

Safety Performance of Construction Industry In Sri Lanka

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This Dissertation submitted in partial fulfillment of the requirement for the Degree of
Master of Science in Construction Project Management

University of Moratuwa



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Abstract

A safe and healthy work environment is the basic right of every worker. However, the global situation falls far short from this right. The ILO estimates that more than 125 million workers are victims of occupational accidents and disease in single year. Of these, approximately 220,000 workers die and about 10 million are seriously injured.

Due to the ever changing environment and temporary nature of the construction industry, it contributes major component of aforementioned accidents. It is common in Sri Lanka, under privileged community has involved in construction industry. This leads to labour exploitation.

Contractors always try to maximize the profit. Hence they always try to allocate lesser amount for health and safety resulting under resources and poor trained labour force at the site.

Top management, middle management and even site personal are much aware of the benefits that can be gained through good health and safety practices. However it is sad to say that poor safety performance of the construction industry continues. This may be due to the poor safety culture, low education, lack of resources, poor commitment etc.

Hence this research tries to find the reasons for poor health and safety conditions of construction sites and find the ways and means to mitigate the risk.

Acknowledgement

This study was done with much enthusiasms and assistance in numerous ways, which I am indebted. It is important to place my deep gratitude to all the individuals and organizations those who impart and extended their strenuous cooperation towards the success of my goal.

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Abbreviations

Abbreviation	Description
OHSA	Occupational Health and Safety Act
ILO	International Labour Organization
B.O.Q	Bill of Quantities
ACGIH	American Conference of Industrial Hygienists
HSWA	Health and Safety at Work Act
ISD	Industrial Safety Division
QFM	Quality Fee Method
H & S	Health and Safety
SPE	Safety Performance Evaluation
ICTAD	Institute of Construction Training And Development
IESL	Institute of Engineers, Sri Lanka
FIDIC	International Federation of National Associations of Independent Consulting Engineers
GDP	Gross Domestic Product



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CHAPTER 01

Introduction



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CHAPTER 01 - Introduction

1.1 Background

Today, both clients and contractors face a variety of risks when they undertake a construction project. Not only clients must be concerned with potential risks to their employees, tenants, or property, but they must also be concerned about the risks that the contractor bears. Safety is a critical item on all construction projects for multiple reasons including protecting the welfare of employees, providing a safe work environment and controlling construction costs.

However, the importance of safety as a cost controlling tool is often overlooked by owners and contractors. As a means of reducing the risks associated with construction, safety can significantly impact the overall cost. A dedicated commitment for the safety of both the client and the contractor helps ensure project success significantly.

To avoid the high financial losses caused by injuries, contractors are required to implement various safety procedures like fall protection, respiratory protection, confined space entry, competent person and other programs that control the causes of injuries. If the contractor is more attentive in preventing these injuries, overhead costs of insurance and hidden costs of accidents will be significantly reduced, bringing more profit back to the contractor. Hidden costs of an accident are four to ten times the actual costs of claim and account for items such as employee replacement costs, loss of use, increased insurance costs, damaged product, so on (Harper and Kohen, 1995). The claim only is included items such as doctors, ambulance, indemnity, as well as prescription and medication costs.

Therefore, if the contractor has a great workers' compensation safety record, the firm will be more efficient in reducing risks, more profitable, more on-time completion of contracts, less rework and is in effect, actively working should be there to reduce the construction risks to the client of the project. Clients who want to recognize the advantage of a good contractor's safety program can bring to a project should hire and demand contractors that actively and successfully control their risks through comprehensive safety programs.

Clients sometimes hesitate and feel that they are interfering with the contractor's way of doing business if they express concerns over safety at a jobsite. In reality, clients have the absolute right to mandate that a good quality safety program is an important part of the selected contractor's culture. The contract documents are a very effective tool in conveying the owner's safety requirements to the contractor.

In addition, there are many benefits to both client and the contractor when they follow good safety practices. A contractor with a good safety program is often a better choice even if the initial bid package is higher than the firm's competitors. Poor safety compliance increases the owner's risks and often inflates the final costs of a completed contract, and it is the final costs that need to be factored into this decision making process.

The process of preventing employee injuries and illnesses itself makes the contractor more efficient and effective with projects. The pressure to cut corners, skimp on materials, reduce quality, or rush to get the project completed is significantly reduced through compliance to a good jobsite safety program.

However, the poor safety performance of the construction industry continues.

According to the above context it is important to study why construction industry reluctant to adopt safety precaution and how to improve safety standards in construction industry.

1.2 Problem definition

It is clear that all three main stake holders, client, consultant, and contractor have identified the importance of health and safety of construction industry. The top management, the middle management and even the site supervisor's emphasis the benefits that can be gained through proper health and safety practicing. However at the ground level, the condition of health and the safety environment are very poor. It may be due to poor commitment, lack of education and training and unavailability of resources etc. Therefore this research tries to identify why construction industry

reluctants to adopt proper health and safety systems and how to improve the conditions.

1.3 Objective of the study

Most of the employers in construction industry tend to absorb workers for very low wages due to its inherent temporary nature. This may be a bad result to a country like Sri Lanka, due to high unemployment percentage. In addition to above there may be various factors relating to poor health and safety practices in construction industry.

Therefore objective of this research is to identify the factors that are caused to prevent the good safety environment. The following sub objectives were set to attain this final outcome.

- Identifying the conditions of construction sites with respect to health and safety.
- Identifying the views and attitudes of persons who engage with the construction industry.
- Learning the legal backgrounds with respect to the health and safety in construction industry.
- Making recommendation to improve the health and safety condition of construction industry.

1.4 Frame work/ Scope limitations

Though, health and safety system may apply almost all the projects, this research is only limited for building constructions projects in Sri Lank. Since building constructions cover very large area, it is further restricted to C3 or above constructions.

1.5 Structure of the report

This thesis comprises following five chapters.

Chapter 01: Depicts the introduction of the report, highlighting the background, problem statement, objectives, frame work and the summary of the report.

Chapter 02: Contains the literature studied on the health and the safety issues and how they tackle those issues.

Chapter 03: Methodology of the research and mechanism of data collection are described.

Chapter 04: Presents the data analysis based on the Questionnaire survey.

Chapter 05: Contains conclusion, recommendation and further research area.



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CHAPTER 2

Literature Review



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CHAPTER 02 - Literature Review

2.1 Over view to construction safety

The construction industry is one of the most hazardous among all the industries (Jaseiskis and Suazo, 1993). The major causes of accidents are related to the unique nature of the industry, human behaviour, difficult work-site conditions, and poor safety management which results in unsafe work methods, equipment and procedures. However, safety is not a luxury, and may be considered an important function to be used against unnecessary loss of property, injury or death. Preventing occupational injuries and illness should be a primary concern of all employers (Harper and Kohen, 1995).

Several definitions on “safety” have been issued over the years but it is recommended that a construction site is said to be safe when persons can go about their normal every day work, without undue risk. This will be a realistic definition, for it accepts that there are risk situations in all every day activities and doesn't make believe that a work place or site can be entirely accident proof.

At a construction site, safety can be either “safety of persons at site” or “Safety of a property which may or may not cause injury or damages through an accident”. So the controlling of work situation by providing safe working conditions and the use of safe working methods and procedures are the art of accident prevention. These are the fundamental concepts of safety in construction process.

2.2 Importance of safety in construction

Central Bank's report 2010 says that construction industry contributes 6% of GDP while construction workers represent 7% of total labour force in the country. This implies how importance of welfare of the construction workers.

Accidents in the construction industry tend to be costly in both physically and monetary terms. These expenses may be concentrated in the areas of health care, litigation, time management, workmen compensation and Occupational Health and Safety Administration (OHSA) sanctions. Other expenses such as transport cost, loss of productivity of workers, cost of fixing or replacing damaged equipment or

material and the cost incurred when hiring new workers (Harper and Kohen, 1995). Further it appears that organizations pay for the cost of safety either through the uncontrolled costs of accidents or through the controlled costs of a safety program. It appears therefore, that safety should be a prime concern for any constructor.

The ever increasing cost of medical treatment, recovery care, and the potential for lawsuits all add up to higher insurance premium, which in turn tend to have a negative impact on a company's profit (Wilson and Koehn, 2001). In addition, companies with high experience variation rating are often banned from bidding on a certain type of work. It is therefore, in the company's best interest to take whatever means necessary to manage safety on the work site in order to be on the safe side for future projects.

Davis and Tomasin, (1990) have revealed some important reasons for poor safety performance in the industry, which in turn has given rise to high rate of accidents.

Such as,

- Short term and transitory nature of the industry.
- Lack of controlled working environment.
- Complexity and the diversity of size of organization within the industry.



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2.3 Common causes of accidents of work sites

An accident is an unexpected happening that results in injury, loss, or damage. Some accidents are minor, such as getting a splinter in your finger. Other accidents are serious, causing severe property damage, personal injury, or even death, can and should be prevented by following appropriate safety precautions. Every accident has a cause, or reason why it happened. An accident of a worker may be caused by the carelessness, forgetfulness, using unsafe equipment, and without using safety equipment etc.

Whenever an accident happens, regardless of its cause, it may be an effect on someone. A worker may be hurt, or there may be equipment or property damage. Of course, time is lost also, which puts the work behind the schedule. As a result, each and every accident cost money. The cost of construction rises due to accidents, so that the whole process costs more in the long run. Also, insurance grow higher, which contribute to the overall cost of a project.

