ESSENTIAL TRAINING NEEDS FOR INJURY REDUCTION IN WATER AND WASTEWATER PROJECTS IN SRI LANKA

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Degree of Master of Science in Occupational Safety and Health Management

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Thesis submitted in partial fulfilment of the requirements for the degree of

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Declaration

I hereby declare that I compiled this thesis and it is a record of the work I completed. I have read all references cited here (unless otherwise stated) and that it has not been previously accepted by a degree or diploma in any other university or institute of higher learning. To the best of my knowledge and belief, it does not contain any material previously published or written by another person except where acknowledgement has been made in the text.

…….. ……

A.G.Amarananda Date

The candidate mentioned above has conducted the research for the dissertation for the Degree of Masters under my supervision.

……. ……

Dr.(Mrs.) Nayanthara De Silva Date

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Essential training needs for injury reduction in water and wastewater projects in Sri Lanka.

Abstract: Water and wastewater projects have been recognized as one of the most vulnerable types of projects and with a reported number of annual injuries due to high involvement of underground / trenching work and crowded and congested sites. Therefore, it is required to maintain proper safety measures in those projects for the reduction of injury. This research is established to investigate the essential training needs that are required to educate on occupational safety and health to reduce injuries of the employees of water and the wastewater projects in Sri Lanka.

Five projects located in Colombo North, Colombo East, Colombo West, Colombo South, and Thimbirigasyaya Divisional secretariat area were selected for the research. Random sampling technique was utilized to select 210 respondents from 401 of the total workforce, which is a 52% sample. A questionnaire survey was carried out to collect data. Printed copies of questionnaires were distributed among the respondents.

This study is able to identify that first-aid type injuries occur frequently in the water and wastewater projects in Sri Lanka. Minor accidents and injuries take place occasionally. Major accidents and injuries seldom occur. Permanently disabling / fatal type accidents happen extremely rarely in the water and wastewater projects in Sri Lanka. It was identified that the risk levels of trench collapsing accidents and electrocution accidents seemed to be relatively high compared to falling from heights, being hit by falling or flying objects, slipping and tripping, traffic, chemical exposures, fire and such other accidents. Further, it was identified that, there is an extreme training demand for trench protection methods. Twelve number of training needs are proposed as essential training areas for the floor level workers in the water and wastewater projects.

Accident preventive actions were categorized as management aspects and employee aspect. Limited time, cost allocations and high number of workforce are the challenging factors of training. Knowledge management strategy can be implemented by forming construction groups to able to share the experience and knowledge with the team as a part of on the job training.

Key words: construction accidents, essential training needs, construction industry, risk assessment, safety in construction site.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

Abbreviation	Description
CMC	Colombo Municipal Council
CPF	Construction Project Features
ESH	Environmental Safety and Health
GDP	Gross Domestic Product
HIRA	Hazards Identification and Risk Assessment
LTA	Lost Time Accident
NWSDB	National Water Supply and Drainage Board
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
Sig	Significance
SOPs	Safe Operation Procedures
SPSS	Statistical Package for the Social Sciences
Std	Standard

LIST OF APPENDICES

CHAPTER 01

INTRODUCTION

1.1 Introduction

A perennial challenge is finding out the best method to reduce injuries of water and wastewater construction projects in Sri Lanka. Kinn, Khuder, Bisesi and Woolley (2000) say that there are many studies have shown the importance of developing employee awareness, knowledge and skills by the management can achieve the employee health and safety expectations. Vredenburgh (2013) indicates that employees have the proper level of awareness in safety and health procedures, but they would not place such safety and health procedures in the work place, however, they would always follow the precautions correctly to avoid dangers and encourage other employees to avoid dangers. Bentley (2006) says that it is essential to identify the demands for the training in the selected industry.

This chapter focuses the background of the research, problem statement, aim and objectives of the research, research methodology and the scope of the research.

1.2 Background of the Research

The Water and Wastewater (W&Ww) construction projects are long-term investment intensions of the country and it links with the rest of the entire economy in terms of Gross Domestic Product (GDP), while being also a process of generation of massive amount of employment opportunities for the wellbeing of the economically active population of the relevant country (Central Bank of Ceylon, 2016). Table 1.1 shows the details of the large-scale W&Ww projects carried out during the past 20 years in Sri Lanka.

Table 1.1: Large Scale W&Ww Projects of Sri Lanka During Last Two Decades

No	Project Name	Donor	District	Duration		Project cost (Rs Min)
				From	To	
1	Greater Kandy water supply phase 1	JICA	Kandy	2012	2017	4,164
2	Greater Dambulla water supply stage 1	India	Kandy	2012	2014	9,593
3	Eastern Coastal Towns of Ampara District (ECTAD) WS Phase II	Australia	Ampara	2002	2010	11,078
4	Eastern Province Water Supply Development Project	JICA	Ampara	2010	2015	6,526
5	Integrated Water Supply Scheme for the Un-served Area of Ampara District Phase III	Australia	Ampara	2015	2017	18,012
6	Jaffna Killinochchi Water Supply & Sanitation	ADB	Jaffna	2011	2016	18,328
7	Killinochchi Rehabilitation Water Supply Project	JICA	Killinochchi	2013	2015	1,900
8	Immediate Arrangements to provide Water Supply to Kilinochchi (New 2 KR)	JICA	Killinochchi	2013	2015	260
9	Thambuttegama WS	China	Kurunegala	2014	2017	1805
10	Anuradhapura North Integrated Water Supply	JICA	Anuradhapura	2013	2015	9736
11	Ruhunupura WS Development	Korea	Mathara	2011	2013	13.131
12	Kirama, Katuwana, Middeniya&Angunakolapelessa Integrated WS	China	Gall	2012	2013	2,662
13	Rehabilitation & Augmentation of Kirindioya Water Supply	Austria	Hambantota	2009	2017	2,104
14	Badulla - Haliela and Ella Integrated WS	US Exim Bank	Badulla	2013	2015	10,396

No	Project Name	Donor	District	Duration		Project cost (Rs Min)
				From	To	
15	Mahiyangana Water Supply	Austria	Badulla	2013	2016	1,785
16	Water Sector Development Project I	JICA	Colombo	2007	2014	6,490
17	Kelani Right Bank WTP	DANIDA	Colombo	2008	2013	12,000
18	Rehabilitation & Augmentation of Labugama - Kalatuwawa WTP	Hangary	Colombo	2013	2016	8,100
19	Augmentation of Negombo WS	DUTCH	Gampaha	2008	2013	7,302
20	Water Sector Development Project I	JICA	Colombo	2007	2015	4,785
21	Water Sector Development Project II, Kaluganga Water Supply Project Phase I -Stage II	JICA	Colombo	2008	2015	10,846
22	Energy Conservation Project at Ambatale WTP	GERMAN	Colombo	2012	2014	6,220
23	Capacity Development Project for NRW reduction in Colombo City	JICA	Colombo	2010	2011	201
24	Colombo Water Supply Service Improvement Project	ADB	Colombo	2012	2018	28,800
25	Katana WS	China	Gampaha	2014	2015	1,641
26	Water Treatment Facilities Moratuwa / Panadura, Ambatale and in Negombo	Spanish	Colombo, Gampaha	2007	2009	2,690
27	Greater Ratnapura Water Supply Project	Spain	Rathnapura	2012	2016	9,928
28	Kolonna/ Balangoda Water Supply Project	Belgium	Rathnapura	2011	2015	4,658
29	Greater Kurunegala	China	Kurunegala	2013	2015	11,943
30	WanduraPinu Ella WS	China	Kurunegala	2012	2014	9,756

No	Project Name	Donor	District	Duration		Project cost (Rs Min)
				From	To	
31	Secondary Towns Rural Community Based WS & Sanitation	ADB	Polonnaruwa, Anuradhapura, Trincomalee, Hambantota, Batticaloa	2004	2013	13,029
32	Hambantota/ Ambalantota/ Weligama/ Kataragama Implementation Project &Badulla, Bandarawela Integrated Feasibility Studies	UNIHA	Hambantota, Matara&Badulla	2004	2013	2,126

Source:(National Water Supply and Drainage Board , 2017)

Workers engaged in W&Ww construction projects are exposed to a wide variety of injuries at work. The activities such as surveying, deep trench excavation, pipe laying, valve and fire hydrant installation, pressure testing, disinfection, lifting, plumbing, back filling, underground work activities, rock blasting, working in confined spaces, micro-tunnelling, construction of structures, working at height, loading and unloading activities, heavy machinery and equipment movement, electrical work, plastering and painting are consisted of different risk levels (Peter, 2003). He further states that each involves different exposures and thus differing health and safety hazards.

The industry exposes the employees to hazards in different job categories such as unskilled labour, skilled labour, plumbers, pipe fitters, machine operators, drivers, supervisors, technical officers, engineers and managers (Sunday Times Sri Lanka, 2017). Arndt (2005) emphasises that training in various skills is required for absorption into the industry of the country. According to Sunday Times of Sri Lanka (2017) the construction industry is a labour-intensive industry, which generates the demand for skilled and semi-skilled labour force continuously. Arndt (2005) states that the work force in W&Ww construction projects is most vulnerable, because employment opportunities are provided

in temporary basis, therefore employer and employee relationship is very fragile and most of the time such employees are short-lived.

Accordingly, workers are inherent risk to life due to lack of safety, health and welfare facilities, together with uncertain working hours in the work place.

Occupational safety is one of the most critical issues in the W&Ww construction projects in Sri Lanka and there is a phenomenal increase of high accident rates during the recent past (Ahamed, Nafeel, Rishath, & Dissanayake, 2016). It is recognized that the construction industry is one of the most vulnerable industries with a number of annual reported accidents (Rameezdeen, Pathirage, & Weerasooriya, 2006). Training programs in safety and health management strategy must be designed to change unsafe habits and promote safe-habits with the integration of technical and organizational aspects of safety (Dong, Entzel, Men, & Chowdhury, 2005). Therefore, it is crucial phenomena that raising labour safety and health awareness to reduce the risk of injury on the job.

Dong et al. (2005) say that there are very few studies have been carried out to evaluate the impact of safety and health training on injury outcomes in the W&Ww sector construction industry. According to Kinn et al. (2000) there are many requirements to bring legislative stability in order to improve employment status while reduction of risks through imparting training on site in the W&Ww projects. Kinn et al. (2000) further states that by providing training for the workers are strengthen the safe working procedures and reduce injuries in the W&Ww projects and also in the construction industry as a whole.

1.3 Research Problem

As mentioned in the background, W&Ww projects have been recognized as one of the most vulnerable to accidents. This is due to expose to a wide variety of hazards at work. Therefore, the workers need to be well trained in order to identify hazard and promote their safety. Rameezdeen et al. (2006) stated that, training requirements are not well established and there is no proper study has been conducted in Sri Lanka to identify the

most significant training needs for W&Ww projects that are essential for reduction of workplace injury. Rameezdeen et al. (2006) further state that a few studies have been reported on training needs, but these studies were not specific to the training needs of W&Ww construction sector in Sri Lanka. Only a few studies investigating the training needs in relation to reducing injuries in the construction industries of Asian countries have been conducted (Raheem, Hinze, Azhar, & Choudhry, 2011). Khan (2013) says that there are many studies have been conducted in developed countries. However, findings of those studies are found to be with certain limitations and therefore, there is a gap in knowledge on the workplace injury reduction. According to him these studies hinder the path of developing essential training needs to mitigate the prevailing situations in the W&Ww construction industry, especially in the local context due to many cultural differences. Thus, this research study is focused to fill the empirical gap on training needs of workers in the W&Ww construction industry.

