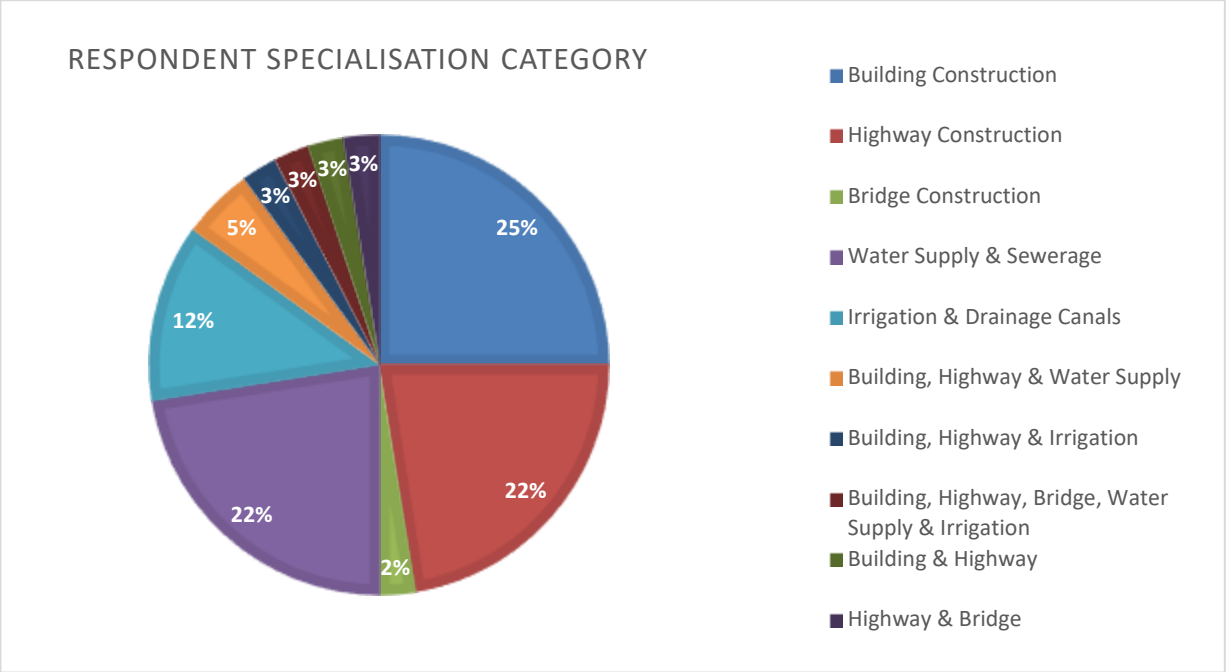

Figure 4.4: Respondents as per their sector of construction

More than 70% of respondents were in building, highway, water supply, and sewerage fields, representing large-scale construction sectors in Sri Lanka. Fast-spreading High-rise Building projects are most dangerous due to its height and complications than other sectors. According to the professionals having experience in high-rise buildings, the fatal accident rate is very high. The second most risky industry is highway construction as the majority of those projects run with day-to-day public life, and motor car accident rate is remarkably high in road construction projects.

Concerning the responses in question number 05, 97.5% of them were involved in the construction sector as the Main Contractor and 2.5% were Investor and Main Contractor; this refers to the scope of work in specified fields. In every construction project, the main contractor plays a significant role holding the responsibility for the safety of their staff, labourers, Client staff, and the Engineer's staff. Response source is more reliable as the main contractor is directly bound by legal requirements of the Law of Sri Lanka.

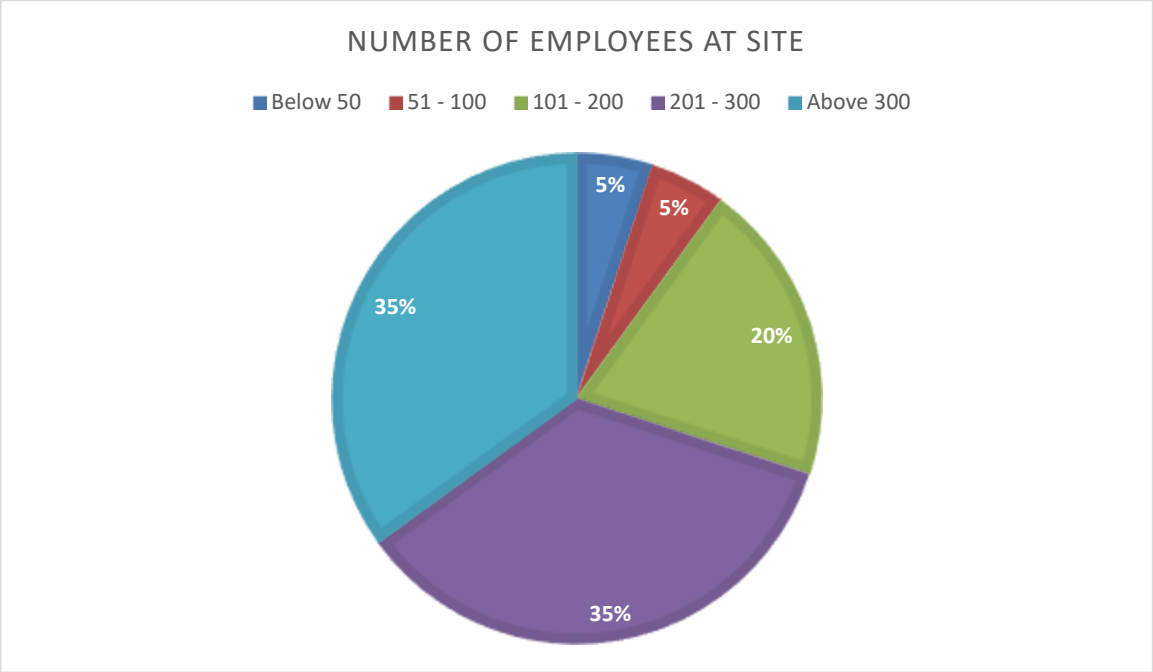

Figure 4.5: Number of Employees at site

According to Fig. 4.5, a majority of responses were from heavy labour utilising sites. The level of health and safety should be high in those construction projects. As per the respondents, most of them were involved in the construction sites with more than 200 employees marked as 70%. Nonetheless, according to the respondents, turnover of the labour employees are very high in local construction projects that disturb the implementation and maintenance of proper occupational health and safety procedures.

4.1.2 Current Practice of Occupational Health & Safety and accidents in Sri Lankan Construction Industry

Question number 07 to check the availability of proper internal management system for OHS, the distribution is as follows:

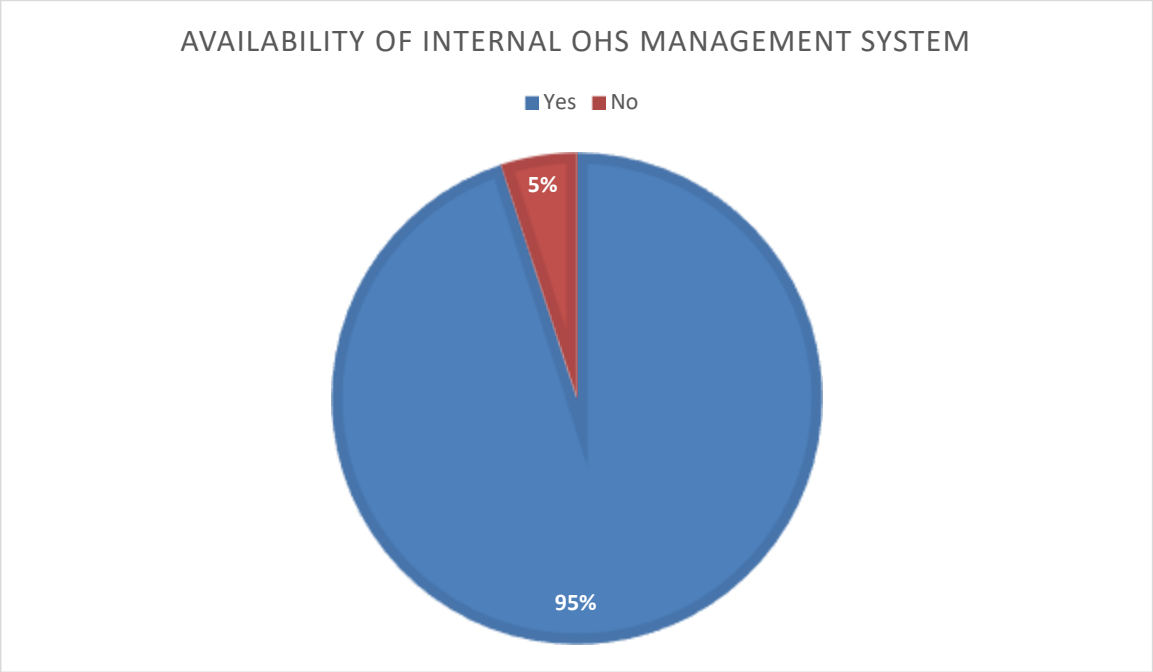

Figure 4.6: Availability of Internal OHS Management System

According to Fig. 4.6, 95% of all respondents had a proper internal OHS management system, but it was evident that most organisations did not follow it properly nor maintained any follow-up procedure. As per the views of respondents, the interest of higher management is meagre, mainly regarding the long-term benefits such as cost saving, time-saving, and goodwill. Above majority includes both written and non-written internal OHS systems.

Figure 4.7 presents the responses on conducting internal occupational health and safety meetings and their frequencies.

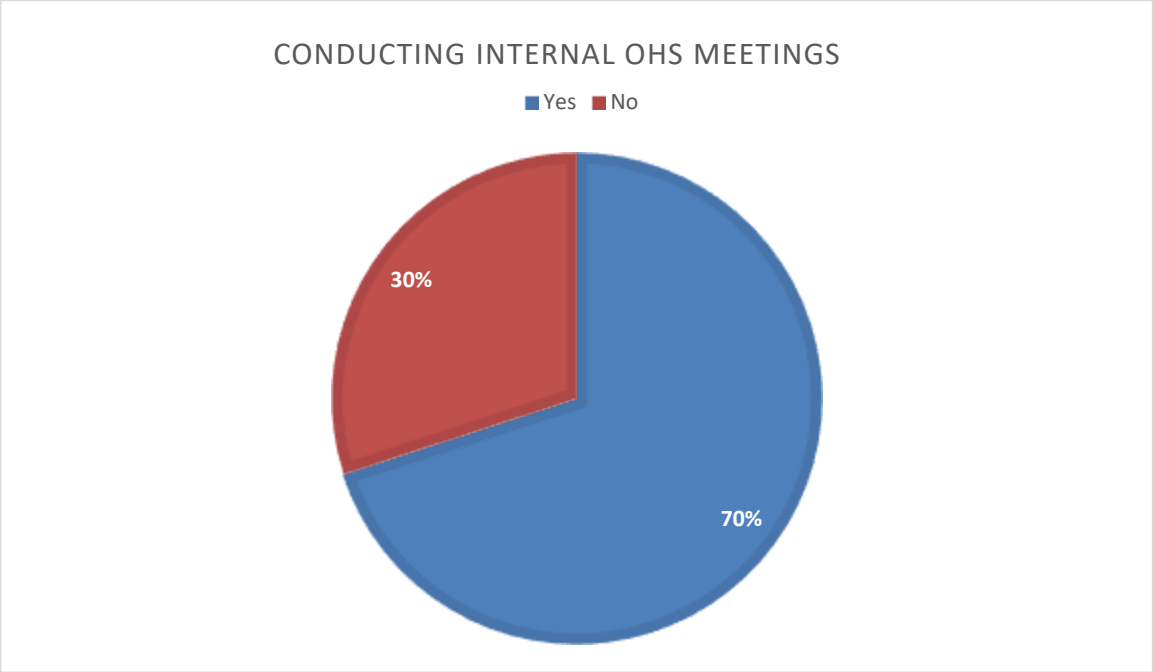

Figure 4.7: Conducting Internal OHS Meetings

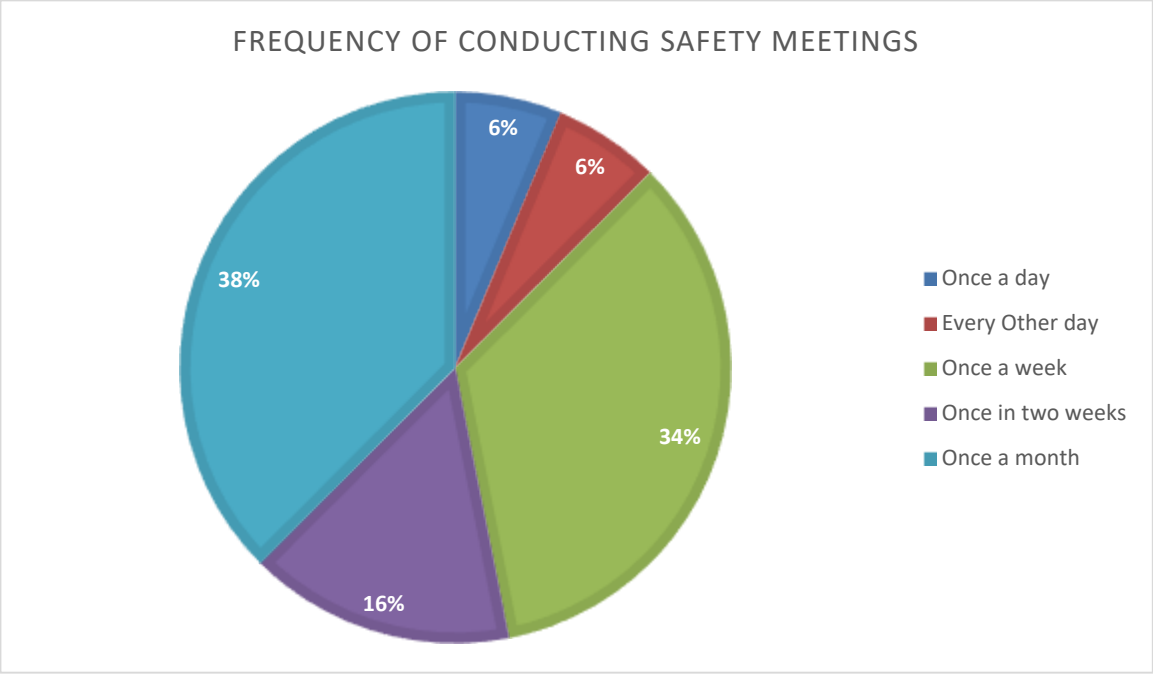

Figure 4.8: Frequency of conducting internal OHS meetings

As per figures 4.7 and 4.8, 70% of above organisations conduct internal Occupational Health & safety meetings. Most companies conduct meetings at monthly and weekly frequency rates marked as 38% and 34% respectively in figure 4.8. However,

according to the respondent views, OHS meetings may require at least once-a-day to implement and maintain a proper OHS system due to the high turnover of the labour force that represent the majority of employees. However, as shown by this study, the frequency of holding safety meetings on a daily basis was only 6% in the actual context.

Table 4.1. Responses to the meeting regarding its purpose

No.	Response Factor	Percentage
1.	Implementation & Maintenance of OHS Procedures	22.22%
2.	Maintenance only for OHS Procedures	77.78%

Apparently, the main objective of holding safety meetings was the implementation and maintenance of an internal occupational health management system. Maintaining the implemented OHS policies as the purpose of the regular OHS meetings received the highest response (77.78%), while according to the content analysis, 22.22% responded for implementing and maintaining OHS procedures as their objective of safety meetings.