Through the thorough examine of collected data, it was identified that several types of common causes of accidents are in construction sites. Davis and Tomasin, (1990) have identified the followings as causes of accidents.

2.3.1 Injuries due to falling

When considering the fatal accidents, it can be seen that the largest amount of fatal accidents in the construction industry have occurred due to falling. Possible causes of falls are working on scaffoldings, bad erection of work items, non consideration of the loading factors and roof work. Such tedious causes in construction sites can be eliminated by proper use of safety nets, scaffolding (with handrails), toe boards and planks without knots, etc.

2.3.2 Struck by falling objects

Accidents due to falling of objects could be tackled by two ways. One way is to make provision to detain, falling objects before it could land on worker or by way of providing nets or boards at the appropriate places. Providing workers with helmets reduce the risk of getting injured by falling objects.

2.3.3 Caught in or between objects

This type of accidents could take place when moving machineries which are engaged in activities within the site. This can be overcome by providing proper planning, better lighting, etc.

2.3.4 Exposure or contact with electric currents

It is proof that the exposure or contact with electric current is the most dangerous type of accident than any other. These accidents can be avoided by having proper insulations, adequate inspection and proper earthing.

2.3.5 Exposure or contact with harmful substances or gases

In construction sites various chemicals are used for various types of works. If these chemicals are not properly stored and used according to specifications, could lead to health problems and fire hazards.

2.3.6 Fire explosions

This is one of the most dangerous types of accidents. Proper inspection and care are needed to avoid explosions occurring due to fire.



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2.4 Common safety procedures in a construction site

2.4.1 Arrangement of general site layout

Good site layout always gives safe place to work. Therefore site layout must be done prior to commence the project to avoid the untidiness of the project. Further it is very important to consider the volume of the project, nature, area when lay outing.

Prior to commencement of the works on a construction site, the following provisions in a site layout plan have to be done to ensure site safety.

- Arrange perimeter fencing or hoarding where appropriate.
- Ensure good visibility and safe access at site entrances.
- Provide adequate warning signs at the entrances and exits where necessary.

- Post emergency procedure and statutory notices at conspicuous locations.
- Consider welfare facilities to offices, compounds and workshops, arrange ventilation, lighting and temporary connections to utility services.
- Provide skips or dumping areas for rubbish and waste materials, and make arrangements for their clearance on a regular basis.
- Arrange storage, transport and use of fuel, other flammable materials, and explosive materials. Obtain the necessary licenses from appropriate authorities.
- Plan fire escape routes and locate firefighting equipment.
- Provide first-aid facilities and display notices at the various work areas to show the locations of those facilities.
- Provide adequate warning of overhead or underground utilities.
- Provide lighting on hoarding or external fencing for public safety.
- Provide and maintain proper drainage and means of sewage disposal.


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Good site layout can be shown as in figure one.

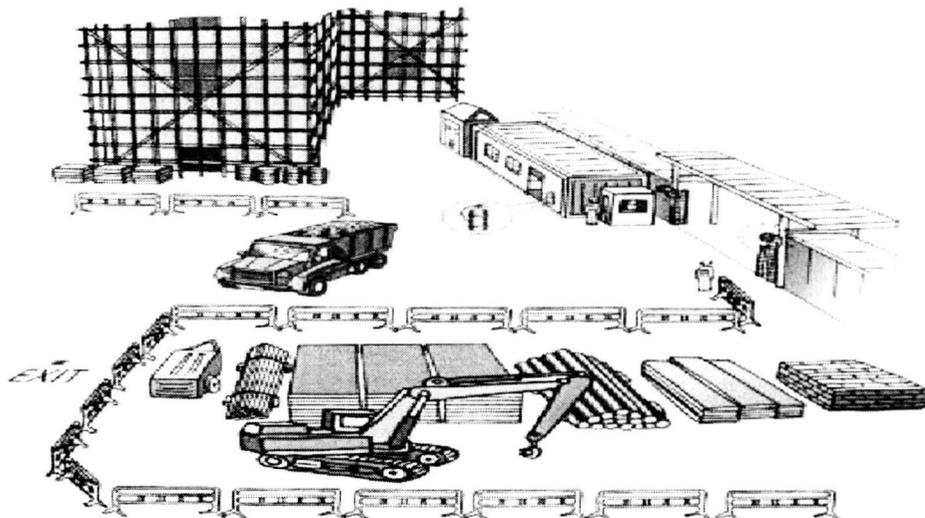


Figure 1: Good Site Layout Arrangement

2.4.2 Site access and site traffic

Following precautions should be taken to avoid traffic accidents on site due to human errors caused as a result of bad driving, carelessness or ignorance during work with special hazards (for instance near excavations or power lines), carrying unauthorized passengers, poor maintenance of vehicles, overloading or improper stacking or securing of loads. Figure two shows how to maintain safe site access and control site traffic.

- Site traffic routes should be clearly indicated and maintained. It should be consistent with safe travel and should be carefully planned taking account of such potential hazards as overhead power lines.
- Establish and display clearly speed limits on site and erect notice boards/signs to draw the drivers' attention on areas of potential hazards.
- When vehicles have to cross public roads, drivers are responsible for seeing that the wheels and tires are cleaned of mud so that the public roads will not be contaminated.

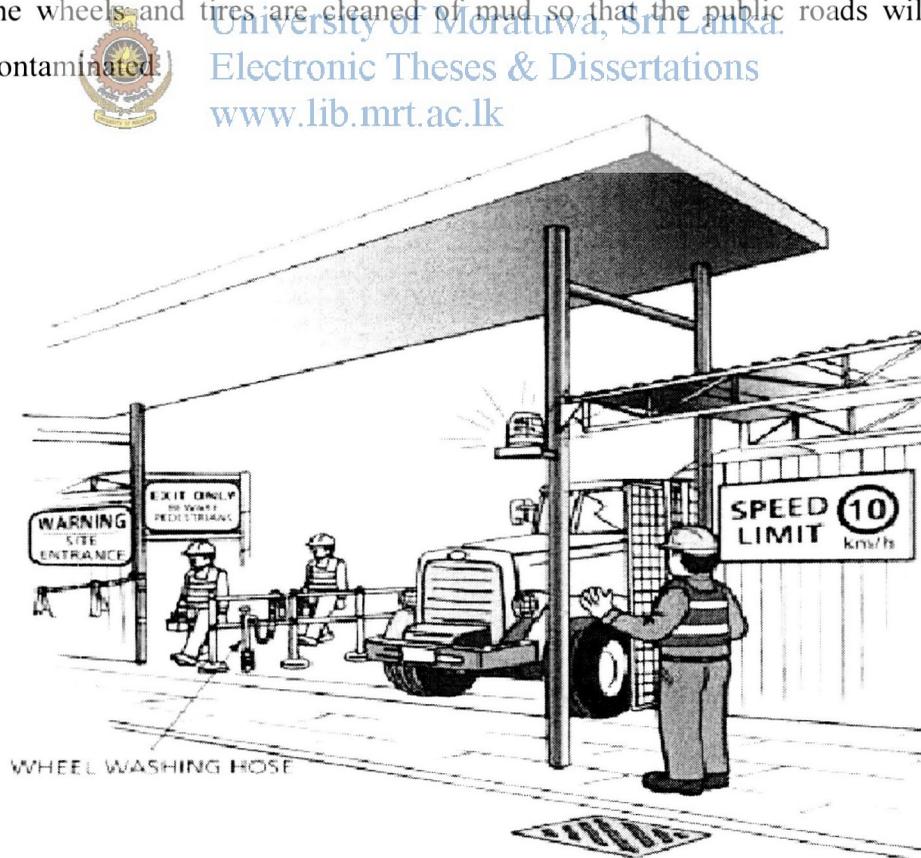


Figure 2 : Safe Access and Site Traffic

2.4.3 Fire prevention

The following precautions must be taken to minimize the risk of fire hazards that may take place in site due to flammable materials, electric leakage, etc.

- Store flammable material in a temporary Dangerous Goods (D.G.) Store. Install fire alarm and provide fire protection measures for the D.G. Store. Paste 'Dangerous Goods' and 'No Smoking' warning notices in the vicinity of the D.G. Store to enhance safety awareness as shown in figure three.
- Electrical equipment that might have flammable or explosive effects should be explosion-proof or basically kept in a safe place.

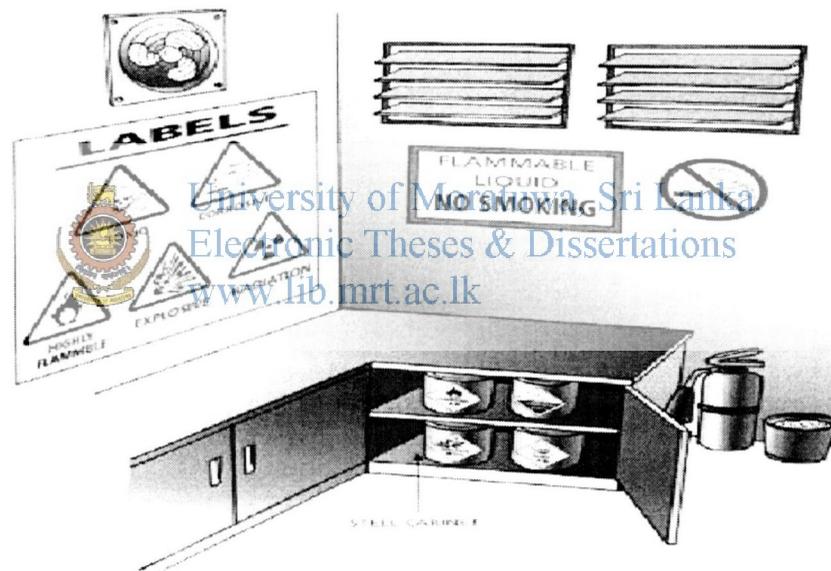


Figure 3: Safe Storage Facilities for Flammable Goods

2.4.4 Proper site keeping

Facilities and locations should be provided for proper placement of tools, materials, etc. so that the work place should be maintained cleanly, tidily and unobstructively always. To ensure safety against untidy environment, it is graphically shown in figure four and five.