1.4 Aim of the study

To investigate the essential training needs for injury reduction in the water and the wastewater projects of Sri Lanka.

1.5 Objectives

I. Identify injuries in the water and wastewater projects in Sri Lanka.
II. Analyse the risk levels of injuries in the water and wastewater projects in Sri Lanka.
III. Establish essential training areas to be implemented to minimize critical injuries in water and wastewater projects in Sri Lanka.

1.6 Research Methodology

This includes primary data collection methods, designing the sampling, target population, identifying the sample frame, sample locations, sample elements, sample techniques and

the selected sample. And it describes the design of the questionnaire, pilot survey, and the questionnaire survey, data being the raw material for carrying out this research.

Primary data is the opinions that are collected from the respondents who are representing the W&Ww projects that are operated in the Colombo Municipal Council (CMC) area. The convenient sampling technique (non-probabilistic sapling criteria) was utilized to select projects from the CMC regions. Respondents were randomly chosen from the on-going projects that are operated in the CMC area. The views of the respondents were obtained by getting them to answer the questionnaire. The questionnaire was distributed among the sample of the respondents to collect their views. However, questions were simple and self-explanatory. A self-administrative questionnaire is always economical, quick and easy to handle (Frederick & Sierles, 2003).

Quantitative data analysis is used in this study. Creswell (1994) indicates that an inquiry into a social or human problem must be based on testing a theory composed of variables, that are measured with numbers, and data must be analysed by statistical procedures or techniques in order to determine whether the predictive generalizations of the theory hold true. This study uses quantitative data in connection with OSH injuries. The questionnaire survey was conducted at various job categories for this study, and data are pertaining to the occupational safety and health training needs toward reducing injuries that are involved in W&Ww projects of Sri Lanka.

1.7 Scope and Limitations attribute

An injury is defined as wound or a trauma; a harm or a hurt; or a damage inflicted on the human body due to the injury caused by an external force (Webster, 2002). This injury must be directly or reasonably linked to the person who was engaged in the work of the W&Ww construction projects.

ADB funded the Greater Colombo Water and Wastewater Management Improvement Investment Program (GCWWMIIP) of CMC area, which covered pipe laying or

replacement / rehabilitation work. The primary data and secondary data were collected from five selected projects for this study. Conclusions were made upon the statistical analysis regarding the OSH training and the types of injury or the accidents, and also the frequency and the level of severity of the injury or the accidents in the W&Ww construction projects.

1.8 Chapter Organization

The first chapter gives an introduction which includes the background of the study, objectives of the study, research questions, the scope and the limitations of the study.

The second chapter presents a literature overview of W&Ww sector workplace injuries and accidents and their causes, methods used to mitigate risks and their hazard levels, training and management systems.

Chapter three deals with the research methodology. It includes research design, the target population, sample frame, selected sample, sample criteria, reliability test, descriptive statistical techniques that were used in the present research.

Chapter four presents the data analysis. The first part of the chapter analyses the respondent's profile. The second analyses part the views of the respondents.

Chapter five offers the research conclusion and recommendations. It includes the research implications.

CHAPTER 02

LITERATURE REVIEW

2.1 Introduction

This chapter provides literature relating to the present study. First part of the chapter reviews the literature relating to the peripheral areas such as severity and frequency of work place accidents, types of occupational safety and health accidents and their hazard levels. The next part of the chapter deals with literature relating to the essential training needs for reduction of injury in the W&Ww construction sector.

The Government of Sri Lanka focuses industrial development in the country, thus encourages the construction projects, with the expectation of infrastructural development of the country. Therefore, there is a high level of demand for W&Ww construction projects in Sri Lanka. Dong et al. (2004) state that construction industry is a mechanism towards infrastructure development of the country. However, industry faces its own challenges. One of the main challenges is the reduction injuries.

2.2 Workplace injuries in W&Ww construction projects

Sri Lanka records the highest percentage of workplace accidents in the construction industry (De Silva & Nawarathna,2014). The report "construction industry of Sri Lanka" indicates that at least an average of thirty people injured daily in the construction projects and are hospitalized to the National Hospital, Colombo (Warakapitiya, 2017). The report further stated that its alarming to both employees and employers to open their eyes to safety and health at their work places. Rameezdeen, Pathirage and Weerasooriya (2006) state that the employees who are working in the construction projects need a higher level of attention and care for their safety.

Department of labour reported that 3500 cases of workplace accidents are occurred annually. However, Department further indicates that most of the accidents are not

reported and this number would have been increased further if all the accidents are properly enumerated. National Water Supply & Drainage Board (NWSDB) is the main client of the government for carrying out large scale W&Ww construction projects in Sri Lanka. Yet, many local or foreign contractors are involved in the construction industry of those projects. According to the report, these construction companies do not take optimum precautions to ensure the employee health and safety (National Water Supply & Drainage Board, 2017).

2.2.1 Definitions for workplace "injury"

U.S. Department of Labor (1992) defines an injury is an abnormal condition or disorder for which include cases such as, but not limited to, a cut, fracture, sprain, or amputation. Ulnifun (2002) defines an injury is a damage to the body caused by external forces, results by accidents, falls, hits, weapons, and other causes. According to him major trauma is an injury that has the potential to cause prolonged disability or death and injury is a collective term for health and safety outcomes from traumatic events.

Rejda (1992) defined an accident as a "sudden, unforeseen and unintentional" event, which may result in physical harm to a person and/or damage to a property.

2.3 Types of Occupational Safety and Health (OSH) accidents in W&Ww projects

W&Ww construction industry divides the employees in to different job categories such as unskilled labourers, skilled labourers, plumbers, pipe fitters, machine operators, drivers, supervisors, technical officers, engineers and they are involved in a number of construction procedures. Due to that, most of the construction related accidents can be seen in such projects. Pathirage (2017) states that one of the most severe cases of injuries in the W&Ww construction projects are trench collapse related injuries since workers have to use heavy machinery and equipment. Brunette (2004) states that excavations cause injuries that should be done to lay large size pipes to ensure the continuous water supply to the zones, thus employees who uses excavating activities should follow a

number of safety precautions. Brunette (2004) stated that dangers couldn't be fully avoided. Therefore, there is a prevalence to happen major or moderate types of accidents occurrences in the workplace. Ahmed (2019) argue that there is a possibility that the worker might fall down in to the trenches causing minor or moderate type accidents and sometimes the water sources make the excavation process more difficult. He further stated that the workers might slip on the ground and can be subjected to first aid or beyond first aid type accidents. It is essential to consider the trench safety of the workers because of the high potential of accidents during the pipe laying activities (O'Connor, Loomis, Runyan, Dal Santo, & Schulman, 2005).

Moreover, some of the excavations could increase the dangers of trench collapse. The nature of the land cannot be predicted and therefore the excavation activities and pipe laying could have various potential dangers in the W&Ww projects. The heavy machineries could dangerously slide away due to the instability of the land conditions. Furthermore, due to the dangerous land conditions, the pipe laying process cannot be done effectively within the assigned time frame, and therefore it creates an urgency in work (O'Connor et al., 2005). That would also increase the potential of the accidents in the work environment.

2.4 Workers training on OSH in W&Ww projects

Based on his USA studies, Toole (2002) implies that the lack of considerable training from higher management can be the reason for accidents. Even the very simple mistakes can occur when performing specified work by a poorly trained worker. For example, if the employees work without a proper knowledge of manipulating the tools and equipment which are used for working in an excavated trench, and in toxic gases rich environments, it can lead to a big issue and can definitely be the reason for accidents.

Since the W&Ww projects are implemented by the government organizations, they have the resources to provide better employee health and safety training to the employees. Management should know how to improve the health and safety of employees through

training and awareness programmes to reduce the potential of danger (O'Connor et al., 2005). The training on safety is necessary to use the equipment and resources to ensure the protection of the employees at the W&Ww construction projects (Arboleda & Abraham, 2004). Jaselskis, Anderson and Russell (1996) state that it is essential to learn various lessons from the previous incidents so as to avoid similar issues in the future. Dong et al. (2004) state that causes of the danger should be identified and the management should rapidly address the causes to avoid further dangers to the employees. Bena, Berchialla, Coffano, Debernardi and Cardi (2009) state that all the improvements in connection with the health and safety functions of the construction projects can be made when the employees and the management have a positive perception and a good approach to the employee health and safety functions of the construction projects.

2.4.1 Use of Personal Protective Equipment

Personal Protective Equipment (PPE) that are worn by the employees can protect themselves from physical harm, chemicals and fire, and to minimize the exposure to different hazards (Sutton , 2017). Protective gloves, safety glasses, fall protection equipment, hearing protection, respirators masks, hard hats and full body suits are the major PPEs that are used by workers in construction projects. Nevertheless, use of PPE does not ensure total protection of employees and does not decrease the hazard itself, but it is known as a means of protecting health and safety.

In addition to the type of work, physical requirements of the work, and the time required, the PPE wears out. The goal should always be to focus on worker / user comfort. Unsuitable use or improper use of equipment may cause discomfort. If all the workers accept the equipment, the utilization rate will be high (Department of Occupational Safety and Health, 2003).

Therefore, it is very important to choose the right supplier according to the industry to provide workers with an appropriate level of personal protective equipment. A study on the knowledge and use of PPE by the staff of the Fun Instrument Hall in Lagos State

found that although the utilization rate of PPE is very low, some workers (50%) have a good understanding of PPE, which makes them face the workplace dangers of the workplace better (Khan,2013).

Poor training on safety and health issues lead to lower awareness of employees, which make employees more susceptible to injury, and thereby reduce the level of safety and health. First, employers should be able to provide personal protection during construction activities (Dong et al., 2004). An appropriate level of knowledge should be communicated to employees so that they can wear various safety equipment when moving construction equipment (Kinn, Khuder, Bisesi & Woolley, 2000). During the training process, they must be aware how to use and wear the hard hats, gloves, boots and overall safety clothing at the field (Ringen & Seegal, 2001).

2.4.2 Traffic Management

The cost of vehicular or traffic disruption and the traffic accidents are most important matters of traffic management associated with W&Ww construction (Bush, 2001). He further stated that the major categories which come under the traffic management are the duration of the project, cost of fuel, cost of travel time, road damage and loss of revenue are important for safety. Bush (2001) found that the average person spends 36 hours a year on sitting in the traffic due to traffic disruption of open cut construction activities. Texas Transportation Institute (TTI) concludes that traffic congestion accounts for 6.8 Billion gallons of fuel consumption and 4.5 Billion hours of travel time and 78 **B**illion US Dollars per year.