Conducting safety meeting is an important factor under the sub-section 4.5.1, OHSAS 18001 – Performance measurement and monitoring; and thus, most organisations follow this requirement.

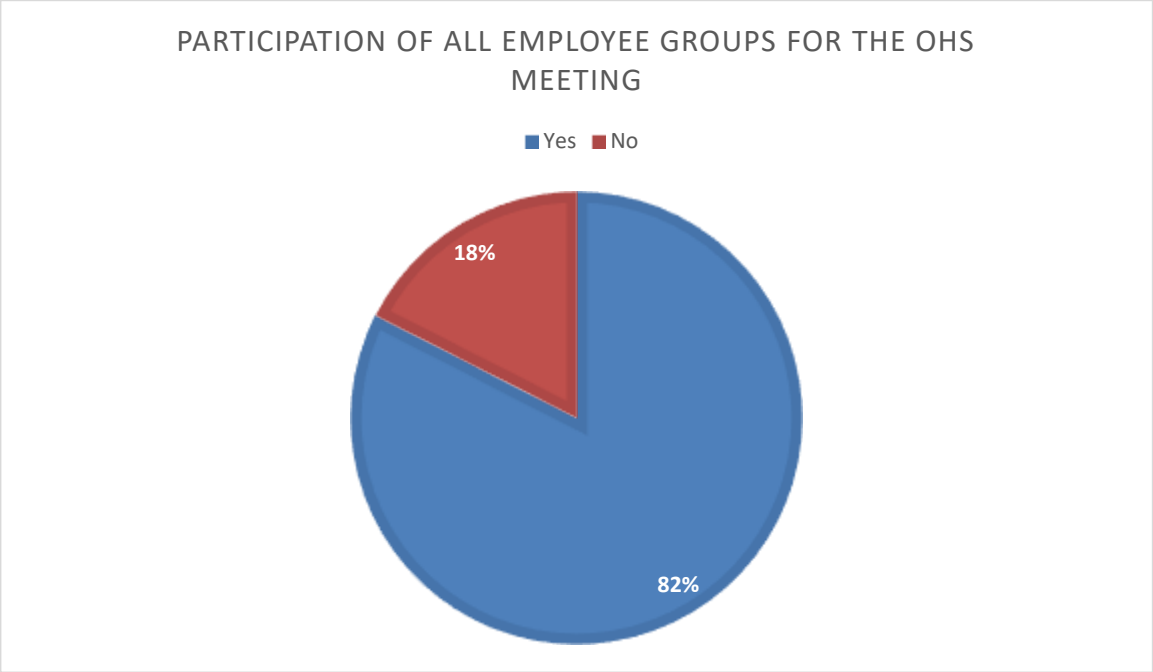

Figure 4.9: Employee Participation in OHS Meetings

Fig. 4.9 indicates acceptable participation from all employee groups including top management for the Safety Meeting (82%). However, according to most respondents, they categorised up to General Manager Level as the top management, but for this study, the response from owner level management was expected. As per the respondent views, company owners always concern on the profitability of the company instead of other requirements such as safety, employee health, welfare. Top management concern was at the lowest level of OHS management requirements in a contractor's party.

Table 4.2. Common Employee Group for the OHS Meeting

No.	Response Factor	Percentage
1.	Engineers, Lower Level Technical Management Staff & Labours	3.70%
2.	Lower Level Technical Management Staff & Labours	92.59%
3.	Project Managers, Engineers, Lower Level Technical Management Staff & Labours	3.70%

According to the content analysis performed to determine the most common Employee group participated in the OHS meetings, Lower level technical management staff and

labourers were found to be the highest with 92.59% response percentage. Middle management level participation (including Project Managers and Engineers) for the OHS meetings was marked as 3.7%. However, as per this distribution, the top level management participation for OHS meetings was unsatisfactory.

Participation of all employee groups for OHS meetings is an essential requirement as per the sub-section 4.4.3 of OHSAS 18001 – Communication, Participation, & Consultation.

Response rates for conducting regular toolbox meetings and the frequency of them were as follows:

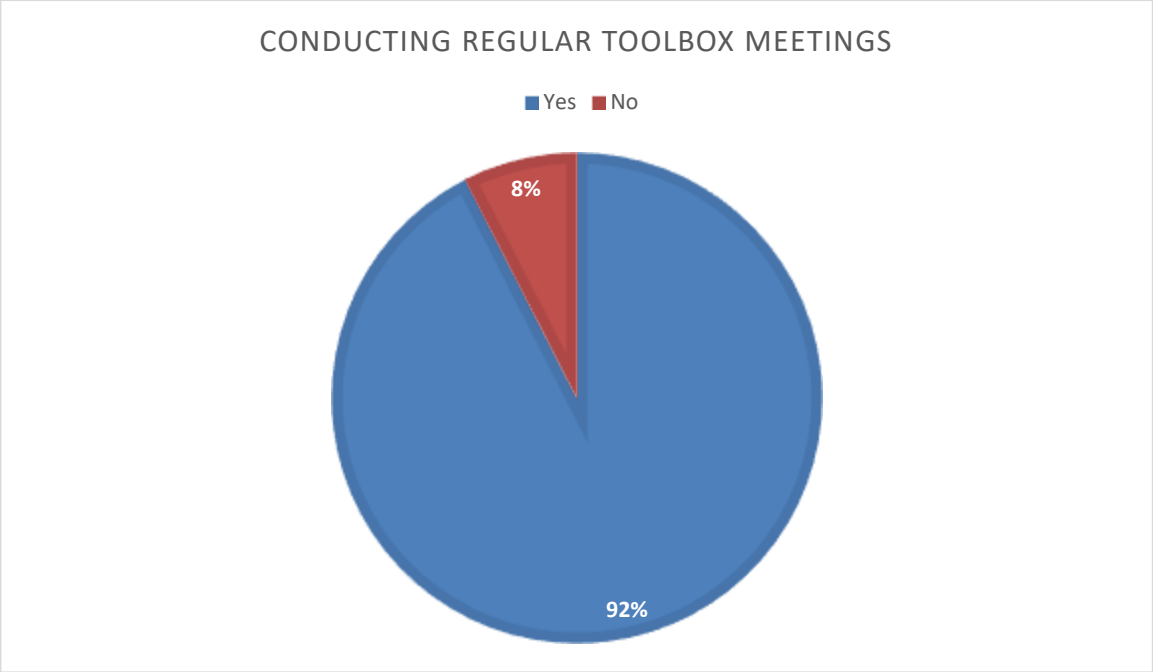

Figure 4.10: Conducting Regular Toolbox Meetings

A 92% rate was marked as "Yes" for conducting regular toolbox meetings. The Safety Officer/Manager of respective site hold the toolbox meeting as his routine job. Toolbox meetings were conducted for separate construction teams located in different places and handled by various construction activities.

Under the sub-section 4.4.3.2 of OHSAS 18001 – Participation & Consultation, conducting regular toolbox meetings are vital, and most organisations follow the practice even they have not obtained the certification.

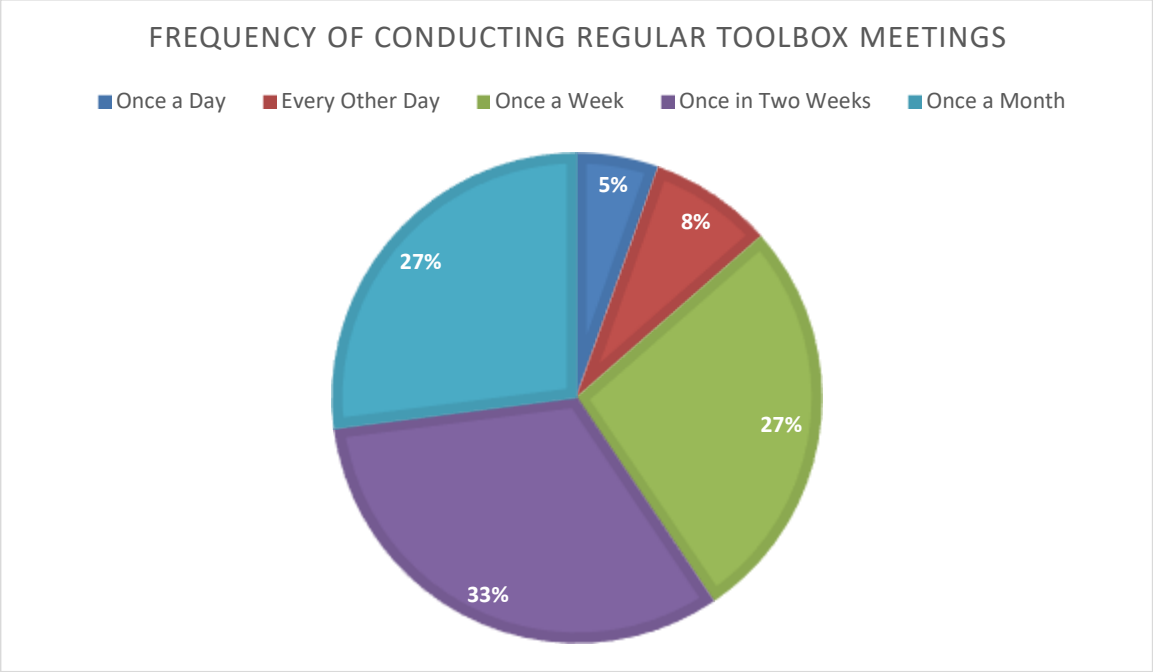

Figure 4.11: Frequency of conducting Regular Toolbox Meetings

Highest frequency was reported as 33% for once-in-two weeks and 27% indicated for conducting toolbox meetings once-a-month and once-a-week. As per the comments of experts in selected sample, regular toolbox meetings are significant to maintain implemented occupational health and safety procedures and also a reliable technique to monitor them periodically. Besides, conducting regular toolbox meetings is practically not an easy task due to complications & tight progress schedules of construction sites.

The frequency of conducting regular toolbox meetings is acceptable and well compared with sub-section 4.4.3.2 of OHSAS 18001.

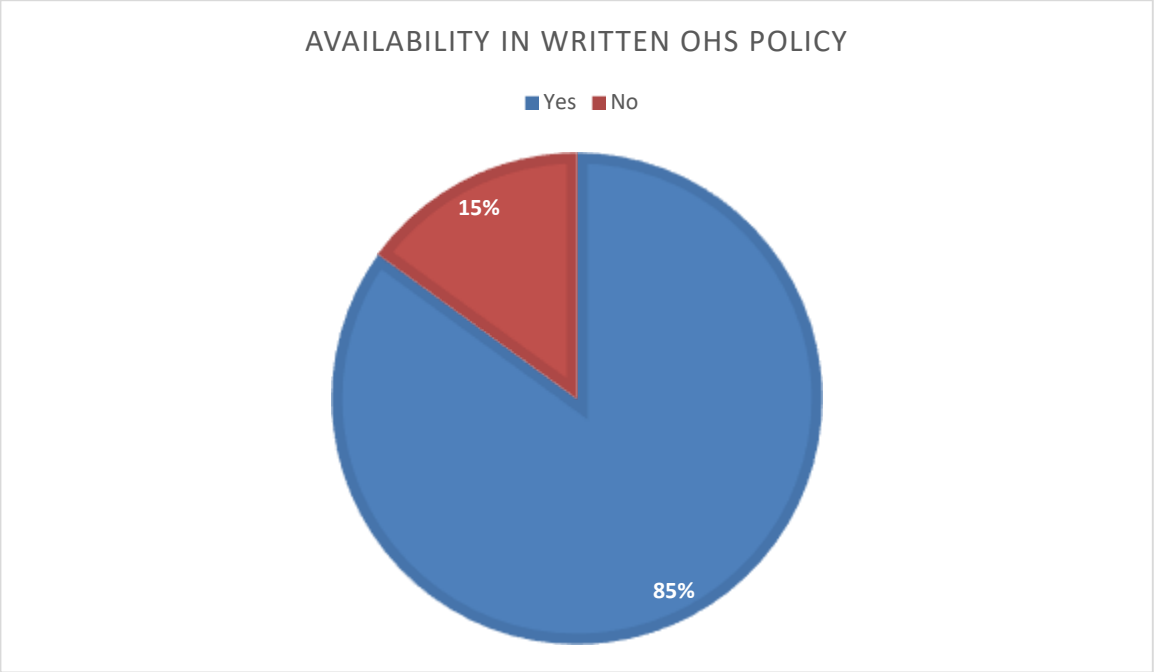

Figure 4.12: Availability of written OHS policy

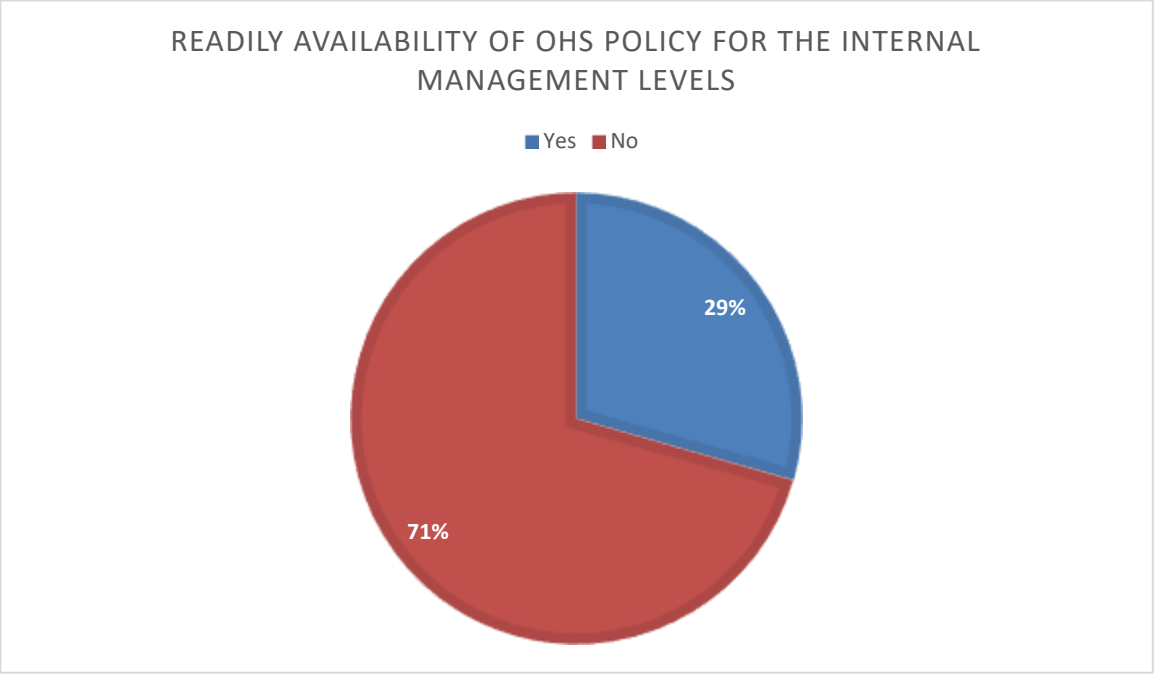

Figure 4.13: Readily availability of written OHS policy

The availability of written OHS policy was marked as 85%, and ready availability was not satisfactory as 29%. Most of the written internal Occupational Health and Safety Policies do not comply 100% with any international OHS management system.

Majority of organisations did not take any accreditation under an internationally recognised institution, and very few followed OHSAS 18001, having certification under the recommended body and without accreditation. Only a very few companies had a specific person called as a 'System administrator/System implementation officer' to implement and maintain the OHS procedures.