Figure 4: Clean Oil or Grease



Figure 5: No Prodding On Nails

2.4.5 Noise control

Permissible noise exposure in a construction site can be classified as follows. It is essential that approved ear protectors shall be provided whenever the noise level exceeds 70 dB.

Table 1: Permissible Noise Levels & Exposure Times

Sound level dB	Exposure hours per day	Hours to rest
85	8.00	16.00
88	4.00	24.00
91	2.00	22.00
94	1.00	23.00
97	0.50	23.50
100	0.25	23.75

(Source: ACGIH Standers 2003)

Personnel should be made aware of noisy areas by suitable warning signs and the requirement of wearing suitable ear protectors. Where the daily personal noise exposure may exceed 70 dB, the area shall be identified and defined as an ear protection zone as shown in the figure six.



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Figure 6: Ear Protection Zone/ Distance for Noisy Equipment

2.4.6 Fall protection

The Contractor should take necessary steps as stipulated in the construction site safety regulations to prevent any person on a construction site from falling from a height of two meters or more by the provision, use and maintenance of one or more of working platforms, guard-rails, barriers, toe-boards and fences, coverings for openings and gangways and runs.

- In all circumstances, safe working platforms should be provided as far as is practicable. Where the special circumstances of the work make it impractical to provide working platforms, scaffolds and other means of fall prevention, suitable and adequate safety nets and safety harnesses/belts (Figure seven) shall be provided. Safety harnesses and belts should only be used as the last resort to prevent falls, and they shall not be considered as suitable and adequate unless they are attached continuously to a suitable and secure anchorage.

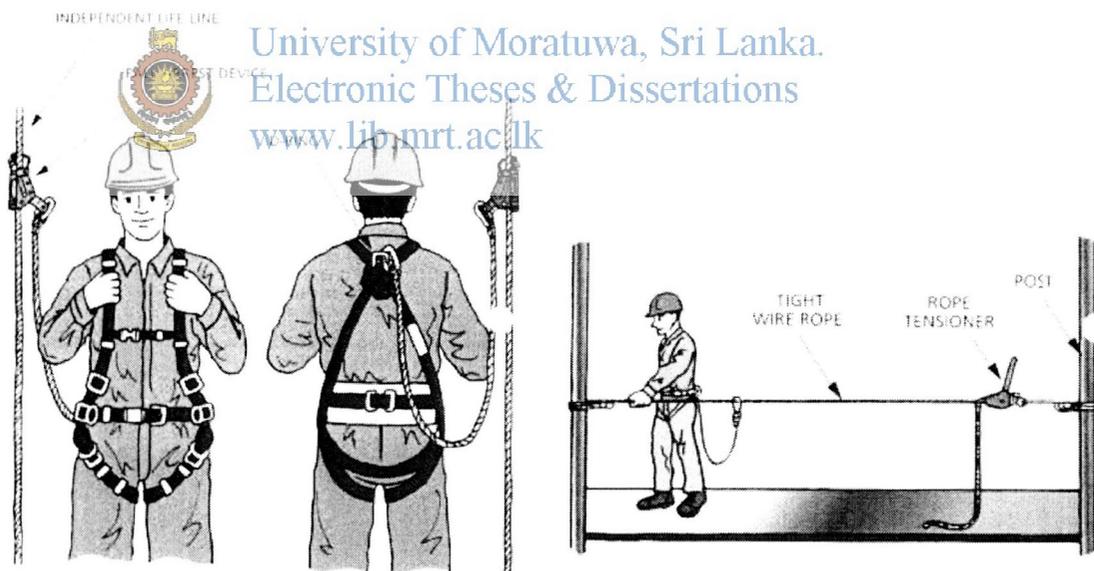


Figure 7: Safety Harness and Safety Belt

- Provide safety harness/belts and inform workers to keep it attached to a secure anchorage whenever the use of a harness/belt is necessary for their or other person's safety.

- The safety harness or belt anchor point should be directly above and the lanyard shall be left with the minimum free length. All anchor points shall conform to B.S. 5845 or equivalent.

2.5 Construction safety equipment

The wearing of protective clothing and the use of safety equipment is crucial in the battle to reduce the effects of accidents in construction sites. Employers have the legal duty to provide protective clothing and equipment free of charge whenever other methods to control risk of safety cannot provide sufficient safeguard.

It should not be assume that all protective safety wear is satisfactory for all circumstances. An employer or self employed person has to make an assessment of the risk at the work place and the parts of the body in danger. According to the Davies and Tomasin, (1990) the choice of the equipment must be taken in to account considering following features.

- The physical effort required to do the job
- The methods of work
- How long the personal protective equipment needs to be worn
- The requirement for visibility and communication

2.5.1 Safety gloves

Gloves shall be provided by the employer and worn by the worker where a worker or other person is required to handle materials, tools, equipment or substances, which could harm the hands. Figure eight shows various types of safety gloveless.

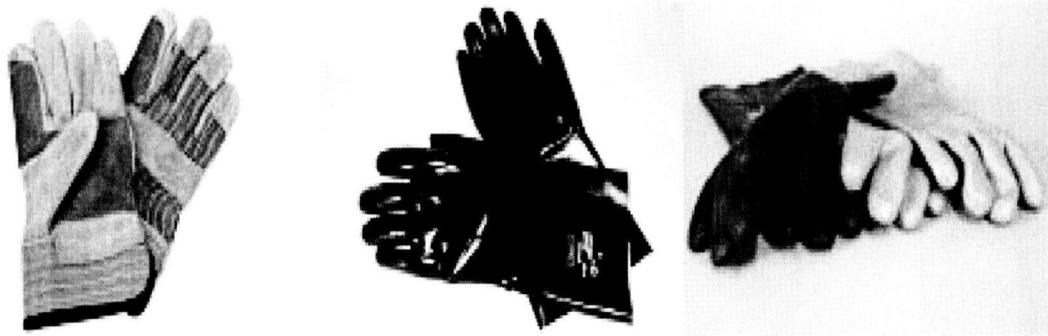


Figure 8: Safety Gloves

2.5.2 Safety glasses and goggles

The danger from flying particles and dust are obvious to most construction workers but the wearing of safety eyewear is far from universal and many thousands of painful eye injuries occurs in construction sites every year. Goggles, face shields and spectacles (figure nine) are available giving protection against impact, dust, chemical, molten metal and gas hazards, and managers should ensure that the correct protection and its correct grade are used by the employee. All safety spectacles, goggles and face shields shall conform to B.S. 2092 or its equivalent.

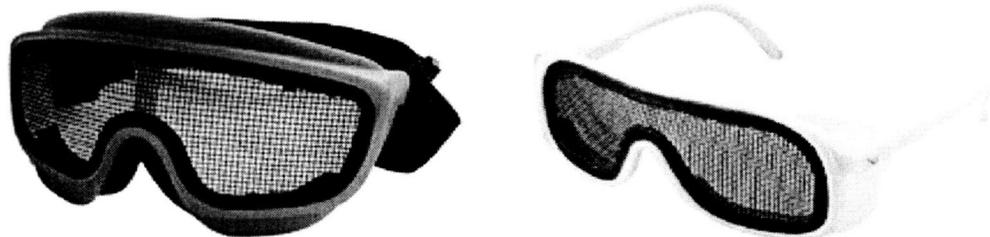


Figure 9: Safety Glasses & Goggles

2.5.3 Ear plugs and earmuffs

The noise level in some areas in construction sites are often well above the level which will cause permanent hearing damage to workers in the vicinity. The common form of hearing protection in the industry is the earmuffs and earplugs (figure ten). Ensure that the attenuation of all ear protectors conform to B.S. 5108.

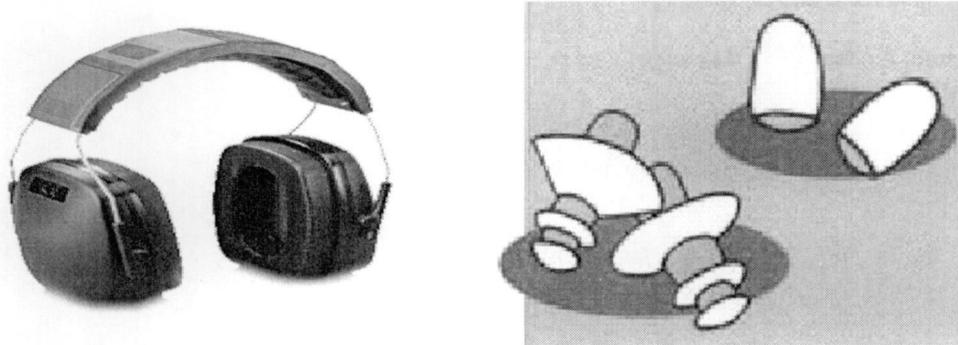


Figure 10: Earmuff & Disposable Ear Plugs
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2.5.4 Masks and respirators

In selecting appropriate protective equipment against the effects of harmful gases and dust, great care should be exercised. First it should consider the protection against the gases and dust and secondly protection against oxygen deficiency. Ensure that suitable respirators can provide adequate protection. This is measured by the degree of inward leakage that occurs when used. Figure eleven shows various types of masks and respirators.