2.4.3 Hazard Identification and Risk Assessment (HIRA) of W&Ww projects

The purpose of hazard identification is to govern the risks that are associated with the work performed by the employees (Carter & Smith, 2006). Accordingly, it involves identifying the locations and processes which linked with the risks, as well as the risk to

employees, visitors or contractors. Rejda (1992) states that hazard identification is the most important factor in risk assessment process.

Carter and Smith (2006) state that recognizing the context of the work activities is the first stage of risk assessment process. According to them, risk assessment should include all the events that employees are involved in the activities and the use of equipment. Huges and Ferret (2011) state that the most effective way is to ensure all the activities that are listed to walk around the workplace as to see what happens in each.

At the risk estimation process, the risks are assessed by the hazards identified at an earlier stage. Thereafter, the possibility and severity of the damage caused by the hazards are considered. Some people think that in order to determine the possibility and severity of damage, the assessor must master the process of normal workday activities in the projects (Lingard & Rowlinson, 2005).

Risk is defined as the probability of occurrence of uncertain, unpredictable and even undesirable events are possible to be occurred (Kartam, 2001). Chicken and Posner (2001) found risk can be qualified as;

$$\text{Risk} = \text{Consequence} \times \text{Likelihood}$$

Fixed rules do not exist on how to carry out occupational health and safety risk assessment, controlling and communication (Huges & Ferret, 2011). But some general principles are available to be followed. Risk assessment methodologies were developed in some studies by researchers to suit their expected requirements (Lingard & Rowlinson,2005). Nevertheless, the quantitative approach is most widely used when estimating the risk level.

The risk evaluation criterion has been based on three types measures: qualitative terms, quantitative terms and semi- quantitative terms. According to this approach determine and evaluate the possibility and severity (Ayyubu, 2003).

According to Petrovic (2017) the figure 2.1 below, shows the matrix for estimating quantitative risks. Whether the risk is tolerable or not tolerable should be decided, for the purpose of risk evaluations (Lingard & Rowlinson, 2005).

	Hazard probability ratings					
Severity of consequences ratings	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	8	10	12
3	3	6	9	12	15	18
4	4	8	12	16	20	24
5	5	10	15	20	25	30
6	6	12	18	24	30	36

	Unacceptable	18-36
	Undesirable	10-16
	Acceptable with controls	5-9
	Acceptable	1-4

Figure 2.1: Risk Rating Matrix

Source: (International Journal on HIRA in Construction Industry, 2018)

As shown in figure 2.1, if the risk is regarded as acceptable, only controlling the risk might be enough, instead of reducing the risk. Nevertheless, solutions for different risk reduction should be analysed and compared. Assessing the team making decisions take place in the evaluation stage of the risk-assessment process, in order to reach a decision on the suitable risk control strategies (Huges & Ferret, 2011).

Risk control measures are used to mitigate hazards, prevent dangerous situations or reduce the severity of the consequences of any occurrence within any system, procedure, process or from an instrument (Lingard & Rowlinson, 2005). To eliminate, prevent, or reduce the probability of such an occurrence, control measures should be proactive as well as reduce the consequences of any of these occurrences (Huges & Ferret, 2011).

2.4.4 OSH policy and practices

According to Hamid, Majid and Singh (2008) workplace injuries mainly attributed to the management due to the poor safety policies and practices in the organization. They mentioned also that the second major cause is the unsafe methods that are mostly related to incorrect work procedures. The human element comes to third position as the lacking of personal protective equipment usage. Workers negligence them and thus become causes of accidents.

Keng and Nadeera (2014) say that generally the construction site is good and structured as far as safety practices are concerned. It is obvious that safety policy, education and training, site safety inspection, safety auditing, safety meeting, site safety organization, personal protective equipment, emergency support and safety measuring devices fall protective systems, and safety promotions are major requirements. However, several problems have been encountered in the safety practices. They are identified as ignorance of workers on work procedures, lack of financial allocation for safety management, lack of awareness among the workers, language barrier between supervisors and workers etc. Several strategies have also been suggested by scholars to overcome these problems, such as to provide effective safety training, allocation of budget for safety management, full commitment from the top management, provide safety booklets in various languages and so on.

2.4.5 Work place activities and accident preventive measures

When considering the prevention of injuries, there are two major aspects of these preventing measures (Jannadi, 2008). The first is the management aspects and the second is the employee aspects. The management aspects imply a situation for which encourage managers positively in the health and safety area. The employee aspects imply the positive approach of workers and attitudes towards health and safety (Keng & Nadeera, 2014).

Management Aspects

Many construction firms take different precautions to reduce accidents due to the high frequency of the occurrence of an accident in the industry (Pathirage, 2017). With defining how to stay protected when dealing with the working environment, the workers of the project are given suitable knowledge during the initial stage (Navaratna & Jayawardane, 2007). In addition, rules and regulations have been established to be followed in the construction zones (Gunasekera & De Alwis, 2008). They recommended the activities of the workers are regularly monitored by the supervisors and the engineers to observe whether the workers are following the safety guidelines accurately or not. While reducing the potential of accidents, actions are taken to ensure that the workers follow the health and safety rules and regulations (Rameezdeen, Pathirage & Weerasooriya, 2006).

Ringen and Seegal (2001) state that multiple management methods can be used to enhance the health and safety of W&Ww construction plans. They further state that the supportiveness of the management to assurance of the employee health and safety will encourage the employees to feel safer and feel better in the working environment in the constructing of W&Ww projects and also the employee commitment could be strengthened (Ringen & Seegal, 2001).

Jannadi (2008) said that high level of potentials to the industrial accidents occur when implementing the W&Ww construction projects. According to him a very high number of accidents have been reported in construction sites and it can be said that most of the activities of the construction are being carried out with a high possibility of danger (Wilkins, 2011). Therefore, there is a great necessity to identify the preventing methods of industrial accidents. The main focus throughout this review is based upon the accidents of the W&Ww construction projects (Ringen & Seegal, 2001).

Management of construction projects can plan and implement necessary policies and practices which are related to employee health and safety (Hinze, Pedersen & Fredley,

1998). According to the analysis, the management can identify the potential threats of the W&Ww construction projects. Afterwards, solutions to prevent the accidents can be found when considering the relevant areas (Wilkins, 2011). The management can consult local experts and relevant employees to develop health and safety policies in the projects. The employee performance can be monitored and supervised by the management to ensure the health and safety of the employees during the construction (Wilkins, 2011).

Employee Aspect

When considering the employee health and safety, they have a high level of responsibility (Mostafa & Momen, 2014). While the workers carry out construction activities, the procedures and protocols should be identified and followed to ensure that the health and safety practises that are being carried out (Wilkins, 2011). A number of potential accidents can be reduced by wearing safety gears and following the given protocols. Moreover, the potential dangers should be identified by the employees in the area of construction by using their experience and knowledge. After recognising the potential dangers, they should actively find a solution to prevent the dangers in the construction area, by informing the management according to the policies (Ringen & Seegal, 2001). Highly knowledgeable and skilled employees should be able to mitigate different harmful situations while they are working (Hinze, Pedersen & Fredley, 1998). Similarly, employees who have a good knowledge and awareness of the hazards and their prevention would have a positive effect on the safety of the employees (Wilkins, 2011). The management of the W&Ww construction projects, should provide the employees with training on handling the appropriate equipment safely (Entzel et al., 2004). Further, due to the improvement of knowledge, the employees should have a full understanding about their conduct during the construction project and the actions to be taken in an emergency.

2.4.6 Unsafe act and behaviour

According to the studies, unsafe act and behaviours are caused to accidents due to lack of awareness of all the parties who are enrolled to work, input resources of low quality

for safety, lack of solid implementation of regulations, poor firm commitment, insufficient technical supervision, and inadequate personal protective equipment (PPE) (Keng & Rasak, 2014). When considering these facts, it can be directly suggested that, accidents happen mainly due to inadequate safety facilities.

2.4.7 Environmental safeguard measures

According to Goetsch (2013) failure to manage a healthy and safe environment in the workplace is the main cause of workplace accidents. Tabesh (2017) says that open cut-and-cover pipe laying activities have negative impact on the environment, ecosystem, and quality of life, this is due to higher rate of traffic disruptions and land usage, higher safety hazards, and higher energy consumption.

2.5 General training consideration for supervisory staff

When conducting projects, there is a high level of potential possibilities of accidents (Warakapitiya, 2017). The literatures show that general training consideration for reduction of accidents caused by a wide range of factors. Sutton (2017) argue that unsafe equipment, job site conditions, the unique nature of the industry, unsafe methods, the human element and the management are caused work place accidents. Most of the accidents occur due to the careless behaviour of the employees in the W&Ww construction industry (Goetsch, 2013). Height-related accidents have caused dangerous consequences and many accidents deliver the result of death or lifetime disabilities to the workers (Rameezdeen, Pathirage & Weerasooriya, 2006).

The following sections give details of training requirements for the workplace injurie reduction.

2.5.1 Trench protection techniques

W&Ww construction projects have many potential hazards for accidents due to trench collapse. It can be identified that there is a high level of potential to accidents in excavations and trenching, piling and working under the tunnels (Wilkins, 2011).

There are three basic approaches are currently used to prevent the soil from caving into the open trench: (a) shielding, (b) sloping, and (c) benching. The figure 2.2 shown in below presents the three methods that are mostly common in the US and Korea (Kim & Bernold, 2008).

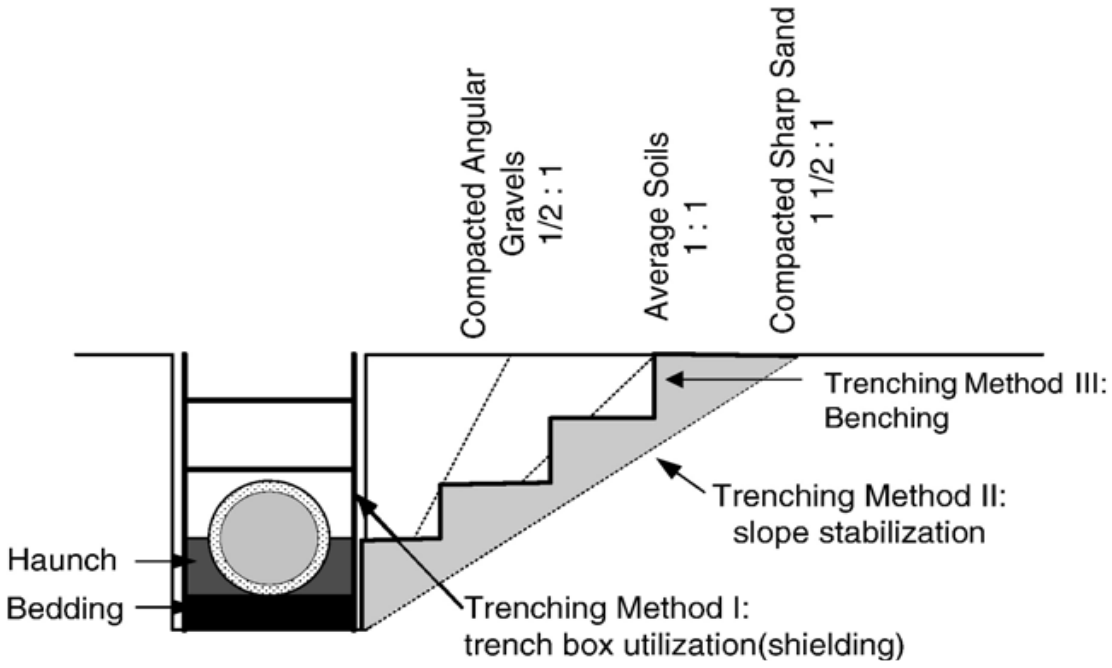

Figure: 2.2 Trench protection methods: shielding, sloping and benching

Source:(Trenching and Excavation Safety OSHA, 2015)

2.5.2 Trenchless pipe laying techniques

According to Kim and Bernold (2008) a trench is a narrow excavation, in relation to its length, that is made below the surface of the ground. Iseley et al. (1999) indicate that trenchless methods of pipe installation are popular and broadly divided into three

categories as, horizontal earth boring, pipe jacking and utility tunnelling. According to Kim and Bernold (2008) trench-less technologies is increasing trenching method which is the most common approach for burying utilities underground. Installation of a utility in a trench requires hands-on aligning and jointing several labourers inside a narrow and a deep trench s extremely hazardous. Furthermore, the authors stated that the main cause of deadly accidents in trench work is the rapid collapse of the trench wall if it is not properly supported and the other potential dangers include being crushed by heavy pipes or being hit by falling tools and materials.