By the sub-section 4.2 of OHSAS 18001 – OH&S policy and sub-section 4.4.4 of OHSAS 18001 - Documentation, implementation, and maintenance of internal OHS policy for the specific organisations is a top requirement for a continuous OHS management system. Responses in this regard are acceptable; thus, the readily availability is unsatisfactory.

Response distribution for the availability of a competent person to implement and maintain OHS policy was as follows:

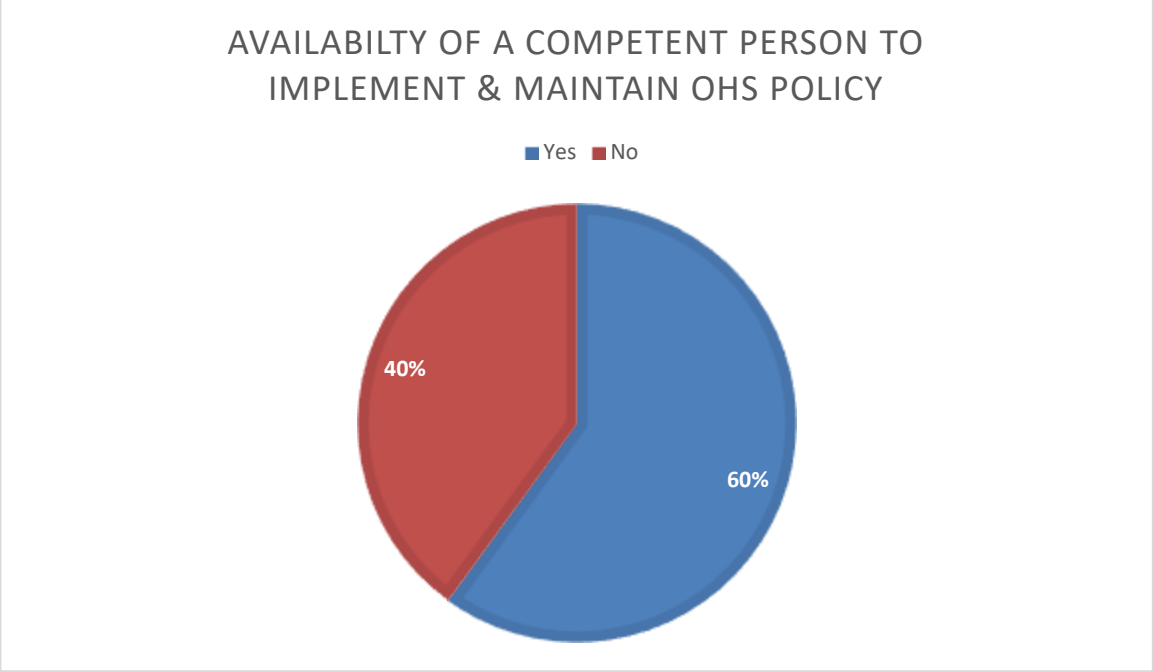

Figure 4.14: Availability of a competent person to implement and maintain OHS Policy

As illustrated in Fig. 4.14, 60% of the selected sample had a competent person to implement and maintain OHS policies, while 40% of the chosen sample had no qualified person to perform OHS procedures matching to internal and international system management standards. Safety officer/Manager was the only responsible

person for such things in most construction sites and majority of incidents; the Safety officer is incapable of executing these activities in addition to timely monitoring the site safety.

A good percentage was marked for having a competent person to implement and maintain OHS policies, even not accredited under OHSAS 18001. This complies well with sub-section 4.4.2, OHSAS 18001 – Competence, training, & awareness.

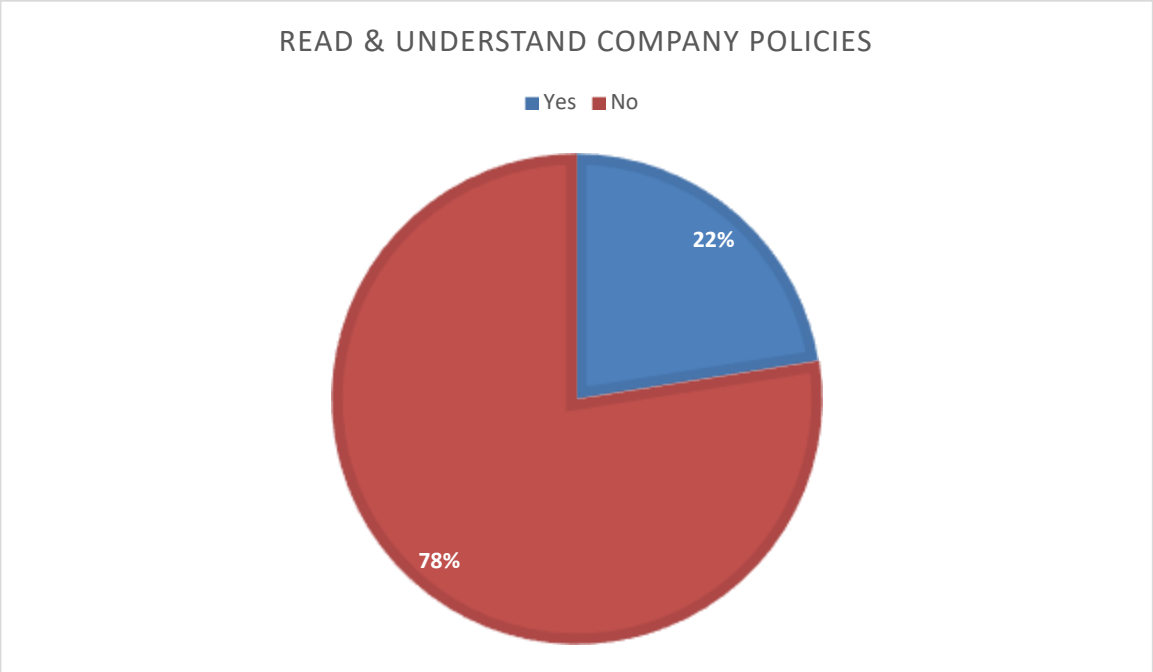

Figure 4.15: Read and Understand company policies

A large number of responses (78%) received were opposite to the above requirement (Fig. 4.15). Occupational Health and Safety is a responsibility of every employee in a construction site, from top-level to bottom-level management. However, under Sri Lankan context, a considerable number of employees are not aware of safety requirements, even on their health and safety with the construction sites. Only 22% of organisations of the selected sample had mandatory internal regulations to read and understand the company policies, including OHS policies. This is according to the sub-section 4.4.3.1 of OHSAS 18001.

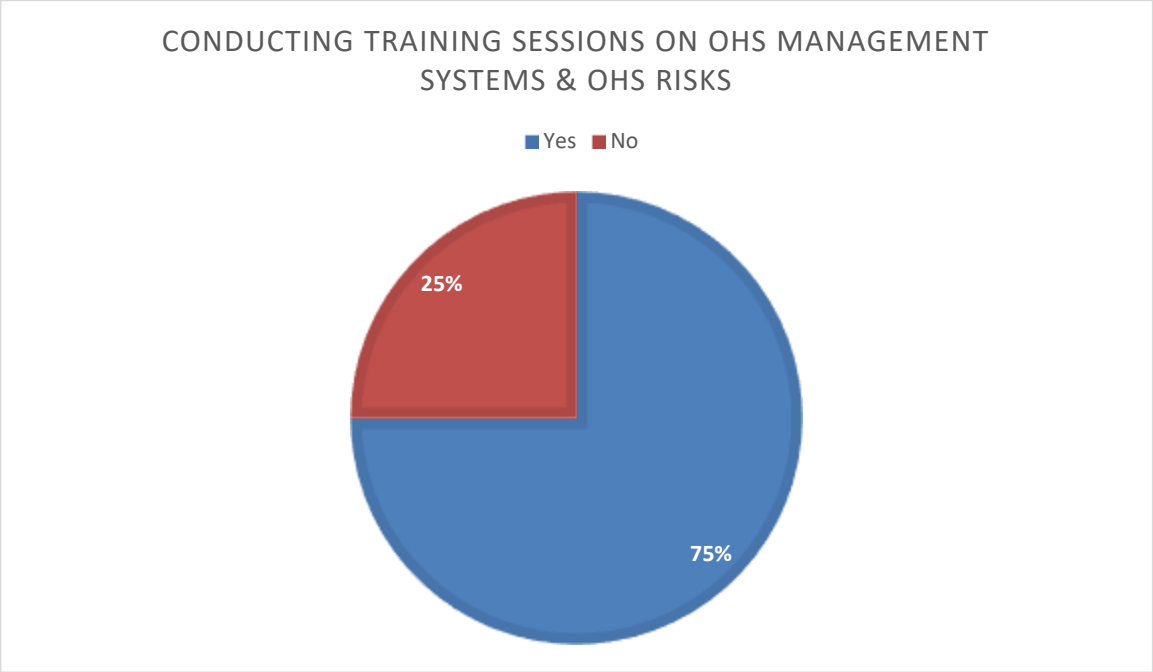

Figure 4.16: Training sessions on OHS management systems and OHS risks

Following Fig. 4.16, most organisations conducting training sessions on OHS management systems and OHS risks are marked as 75%. In the set of local C1 contractors, the majority of them holds OHS training sessions. As per their further comments about the Sri Lankan context, clients do not allocate sufficient amount of money for OHS management in construction projects. In most cases, the contractor suffers from lack of adequate funds to conduct such safety training sessions, and marked as 25% of the selected sample.

The response received for conducting OHS training sessions is acceptable as it conforms with sub-section 4.4.2 of OHSAS 18001 – Competence training and awareness.

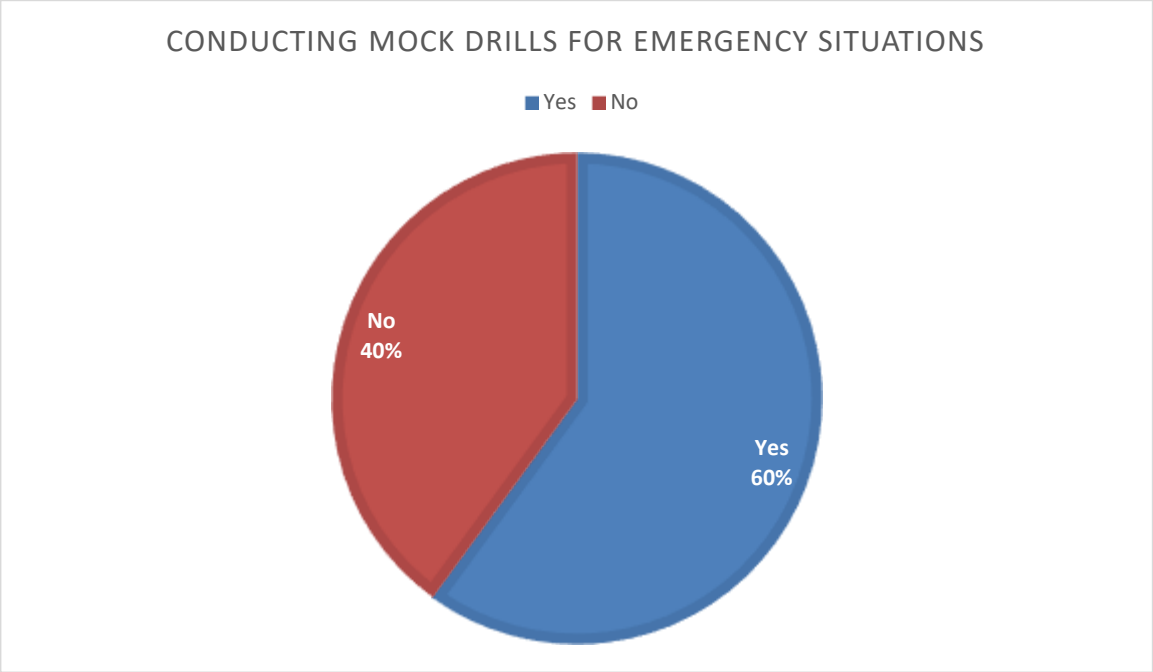

Figure 4.17: Conducting Mock Drills for Emergency Situations

Most respondents (60%) conduct mock drills for emergency situations. In complex construction sites, the mock drills are beneficial to train construction employees to face an emergency situation. According to the experts of the sample, the establishment of fire assembly points, emergency assembly points, and exit gates are vital to saving lives in an unexpected danger situation. However, 40% of the selected sample does not conduct mock drills for emergency situations.

Same as the Fig. 4.17, the response rate from the selected sample for conducting mock drills was satisfactory as per the sub-section 4.4.7 of OHSAS 18001 – Emergency preparedness & response.

The frequency of conducting mock drills is as below:

Table 4.3 Frequency of Conducting Mock Drills for Emergency Situations

No.	Response Factor	Response Percentage
1.	Once in Three Months	40%
2.	Once in Six Months	35%
3.	Once a Year	25%

As per the comments of the expert professionals, 40% of them performs mock drills once in three months, and 35% of them once in six months. However, conducting mock drills and their frequency was not satisfactory as per the current construction industry requirements.

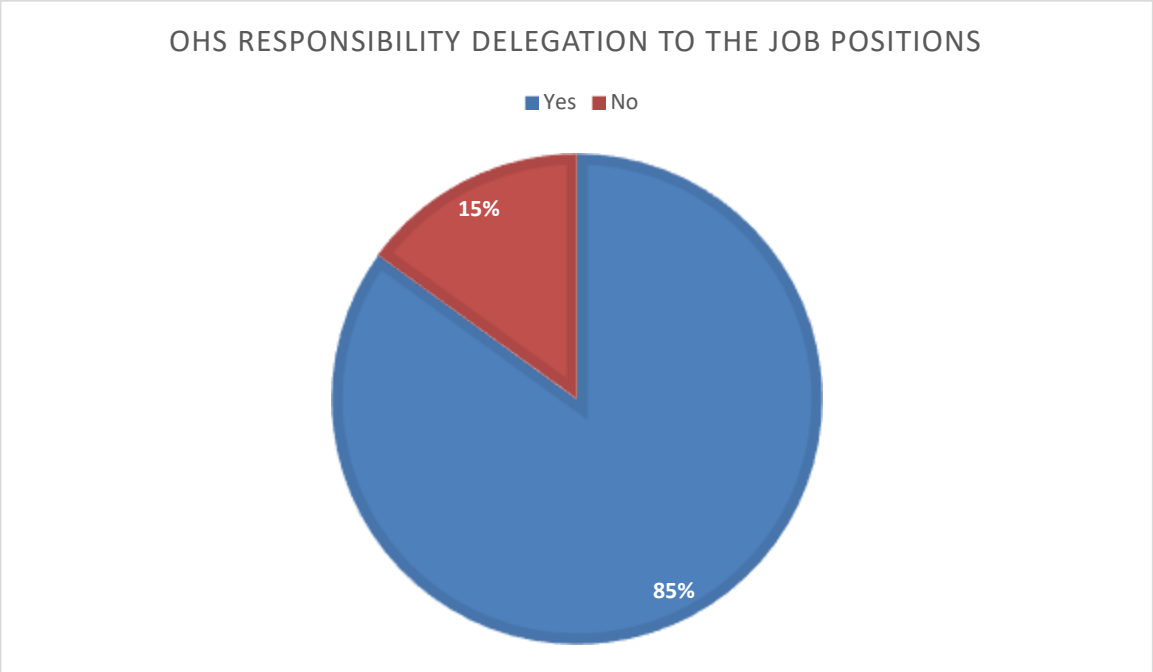

Figure 4.18: OHS responsibility delegation to job positions

OHS responsibility was suitably delegated to the specific job positions in the majority of responses (85%). However, as per the further comments of the respondents, most organisations have no follow-up procedure about OHS responsibility connecting to each delegated job position. It proved that the top management commitment is more essential for successful OHS management system.