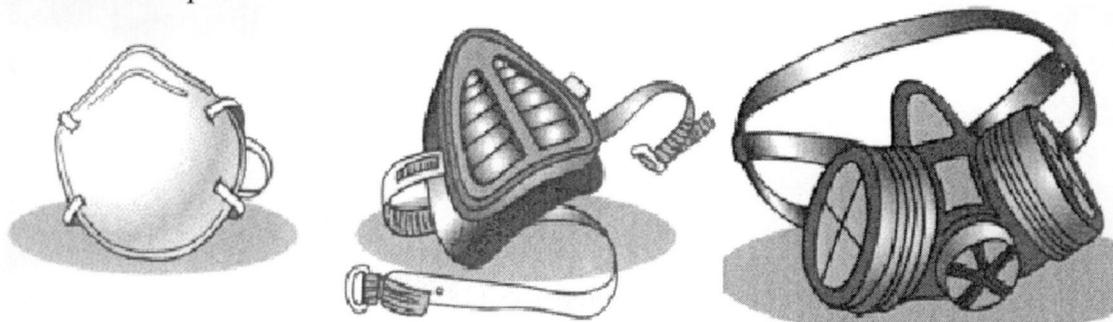


Figure 11: Masks and Respirators

2.5.5 Safety helmets (Head wear)

Safety helmets are for protection against falling objects and heavy blows and shall conform to EN 397 or equivalent. Bump caps are for protection against light blows and shall conform to B.S.4033. Some of the head wear used in construction are shown in figure twelve.

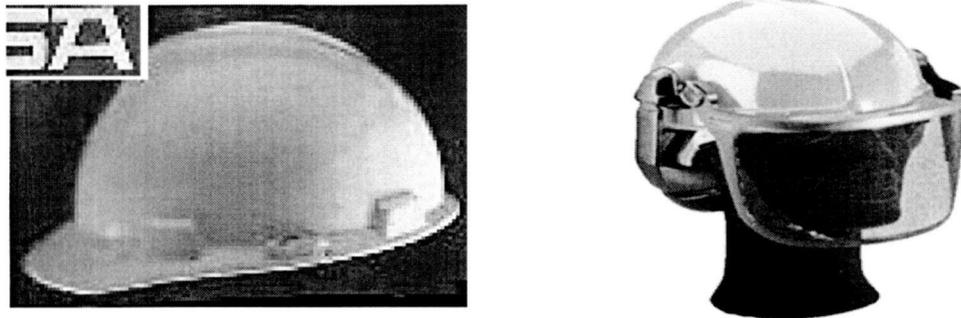


Figure 12: Head Wear

2.5.6 Safety footwear

Construction workers, including those who are in site offices are advised to wear sensible shoes or boots to prevent abrasion and cuts from sharp objects on the ground. All safety footwear, including safety shoes, ankle boots and rubber boots shall be fitted with steel toecaps. Where there is a risk of treading on protruding nails or sharp objects, the footwear shall be fitted with penetration resistant soles, and be identified with a symbol "P" in accordance with EN 344. For electrical workers, or where electrical hazard exists, safety footwear with electrical resistant soles shall be fitted as appropriate. The following figure thirteen shows a pair of safety footwear used by a construction worker.



Figure 13: Safety Footwear

2.5.7 Protective clothing

It is advised to wear protective clothes, gloves and dust caps when working or handling asbestos and asbestos based products, lead and lead based products including lead paint, and other harmful chemicals, which may be absorbed through intact skin, provide impermeable protective overalls when entering a manhole where there is possible contact with sewage or unlined tunnels with unknown drippings. All suitable gaiters manufactured to B.S.4676:1971 or equivalent when engaged in handling molten metal and knocking out hot materials. Figure fourteen provides a view of protective clothing that is currently used at construction sites in Sri Lanka.



Figure 14: Protective Clothing

2.5.8 First aid facilities

Construction site with five or more workmen shall have a first aid box (preferably a portable one). A separate first aid box shall be provided for every 50 workers on site. Every first aid box shall be marked plainly "FIRST AID" in English, Sinhala and Tamil. If a first aid box is not provided in any workroom, the location of the nearest first aid box and the name of the person in charge of the box shall be displayed in that workroom. All material for dressings shall be in acceptable grade and quality.



Figure 15: First Aid Facilities

2.6 Safety regulations

2.6.1 Sri Lankan safety regulations

A safe and healthy work environment is the basic right of every worker. However, the global situation falls far short of this right. The ILO estimates that more than 125 million workers are victims of occupational accidents and disease in a single year. Of these approximately 220,000 workers die and about 10 million are seriously disabled.

Due to the nature of the construction activities and involvement of various parties, it is difficult to survive without the control of a legal system so creating legislature to govern the construction industry is very important (Jaseiskis and Suazo, 1993).

During the last few decades, various acts and legislations were passed which are related to global construction health and safety. Among them the following regulations were found out to be practiced in Sri Lanka.

In 1942, factories Ordinance No 45 came into power and subsequently it was amended several times. Factories Ordinance mainly focused on workers who work in factories. However some parts of the ordinance may be applied to the building operations and civil engineering works.

The following regulations are initially enacted at USA and UK respectively. These legislature were blindly copied by the responsible Sri Lankan authorities, hence at present, these regulations are mere restricted to writing.

- Occupational Safety and Health Act of 1970 (OSHA),USA

- Health and Safety at Work Act of 1974 (HSWA),UK
- Construction (Design and Management) Regulations of 1994,UK

Occupational Safety and Health Act (OSHA) of USA is concerned about the occupational safety and health at work place. The employees can inform any safety violation in trade unions against the employer. Thereby the employees are given more rights to determine their safety and health at work.

The Health and Safety at Work Act 1974 (HSWA) provides a wide, embracing, enabling framework for health, safety and welfare in the UK. The Act places specific duties on;

- Part (I)— employers who have duties to employees and others who are not their employees
- Part (II) — employees who may be junior staff, managers or indeed even safety representatives. All employees need to understand their employer's obligations.
- Part (III) — occupiers of premises
- Part (IV) — designers, manufacturers, importers and suppliers and their responsibilities for Articles/substances

Construction (Design and Management) regulations are a new legislation, which eliminates inefficiencies included in previous legislature. It is noted that designers should consider the safety of the workers at site when designing and should provide safety information and advices to both client and contractor initiate those and give a feed back to the designer.

Sri Lanka has a very poor health and safety record. Much legislation exists to protect workers' rights and health but they are not implemented properly and only elite of workers enjoy the benefits. The workforce is abundant, low skilled and easily available and the high rate of unemployment makes them susceptible to exploitation. Getting work is more important than the hazards involved.

2.6.2 Constitutional provision for occupational safety and health

Safety and health occupies a very significant position in Sri Lanka's constitution which prohibits employment of children under 18 in factories, mines and in hazardous occupations. Policy aims to protect the health and strength of all workers. It prevents employment in occupations unsuitable for the age and strength of the workers. It is the policy of the state to make provisions for securing just and humane conditions of work. The constitution provides a broad framework under which policies and programs for occupational health and safety could be established.

2.6.3 Necessity of policies, regulations and standards for construction safety

The necessity of policies to prevent accidents in construction industry is increasing rapidly with the growing of construction industry. Due to the development of technology, today most of the construction firms tend to apply new construction techniques and processes. Therefore policies, regulations and standards to prevent accidents and to ensure safety in construction sites, have become very essential part in construction industry.

Accidents in construction sites are wasting time and money of contractors and rest of the parties involved. Hence management has to face the loss of productivity but also they have to pay compensation for injured parties.

Accidents create social problems too, because when a worker gets injured most often, he would not be able to support his family with the compensation gets from the employer for a long period of time. If he is not in the position to perform normal duties after the accident and also not competent in performing any other work; due to frustration and helplessness the worker might be tempted to earn money by illegal manner creating a hazard for the society.

Consequently it is necessary to bring fair policies, rules and regulations and standards by the government to protect workers and the public from these accidents, to ensure the safety at construction sites and to identify specific obligations and duties of members of building team and the workers.

2.6.4 Accidents recorded according to regulations

Industrial Safety Division of Department of Labour (ISD), Sri Lanka mainly considers the occupational health and safety of the workers and effect to the third party during the work proceeds. According to the factory ordinance of Sri Lanka the employer is liable to report every nonfatal accident that caused within three days from occurrence and their occupation information to the relevant district inspecting engineer, within ten days of time after the injured worker resumes his employment. Further, if the accident causes lossthe life of the injured employee, the employer must inform immediately to the district factory inspecting engineer.

The ISD keeps records of the occupational accidents, which have been reported to its district offices. Table two & Table three illustrates the past accident records in the construction industry and all other industries from 1999 to 2008. It can be seen that the number of fatal accidents and non-fatal accidents have been changing year to year. However the construction industry has recorded considerable number of fatal accidents most of the time during the said period.