2.5.3 Automated technique for pipe laying

Skibniewski (1993) states that there are two most prominent characteristics of the construction industry which support the need for automation, that are (i) health hazard and (ii) a physically dangerous work environment construction in which high rise construction or work on sites with contaminated soil such as chemical dumps and areas polluted by oil spills or radioactivity. He further stated that the situations challenge the existing construction technology and encourages innovation in automation to achieve better construction processes. According to him these cases are successfully reduce the labour injuries.

2.5.4 Safe operation procedures (SOPs)

Safe operation procedures (SOPs) identify the technological options, alternatives for environmental issues and suggests alternative technologies, and/or implementation methodology, necessitating revision of safe methods of technical analysis (Dey, 2012). He further stated that the unsafe operation methods are highly related to fatal accidents or these methods cause injuries in many ways. Davies and Tomasin (1996) have stated that workers struck by moving parts of machinery or ejected material or trapped between rollers, belt and pulley drives are major or fatal accident in construction industry. They further stated that workers are subjected to accidents due to the improper conditions of PPE.

2.5.5 Leak detection techniques

According to literature research, different scholars have different classifications of detection technologies. According to the degree of automation, detection techniques can be divided into automatic detection, semi-automatic detection, and manual detection (Moser, German & Smith, 2015). The degree of identification information and detection technology have identified as direct detection and indirect detection (Meseguer, Mirats-Tur, Cembrano, & Puig, 2015). However this can be technically identified as optical methods and non-optical methods (Nejjari, Sarrate, & Blesa, 2015). This can be further classified as hardware-based method and software based method which is most commonly address in construction industry, because this is based on the detection technology characteristics and application (Moser, German, & Smith, 2015). However the water projects commonly used acoustic detection techniques for identify the water leaks in pipeline (Meseguer, Mirats-Tur, Cembrano, & Puig, 2015).

2.5.6 Management of emergency situation

An emergency management system and safety management system is required for construction site, because human life is most important than anything (Tudayekar & Kulkarni, 2014). Emergency management is the discipline to avoid both natural and man-made disasters. Emergency is a serious, unexpected and often dangerous situation requiring immediate action (Tudayekar & Kulkarni, 2014). They further stated that Safety and Emergency Management (SEM) models are reduce accidents up to large extent in the construction sites. The level of awareness and training of SEM motivates employees for safety and health priorities in construction sites and which will increase the organization's profit due to less accident.

2.6 Work place injury reduction measures

Risk management framework can be used as proactive measure of work place injury reduction (Petrovic , 2017). Regardless of the method that is used for differentiate the

industry risk, most assessment techniques are found to be similar. The basic principles, the content and the main components are found to be common. Figure 2.3 shows the components.

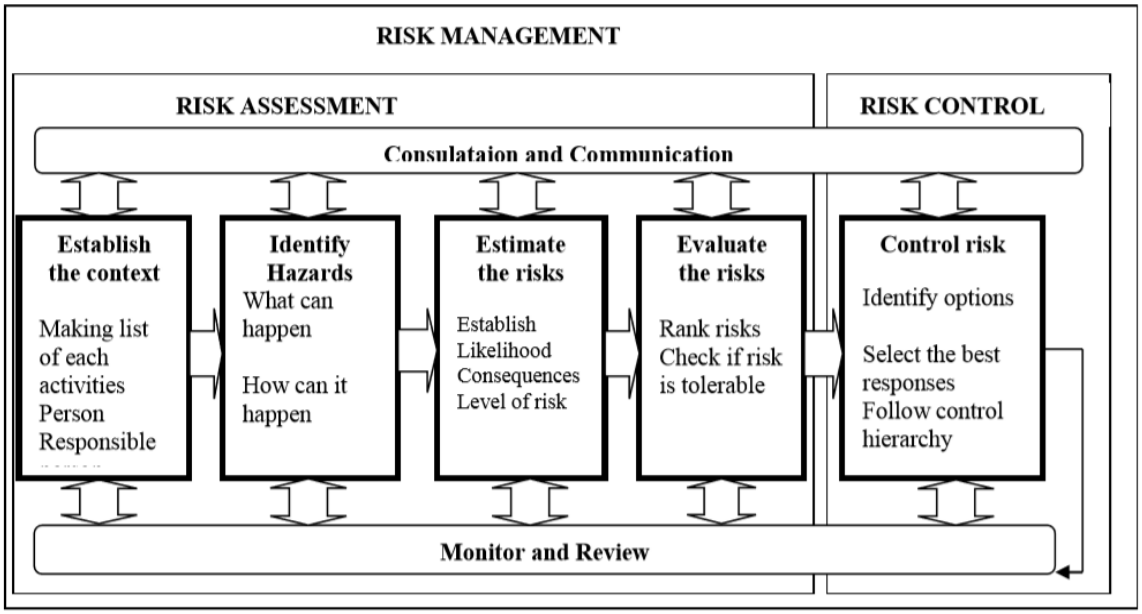

Figure 2.3: Risk Management process

Source: (International Journal on HIRA in Construction Industry, 2018)

2.6.1 Awareness and training

The lacking part of proper awareness on OSH policies and the usage of safety gears and also the negligent behaviour of relevant employees may create a higher number of risks to injuries (Navaratna & Jayawardane, 2007). Employees had neglected to use the safety equipment in the early times when they are conducting construction activities. (National Water Supply and Drainage Board , 2017). Even though they had been provided with relevant equipment to ensure their safety and health, they would not use the equipment due to laziness and carelessness (Bently, 2006). This had generated alarming consequences to the projects and the management had to implement strict laws to follow

while working in the construction projects (National Water Supply and Drainage Board , 2017).

Rameezdeen, Pathirage and Weerasooriya (2006) say that workers take many risks when they are working at a project. They have neglected to wear safety gears while they are working at a project (Rameezdeen et al., 2006). According to Pathirage (2017) employees have created a high level of potentials and possibilities of injuries. Rameezdeen et al. (2006) further indicate that the attitude of workers have been lead to industrial injuries. According to Pathirage (2016) the most of the workers in the W&Ww construction projects are coming from rural areas of the country and they do not have a proper education in industrial related health and safety. Most of them do not care about the safety gears. They have realized the safety gears are only mandatory requirements of the construction projects.

2.6.2 Adaptation of new technology

Even if employees understand health and safety regulations, they should know how to handle new technological tools and equipment in the construction area (Aksorn & Hadikusumo, 2008). They further stated that, in terms of W&Ww construction projects, it can be said that various new technologies have been adopted to improve the construction of the W&Ww projects.

According to Jaselskis, Anderson and Russell (1996) many new and innovative equipment have been introduced in wastewater management and water purification activities. However, when considering the practical situations, there is a gap between the existing knowledge and the new technologies. According to them employees should be properly trained to improve their knowledge to make use of new knowledge relating to technological items of W&Ww projects. This situation is found to be similar to other construction equipments.

Jaselskis, Anderson and Russell (1996) say that innovations are being made every day to improve the safety of workers in construction projects. The management should have been able to identify these new methods and should be able to deliver them effectively to the employees. According to them employees are primarily responsible for learning new ways to improve health and safety during the times they are engaged in construction activities. Aksorn and Hadikusumo (2008) state that various studies and researches have been conducted in the field of "employee health and safety" and useful to develop new technologies to prevent the potential accidents.

2.6.3 The legal framework

Gunasekera and De Alwis (2008) indicate that the legal framework of Sri Lanka is pressing the employers to deliver the knowledge of health and safety equipment. Accordingly, Labour Department conducts a series of inspections to measure the health and safety levels of the working environment at the companies. Warakapitiya (2017) states that this is not an easy process as the department does not have capacity to cover all the business organizations at present, especially the construction projects. However, Department of Labour takes necessary action once they receive such reports from the construction projects.

The legal framework of the country has also introduced a compensation policy to the construction accidents. This encourages the management to pursue various precautions in the construction industry (O'Connor, Loomis, Runyan, Dal Santo, & Schulman, 2005). Management is required to consider the employee safety and should be aware of the negligence of health and safety behaviours of employees. Because, the organizations bear high expenditure, if any occupational accident is occurred.

Warakapitiya (2017) says that the level of awareness of the health and safety in the construction industry is increasing. Many contractors are implementing such measures in their construction zones to ensure the health and safety of the employees. However most of injuries in the industry could be avoided. Rameezdeen, Pathirage and Weerasooriya

(2006) state that workers demand their protection during the work and therefore contractors cannot neglect the health and safety concerns in the industry. Proper level of awareness improvement would encourage the workers and contractors to use the health and safety measures effectively during the construction activities (Warakapitiya, 2017).

2.6.4 Cost Factors

Most construction projects focus on cost factors. Therefore, companies attempt to improve their profit margins, especially, in the small-scale companies. Contractors maintain such projects at a lower cost level. They are very sensitive to cost factors and they will choose the contractors whose favourable to cost solutions (Cruickshank & Cork, 2005). When selecting a contractor, most clients do not inquire about the employee's health and safety situation. It is often overlooked and ignored (Rameezdeen, Pathirage & Weerasooriya, 2006). If more consideration is given to employee health and safety factors, it would increase the cost of the contractors (Gunasekera & De Alwis, 2008). Some safety equipment is expensive, and in the process of cutting costs, they pay more attention to exclude those high cost safety measures for the workers (Goetsch, 2013). For contractors, this would be an excellent opportunity to reduce the cost of purchasing and maintaining such safety gear (Rameezdeen, Pathirage & Weerasooriya, 2006).

Workers do not use safety equipment properly. The contractor does not realize the significance of using safety equipment and devices (Gunasekera & De Alwis, 2008). Eventually, workers are exposed to potential injuries and accidents in the workplace (Cruickshank & Cork, 2005). According to their study that the workers may ignore the use of such safety measures, and hence, they face high risks due to the lack of safety awareness and proper supervision.