The positive response rate for this is significant when compared with sub-section 4.4.2, OHSAS 18001 – Competence, training, & awareness.

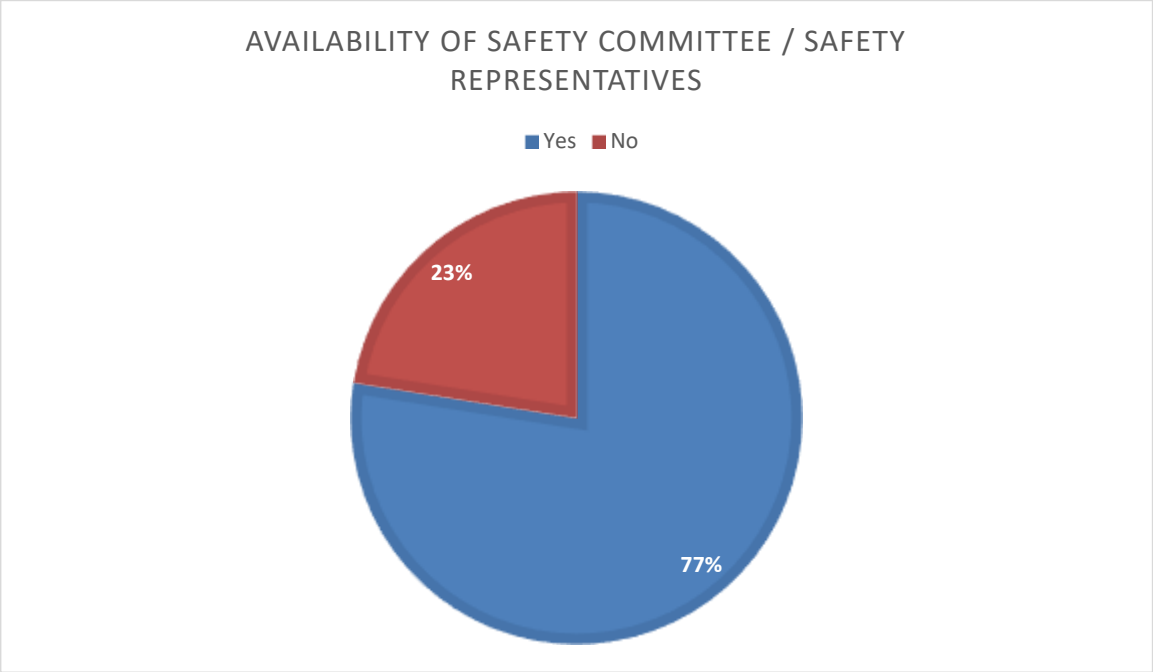

Figure 4.19: Availability of safety committee/safety representatives

Most companies had safety committees/safety representatives marked 77% response rate. Many companies had safety committees, but they were not functioning at the expected level to achieve long-term organisational goals, as stated by the experts.

Availability of safety committee/safety representatives were in an acceptable level by sub-section 4.4.3.2 of OHSAS 18001 – Participation & Consultation.

Top management participation for the safety committees was according to Table 4.4.

Table 4.4 Top management participation for safety committees

No.	Response Factor	Response Percentage
1.	Yes	12.5%
2.	No	87.5%

Top management participation for the safety committee is not acceptable as 12.5% of the selected sample. As mentioned before, the senior management concern on Occupational Health & Safety requirements were not acceptable as they are running behind massive financial targets, except those OHS requirements.

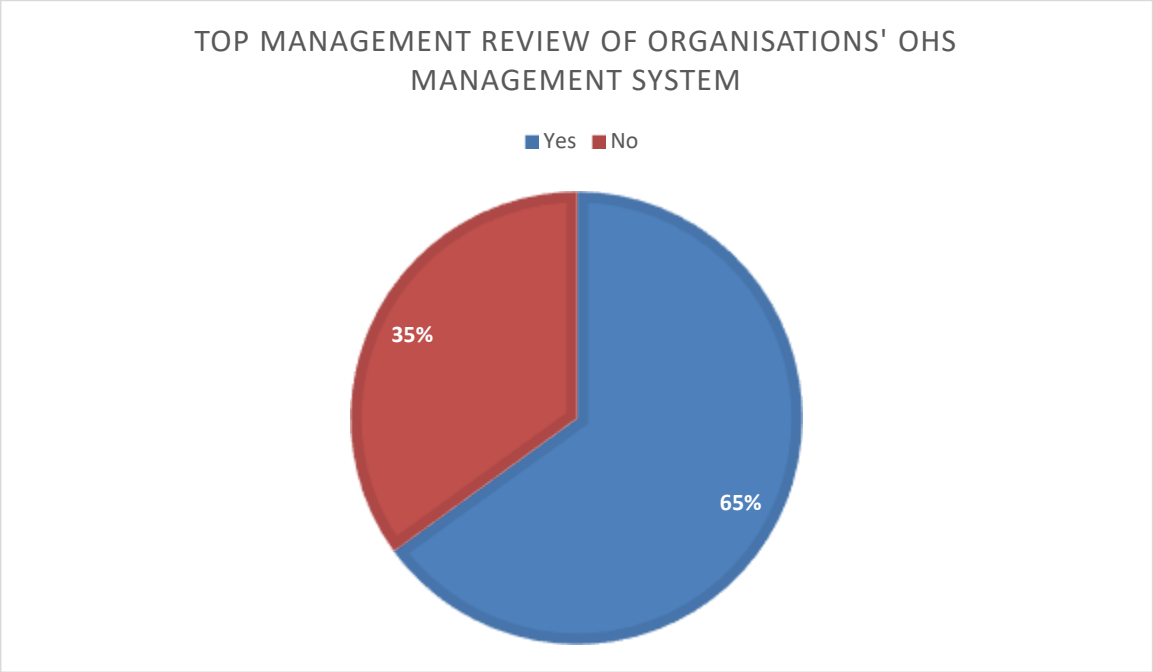

Figure 4.20 Top management review of the organisations' OHS management system

According to the responses of top management, the concern on OHS system was acceptable to some extent as 65%, but the proper implementation and maintenance are crucial to make a successful Occupational Health & Safety Management system. However, only a few organisations control OHS procedures by recommended local and foreign accreditation bodies. Satisfactory responses (65%) were received for top management reviews on internal OHS management system as comply with sub-section 4.6 of OHSAS 18001 – Management Review even without accredited under a recognised body for OHSAS 18001.

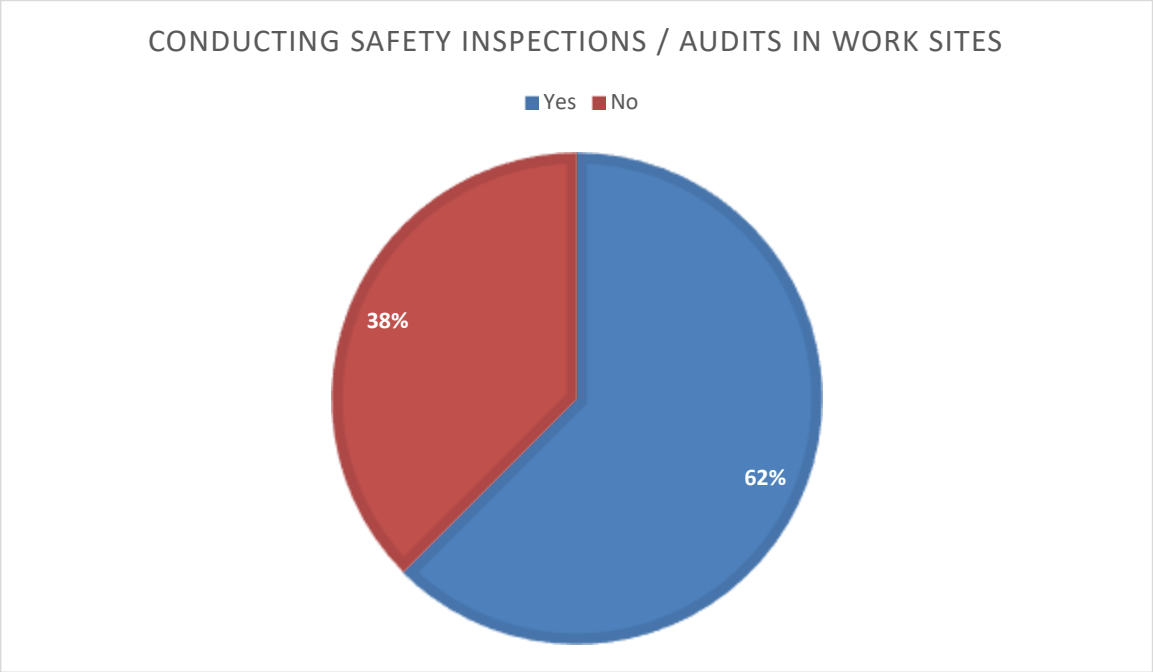

Figure 4.21: Conducting safety inspections/audits in work sites

Safety audits/inspections are conducted by 62% of sample organisations.

The frequency of conducting safety audits/inspections and audit guidelines are described in Table 4.5.

Table 4.5. Frequency of conducting safety audits/inspections and audit guidelines

No.	Response Factor	Percentage
1.	Once a year	40.90%
2.	Once in six months	50%
3.	Once in three months	4.55%
4.	Once a month	4.55%

Highest frequencies were reported on once-a-year and once-in-six months as 40.90% and 50% respectively.

Therefore, conducting percentage of safety audits/inspections and frequency rate was acceptable according to this analysis as per the sub-section 4.5.5 of OHSAS 18001 – Internal Audit.

Distribution of guideline for safety audits/inspections are presented in Table 4.6.

Table 4.6. Guidelines for safety audits/inspections

No.	Response Factor	Percentage
1.	OHSAS 18001	59%
2.	Internally implemented procedure	41%

Following Table 4.6, 59% of the selected set used OHSAS 18001 as their auditing guideline while 41% practised an internally implemented guideline, not 100% compatible with OHSAS 18001. As per the audit frequency, 50% is marked for once-in-six months, which is not acceptable for every construction site, since the danger level in each construction work site is different. Therefore, the Occupational Health and Safety systems must differ according to the work site. The safety audit frequency also should not be at same intervals in every work site and should be held in very short intervals at most dangerous sites. As per further comments of experts who followed OHSAS 18001 as their OHS management system, repetitive audits are essential to implement and maintain OHS policies.

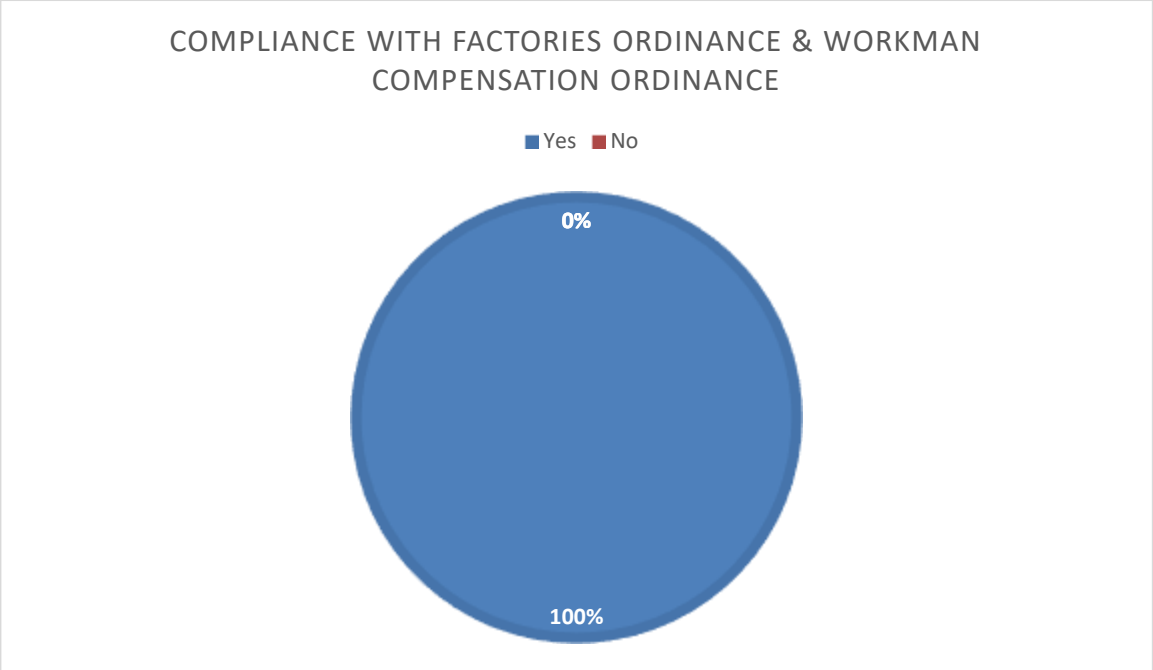

Figure 4.22: Compliance with Factories Ordinance and Workman Compensation Ordinance

According to Fig. 4.22, 100% of the selected sample complied with Factories Ordinance & Workman Compensation Ordinance of the law of Sri Lanka. However, further discussions with the expert panel revealed that most organisations in the selected sample did not comply with the legal requirements accurately. In the factories ordinance of the Sri Lankan Law, it should follow a specific register for accidents, all accidents should be reported to the Factory Inspection Engineer, and the Factory Inspection Engineer should inspect every worksite/factory at a very early stage of each site. Also, feedback from the department of labour was not satisfactory as per the comments of the selected expert panel. Full (100%) positive response was received for compliance with factories ordinance and workman compensation ordinance, conforms to sub-section 4.3.2 of OHSAS 18001 – Legal & other requirements.