Table 2 : Fatal Accidents Recorded During 1999 To 2008

Year	Fatal Accidents in the Construction Industry		Fatal Accidents the other Industries		Total Fatal Accidents
	Numbers	Percentage of Total	Numbers	Percentage of Total	
1999	10	27.03%	27	72.97%	37
2000	10	24.39%	31	75.61%	41
2001	10	37.04%	17	62.96%	27
2002	07	19.44%	29	80.56%	36
2003	15	35.71%	27	64.29%	42
2004	08	19.05%	34	80.95%	42
2005	19	36.54%	33	63.46%	52
2006	24	28.57%	60	71.43%	84
2007	27	35.06%	50	64.94%	77
2008	17	34.69%	32	65.31%	49

(Source: ILO web site: 5th May 2011)

Table 3: Non-Fatal Accidents Recorded During 1999 To 2008

Year	Non-Fatal Accidents in the Construction Industry		Non-Fatal Accidents the other Industries		Total Fatal Accidents
	Numbers	Percentage of Total	Numbers	Percentage of Total	
1999	103	4.81%	2039	95.19%	2142
2000	85	4.01%	2034	95.99%	2119
2001	66	3.06%	2091	96.94%	2157
2002	68	3.88%	1686	96.12%	1754
2003	46	3.08%	1446	96.92%	1492
2004	25	1.77%	1386	98.23%	1411
2005	34	2.45%	1354	97.55%	1388
2006	23	1.32%	1717	98.68%	1740
2007	43	2.45%	1712	97.55%	1755
2008	40	2.62%	1485	97.38%	1525

(Source: ILO web site: 5th May 2011)

2.6.5 New act

It is please to mention that new act shall be enforced near future which is focused construction industry. However much information is not available at the moment since it is at under evaluation stage.

2.7 Stakeholders in construction safety

Personnel involved in maintaining site safety

According to Kamardeen (2007), it is identified that the subsequent people are the stakeholders for safety in a construction project and their duties and obligations are as follows.

2.7.1 Contractor

The contractor is responsible to take following actions so that safety of employees is ensured in the site.

- Formulate a policy with regard to the safety and health at work of all staff
- Provide a safe and healthy working environment to his employees and protect others who may be affected by the work
- Provide adequate and appropriate information, instruction, training and supervision to his employees.
- Set out safety and health standards and procedures.
- Appoint responsible personnel to ensure that the safety and health policy is fully implemented and the safety and health standards, instructions and procedures are strictly observed and followed.
- Provide adequate and proper personal protective equipment for his employees

2.7.2 Employees

The contractor should ensure that his working staff is aware of the safety procedures adopted in the site and to satisfy his working staff under the following conditions.

- Be conversant and co-operate with the contractor in administering the safety policy and following the safety and health requirements as stipulated

under the law and the works contract, such as the site safety manual, the site safety handbook, and other safety and health standards, instructions and procedures, which are related to their work to avoid accident.

- Work safely and take good care of themselves and others who may be affected by them at all times, avoid being complacent and taking dangerous shortcuts, avoid improvising dangerous tools, and always seeking assistance and advice if in doubt.
- Use the personal protective equipment as required and take reasonable care of them when they are not used.
- Take immediate action to rectify any unsafe tools, equipment and plant or any unhealthy conditions, or report them immediately to their supervisors or the responsible person in control of the workplace.
- Report all accidents to the supervisors immediately after their occurrences.



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2.7.3 Safety officer

It is the duty of the contractor to employ and get the assistance of a safety officer to assist following work.

- Implementation of the safety policy and the safety and health requirements as stipulated under the law and the works contract, such as the site safety manual, the site safety handbook, and other safety and health standards and instructions.
- Assist in ensuring that all plant, machinery, equipment and tools are maintained in safe working order. Ensure that the names of the persons designated by the Contractor for the operation of particular plant and equipment are recorded in a register and check that the plant and equipment are only operated by designated competent persons.
- Assist in ensuring that all fire services installations and fire escapes are maintained in good working order.

- Assist in ensuring the safe and health condition and good housekeeping in the workplace.
- Conduct safety inspections to project sites, plants and workshops, and prepare inspection reports.
- Ensure the observance of the safety rules and safe practices by the staff, and assist in the supervision of safety supervisors.
- Report to the site management any unsafe practices and unsafe conditions in the workplace and prepare and submit statutory reports to the contractor.
- Carry out risk assessment and prepare safety method statements, including control measures for high and medium risk activities as necessary. Conduct accident investigation and prepare investigation reports; and recommend preventive measures to avoid recurrence.
- Organize/conduct safety training courses and seminars, and prepare training records and organize safety promotion activities.
- Communicate with labour department's occupational safety officers and representatives of safety & health organizations.



2.7.4 Safety supervisor

The contractor should employ a safety supervisor to perform following duties.

- Assist the safety officer and the contractor in implementing the safety and health requirements, standards and instructions.
- Be familiar with the statutory regulations applicable to the work on which their gang is engaged; insist that the regulations are observed and followed, and all accidents reported immediately.
- Keep all staff informed of the safety policy and take all reasonably practicable steps for carrying it out.

- Incorporate safety instructions in routine orders and see that they are obeyed. Take all reasonable steps to prevent workers from taking risks.
- Assist the safety officer in arranging new employees, particularly inexperienced and apprentices or new recruits to receive site specific safety induction course and to learn to take safety precautions.
- Ensure that protective clothing and equipment are used whenever appropriate. Discourage “horseplay” and reprimand those who fail to consider their own safety and that of others.
- Report to the immediate supervisor on any defects and ensure that any unsafe plant and equipment are not used.
- Ensure that all plant and equipment are in a safe and secure state when left unattended.
- Remind the Contractor to replenish first aid boxes at regular intervals.
- Report to the Contractor and/or Safety officer on matters relating to safety and health.



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2.7.5 Safety representative

The Contractor should employ a safety representative, full time in site for following reasons.

- Assist the safety officer and the contractor in enforcing the safety and health requirements, standards and instructions.
- Incorporate safety instructions in routine orders and see that they are obeyed.
- Take all reasonable steps to prevent workers from taking risks. Discourage “fooling around” and reprimand those who fail to consider their own safety and that of others.
- Ensure that protective clothing and equipment are used whenever appropriate.

2.7.6 Consultant's representative

A consultant's representative will be employed by the consultant to perform following tasks.

- Implement safety policy and the safety and health requirements as stipulated under the Specification and the works contract, the construction site safety manual, the construction site safety handbook, safety plan (if any) and other safety and health.
- Carry out site inspections to ensure that the safety and health standards, rules and practices are being complied with and corrective actions are taken as necessary.
- Ensure maintenance records of all machinery, plant, equipment and tools are kept, and all plant and equipment are operated by competent persons.
- Ensure that all identified defective machinery, plant, equipment and tools are suspended /withdrawn from service until they are satisfactorily repaired.
- Check that the personal protective equipment is properly maintained, readily available and are correctly used.
- Report any inadequacy in safety and health measures and dangerous incidents for follow up action.
- Closely monitor the contractors' works for any unsafe practices or unsafe methods. Ask for their rectification as soon as possible by means of the power delegated to him under the contract.
- Lead the Site safety management committee meetings, and attend the site safety committee meetings.
- Closely communicate with the labour department and/or the on the construction site safety matters.
- Conduct accident investigation and recommend corrective action for preventing similar accidents.

- Compile site accident statistics and report on the contractors' safety performance.
- Assign and train site staff to administer safety provisions in the contract.
- Attend safety audits and ensure that follow-up actions on the recommendations made by safety auditors in the safety audit reports are taken.

2.8 Occupational injuries in construction

Occupational injuries from construction activities in general are defined by Davies and Tomasin (1990) as:

- Danger of physical injury and fatality; and
- Health problems

Construction accidents resulting in physical injuries and fatalities can be broadly categorized into the following eight basic groups (Hinze, 2005):

1. Falling from heights-involves workers falling from higher floors to lower floors/ground level, and falling from ground level to excavation level.
2. Struck by falling objects/moving vehicles-primarily involves workers being struck by equipment, private vehicles, falling materials, vertically hoisted materials and horizontally transported materials.
3. Excavation related accidents-encompass cave-in, contact with underground utilities, subsidence of nearby structures, falling of materials/vehicles/objects on to people working in excavation, fumes, gases, and inrushes of water at the bottom of excavations.
4. Accident by operation of machinery / tools- caused by toppling of machinery, collapse of part of the machinery, and unsuitable or unsafe hand held tools.

5. Electrocution-caused by contact with electric current from machines, appliances, light fixtures, faulty electrical equipment and tools, contact with overhead/underground power lines.
6. Fire/explosion-resulting from the explosion of pressure vessels or gasoline pipes, and fire due to welding/hot works.
7. Failure of temporary structures-involves the failure of formworks and scaffoldings.
8. Others- e.g. slipping on the same level, oxygen deficiency in confined spaces, lightning strike, etc.