2.7 Opportunities of training and awareness

It has been shown through several studies that employee health and safety expectations can be achieved via proper health and safety awareness programmes and knowledge and also skills management (Kinn et al., 2000). If employees have a sufficient knowledge of

safety and health procedures, they will not be subjected to accidents or danger (Khan , 2013). Therefore, they will take immediate preventive actions to avoid the dangers and accidents as well as motivate other employees to get rid of danger which can lead to accidents in the workplace. However, the training needs of the organization or industry must be clearly identified in order to obtain appropriate training opportunities (Bentley et al., 2006).

Training cannot cover all areas, but the management is responsible for establishing the employee health and safety awareness in these areas (Jaselskis, Anderson, & Russell, 1996). Hence, the employees must have a proper understanding to protect themselves from dangers to various potential accidents in the workplace and to conduct themselves in the construction site (Wilkins, 2011). In addition, employees need to know how to act properly in case of an emergency situation to minimise the negative outcomes to themselves and other employees (Aksorn & Hadikusumo, 2008). Accordingly, it shows the importance of having employee awareness programs to minimize accidents in the workplace.

According to Zhou, Fang and Wang (2008) there are various gaps exist in the knowledge of employee health and safety. It is very essential to assess the current knowledge of employees regarding the subject of health and safety before delivering the effective training programs to the employees (Entzel et al., 2004). Accordingly, in order to ensure health and safety in the construction sites, both the management and the employees should work with genuine commitment (Aksorn & Hadikusumo, 2008).

The cost factors should also be considered when it comes to the training functions to the employees, (Lingard, Cooke, & Blismas, 2012). W&Ww construction projects have a high number of workers (Griffith & Howarth, 2000). Delivery of training is very challenging due to the unavailability of resources. The employers of W&Ww projects deliver essential services to the country (Lingard, Cooke, & Blismas, 2012). Organization has a high level of urgency at the time allocation for the training and development

activities, which is very challenging and such situations liable to open gaps in the knowledge (Aksorn & Hadikusumo, 2008).

The cost factors of the training programs would not be much challenging to those organizations that make high levels of profit. Yet there are some effective ways to reduce the cost and training times for the employees (Bena et al., 2009). The management can use various strategies to encourage the employees to learn more about the health and safety of the construction projects. Entzel et al. (2004) says that forming of construction groups is one the strategies to allow employees to pursue proper health and safety precautions. Such groups may have a lot of experience and they would be able to give advice to the other members of the group. Such strategies would allow employee to learn about the employee health and safety in alone with 'on the job training method' (Bena et al.,2009). The team leader of a group would reduce the pressure on the management and has the responsibility of keeping the team members safe during the time of constructions are going on while assessing the current level of knowledge of team members.

Furthermore, the employer of W&Ww projects can take up the role of the consultant of the project and thereby she can give consultation to the Mechanical Training Colleges of the project (Hinze, Pedersen & Fredley, 1998). The employers can encourage the training colleges to impart the proper health and safety knowledge when organization has potential threats in the industry. By doing so, the organization would have to consider the necessary training requirements and the level of knowledge improvements (Jaselskis, Anderson & Russell, 1996). However, all these suggestions should not be seriously considered by the employers when they design health and safety procedures (Arboleda & Abraham, 2004).

2.8 Training need identification

By effectively addressing these matters, the future training programmes would be more successful. The correct level of assessment should be done to identify the training needs and gaps in the skill of the employees (Jaselskis, Anderson & Russell, 1996). They further

stated that the management can initially define the skill levels and competency levels required for the job role and according to that specification the management can measure the current skill levels and the competency levels of the employees.

After the identification of the gaps, it is essential to define the training programmes to improve the awareness and skills of the employees. Mainly it is essential to remember that some of the employees are in lower educational levels (Jaselskis, Anderson & Russell, 1996). The level of understanding of the construction workers may be challenging when it comes to the training programmes (O'Connor et al., 2005). But the management should properly establish the training and skill building programmes to address these gaps. Mainly the enthusiasm of the employees should be improved, and their attitudes should be improved as well. Then the employee would see the positive benefits of the training and skill building functions (Jaselskis, Anderson & Russell, 1996).

By performing training programs, the construction related accidents can be reduced and this is common to the W&Ww construction projects as well. If the management fails to identify the correct training and skill building requirements of the employees, it would waste the training and skill building resources of the organisation. It is essential to take the maximum level of utilisation of the organisational resources and to achieve that the management should identify the requirements of skill improvement correctly (O'Connor et al., 2005). Furthermore, the management should measure whether they have delivered the training programmes effectively and efficiently to the employees as well (Bena et al., 2009). The post evaluation should be done properly to identify whether the training programmes were able to achieve the expectations of the management. The level of accidents and injuries should reduce due to the improvement of the knowledge and skills of the employees (O'Connor et al., 2005).

During the post evaluation the management would be able to identify the potential development of the current training methods (Bena et al., 2009). The continuous assessment of the training needs and the improvement of the quality of the training

programmes would effectively ensure the development of the employees while reducing the potentials of accidents and injuries (Jaselskis, Anderson & Russell, 1996). Accordingly, training the employees can be identified as a major aspect of reducing accidents and injuries.

CHAPTER 03

RESEARCH METHODOLOGY

3.1 Introduction

This chapter deals with the research methodology and briefly describes the research design which includes the data collection methods: both primary data and secondary data, sample design, target population, sampling frame, the sampling techniques and the selected sample. Chapter describes the research instrument and the questionnaire survey.

3.2 Research Process

The series of actions or the sequences of steps taken to carry out a study in an effective way is considered as a research process.

Figure 3.1 which is given below exhibits the step-by-step approach that was adopted in this research. Accordingly, it shows the steps, namely, problem identification, development of research objectives, review of the existing literature etc.

Subsequently, appropriate data collection and data analysis techniques were determined to present the findings of the research. Ultimately, conclusion and recommendations are derived from the data analysis were presented.

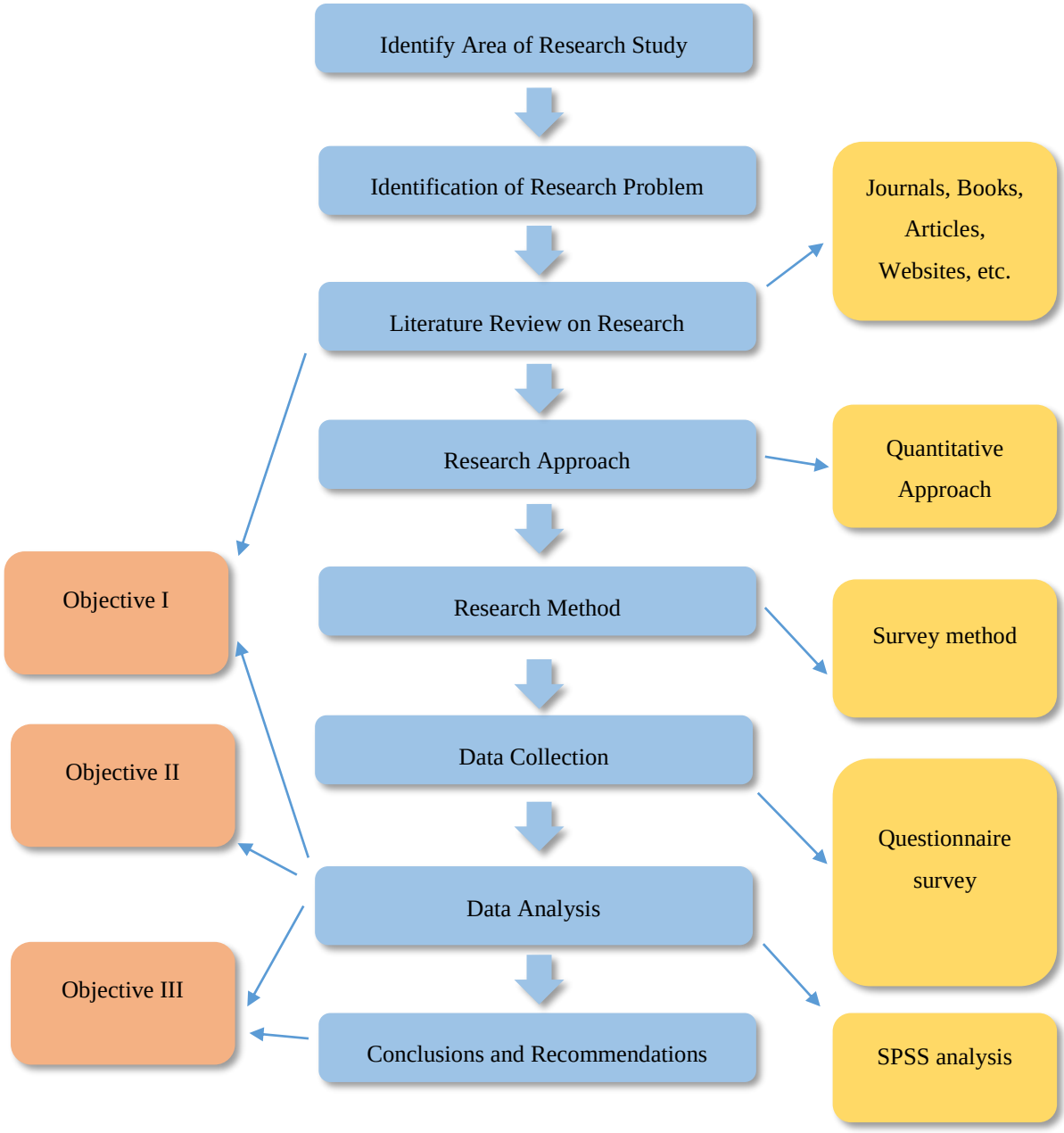

Figure 3.1: Research Process

3.3 Method of data collection

The convenient sampling technique (non-probabilistic sapling criteria) was utilized to select projects from the CMC regions. Primary data was collected using a questionnaire survey. The respondents for the survey were randomly chosen from on-going projects

that are carried out in the CMC area. The opinions of the respondents were obtained by distributing the questionnaire. The questionnaire was distributed among the sample of respondents to collect their views. However, questions were simple and self-explanatory. A self-administrative questionnaire is always economical, quick and easy to handle (Frederick & Sierles, 2003).

3.3.1 Target population and Survey Sampling

The project technical staffs of five on-going W&Ww construction projects in CMC area were chosen for the collection of data and the following table reveals the respective projects and operational areas and also the total technical staffs in each project.

Table 3.1:Total technical staffs and operational areas of the projects

Projects number	Location	No. of technical people in the staff
Project 1	Colombo North	95
Project 2	Colombo East	90
Project 3	Colombo West	78
Project 4	Colombo South	76
Project 5	Thimbirigasyaya	62
Total technical work force in the target population		401

3.3.2 Sample frame

The technical staffs on five ongoing projects in CMC area shown in the table 3.1 above is the sample frame. According to the table 3.1 shown above, the sample frame contains a total of 401 employees. Accordingly, the sample was chosen on a random basis.