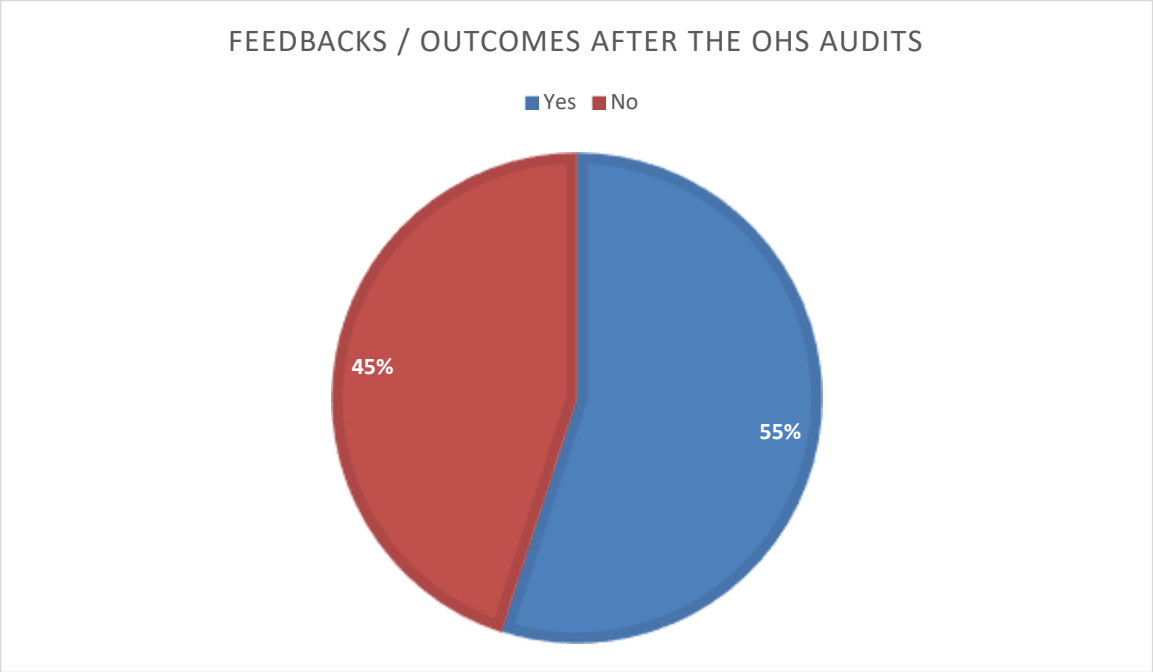

Figure 4.23 Distribution of Feedbacks / Outcomes after the Audits

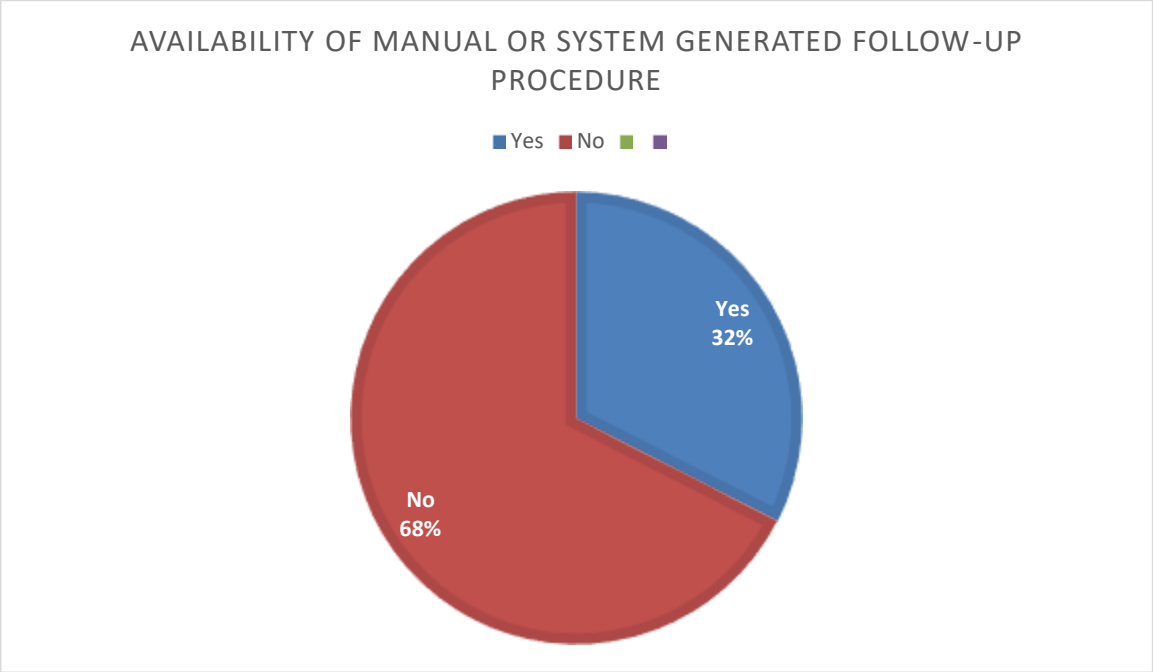

Figure 4.24: Availability of Manual or System Generated Follow up Procedure

According to Fig. 4.23, feedback/outcomes reporting percentage is at an average level of 55%. Sending audit findings or any other comments to further improvement was not satisfactory in most companies, especially in internal audits, although those were the most required events of a system audit in any organisation. It helps to track the current shortcomings, if necessary, and a manual- or system-generated follow-up system should be significant to remind the periodical audits, mock drills, and other such events. However, as per this study, the availability of internal organisational follow up procedure was 32%, which is not acceptable. Conversely, audit feedback/outcome reporting percentage is in an average level since most of companies were OHSAS 18001 non-certified organisations.

Conducting risk assessments:

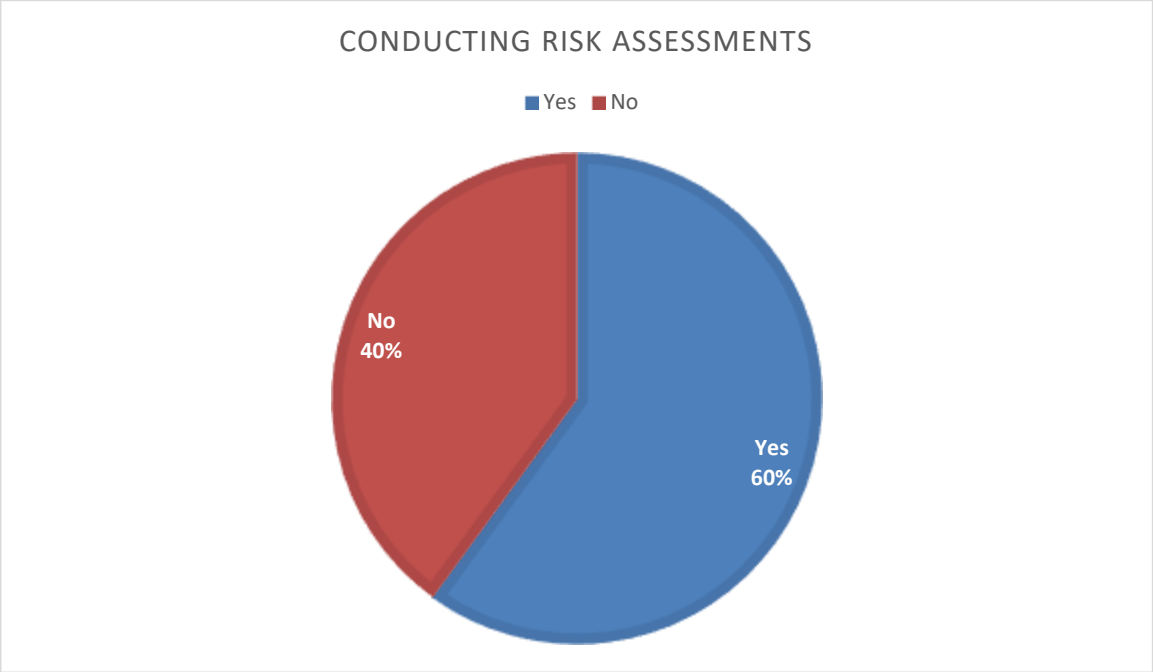

Figure 4.25: Distribution of Conducting Risk Assessments

Table 4.7: Frequency of conducting Risk Assessments

No.	Response Factor	Percentage
1.	Every Three Months	5.56%
2.	Every Six Months	11.11%
3.	Project Basis	77.78%
4.	Once in Two Years	5.56%

Positive responses for conducting risk assessment were in an average level (60%). As per the expert comments, risk and hazard assessment is an essential Occupational Health and Safety requirement of every construction project during implementation stages. All Safety risks/hazards should be pre-determined and recorded in a risk register and firmly analysed. The mitigation plans should be then correctly implemented for the project period, and all site members must be well aware of the risks and hazards involved. According to Table 4.7, conducting a project basis frequency of risk assessments was marked as 77.78%. This verifies that a risk assessment must be conducted at least once for a project. This frequency is

unacceptable as per the current construction accidents rate in Sri Lanka, as per the further comments of the respoendents.

Satisfactory percentage of conducting risk assessments complied with sub-section 4.3.1 – Hazard identification, risk assessment, and determining controls of OHSAS 18001.

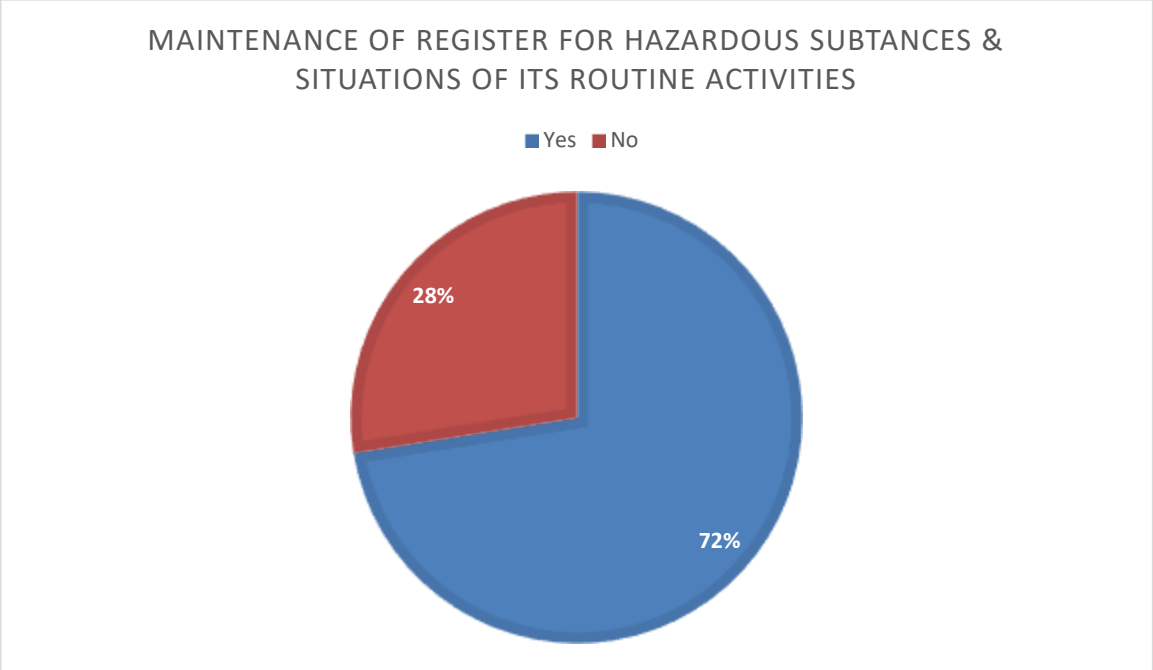

Figure 4.26: Maintenance of Register for Hazardous Substances and situations of its routine activities

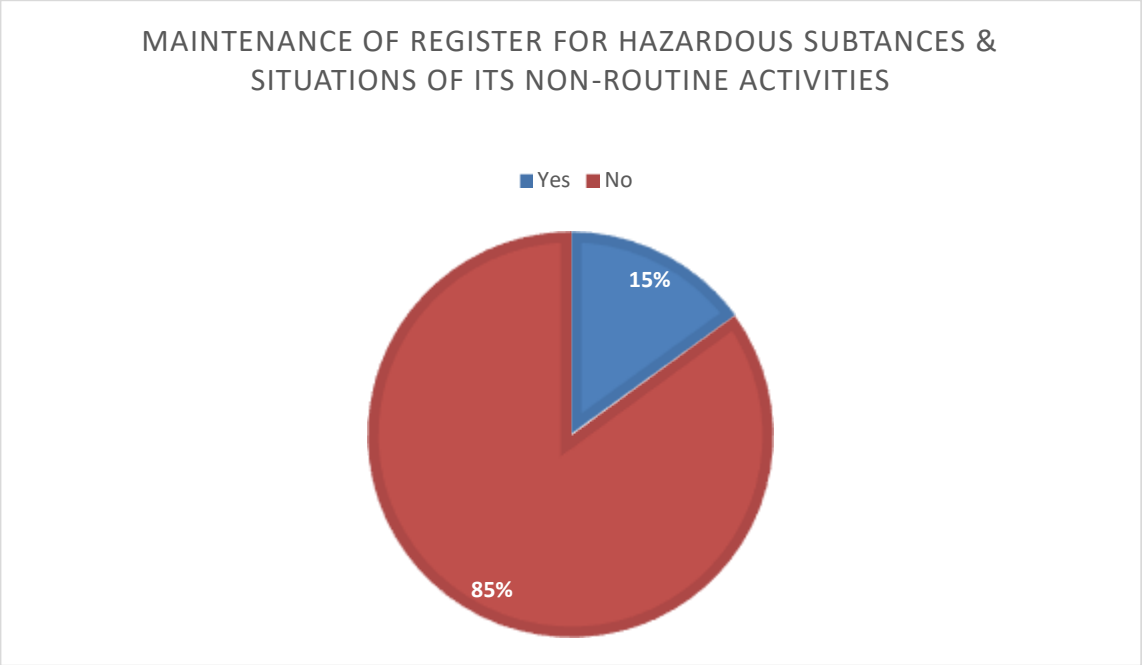

Figure 4.27: Maintenance of Register for Hazardous Substances & Situations of its non-routine activities

According to Fig. 4.26, an acceptable percentage followed for keeping a register for the hazardous substances and situations of worksite-specific routine activities with respect to the construction industry. It was marked as 72% for this study and comply with sub-section 4.3.1 – Hazard identification, risk assessment, and determining controls of OHSAS 18001.

As per the Fig. 4.27, it is evident that the concern in hazardous substances and situations of its non-routine activities were at an inferior level compared to routine activities as presented above. It was marked as 15%, and as per the comments of experienced professionals in the same capacity, it requires an extensive analysis of routine and non-routine health and safety hazards in very early phases of project planning stage, for the betterment of employee and other related lives.

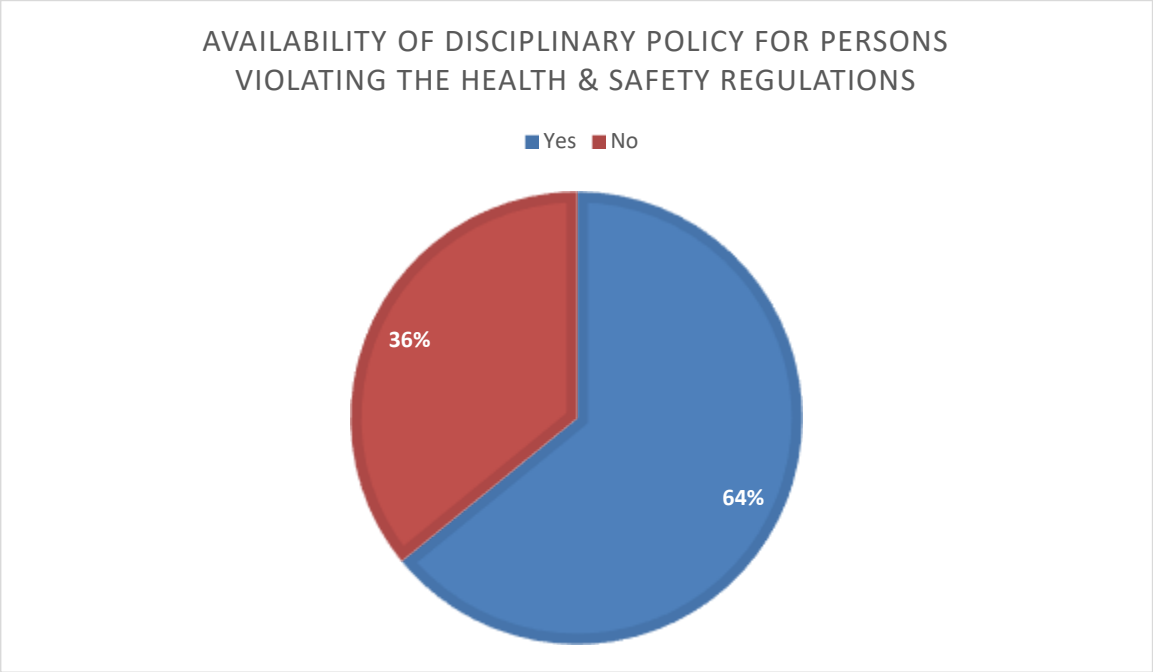

Figure 4.28: Availability of a disciplinary policy for persons violating health and safety regulations

A 64% of respondents maintain a disciplinary policy to take actions for those who violate the health and safety procedures. Those internal rules and fine systems support to implement and maintain a proper internal Occupational Health and Safety System. Experts further state, negative attitudes and cultural barriers of site employees discourage the internal routine OHS functions. That is the main reason for disciplinary policies for persons who violate OHS regulations. This can be taken under the subsection 4.4.6 – Operational control of OHSAS 18001.