Table 4: Hinze And Wilson (2000) Explains Health Problems Affecting Construction

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Health hazard	Cause
Skin diseases	Contact with cement, slaked lime, paint, varnish, thinner, solvents, strong chemicals, grouts, seals and adhesives.
Hardness of hearing	Noise
Respiratory diseases	Inhalation of toxic dust, vapour and ashes
Muscular and bone diseases	High static stress and unnatural working postures
Cancer	Carcinogenic materials
Mental illness	Stress, inhalation of toxic materials affecting brain and central nervous system.
Diseases caused by vibration	Vibration

Table 5: Hinze And Wilson (2000) Intensely Analyzed The Root Causes Of Construction Accidents. Their Work Can Be Summarized By The Four Clusters As Shown In

Cluster	Factor
1. Working condition	Type of work Work location Status of tools, equipment and temporary structures Physical layout of the work place
2. Management failure	Poor house keeping Violation of workplace safety standards Poor supervision and checking of work progress, tools, and equipment and temporary structures.
3. Unsafe acts of workers	Disregarding safety rules Horseplay Skill and training
4. Non human related events	Unexpected ground conditions/terrain Adverse weather/earthquake/tsunami, etc. on site

2.9 Assessing project hazards

The combination of work by Davies and Tomasin (1990), and Jannadi and Assaf (1998) produced a list of high hazardous trades in building construction projects for facilitating hazards assessments. The hazardous trades are as follows:

- 1) Demolition works
- 2) Excavation works
- 3) Scaffolding and ladder works
- 4) False works (temporary structures)
- 5) Roof works
- 6) Erection of structural frame works
- 7) Crane use
- 8) Construction machinery and tools usage

- 9) Works on contaminated sites
- 10) Welding and cutting works
- 11) Works in confined spaces

The working condition is the inherent work hazard owing to a project's scope and the location. The inherent hazard is managed with a safety management system, which can cause occupational injuries when flows exist. The negligent attitude of workers to forego safety standards also causes accidents, although it is less quantifiable. Non human related event are beyond control and prediction. Hence, the estimation of occupational injury risks in construction projects shall assess two factors: the inherent hazard level in the project, and safety management level. As shown in figure sixteen, hazards incline the project towards the accident zone while safety pulls it towards the safe zone. When the safety force is at least equal in magnitude to the hazards imposed, the project stays in a neutral zone. Safety below hazard level moves the project towards the accident zone. Hence, the prediction of occupational injuries in a project entails the assessment and comparison of the magnitudes of project hazards and safety.

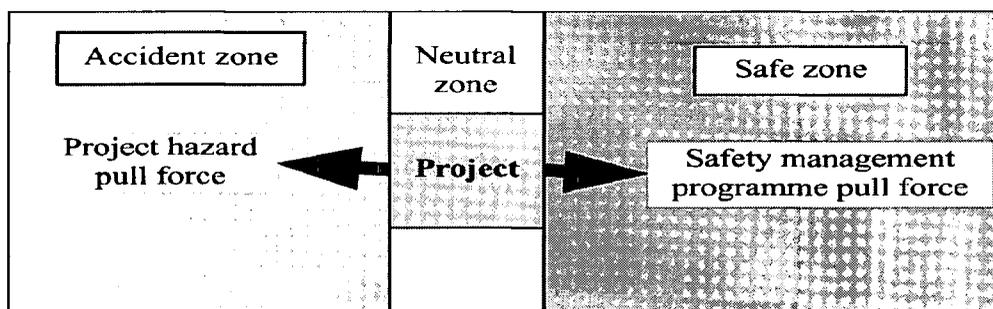
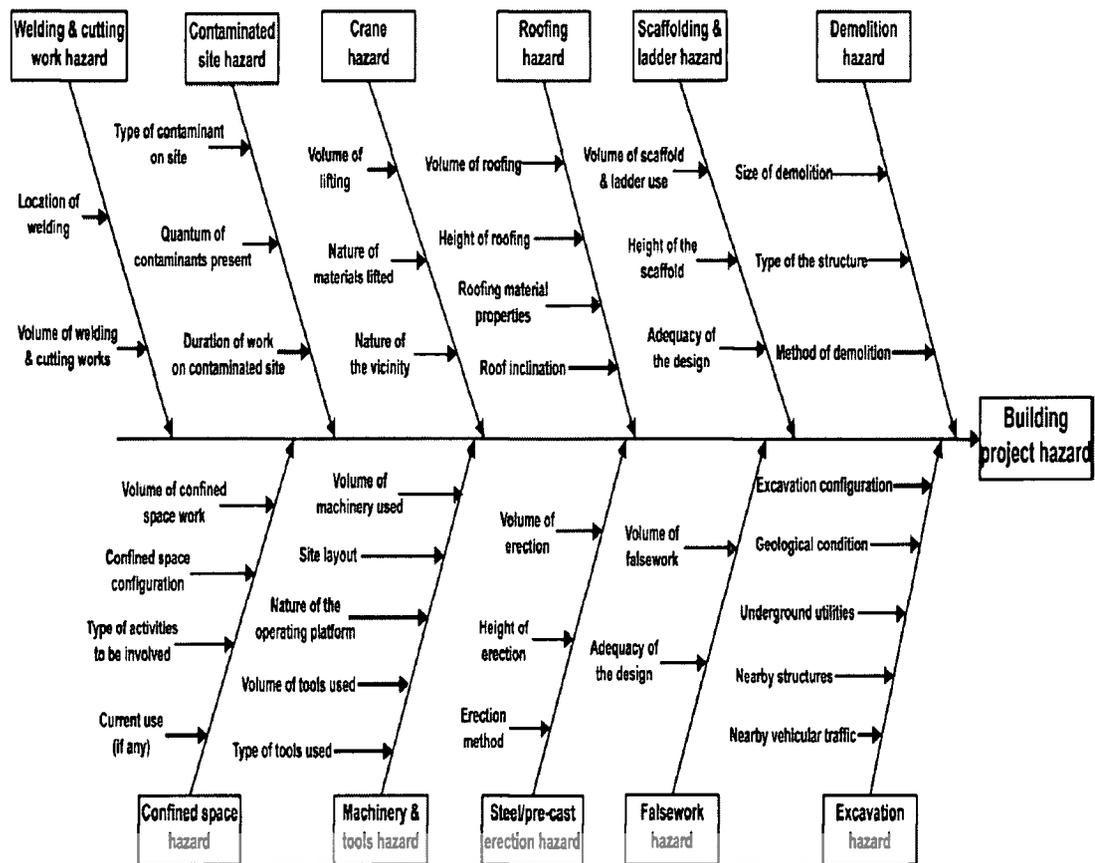


Figure 16: Hazard Vs Safety Trade - Off

According to Davies and Tomasin (1990), and Jannadi and Assaf (1998) a particular project may have many of these trades and the level of hazards inherent in each trade is determined by its respective risk attributes. There are number of attributes that contribute to the level of hazard in each of the above hazardous trades. The fishbone diagram in figure seventeen summarizes these risk attributes.



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Figure 17: Fishbone Diagram – Building Hazard Attributes

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As part of its strategies to improve safety standards in construction projects, Singapore conceptualizes the implementation of the Quality Fee Method (QFM) for tender evaluation, departing from the traditional lowest price method. Under the QFM, tenders are scored based on both price and quality attributes. Safety management proposal is one of the key quality attributes. The effective assessment and scoring of tenders' safety proposal is therefore a crucial task for clients' project managers (Kamardeen 2007).

2.10 Measuring contractors' safety performance

In view of the importance of occupational health and safety, countries such as the United Kingdom, Singapore and Hong Kong have adopted a self – regulatory approach to safety, whereby proprietors (including contractors) are required to develop, implement and maintain safety management systems. In addition to setting

out safety objectives and targets in their safety management systems, construction firms need a rational framework for Safety Performance Evaluation (SPE) in order to objectively gauge their effectiveness in accident prevention over time.

There are several methods for measuring the safety performance on construction sites:

- 1) Applying the concept of profiling that consists of the development of a corporate safety performance standard in a number of categories that are considered important by clients' project managers. Companies are then compared to these categories and a profile is made showing this comparison (Fletcher, 1972).
- 2) Conducting a safety audit-a comprehensive audit is a review of the company's safety program. A properly conducted safety will determine the strengths and weaknesses of the current safety program (Kavianian and Wentz, 1990).
- 3) The injury frequency, which is the number of lost-time injuries per million hours of exposure, can also be used to measure the safety performance (Jannadi and Al-Sudari, 1995).

Nevertheless, conducting a safety audit can give a leading indicator of the safety performance of a contractor whereas the other two methods provide with lagging indicators. Jannadi and Assaf (1998) also recommended that safety auditing is better than the other methods to assess the safety performance of contractors.

Teo et al (2004) developed a (3P+I) model for measuring the effectiveness of safety management systems of construction firms in Singapore by assessing policy factors, process factors, personal factors and incentive factors. Policy factors refer to safety principles and structures that are in place to ensure safety on site. These are included in relevant code of practice, and in-house safety rules and regulations. Process factors comprise safety attributes that are directly associated with construction operations. Among these attributes are management of subcontractors, safe work procedures, communication and information transfer, hazard identification, and housekeeping. Personal factors refer to key human-related variables that effect site safety such as training and competency,

and the structure of the safety committee. Finally, incentive factors are defined as the system that a project has in place to motivate site personal and sub-contractors to work safely.

2.11 Safety culture

The construction industry is characterized as one with a poor safety culture, and it appears that attempts to improve the safety record will not be fully effective until safety culture is improved. A better understanding of safety culture will definitely help construction organizations to strategically allocate resources and concentrate their effort to ensure the improvement of their overall safety performance. Many research studies have investigated the nature of construction safety culture, focusing mainly on its characteristics, attributes, key success factors and assessment.

Molenaar et al. (2002) identified a total of 31 characteristics that define organizational safety culture, including management commitment, communication, strategy development and implementation, resources and empowerment, to name but a few. Ho and Zeta (2004) established a set of key factors (Behavior, Environment, Organization and person) that effect construction safety culture. They argued that safety culture would fail when it lacks support of four factors.