3.4 Survey Sample

The sample is a part of the target population. It must represent the whole project; therefore, the sample should be collected very carefully. Different methods of sampling have been developed by experts in order to select the best representative samples. Simple

random sampling, cluster sampling, systematic sampling, quota sampling and stratified sampling are probabilistic sampling methods. Purposive sampling, judgment sampling and convenient sampling are known as non-probabilistic sampling methods (Zikman,2013).

In this research random sampling methods were utilized to select the respondents from the water and waste water projects which are operated in the CMC region. The sample was selected as shown in the table no 3.2.

Table 3.2:Selected sample in accordance with the Morgan criteria.

Description	Project 1	Project 2	Project 3	Project 4	Project 5	Total
No. of project technical staff in each Project.	95	90	78	76	62	401
No of project technical staff selected at random basis.	50	50	45	45	35	225
No of the respondents	49	48	41	39	33	210

Sampling elements are the number of employees attached to the five projects stated above as Project 1, Project 2, Project 3, Project 4 and Project 5. Locations are Colombo North, Colombo East, Colombo West, Colombo South, and Thimbirigasyaya Divisional secretariat area.

The convenient sampling technique (non-probabilistic sapling criteria) was utilized to select projects from the respective regions as stated above. Accordingly, a sample population of 225 were selected out of the total population, which was 410. Out of that 210 members of the staff have responded. This is a 25% sample, which is statistically significant and representative and efficient (Uma Sekaran, 2016).

3.5 Research Questionnaire

The research instrument, which is the structured questionnaire, was used to collect data (views of respondents). The questionnaire which was used in this research was self-administered. It contains 10 questions which are based on the required information from the respondents. The Five-point Lickert scale measure was used. The printed copies of the questionnaire were distributed among the respondents and administered.

3.5.1 Structure of the Questionnaire

The structure of the questionnaire is as given below. A total number of 48 questions were in the questionnaire which included the demographic profile related questions as well. The questionnaire was structured as shown in the table no 3.2

Table 3.3: Questionnaire structure.

Description	No. of questions
Demographic characteristics	6
The severity and the frequency of the accident in the organization	5
Type of OSH accidents in the organization	12
To what extent do you believe that the supervisory staff should acquire knowledge to minimize accidents in the organization	12
To what extent do you believe that the floor level workers knowledge should be to minimize accidents	13
Total no. of questions	48

3.5.2 Conducting the survey

It was decided that a pilot survey should be done in order to test the reliability, accuracy and the practicability of the questionnaire. 20 sets of questionnaires were distributed initially among the respondents who were selected primarily, before launching the actual survey. The results of the pilot set of 20 questionnaires were entered in to the spread sheet

of the SPSS package to check the reliability of the instrument. This reliability test is usually known as Cronbach's Alpha test.

3.6 Data Analysis

The views of the respondents were collected by distributing a structured questionnaire. The questionnaires were distributed among the respondents (Managers, Engineers and the Supervisors) by meeting them personally. A minimum of 15 minutes had to be spent with each respondent during the working time at their respective work places. Since the questionnaire was simple and direct and was self-administered, it was very convenient to collect the necessary data from the respondents.

The views were converted into numerical values using the relevant scale and then were entered in to the computer data sheet. The SPSS software package was (IBM SPSS version 23rd) used to develop the spread sheet. The spread sheet contains all the data collected through the questionnaires. The mean values in the vertical column and the standard deviation values were computed and also percentages and cumulative percentages were also obtained for the respondents' profile data, which was used to form the respondents profile in the chapter.

The data was presented in both descriptive and graphical forms. The respondents profile data was presented in Tabular form using percentages. The Risk levels of different types of accidents were calculated using the following formula and the risk matrix table (Appendices – A)

Risk Level = Probability * Severity.

The data of the assessment for the need in training were analysed using statistical techniques. Student t - test, 0.05 significance level (one sample) was employed for testing the statistical significance of data.

3.7 Summary

This chapter describes the research methodology which was used for the present research. It explains how the samples were selected from the sampling frame and what the target population was. This chapter also describes the method of data presentation and analysis.

CHAPTER 04

RESEARCH FINDINGS AND ANALYSIS

4.1 Introduction

This chapter deals with data presentation and data analysis. This chapter consists of five sections. The first section analyses the demographic profile of the respondents. The second section analyses the different types of accidents, the severity and the frequency of workplace accidents of the W&Ww projects. The third section analyses the different types of accidents and their risk levels. The fourth section attempts to determine the areas of essential training that is required for the supervisory staff of the W&Ww projects. The fifth section attempts to determine the areas of essential training that is required by the floor level workers in order to protect the employees or to minimize the industrial injuries that occurs in the W&Ww projects in Sri Lanka.

4.2 Demographic Profile of the Respondents

The respondents 'participation rate of the survey was 93%. Descriptive statistical analysis was used to analyse the respondents' profile data. Percentage values, cumulative percentage values and pie charts were used in this analysis. The details of their experience are shown in Table 4.1. Figures 4.1 to 4.3 illustrate the gender distribution, marital status and the types of projects which were handled by the respondents respectively.

Table 4.1: Respondents experience in the field

Experience (years)	Number of respondents	Percentage (%)	Number of projects	Percentage (%)
Less than 5	43	21.2	Less than 3	19
6-10	135	66.6	4-6 projects	54
11-15	18	8.9	7-9 projects	17
16 - 20	7	3.4	10-12 projects	9
Total	210	100	More than 13	1

As per the table 4.1, 21.2% have less than 5 years of experience, 66.6% have between 6 and 10 years of experience, 8.9% have between 11 and 15 years of experience, 3.4% have between 16 and 20 years of experience.

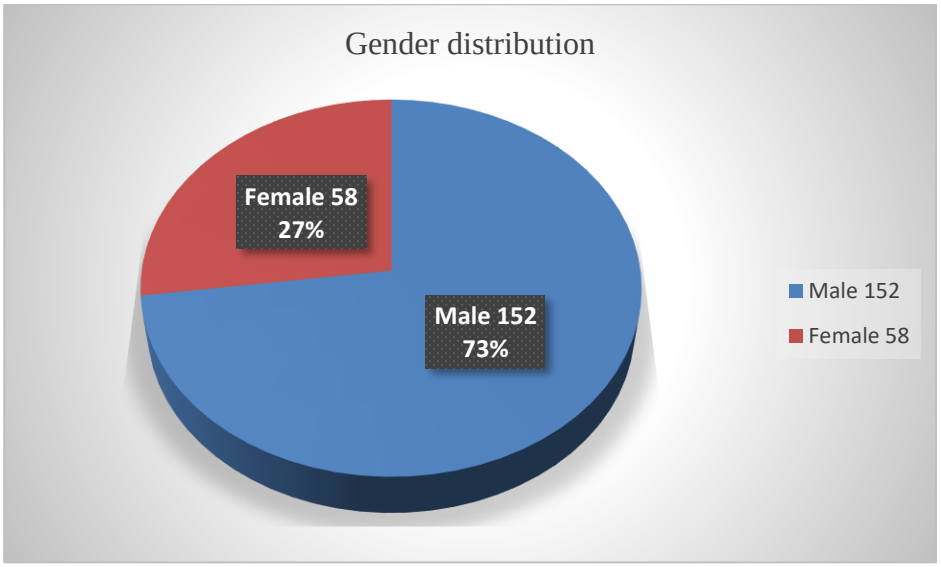

Figure 4.1: Gender distribution of the respondents.

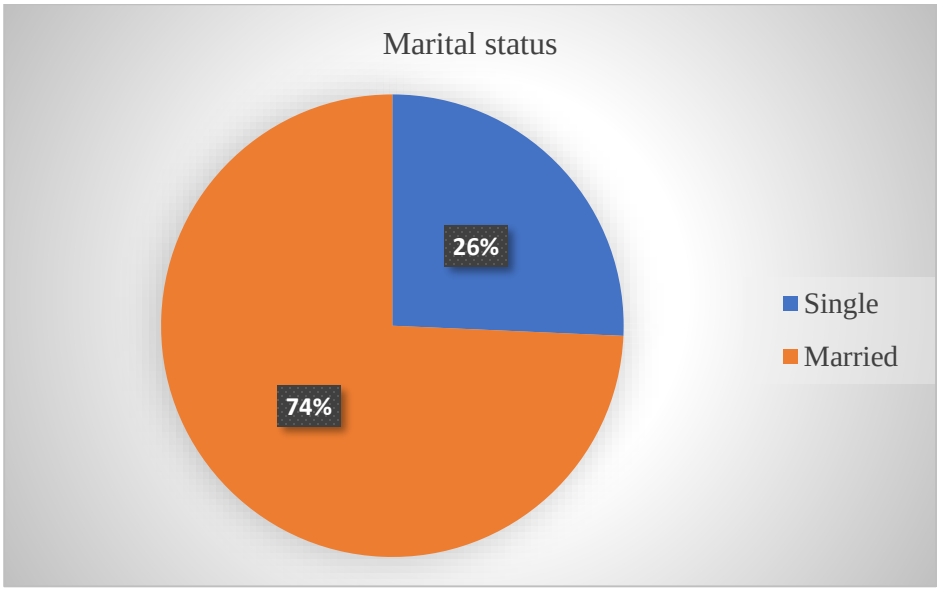

Figure 4.2: Marital status of the respondents.

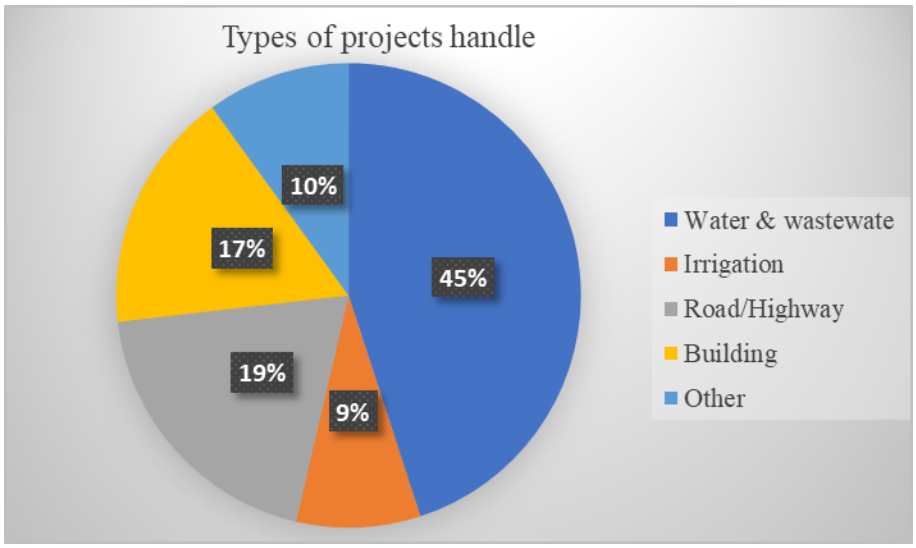

Figure 4.3: Types of projects handled by the respondents

4.3 Analysis of workplace injuries in the W&Ww projects:

The views of the respondents regarding the severity and the frequency of accidents and injuries were obtained by distributing the questionnaire. The following section presents the views of the respondents regarding the severity and the frequency of accidents and injuries in the respective projects.