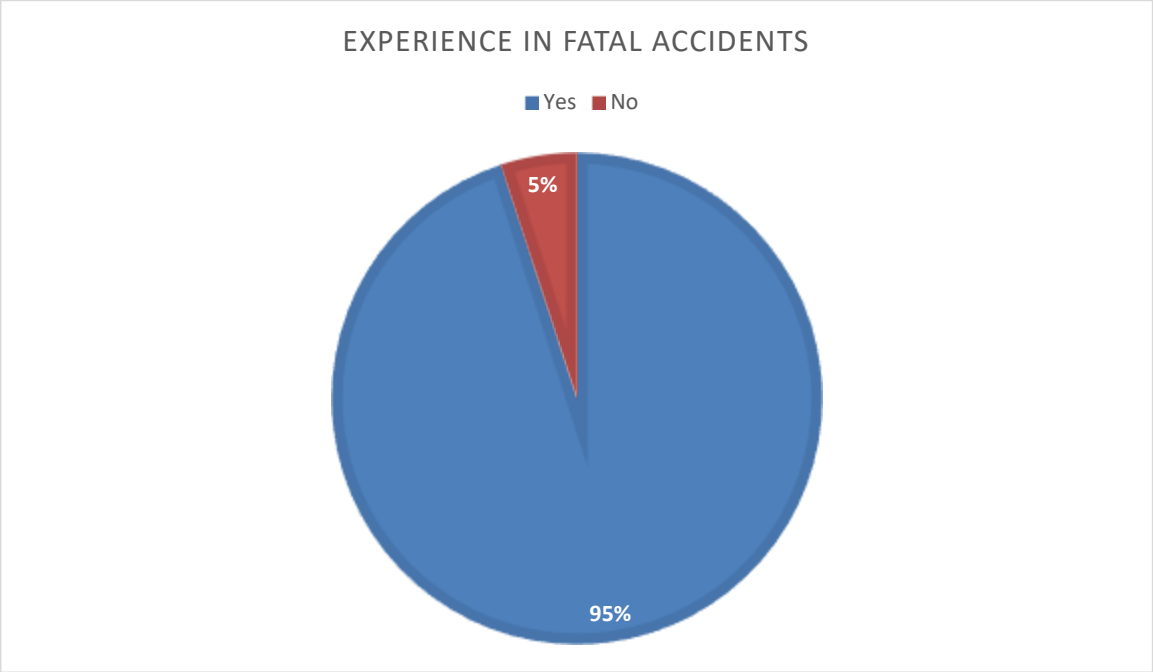

Figure 4.29: Experience in Fatal Accidents

According to responses in the selected sample, the fatal accident rate with the construction industry was not acceptable and marked as 95%. As one of the most dangerous industries in the world, serious accidents cannot be eliminated from construction sites but minimising is possible by implementing and maintaining proper Occupational Health and Safety Policies in construction organisations. High rise buildings, Highways, and Irrigation & Water supply projects are high-risk work sites that report a higher number of fatal accidents in a year, as stated by the panel.

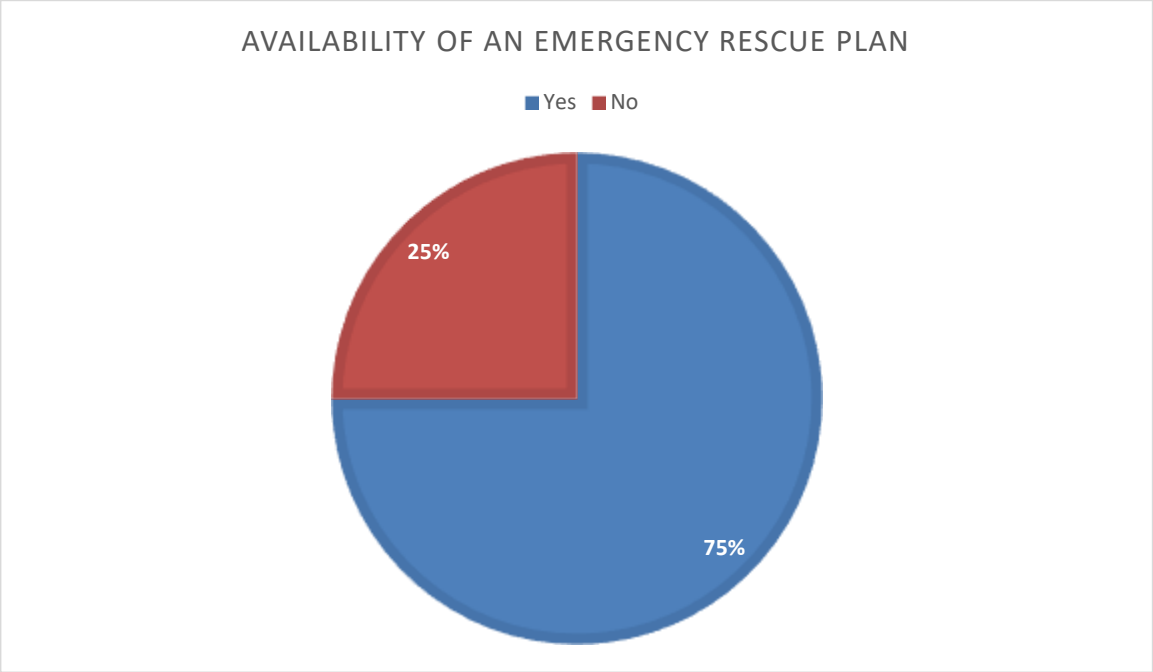

Figure 4.30: Availability of an Emergency Rescue Plan

Most organisations (75%) have emergency rescue plans as per Fig. 4.30. According to their further comments, emergency rescue plans and emergency assembly points were well-established at the site level, since 93% of total response was "yes" for the above requirement. Other responses were as per the situation – 7%. Content analysis was performed for the second answer since those are open-ended descriptive answers. However, it was clear that emergency rescue plans were established in the majority of construction sites in the selected sample.

Preparedness for emergency situations is in an acceptable position concerning to this study, and comply with sub-section 4.4.7 – Emergency preparedness and response.

Calculated mean weighted ratings for accidents are presented in Table 4.8.

Table 4.8: Mean Weighted Rating for Accidents

No.	Accident Category	Mean Weighted Rating
1.	Fatal	0.36
2.	Major (Permanent or Partial Disablement)	0.45
3.	Temporary Disabled (More than 03 days)	0.63
4.	Minor (Below 03 days)	0.95

As depicted in the subtitle, Method of Data Analysis, in Research Methodology chapter, following weightages were used to analyse question number 30.

Factor	Below 05	06 to 10	11 to 15	16 to 20	Above 20
Rate	01	02	03	04	05

Under Table 4.8, the highest mean weighted rating for Minor Accidents was 0.95, and the fatal accident and major accident rates were not negligible with its weighted mean rating marked as 0.36 and 0.45 respectively. Thus, it is apparent that the rate of fatal and major accidents in Sri Lankan construction industry is remarkably high, compared with industries. However, the above situation in OHSAS 18001 certified and non-certified organisations (very few number in the selected sample) is as per the Table 4.9.

Table 4.9: Mean Weighted Rating for Accidents in OHSAS 18001 certified and non-certified companies

No.	Accident Category	Mean Weighted Rating in OHSAS 18001 certified organisations	Mean Weighted Rating in OHSAS 18001 non-certified organisations
1.	Fatal	0.25	0.41
2.	Major (Permanent or Partial Disablement)	0.29	0.51
3.	Temporary Disabled (More than 03 days)	0.35	0.75
4.	Minor (Below 03 days)	0.71	1.05

In accordance with Table 4.9, the lowest mean weighted rates were reported in OHSAS 18001 certified companies for all the accident categories in the selected sample. This justifies well that OHS level in the companies using OHSAS 18001 as their Occupational Health and Safety System is comparatively higher than non-certified companies.

Figure 4.31 illustrates the respond distribution for practising a register for accidents, near misses, and ill health conditions.

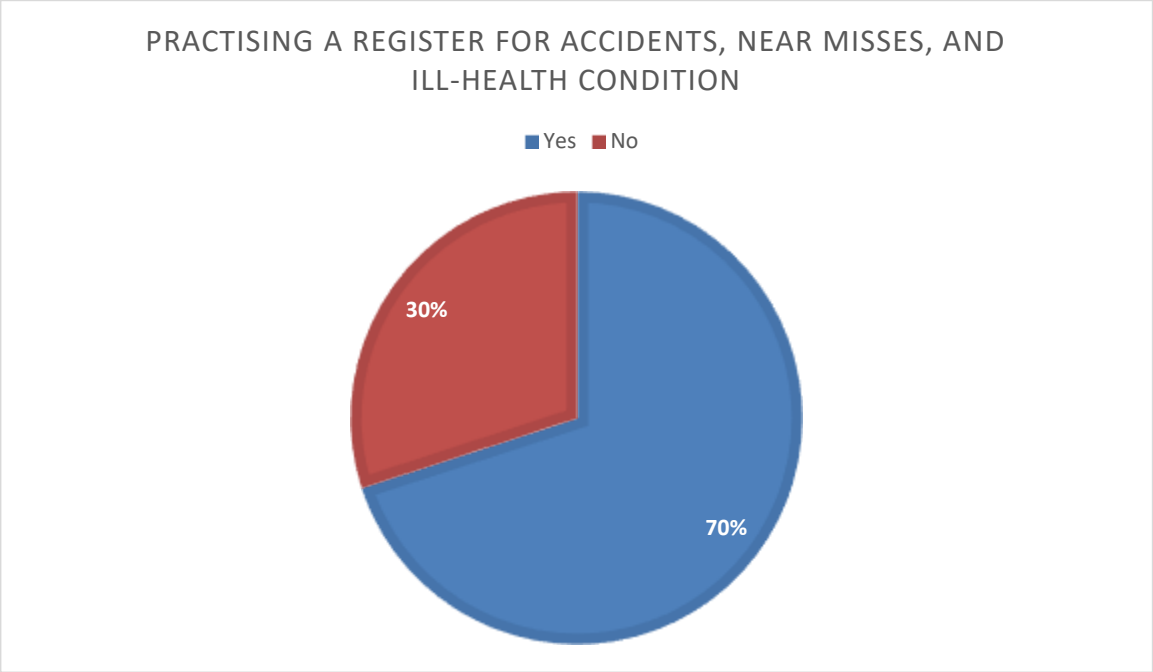

Figure 4.31: Practicing a register for accidents, near misses, and ill-health condition

In accordance with the Factories ordinance of Sri Lanka, all construction worksites are under the law, and all accidents should be reported to the labour department, and a register should be maintained for work site accidents. However, as per this study, only 70% responds recorded of following a register for accidents, near misses, and ill-health condition. Therefore, it is well understood that recording of accidents in the construction sector is not acceptable, even it is included in the Sri Lankan legal system. Further, it can be assumed that a large number of accidents are not reported to any responsible government institution. This requirement conforms to sub-section 4.5.3.1 – Incident investigation of OHSAS 18001.

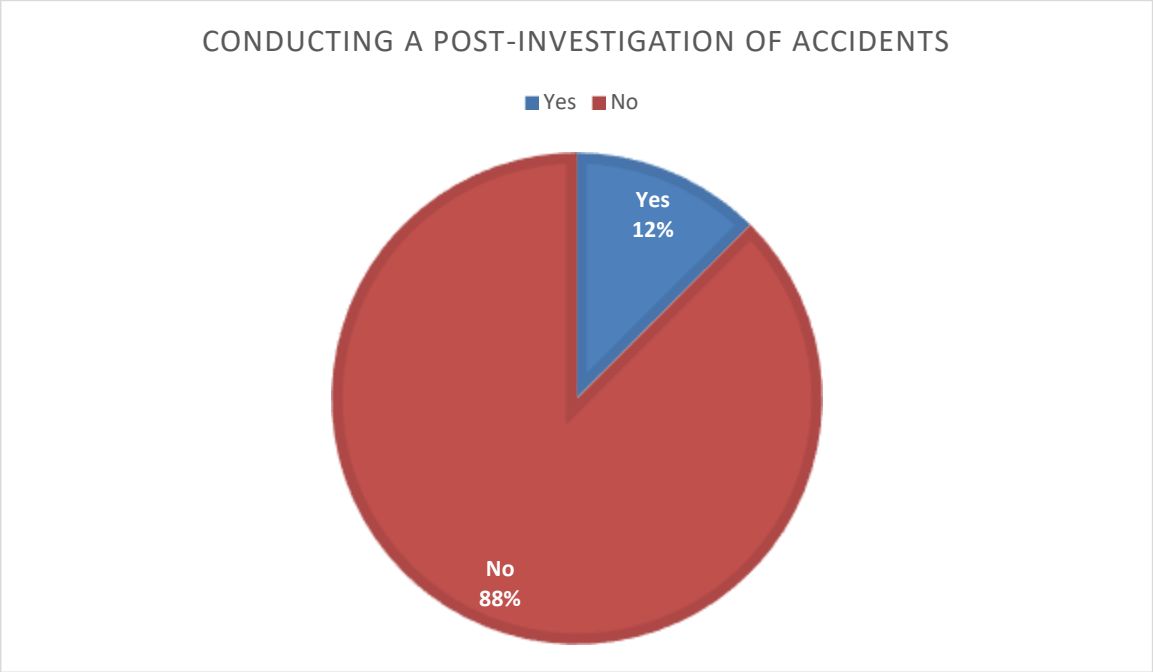

Figure 4.32: Conducting a post-investigation of accidents

According to Figure 4.32, only a few respondents (12%) were conducting a post-investigation regard to accidents. In a situation of having a small rate of recording accidents, the post-investigation rate of accidents was also not acceptable since it is not a mandatory regulation in Sri Lanka. However, as per the expert comments, post investigation of accidents is a crucial factor to analyse and understand the main causes of accidents, how it happened, and other associated reasons to mitigate them in future. The experts further stated that most of the developed countries conduct post investigations with regard to accidents. Conducting post investigations of accidents is required by sub-section 4.5.3.1 – Incident investigation of OHSAS 18001.