Chinda and Mohemad (2007) proposed a structural model for construction safety culture aiming to verify the casual relationship and interactions between enablers and goals of construction safety culture. He identified five enablers, namely Leadership, policy and strategy, people, partnership and resources, and processes, as well as four result criteria including people results, customer results, society results, and key performance results. The enablers represent how the organization operates, while the results concentrates on achieving predetermined organizational goals.

In this study, however, the focus has been mainly on the improvements to the enablers' criteria in order to achieve better results. For this reason the four "results" criteria are combined together into a single construct named as Goals. It is assumed that leadership drives people management, policy and strategy and resources. These three enablers collectively influence the ability to achieve predetermined goals

through the implementation and improvement of suitable processes. The six theoretical constructs (five enablers and a single set of goals) represent the basic elements of the proposed construction safety culture model. Their details, along with the associated attributes, are briefly described below.

Leadership enabler

Through the leadership enabler, leaders develop and facilitate the achievement of a mission and vision of safety, develop values required for long term success, and implement them via appropriate actions and behaviours. They are personally involved in ensuring that the organization's safety management system is developed and implemented. Leadership and management commitment to safety are recognized as a fundamental component of an organization's safety culture. In construction, leadership is considered as the main enabler in developing a good safety culture. Leadership can basically be examined by four attributes, namely top management commitment, effective two way communication, management accountability, and management leading by example.



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People enabler

The people enabler facilitates how an organization manages develops and releases the knowledge and full potential of its human resources at an individual, team-based an organization-wide level, and how it plans these activities in order to support its policies and strategies, and the effective operation of its processes. It is not only management participation and involvement in safety activities that is important, but also the extent to which management encourages the involvement of the work force. It is clear that the higher the level of the workers' involvement in safety activities, the more positive the safety climate. This enabler consists of seven attributes, namely shared perceptions about safety, safety empowerment and responsibilities, supportive environment, workers, involvement, relationship among workers, workload and work pressure .

Policy and strategy enabler

This enabler refers to how the organization implements its mission and vision of safety via clear stakeholder focused strategies, supported by relevant policies, plans, objectives, target and processes. It consist of safety awareness and promotion, alignment of productivity and safety targets, safety standard, laws and regulations, safety initiatives to continually improve safety standards, and integrating safety in business goal settings.

Partnership and resources enabler

This enabler refers to how an organization plans and manages its external partnerships with project participants and other stakeholders, and its resources needed to support its safety polices and strategies, and the effective operation of its safety related processes. Four attributes were used to describe this construct.

These are: project participants and stakeholder cooperation, adequacy of financial resources dedicated to safety, availability of necessary safety related resources, including human resources.



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Processes enabler

This enabler allows and organization to design, manage and improve its processes in order to support its policy and strategies and to fully satisfy and, and generate increasing value for, it customers, employees and other stakeholders. Its consist of many attributes namely, namely safety training, risk and hazards assessment, feedback on safety implementation, adopting a no blame approach, site layout planning, environmental control and good housekeeping, site safety documentation, and having an effective benchmarking system .

Goals

Goals, with respect to employees, customers, society and business performance, represent the ultimate aim the organization endeavors to achieve as a result of implementing the attributes stated in the five enablers listed above. The Goals construct consist of seven attributes, including the level of job satisfaction, safe work behavior, reduced number of accidents and safety related incidents, exceeded

customer's expectations, improved industry image and safety standards, higher work force morale, and reduced total costs associated with accidents).

Chinda and Mohamed (2007) revealed that a very strong relationship between Processes and Goals, implying that excellent safety outcomes (i.e. reduced number and cost of accidents, higher workforce morale and enhance industry image) can only be achieved through the rigorous implementation of safety related processes, which appears to be directly related to people and policy and strategy, and not to partnerships and resources. Further, although, partnership and resources did not have a significant direct effect on processes, they did, however, have a significant indirect effect through its influence on policy and strategy.

According to Chinda and Mohamed (2007), Leadership strongly influences People and Policy and strategy. Thus leaders should become role models in promoting safe work behavior, ensure that workers accept their safety responsibilities, and set a realistic safety policy and communicate throughout the organization. It is clear that leadership is the main driver to effective safety culture, and that the strong commitment of leaders is crucial in promoting safety culture. Additionally, safety policy and strategy should reflect the need of safety resources requested by the workers, as direct and indirect relationships exist between partnerships and resources and policy and strategy and between people and policy and strategy, respectively.

2.12 Construction workers' health and safety knowledge

Typically, H&S management is formalized through an "inclusive" approach that places accountability on everyone at the workplace. This accountability can be conveniently considered hierarchically where all in an organization hold some H&S responsibility: from the chief executive officer or director; through all tiers of middle management, and including every individual employee whether they work in an office or site. Individual responsibility with respect to H&S will vary. For example, directors are charged with specific accountability, some employees might be a communication interface between management and workers, whereas others may represent their colleagues or contribute to H&S committees. In a construction context, clients also have contribution to make in upholding H&S standards, as does

the actual relationship formed between contractors and their clients. Indeed, it can be highlighted that safety improvement in construction involves all who are involved in the operation of construction sites and requires a “pro-active” approach.

Fundamental to any effective H&S regime is the inherent degree of H&S knowledge, or the “personal attributes” to H&S, held by workers. Ahamed and Gibb (2003) alternatively described this concept as a function of employee attitude; toward the organization they work for, and to the magnitude of risk to which they are exposed. However, H&S knowledge is often more broadly defined as “competence” and H&S competence specifically, has been described as an integral part of corporate responsibility. To be written something.

2.13 Summery

Under the literature review, attention was given to identify the global scenario of health and safety in construction industry. In addition to that local conditions and legal background also have been studied.



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Further, this chapter emphasis the importance of health and safety. Attention was given to study the common causes of accidents, safety procedures, safety equipment etc.

Author has tried to learn about stakeholders relating to health and safety and their key role. In addition assessing of project hazards, measuring contractors’ safety performance, construction workers’ health and safety knowledge have also been included in this chapter. Finally safety culture was explained in detailed.

CHAPTER 3

Methodology of Study



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CHAPTER 03 -Methodology of Study

3.1 Introduction

This chapter explains the framework which was set for the research process. Since the main objective is to find out the causes of poor safety practices in construction industry and making suggestions to improve the conditions, research methodology was set to suit to achieve the aforementioned goals. Therefore it consists of procedures to absorb information from various levels of construction industry managerial persons and current trends of international construction industry via literature review.

3.2 Research design

3.2.1 Preliminary discussion

After making several discussions with the project supervisor, exact problem was identified. Then preliminary discussions were held with following groups to formulate the questionnaire.

- University academic staff
- Company directors
- Project managers
- Site engineers
- Site supervisors

Following areas were discussed with these groups.

- General background of the health and safety
- Top management commitment regarding the health and safety
- Education and knowledge of the technical staff and workers relating to the health and safety
- Training requirement
- Legal background

These discussions were greatly helped to identify the lapses and shortcomings in construction industry relating to health and safety.

3.2.2 Literature survey

A comprehensive literature survey was carried out to cover the current knowledge in the subject area, by using reports journals, relevant books and electronic media. This consist of,

- Past research relating to health and safety
- Organization's safety culture
- Legal background of health and safety
- Accident records
- Safety wears

3.2.3 Questionnaire survey

Based on the literature survey and interviews, key issues were identified for the questionnaire. Actually this is the most important part of the research. Hence several discussions were held with the project supervisor and several revision was made to suite the requirements and user friendly.

The questionnaire consists three sections. First section is used to identify the back ground of the respondent. Under the first section, respondent's information such as name, organization, designation was asked. However respondent was allowed to refrain from answering some quarries such as name, address because of to keep confidential.

Section (II) consists, general information of respondent's organization.

Section (III) covered following areas to absorb the views of respondents regarding the different aspects of health and safety.

- Clients supports
- Contractors supports
- Consultants supports
- Top management commitment
- Level of fund allocation for health and safety
- Contractual clauses
- Training requirement

- Education level of workers
- Quality of safety wears
- Attitudes of the society
- Resources availability
- Record keeping
- Safety guidelines
- Safety audits

3.3 Method of sample selection

The selected sample for this study is included employers, engineers and most of construction organizations, which are equivalent to C3 or above according to the ICTAD registration. Two hundred and ninety two numbers of questionnaires were distributed among selected persons via electronic mail and facsimile.

The sample was selected by using the technique of snow ball sampling method. The snow ball sampling method is a non probability sampling technique and this can be used where the population size cannot be determined exactly by the researcher. Therefore, the 292 number of questionnaires were distributed through referral net works to be the sample more random. The sample consists with managers, engineers, technical officers and supervisors who are working at building construction sites. They were selected since their attitudes are most important because they always influence the attitudes of workers at construction site. In addition to them the personnel who are directly engaged with construction process were considered for the sample. The other party to the survey was consisted with independent persons who have knowledge of construction safety but do not directly working with building construction projects presently. Consulting engineers, university lecturers and clients of construction projects were randomly selected as the third group of the sample.

CHAPTER 4

Analysis of Data



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CHAPTER 04 - Analysis of Data

4.1 Introduction

This chapter focused on thorough analysis of the responses received from the respondents. One hundred and forty three numbers of responses were received out of two hundred and ninety three questionnaires, after making several reminders.