Table 4.2: Severity and frequency of work place injuries in the project

No	Severity of occurrence	Probability of occurrence – percentage (%).				
		1.Not at all	2. Seldom	3. Occasional	4. Likely	5. Most likely
1.	First Aid only	1.4	6.2	6.7	73.1	12.6
2.	Beyond first Aid but not LTA	5.8	4.3	21.4	58.5	10
3.	LTA but not more than 3 days	5.7	5.7	48.1	35.7	4.8
4.	LTA and more than 3 days (Reportable accident)	5.7	48.1	35.7	5.7	4.8
5.	Total permanent Disable/ Fatal	86.7	8.6	4.7	0	0

As per table 4.2 shown above, 12.6 % of the respondents have indicated that first aid type accidents and injuries occur frequently. 73.1 % of the respondents have indicated that first aid type accidents and injuries are likely to happen. 6.7 % of the respondents have indicated that first aid type accidents and injuries take place occasionally. 6.2 % of the respondents have indicated that first aid type accidents and injuries seldom occur. And 1.4 % of the respondents have indicated that first aid type accidents and injuries not at all occur in the organization.

The table shows that, 10.0 %of the respondents have said that beyond first aid type accidents and injuries occur frequently. 58.5 %of the respondents indicated that beyond first aid type accidents and injuries are likely to occur. 21.4 % of the respondents have specified that beyond first aid type accidents and injuries happen occasionally. 4.3 % of the respondents mentioned that beyond first aid type accidents and injuries seldom occur. And 5.8 % of the respondents have indicated that beyond first aid type accidents and injuries not at all occur in the organization.

According to the table 4.8 %of the respondents have indicated that LTA but not more than 3 days type accidents and injuries happens frequently. 35.7 % respondents have indicated that LTA but not more than 3 days type accidents and injuries likely to be happened. 48.1 % of respondents have indicated that LTA but not more than 3 days type accidents and injuries happens occasionally. 5.7 % of respondents have indicated that LTA but not more than 3 days type accidents and injuries seldom occur. And another 5.7 % of respondents have indicated that LTA but not more than 3 days type accidents and injuries not at all occur in the organization.

The table illustrate 4.8 % of respondents have indicated that LTA and more than 3 days type accidents and injuries occur frequently. 5.7 % respondents have indicated that LTA and more than 3 days type accidents and injuries are likely to occur. 35.7 % of respondents have indicated that LTA and more than 3 days type accidents and injuries happen occasionally. 48.1 % of respondents have indicated that LTA and more than 3 days type accidents and injuries seldom occur. And another 5.7 % of respondents have indicated

that LTA and more than 3 days type accidents and injuries not at all occur in the organization.

Further it shows no respondents have indicated that permanent disabling type of accidents could happen frequently or likely. 4.7 % of respondents have indicated that permanent disabling type accidents and injuries happen occasionally. 8.6 % of respondents have indicated that permanent disabling type accidents and injuries seldom occur. 86.7 % respondents have indicated that permanent disabling type accidents or fatal accidents are improbable or extremely rare in the W&Ww projects.

4.4 Different types of accidents and their risk levels

The following table presents the views of the respondents regarding the risk levels of the accidents and injuries in the respective projects.

Table 4.3: Risk level

No	Type of Accident	Risk Level			
		Low risk	Moderate risk	High Risk	Extreme Risk
1	Trench collapse	10	25	60	115
2	Being caught or Struck by objects	13	42	128	27
3	Electrocution	8	21	64	117
4	Falling from heights	123	47	31	9
5	Hit by falling or flying objects	17	38	132	23
6	Slipping, tripping & falling	19	44	127	20
7	Traffic/Transportation accidents	36	152	16	6
8	Chemical exposures	51	113	30	16
9	Fire and explosion	44	126	29	11
10	Musculoskeletal disorders	24	31	142	13
11	Overexertion and Repetitive stress injuries	128	42	33	7

As per table 4.3shown above, 115 and 117 of the respondents have indicated that the risk of trench collapse accidents and electrocution accidents are very high. 128 respondents have indicated that being caught or struck by objects, 132 respondents have indicated that being hit by falling or flying objects, 127 respondents have indicated that slipping, tripping& falling and 142 respondents have indicated that musculoskeletal disorders are high risk hazards that can cause accidents.

The respondents of 113, 126 and 152 have indicated that, chemical exposure, fire & explosion and traffic accidents are of moderate risk, respectively. The respondents of 123 and 128 have indicated that, falling from heights, overexertion and repetitive stress accidents are of low risk, respectively.

4.5 Analysis of training needs for the supervisory staff

The views of the respondents regarding the training needs were obtained by distributing the questionnaire among the supervisory staff. The following table describe the key Knowledge-areas that views are required from the respondents.

Table 4.4: One-Sample t-test for training needs analysis of supervisory staff

Knowledge area	Test Value = 3			
	t-value	Mean	Sig. (2-tailed)	Rank
Trench protection methods	31.728	4.17	.000	1
Safe Operation Procedures	19.250	3.97	.000	2
Risk control measure	19.240	3.96	.000	3
Emergency preparedness	18.397	3.91	.000	4
Trenchless pipe laying technique	18.272	3.88	.000	5
Emergency Response procedures	17.622	3.86	.000	6
Underground utilities tracing technique	16.911	3.81	.000	7
Hazard Identification and Risk Assessment	16.261	3.77	.000	8
Emergency recovering procedures	16.137	3.76	.000	9
Leak detection technique	4.249	3.24	.000	10
Automated technique for pipe laying	4.245	3.24	.000	11

As per Table 4.4, excavation and trenching activities have a high level of potential to danger. This indicates that employees support the activity and their supervisors at the excavation and the trenching process.

According to the table 4.4shown above, there is an extreme training demand for trench protection methods, as the t-value was found to be 31.728. The mean value was found to

be 4.17 which indicate that the demand is extremely high. The second highest training demand for safe operation procedures, as t-value was found to be 19.250, the mean value was found to be 3.97. The third highest training demand for risk control measures as the t-value found to be 19.240 and mean value was found to be 3.96. The fourth training demand that exists for emergency preparedness as t-value was found to be 18.397, the mean value was found to be 3.91. The fifth training demand that exists for trenchless pipe laying technique as t-value was found to be 18.272 and the mean value was found to be 3.88. The sixth training demand exists for emergency response procedures and its t-value was found to be 17.622 and the mean value was found to be 3.86. The seventh and eighth training demands exist for underground utilities tracing techniques and hazard identification and risk assessment as t-values were found to be 16.911 and 16.261 respectively. The next training demand exists for emergency recovering procedures and its t-value was found to be 16.137. In an emergency situation the supervisors should know what actions to be taken to prevent the impact of the situation on others. The initial reaction of the employees has a high level of impact to reduce post-traumatic incidents. An emergency situation can arise due to various toxic gases and toxic chemicals, which would create breathing problems for the workers. However, there are fewer training demands for leak detection technique and automated technique for pipe laying as the t-values were found to be 4.249 and 4.245 respectively.

All the t-values are statistically significant as the p-value is always 0.000. The t - test was done at 0.05 significance level (at a 95% Confidence level).

It was identified that there are high potential dangerous situations in the W&Ww construction projects. Trenching and excavations have a high level of potentials to danger. All the areas cannot be covered by the training yet the management has the responsibility of building the awareness in employee safety and health in those areas.

Management should be able to provide proper health and safety practices to the employees. Management should also have a proper level of awareness regarding the area. Employee are to be trained well to identify the health and safety needs. Consequently, the

management of the W&Ww construction projects would be able to address the needs of employee health and safety effectively.

The management can assess the W&Ww construction projects as to identify the potential hazards and risks according to the analysis. Then they can find solutions for the prevention of accidents in the area. They can get the consultations from the specialists in the area too and also management must be able to explain the health and safety policies to the relevant employees. At the same time management can monitor and supervise the activities of the employees to ensure their health and safety during the times of construction activities are operated.

It is essential to conduct a thorough assessment of the current level of employee knowledge, regarding the employee health and safety in order to provide effective training opportunities to the employees. The management should effectively assess the knowledge levels of the employees regarding the health and safety to fill the gaps fully and efficiently.

The correct level of need assessment should be done to identify the most essential training of the employees. After the identification of training need, it is essential to define the training programmes to improve the awareness and skills of the employees. Mainly it is essential to remember that some of the employees are in lower educational levels. The level of understanding of the workers may be challenging when they are undergoing the training programmes. But the management should properly establish the training and skill building programmes to address these gaps.

4.6 Analysis of the areas of essential training for floor level workers

Views of respondents regarding the training needs for floor level workers were obtained by distributing the questionnaire which is included in the Annexure - B. The following table presents the views of the respondents regarding the training needs for floor level workers in the W&Ww projects.

Table 4.5: One-Sample t-test for training need analysis of floor level workers

Knowledge area	Test Value = 3			
	t- value	Mean	Sig. (2-tailed)	Rank
Knowledge on OSH policy	32.442	4.38	.000	1
Knowledge on the mitigation measures on ESH issues	31.728	4.17	.000	2
Knowledge on unsafe behaviour	19.249	3.97	.000	3
Knowledge on negative impact of Environmental Consequences	19.240	3.96	.000	4
Knowledge on work place activities	18.785	3.80	.000	5
Knowledge on hazards of machinery and equipment	18.397	3.71	.000	6
Knowledge on SOP's	17.622	3.56	.000	7
Knowledge on unsafe act and conditions	16.261	3.47	.000	8
Knowledge on wearing of PPE	15.075	3.40	.000	9
Knowledge on preventive measures	14.806	3.30	.000	10
Knowledge on OSH practices	5.008	2.29	.000	11
Knowledge on traffic management	3.698	2.17	.000	12

As per Table 4.5shown above, the highest demand for training of floor level workers is knowledge on OSH policy, as the t-value was found to be 32.442 and the Mean value was found to be 4.38. The second highest training demand for knowledge on the mitigating measures on ESH issues, and the t-value was found to be 31.728 and the Mean value was found to be 4.17. The third highest training demand for knowledge on unsafe

behaviour, and the t - value was found to be 19.249 and Mean value was found to be 3.97. The fourth highest training demand for knowledge in the negative impact of environmental consequences, and the t - value was found to be 19.240 and Mean value was found to be 3.96. The next training demand exists for knowledge in the work place activities, and the t - value was found to be 18.785 and Mean value was found to be 3.80. The sixth highest training demand for knowledge on hazards of machinery and equipments, as t-values was found to be 18.397 and the Mean value was found to be 3.71. The next highest demand for knowledge on SOPs and knowledge on unsafe activities and the t-value is 17.622 and the Mean value is 3.56. The eighth highest demand is for knowledge on unsafe activities and conditions and the t-value is 16.261 and the Mean value is 3.47. The ninth highest demand is for Knowledge on wearing of PPE. The t-value is 15.075 and the Mean value is 3.40. The next highest demand is for Knowledge on preventive measure. The t-value is 14.806 and the Mean value is 3.30.

However, there are insignificant demands for knowledge regarding OSH practices and knowledge on traffic management and the t-values were found to be 5.008 and 3.698 respectively. The Mean values were found to be 2.29 and 2.17 respectively.