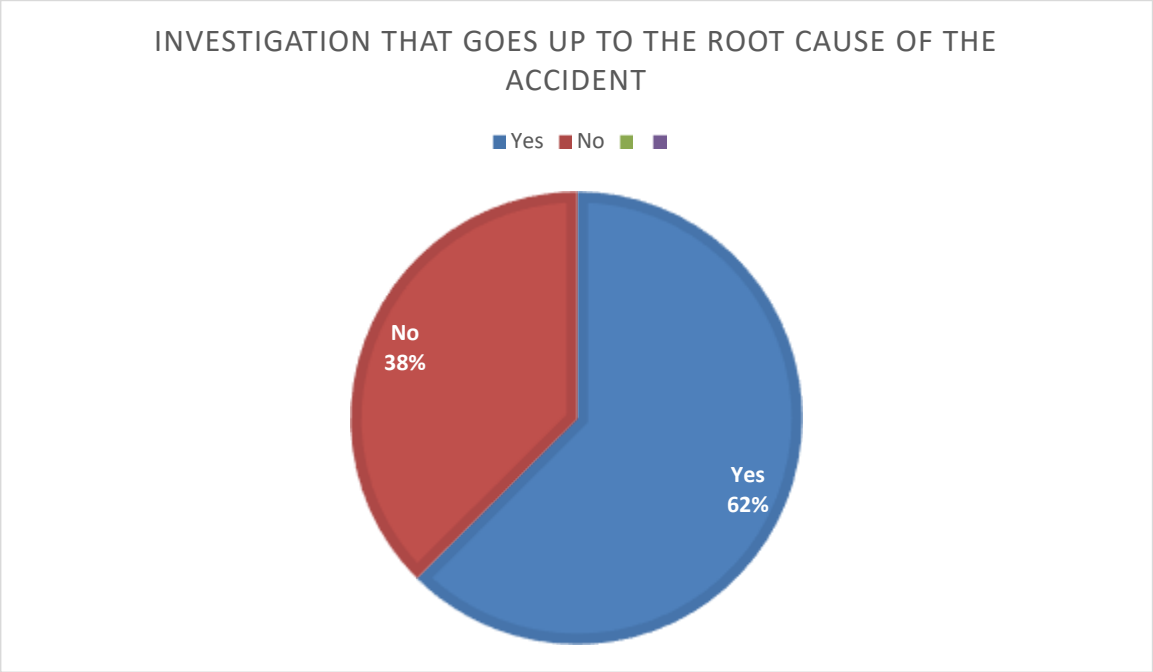

Figure 4.33: Investigation that goes up to the root cause of the accident

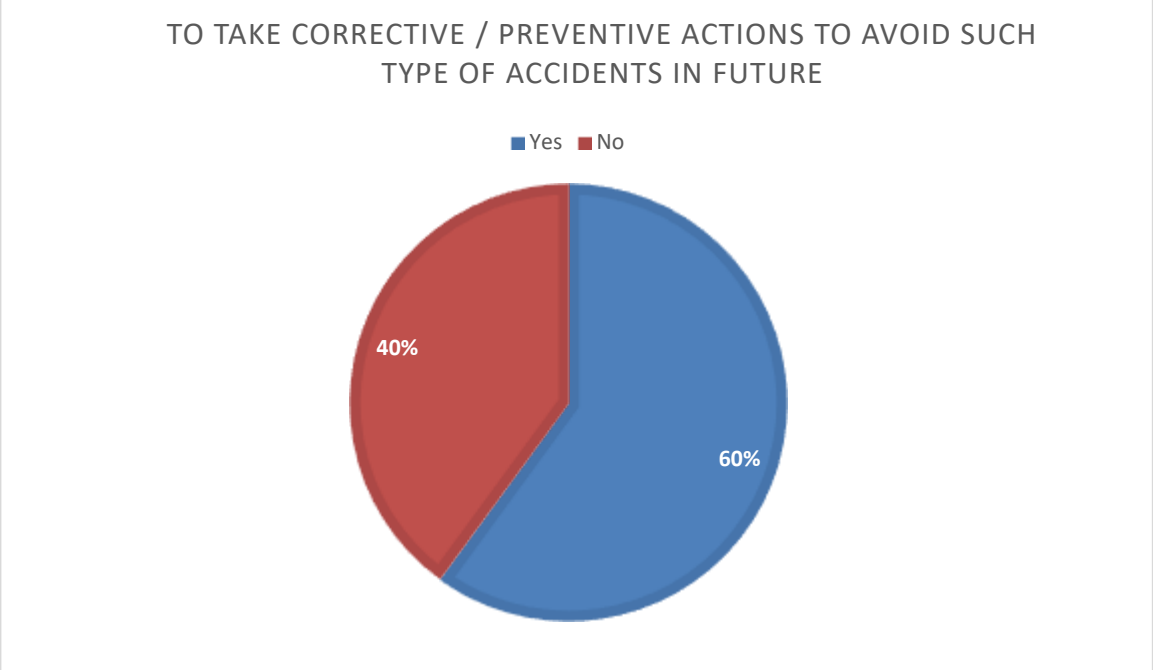

Figure 4.34: Taking corrective/preventive actions to avoid such type of accidents in future

From the set of who conducts a post-investigation of an accident, a 62% goes up to the root cause of the accident. That was not acceptable when compared with other

countries. Root cause investigation is vital to wipe out such causes from the construction sites as soon as possible.

As per the above Fig. 4.34, 60% of respondents took corrective and preventive actions to avoid such type of accidents, while 40% said "No." That means a 40% of the selected sample did not take any action to avoid such identified accidents in future, even after performing a post investigation. This is an essential requirement of OHSAS 18001 as per the sub-section 4.5.3.2 – Nonconformity, corrective action, and preventive action; and was satisfactory even in the companies that did not follow the management standards.

Further, independent comments of the selected experts signify that the Sri Lankan construction industry runs under a highly profit-oriented environment, and hence not considering of long-term value additions to their business organisations. With their experience, the professionals insist that to pacify such requirements to the legal system of Sri Lanka.

It is highly beneficial to minimise the repetitive accidents harming to human resources in the construction industry, and it saves direct and indirect costs to the organisation due to accidents.

Annual direct and indirect costs related to accidents are presented in Table 4.10.

Table 4.10: Responds distribution on annual direct and indirect costs related to accidents

No.	Response Factor	Percentage
1.	About Rs: 100,000.00 to Rs: 200,000.00	3%
2.	About Rs: 200,000.00 to Rs: 300,000.00	5%
3.	Above Rs: 300,000.00	8%
4.	No Idea / No monitoring procedure	84%

As per Table 4.10, a considerable percentage (84%) have no proper idea of the cost of accidents. As an OHS management requirement, responds rate for awareness of the accident cost is not acceptable. As per the expertise comments, realising direct and

indirect annual cost of accidents may be vital for top-level management in construction companies to analyse the financial impact of accidents with their annual earnings. However, following the above results, it is concluded that most companies in the construction industry in Sri Lanka are ignore their accident costs.

4.1.3 Factors affecting for implementation of OHSAS 18001

Responds to follow the OHSAS 18001 standard as the organisational internal OHS standard has been distributed as below:

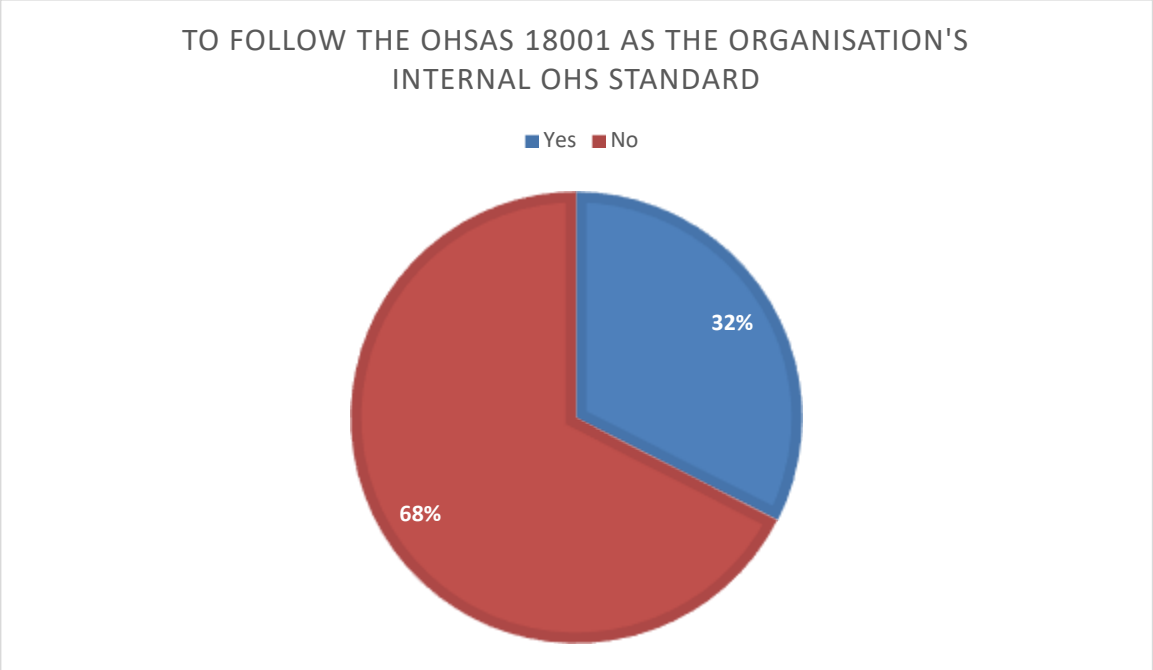

Figure 4.35: To follow the OHSAS 18001 as the organisation's internal OHS standard

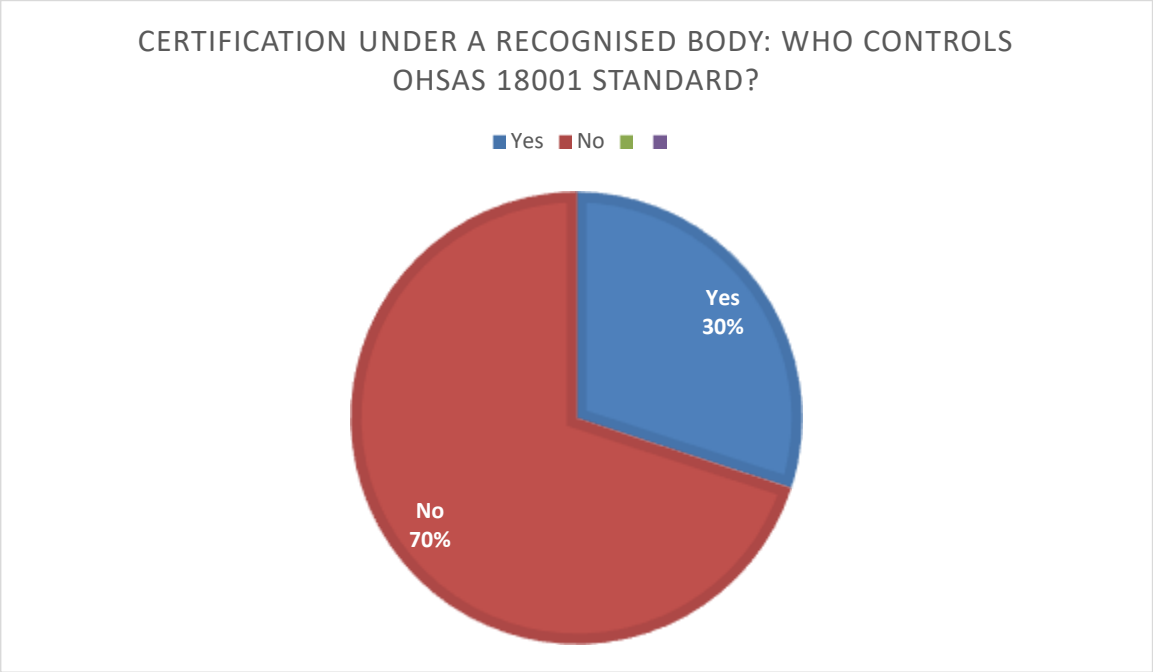

Figure 4.36: Certification under a recognised body: who controls OHSAS 18001 standard?

According to Fig. 4.35, 32% of the total respondents were following OHSAS 18001, and 68% were not following the same with respect to the local construction contractors. From the response of Fig. 4.36, 70% were not accredited in a recognised control body and, 30% were registered in such institutions and maintained properly. It is clear that the majority of the above positive respondents were following OHSAS 18001 management standard without any recognised standard guideline. However, for continuously developing Occupational Health and Safety management standard, it is important to certify construction organisations under an internationally recognised accreditation body, stated by the experts.

The perspective on OHSAS 18001 is shown in Table 4.11.

Table 4.11: Perspective on OHSAS 18001

No.	Response Factor	Response Percentage
1.	A comprehensive standard to be implemented for local construction industry	40%

2.	Not a practical standard with respect to the construction industry	22.50%
3.	Cost is an important factor, and clients' financial support is required to implement	2.50%
4.	An international OHS standard	22.50%
5.	No idea	12.50%

A content analyses were performed to extract the answers to question numbers 37 and 38. According to the table 4.11, 40% responds were received for "A comprehensive standard to be implemented for local construction industry," 22.5% responds for "Not a practical standard with respect to the construction industry," and 22.5% of total responds to indicate the general awareness on OHSAS 18001 as an international OHS standard.

4.1.3.1 Constraints on obtaining OHSAS 18001 certification

Constraints related to obtaining OHSAS 18001 certification:

Table 4.12: Constraints related to obtaining OHSAS 18001 certification

No.	Response Factor	Response Percentage
1.	Cost	35.11%
2.	Attitudes and Cultural Behaviour	19.15%
3.	Business interest	13.83%
4.	Interest of top management	6.38%
5.	Training	17.02%
6.	Expertise Knowledge	7.45%
7.	Bureaucracy of the institutions that control the OHSAS 18001 standard	1.06%

As per Table 4.12, most significant constraint to obtaining OHSAS 18001 was the cost (35.11%). Attitudes and cultural behaviours and training were placed second and third accordingly as 19.15% and 13.83% respectively. With reference to the above results, both considerable percentages agree to implement OHSAS 18001 management

standard for the local construction industry, and they consider 'cost' as a significant barrier to implement OHSAS 18001. As per their further comments, the fund allocation for Occupational Health & Safety is insufficient to implement high-cost standards. If local clients allocate money for OHS under the BOQs and mandate OHSAS 18001 for construction projects, they can get the certification of OHSAS 18001. Further, in general, Davies and Thomasin (1990, as cited in Rameezdeen et al., 2003) have highlighted some important reasons for this poor safety performance in the industry, as lack of controlled working environment and complexity, and the diversity of the organisation size within the industry.

4.1.3.2 Effective factors for successful OHS management system

Calculated mean weighted ratings for initiated effective factors for a successive OHS management system is presented in Table 4.13.

Table 4.13: Response regarding effective factors for successive OHS management system

No.	Effective Factors	Mean Weighted Rating
1.	Top management commitment	0.71
2.	Cost	0.68
3.	Awareness	0.67
4.	Training & development	0.69
5.	Cultural / Attitude Barriers	0.60
6.	Academic qualification related to health and safety in Sri Lanka	0.58
7.	Expertise Knowledge in the sector	0.67
8.	Periodical Audits (Internal / External)	0.02

Following the distribution in Table 4.13, the highest mean weighted rating for Top management commitment was 0.71. Training & development, cost, awareness, and expert knowledge in the sector were indicated as 0.69, 0.68, 0.67, and 0.67 significantly. Gambatese (1996) contended that, this might have caused by the design professionals who distance themselves from the responsibility due to lack of safety

education and training, lack of safety design tools, and their attempt to limit their liability exposure.

Furthermore, according to Sawacha et al. (1999, as cited in Priyadarshani et al., 2013), accidents at work occur either due to lack of knowledge, training or supervision, lack of means to carry out a task safely, errors in judgment, carelessness, laziness, or total irresponsibility.

However, with reference to the above analysis, following factors can be highlighted as the most effective for successive OHS management system:

- ✓ Top management commitment
- ✓ Training & development
- ✓ Cost
- ✓ Awareness
- ✓ expertise knowledge
- ✓ Cultural / Attitude Barriers
- ✓ Academic qualification related to health and safety in Sri Lanka

4.1.3.3 Can OHSAS 18001 be legalise in Sri Lanka?

Responses regarding OHSAS 18001 should be converted to mandatory regulations in the national construction industry, referring to the occupational health and safety as per Table 4.14.

Table 4.14: OHSAS 18001 should be converted to mandatory regulation in national construction industry, referring to the occupational health and safety

No.	Response Factor	Percentage
1.	OHSAS 18001 should be legalised in Sri Lanka	60%
2.	Impossible to regularise in local context	30%
3.	No idea	10%

Other responses that indicate OHSAS 18001 can be legalised in Sri Lanka based on their current OHS practice, is given in Table 4.15.

Table 4.15: Positive responses for the requirements as stipulated in OHSAS 18001 as per the current OHS practice in the selected sample

No.	OHSAS 18001 Requirement	Positive response percentage
1.	Availability of internal OHS management system	95%
2.	Conducting internal OHS meetings	70%
3.	Conducting regular toolbox meetings	92%
4.	Availability of written OHS policy	85%
5.	Availability of competent person to implement & maintain OHS policy	60%
6.	Conducting training sessions on OHS management systems & OHS risks	75%
7.	Conducting mock drills for emergency situations	60%
8.	OHS system has properly delegated to the job positions	85%
9.	Does the company have safety committee/safety representatives?	77%
10.	Does the top management review the organisation's OHS management system?	65%
11.	Conducting safety inspections/audits in work sites	62%
12.	Compliance with factories ordinance and workman compensation ordinance	100%
13.	Feedbacks/outcomes after the audits	55%
14.	Conducting risk assessments	60%
15.	Maintenance of a register for hazardous substances and situations of its routine activities	72%
16.	Availability of disciplinary policy for the persons who violate health and safety standards	64%
17.	Availability of an emergency rescue plan	75%
18.	Practicing a register for accidents, near misses, and ill-health conditions	70%

According to Table 4.14, 60% responds for OHSAS 18001 should be legalised in Sri Lanka while 30% were against it from the whole set. As per the Table 4.15, it shows a satisfactory positive approach to their current OHS practices stated in OHSAS 18001 management standard. Experts further highlighted that Sri Lanka, as a third world developing country, confronts many barriers to implement new systems without compulsory by regulating it as a law. They re-confirmed that the cost, negative attitudes, cultural barriers, and educational background as the most effective factors to implement OHSAS 18001 in Sri Lankan construction industry. Finally, as per the key question of this study, it is well concluded that OHSAS 18001 should be a mandatory regulation with reference to the Sri Lankan construction industry.

Chapter 05

CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusion

The Occupational Health & Safety is one of the major research areas in any industry. Protection and existence of human lives must be given the priority of any industry, ahead of any other business targets. In almost all the countries, the construction industry is a major industry that severely affects the countries' economy; however, it has a high occupancy of labours with the latest technology, even with its rapid development. Therefore, the Occupational Health & safety is a significant factor in the Construction industry to protect the human lives.

Most developed countries have established many acts and regulations for Occupational Health & Safety related to the construction industry. Factories ordinance and Workman Compensation ordinance are the only acts that cover all the OHS requirements for any industry in Sri Lanka, and as an international level OHS standard, OHSAS 18001 is still a non-compulsory management standard in the country.

The study attempts to identify the limitations to implement OHSAS 18001 as a regulation in the local construction industry with particular reference to the contractor's perspective. Accordingly, following activities were the main core of this study:

1. To study the OHSAS 18001 standard process.
2. To identify the current practice of occupational health & safety in Sri Lankan construction industry.
3. To identify factors to implement OHSAS 18001 standard as a regulation in the local construction industry: Contractor's perspective.

A comprehensive literature survey was conducted to understand the existing background concerning the occupational health and safety, and the importance level of health and safety factor related to construction industry. OHSAS 18001, past research studies, and acts and policies in other countries were referred to accomplish

the literature survey. The first objective was achieved with the literature survey along with an in-depth study of OHSAS 18001 standard process.

OHSAS 18001 mainly focuses on 20 management requirements as included in Section 04 of standard as follows:

1. Sub Section 4.1 – General Requirements
2. Sub Section 4.2 – OH&S Policy
3. Sub Section 4.3.1 – Hazard identification, risk assessment, and determining controls
4. Sub Section 4.3.2 – Legal and other requirements
5. Sub Section 4.3.3 – Objectives and programs
6. Sub Section 4.4.1 – Resources, roles, responsibility, accountability, and authority
7. Sub Section 4.4.2 – Competence, training, and awareness
8. Sub Section 4.4.3.1 – Communication
9. Sub Section 4.4.3.2 – Participation and consultation
10. Sub Section 4.4.4 – Documentation
11. Sub Section 4.4.5 – Control of documents
12. Sub Section 4.4.6 – Operational Control
13. Sub Section 4.4.7 – Emergency preparedness and response
14. Sub Section 4.5.1 – Performance measurement and monitoring
15. Sub Section 4.5.2 – Evaluation of compliance
16. Sub Section 4.5.3.1 – Incident investigation
17. Sub Section 4.5.3.2 – Nonconformity, corrective action, and preventive action
18. Sub Section 4.5.4 – Control of records
19. Sub Section 4.5.5 – Internal Audit
20. Sub Section 4.6 – Management review

The survey method was applied as the data collection technique and the questionnaire was made with the primary intention of checking the above requirements with current occupational health and safety practise in Sri Lankan construction industry. The

respondents of the survey consist of Senior General Managers, Project Managers, Quantity Surveyors, Engineers, Safety officers, and Architects.

As per the results of this study, the awareness on internationally adopted best practising OHSAS 18001 management standard among local construction contractors is at an inferior level. The analysis of Occupation Health & Safety requirements, as stated in OHSAS 18001, declared over 60% of positive responses received for most requirements as depicted in Table 4.15. As per the results, fifteen number of management requirements of OHSAS 18001 can be taken as the most significant and in line with the current occupational helath and safety practise in Sri Lankan construction industry.

Availability of an internal OHS management system, in compliance with factories & workman compensation ordinance and conducting regular toolbox meetings receive more than 90% response rate.

Therefore, it was identified that most contracting organisations follow the requirements as stipulated in OHSAS 18001, though they have no any certification under a recognised accrediation institute. Only few number of contractors certified OHSAS 18001 under recognised accrediatation bodies.

The next objective of this study was to identify the factors that affect the implementing of OHSAS 18001 as regulation in local construction industry, and then the necessary questions were prepared to check constriants and included in the questionnaire.

As per the responds, below factors were identified as significant constraints to regularise OHSAS 18001 in Sri Lanka.

1. Top management commitment
2. Cost
3. Awareness
4. Training & development
5. Cultural/attitude barriers
6. Expertise knowledge in the sector
7. Academic qualifications related to health and safety in Sri Lanka

Finally, based on the comparison of current industry occupational health & safety practising level with OHSAS 18001 management requirements, and as per other direct responds of the construction experts from the majority of the sample, it is recommended that the OHSAS 18001 management standard should be amended to the legal system of Sri Lanka with special reference to the construction industry.

Findings of this study may be useful for managerial professionals willing to get the OHSAS 18001 certification, those who follow OHSAS 18001, top managerial persons in system accreditation bodies, and professionals who make laws and reforms in Sri Lanka. Also, this can be recommended for all construction professionals interested in Occupational Health & Safety.

5.2 Recommendations

According to the findings of this research study, OHSAS 18001 can be recommended to Sri Lankan construction industry and should be amended as a regulation in Sri Lanka.

5.3 Further Interests

This research was performed to identify the limitations to implement OHSAS 18001 as a mandatory regulation in Sri Lanka. Further research can be executed in following areas:

1. To study how to implement OHSAS 18001 management standard in Sri Lanka.
2. To study the possibility of implementing OHSAS 18001 to other industries.

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Appendices

Appendix A: Questionnaire

M.Sc in Construction Law and Dispute Resolution

University of Moratuwa

RESEARCH QUESTIONNAIRE

Research Title: Study the Possibility of implementing OHSAS 18001 as a mandatory regulation for Local Construction Industry: Contractor's Perspective.

Study Background: Accidents are alarming high in Sri Lankan construction industry. There are many lapses in occupational health and safety; especially referring to the construction industry. Having admitted to the contractor's perspective on occupational Health and safety in construction, large numbers of shortcomings are reporting time to time. As an internationally recognized, OHSAS 18001 is still general standard in locally as the best practice. The study focus to see the possibility of inserting OHSAS 18001 as a mandatory regulation to the Sri Lanka legal frame work

Interview Guideline: Section A: General Information

Section B: Organizational Occupational Health & Safety Management Practice.

Section C: Accidents & Health Hazards

Section D: Awareness on OHSAS 18001 & Expert's Views

Confidentiality: Confidentiality of data / information provided in this document is fully assured.

Thanks Giving: Thank you in advance for your valuable time, guidance and support to my mission success.

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QUESTIONNAIRE

Abbreviations

OHS – Occupational Health and safety

HR – Human Resource

IT – Information Technology

Note: Please put "√" in appropriate cage where necessary.

SECTION A: GENERAL INFORMATION

1. Designation of the interviewee.

i. Project Manager ☐ iii. System Implementation Officer ☐

ii. Safety officer / Manager ☐ iv. Other specify ……

2. Experience in similar capacity.

i. Below 05 Years ☐ v. Above 15 Years ☐

ii. 05 – 10 Years ☐

iii. 10 – 15 Years ☐

3. Highest educational level achieved.

i. National Certificate ☐ iv. Bachelors ☐

ii. National Diploma ☐ v. Masters ☐

iii. Higher National Diploma ☐ vi. PHD ☐

- **Organizational information**

4. Nature of the business.

i. Building Construction ☐ iv. Water Supply & Sewerage ☐

ii. Highway Construction ☐ v. Irrigation & Drain Canals ☐

iii. Bridge Construction ☐ vi. Others Specify ……

5. Describe the scope of work under the above sector (*refer Q.01*) of your organization?

……

……

6. Total number of persons employed at site.

i. Below 50	☐	iv. 201 – 300	☐
ii. 51 – 100	☐	v. Above 300	☐
iii. 101 – 200	☐		

SECTION B: ORGANIZATIONALOCCUPATIONAL HEALTH & SAFETY MANAGEMENT PRACTISE

7. Does your organization following an internal management system for occupational health and safety?

Yes	☐	No	☐

Please state the reason.

……

……

8. Do you conduct the safety meetings?

Yes	☐	No	☐

If yes, How frequently?

i. Once a day	☐	iv. Once in two weeks	☐
ii. Every other day	☐	v. Once a month	☐
iii. Once a week	☐		

Purpose of the meeting.

……

……

9. Do all the employee groups in your organization participate to it? (*Including top management*)

Yes	☐	No	☐

What is the most common employee group participate? List them.

……

……

10. Does the company hold regular "toolbox" safety meetings ?

Yes ☐ No ☐

If yes, How frequently?

i. Once a day ☐ iv. Once in two weeks ☐

ii. Every other day ☐ v. Once a month ☐

iii. Once a week ☐

Please put "√" in appropriate cage and comment where necessary.

No.	Management Practice	Yes	No	Reason / Remarks
11.	**Does the company have a written occupational health and safety policy, addressing specific activities?**			
	Is the manual readily available to your relevant employees?			
12.	**Does the company have a competent person to implement & maintain such internal OHS policies?**			
13.	**Is there mandatory requirement to read and understand the company policies (IT, OHS, HR) at new recruitments?**			
14.	**Do you conduct training sessions on OHS management systems & OHS risks?**			
15.	**Do you conduct any mock drill for emergency situations?**			
	If yes, How often?			
16.	**Does the responsibility of health and safety is properly delegated to job positions?**			
17.	**Does the Company have a safety committee/ safety representatives?**			
18.	**Does there any participation from top management for safety committee?**			
19.	**Does the top management review the organization's OHS management system at planned intervals, to ensure its continuing suitability, adequacy & effectiveness?**			
20.	**Does the company conducts, project or worksite safety inspections / audits?**			
	How often?			
	If yes (Q.20), What is guideline that follows for the audit?			
21.	**Does your business compliance with Factories Ordinance & Workmen's Compensation Ordinance including their latest amendments?**			
22.	**Do you receive the feedbacks / outcome after the audits including corrective actions, etc…?**			

23.	**Is there any manual or system generated follow up procedure?**			
24.	**Does the company have a system for conducting risk assessments?**			
	How Often?			
25.	**Does the company maintaining register for hazardous substances& hazardous situations of its routine activities?**			
26.	**Does the company maintaining register for hazardous substances& hazardous situations of its non-routine activities?**			
27.	**Does the company have a disciplinary policy for who violates the health and safety regulations?**			
28.	**Experience in fatal accidents (*death, permanent disablement*) in your organization?**			
29.	**Is there any emergency rescue plan?**			
	If yes please describe.			

SECTION C: ACCIDENTS & HEALTH HAZARDS

30. Indicate fatal accident rate per year in your organization?

Accident Category	Rate (Please Indicate)				
	Below 05	06 – 10	11 – 15	16 – 20	Above 20
Fatal	☐	☐	☐	☐	☐
Major (Permanent or Partial Disable)	☐	☐	☐	☐	☐
Temporary Disable (more than three days)	☐	☐	☐	☐	☐
Minor (below three days)	☐	☐	☐	☐	☐

Please put "√" in appropriate cage and comment where necessary.

No.	Management Practice	Yes	No	Reason / Remarks
31.	**As refered by factories ordinance, do you practicing any register for reporting of accidents, near misses, etc… and identifiable ill health condition arising out of the work?**			
32.	**Is there any post investigation with regard to the accident?**			
	If yes, Does it go up to the finding of root course of the accident?			
	Indicate them.			
33.	**Have you taken any preventive / corrective action to avoid such occurrences in future?**			

34. On average, do you have any idea on annual direct and indirect cost related to the accidents?

……

……

SECTION D: AWARENESS ON OHSAS 18001 & EXPERT'S VIEWS

35. Are you following OHSAS 18001, as the occupational health and safety standard?

Yes ☐ No ☐

36. Is your company obtained a certification under an institution or body who controls OHSAS 18001 standard?

Yes ☐ No ☐

37. Your perspective on certification of OHSAS 18001?

……

……

38. What are the constraints related to obtaining OHSAS 18001 certification?

……

……

39. Please indicate the factors below, on their level of importance for a successive OHS management system.

Factors	Importance (Please Indicate)				
	Very Important	Important	Neutral	Unimportant	Not Applicable
Top management commitment	☐	☐	☐	☐	☐
Cost	☐	☐	☐	☐	☐
Awareness	☐	☐	☐	☐	☐
Training & Development	☐	☐	☐	☐	☐
Cultural / Attitude barriers	☐	☐	☐	☐	☐
Academic qualification related to health and safety in Sri Lanka	☐	☐	☐	☐	☐
Expertise knowledge in the sector	☐	☐	☐	☐	☐
Any other	……				

40. Please provide your comments on, that OHSAS 18001 should be converted to mandatory regulation in national construction industry referring to the occupational health and safety aspects?

……
……
……
……