All the t-values are statistically significant as the p-value is always 0.000. The t - test was done at 0.05 significance level (at 95% Confidence level).

Various harmful situations can be prevented if employee has a high level of knowledge and skills. The knowledge and awareness of the employees would influence positively on the employee health and safety. The improved knowledge of employee knows how to act during the times of construction projects are operated. t

when the employees have a proper level of awareness in health and safety procedures they would not be fallen themselves in danger. However, they are not always follow the precautions correctly to avoid the danger situations. Management must encourage all the employees to avoid the danger situations while providing proper training opportunities to them.

The employees should know how to conduct themselves in a construction zone. They must follow self-protection techniques at the various potential dangers. Moreover, they should know how to act in an emergency situation to minimize the negative impact on themselves. This indicates that the awareness of the employees is the most important element in the employee safety.

CHAPTER 05

CONCLUSIONS AND RECOMMENDATIONS

The present chapter includes the Conclusions, Recommendations, Implications, and Limitations of the Study and it is evident that further research is needed.

5.1 Conclusions

The injuries identified in the W&Ww projects can be categorized as minor injuries, moderate type injuries and major type of injuries. Minor injuries are first-aid type injuries and beyond first aid type injuries which, are likely to be occur in the W&Ww projects in Sri Lanka. Moderate type injuries caused to Lost Time Accident (LTA). Some of them are lost less than 3 days and take place occasionally. The others are lost more than 3 days which do not occur frequently. Major type of injuries caused to permanent disabling or fatal accidents which are rare in the W&Ww projects in Sri Lanka.

Risk levels of trench collapse injuries and electrocution injuries are relatively extremely high. The risk levels of being caught in machinery or being struck by objects injuries, being hit by falling or flying objects injuries, slipping, tripping and falling injuries and musculoskeletal disorders injuries are also relatively high. The risk levels of fire and explosion injuries, chemical exposure and traffic accidents are relatively moderate. Risk levels of falling from heights accidents occur in low-level basis in W&Ww construction projects in Sri Lanka.

The highest training demand is on trench protection methods (shielding, sloping, and benching). Therefore, it was concluded that it is essential to train the supervisory level staff in the W&Ww projects on trench protection methods. There is a moderate demand for safe operation procedures, risk control measures, emergency preparedness, trenchless pipe laying techniques, emergency response procedures, hazard identification and risk assessments, underground utilities tracing techniques, and emergency recovering

procedures. There is an insignificant demand for leak detection techniques and automated techniques in the W&Ww construction projects in Sri Lanka.

The most essential training areas for floor level workers are knowledge in OSH policy and the mitigating measures proposed on environmental issues in the W&Ww projects. According to the findings, the next most essential and significant training areas are knowledge on unsafe behaviour, knowledge on the negative impact of environmental consequences, knowledge on work place activities, knowledge of hazards of machinery and equipment, knowledge on SOPs and knowledge on unsafe acts and conditions, knowledge in wearing on PPE and knowledge on preventive measures. However, the need for training in areas such as knowledge in OSH practices and knowledge on of traffic management is found to be less essential for the floor level workers.

5.2 Recommendations

Since the severity and frequency of first-aid type and beyond first aid type accidents and injuries seemed to be high and are likely to happen in the W&Ww projects in Sri Lanka, it is recommended that continuous training of supervisory staff and floor level workers is essential. The situation can be improved to the level of reducing the injuries in the W&Ww projects, through essential training.

Risk levels of trench collapse accidents and electrocution accidents seemed to be relatively high compared to falling from heights, being hit by falling or flying objects, slipping tripping and falling, traffic accidents, chemical exposures, fire and such other accidents. Therefore, training on trench protection methods and preventive measures of electrocution are highly recommended to have continuous training for supervisory staff to reduce injuries in W&Ww projects in Sri Lanka.

Employees should have a high level of training. They must be able to adhere the policies, programs and procedures to ensure the health and safety practices in the organization. They must follow the safety protocols in the organization and it is necessary to wear safety gears to avoid the potentially of harmful incidents.

Further in this regard, it is suggested that they should be able to identify the potential hazards in the W&Ww projects.

They can find solutions to the potential dangers by identifying the potential dangers in the work place and should inform the management quickly. The management would be able to create the necessary policies on the basis of such information to overcome the dangers accordingly in addition to their own experience and knowledge.

5.3 Implications

Sri Lanka is experiencing a high number of industrial accidents in the construction industry. W&Ww construction projects also face a high level of industrial risk. Most of the industrial activities of the country have a very high potential for danger. Therefore, it is essential to identify the ways of preventing the industrial accidents

The preventive actions can be categorized into two major aspects. One is the management aspects for which management must positively encourage employee to prevent the accidents. The second is the employee aspects, for which employees must positively develop attitude to their own health and safety. A number of studies have shown the importance of employee awareness of potential dangers. Studies emphasized that the knowledge and skills of the management are necessary to achieve employee health and safety expectations.

Training of the employees is expensive, due to the essential cost factors in the training programs. Providing training to all is very challenging due to the availability of resources. In the case of W&Ww construction projects, there is a very high number of workers to be trained and due to the time allocation for the training and development activities is also very challenging and this situation is leading to a gap in the knowledge in the W&Ww construction projects.

The management can use various knowledge on management strategies to encourage the employees to learn more about their health and safety while working in the construction projects.

The forming of construction groups is one such strategies in which strategy allows the employees to pursue proper health and safety functions in the work place.

The workgroups may have number of employees having a wide experience. They would be able to give advice to the other members of the group. This strategy would allow the employees to learn from the employees. The team leader in the group would reduce the pressure on the management since the leader bears the responsibility of keeping the team members safe. The team leader would assess the current level of knowledge of the team members and positively deliver the knowledge to team members. Organizations whose making high level of profit, the cost factors of the training programs would not be much challenging.

5.4 Limitations

This study has been conducted in the Colombo Municipal Council area involving five W&Ww construction projects. All studies have their limitations, which are potential constraints or influences that cannot be controlled and therefore, restrictions are imposed on the researcher (Thomas et al., 2011). The present study is not an exception to experiencing such limitations.

Present study was conducted only in CMC area, taking only five construction projects. Only the engineers and the technical staff were participated in the study. If other groups of employees, for example, floor level workers had been involved, this study would have been more comprehensive. Nevertheless, due to time, effort and cost constraints, only engineers and technical staff were selected to participate in the study.

Conclusions were made on the basis of the statistical analysis. Primary data in connection with accidents that had occurred during a project period were taken in to considered.

5.5 Further Research

Further Research is necessary to determine the areas of essential training with a large sample covering the industries representing the whole country and Secondary data would have to be collected from industries for comparison purpose by spending a considerable amount of time.

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APPENDICES – A

Risk Rating Matrix

		PROBABILITY				
		1.Improbable	**2.**Seldom	**3.** Occasional	**4.** Likely	**5.** Frequent
SEVERITY	**5.**Total permanent Disable/ Fatal	**5**	**10**	**15**	**20**	**25**
	4.LTA and more than 3 days (Reportable accident)	**4**	**8**	**12**	**16**	**20**
	3.LTA but not more than 3 days	**3**	**6**	**9**	**12**	**15**
	1.Beyond first Aid but not LTA	**2**	**4**	**6**	**8**	**10**
	1.First Aid only	**1**	**2**	**3**	**4**	**5**

1 – 3 = Low Risk, **4 – 6** = Moderate Risk, **8 – 12** = High Risk, **15 – 25** = Extreme Risk.

APPENDICES – B

ASSESSMENT OF ESSENTIAL TRAINING NEEDS FOR INJURY REDUCTION IN WATER AND WASTEWATER PROJECTS IN SRI LANKA.

Section A; Respondent profile.

1. Gender – Male ☐ Female ☐
2. Marital status - Married ☐ Single ☐
3. Designation : - ……
4. Experience in the field (years)

Less than 5	6 -10	11 -15	16 – 20	More than 21

5. Types of projects handle/supervise

Water & wastewater	Irrigation	Road/Highway	Building	Railway	Hydropower	Other

6. Number of project handle/supervise

Less than 3	4 – 6	7 – 9	10 – 12	More than 13

Section B;

7. Indicate the severity and the frequency of the accident in your organization.

No	Severity of occurrence	Probability of occurrence				
		1. Unlikely	**2**. Seldom	**3**. Occasional	**4**. Likely	**5**. Most likely
1	First Aid only					
2	Beyond first Aid but not LTA					
3	LTA but not more than 3 days					
4	LTA and more than 3 days					

	(Reportable accident)					
5	Total permanent Disable/ Fatal					

*LTA – Lost Time Accident.

8. Indicate the type of OSH accidents in your organization (follow the above scale for Severity and Probability of occurrences).

No	Type of accident	**Severity of occurrence**					**Probability of occurrence**				
		1.	**2.**	**3.**	**4.**	**5.**	**1.**	**2.**	**3.**	**4.**	**5.**
i.	Trench collapse										
ii.	Being caught or Struck by objects										
iii.	Electrocution										
iv.	Falling from height										
v.	Hit by falling or flying object										
vi.	Slip, trip & fall										
vii.	Traffic/Transportation accident										
viii.	Chemical exposures										
ix.	Fire and explosion										
x.	Musculoskeletal disorder										
xi.	Overexertion and Repetitive stress injuries										
xii.	Others ……										

Section C;

9. To what extent do you believe that you should acquire knowledge on following areas to minimize accidents in you/your workers.

No	Knowledge Area	Importance				
		Not at all	Less	Moderate	High	Extremely high
i.	Trench protection methods (shielding, sloping and benching)					
ii.	Trenchless pipe laying technique					
iii.	Underground utilities tracing techniques					
iv.	Leak detection techniques					
v.	Automated techniques for pipe laying.					
vi.	Hazard Identification and Risk Assessment (HIRA)					
vii.	Risk control measures					
viii.	Emergency preparedness					
ix.	Emergency response procedures					
x.	Emergency recovering procedures					
xi.	Safe Operation Procedure (SOPs)					
xii.	Other (……..)					

Section D;

10. To what extent do you believe that the workers' knowledge on following areas are effect to minimize accidents.

No	Knowledge area	Importance				
		Not at all	Less	Moderate	High	Extremely high
i.	Knowledge on OSH policy					
ii.	Knowledge on work place activities					
iii.	Knowledge on preventive measures					
iv.	Knowledge on OSH practices					
v.	Knowledge on wearing of PPE					
vi.	Knowledge on unsafe act & condition					
vii.	Knowledge on unsafe behavior					
viii.	Knowledge on Hazards of machinery & equipment					
ix.	Knowledge on SOPs.					
x.	Knowledge on traffic management					
xi.	Knowledge on negative impact of Environmental consequences					
xii.	Knowledge on the mitigatory measures proposed on environmental issues					
xiii.	Other (……)					

*__OSH__ – Occupational Safety & Health. *__SOP__ – Safe Operation Procedures.

*__PPE__ – Personal Protective Equipment.

Remark: - Please use the space below to provide additional information, if any.

……...
Signature

Thank you for sparing y our valuable time & filling information