4.2 Analysis of responses received to questionnaire survey

4.2.1 Analysis demographic data

- SECTION 01

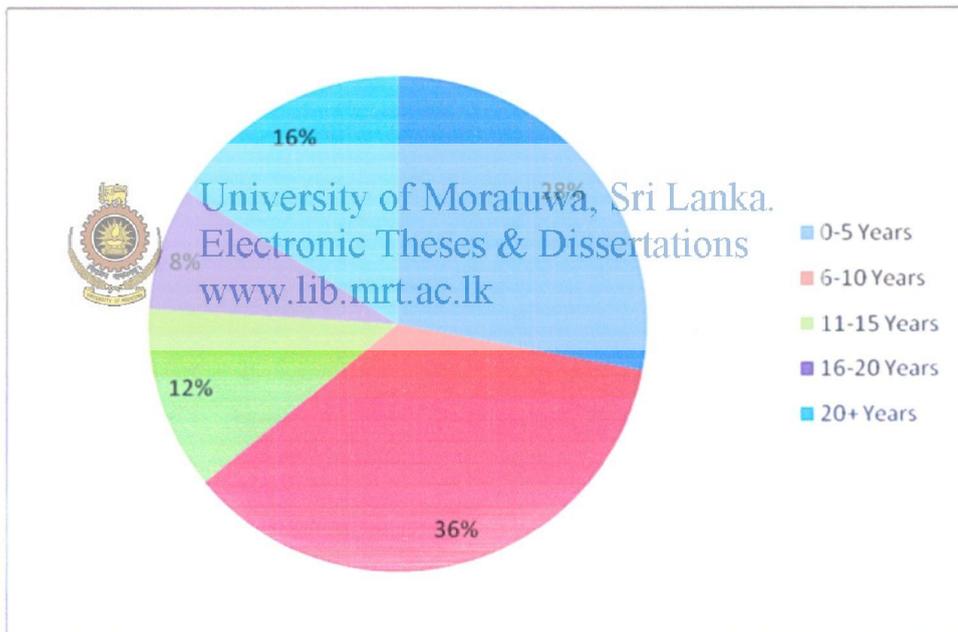


Figure 18 : Respondents Experience Relating To Construction Industry

SECTION 02

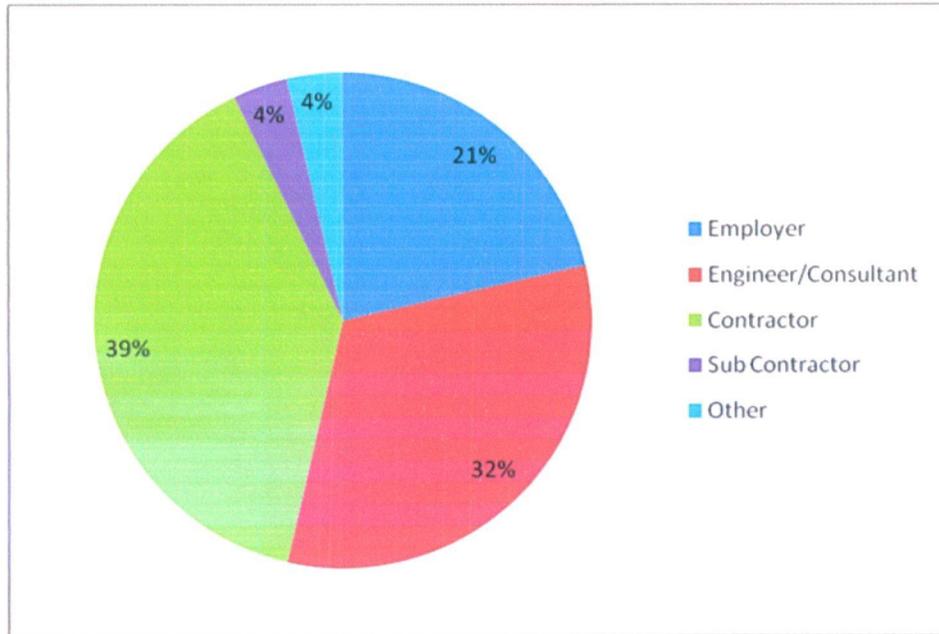


Figure 19 : Respondent's Representation



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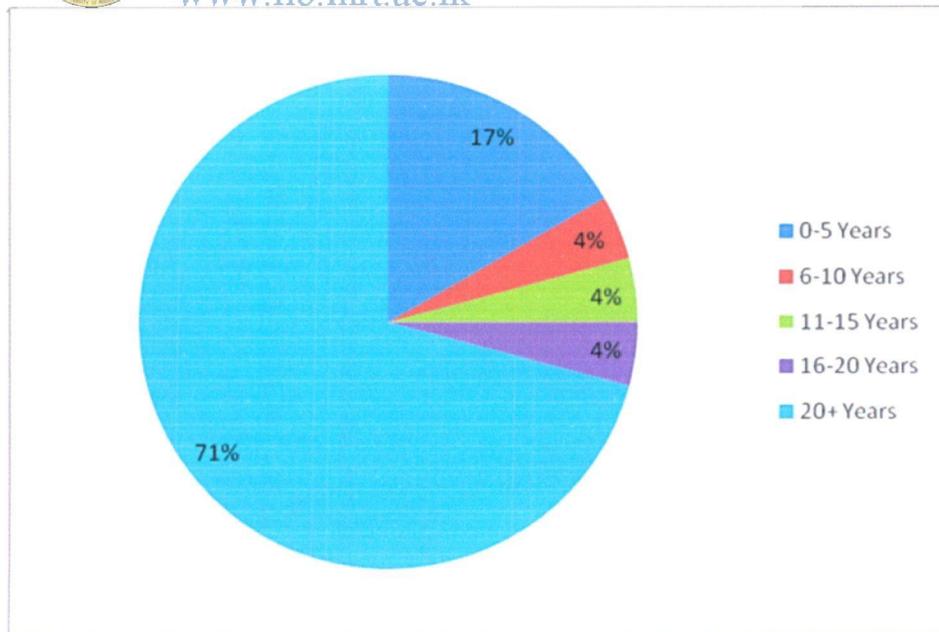


Figure 20 : Respondent's Representative Organization's Experience Relating To Construction Industry

4.2.2 Analysis of respondents' views

Query 02: Why do your construction project□/ projects□, truly want to have health and safety Policy?

Client's requirement	22%
Contractor's own interest	22%
Contractual requirement	25%
Legal requirement	31%

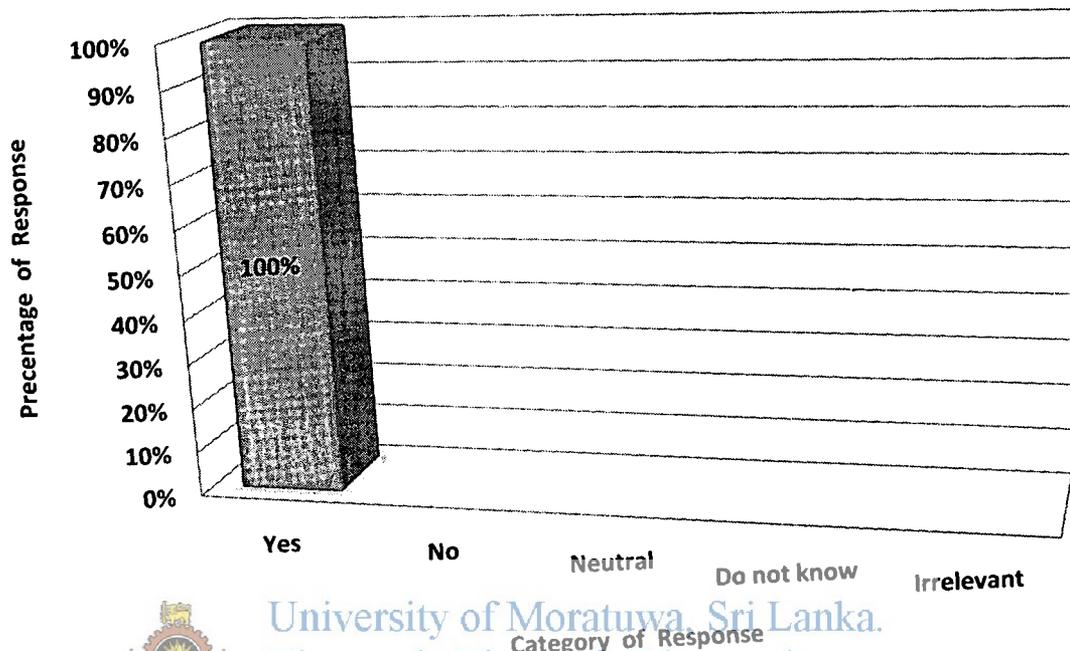
Only 22% say that they adopt safety practices on their own interest. Rest of the respondents practice due to others' influence. This clearly indicates that most of contractors do not want to adopt safety measures unless they are forced. This situation must be changed. They must be encouraged to adopt self-discipline. In addition, above quarry implies the importance of all four aspects (clients' requirement, contractor's own interest, contractual requirement, legal requirement) for better health and safety environment at the work site.

Table 6: Reponses Received For Questionnaire Survey

Question No.	Query	No. of Respond					Total	Percentage					
		01	02	03	04	05		01	02	03	04	05	
1	Do you believe that pre planning helps to improve the efficiency, quality, and reduce the cost of the project?	143					143	100%					
3	Do you believe that top management has committed in regard of health and safety?	98	19	19	7		143	69%	13%	13%	5%		
4	Are contractual clauses on health and safety in FIDIC and ICTAD condition of contract sufficient to cover the health and safety issues?	60	30	42	11		143	42%	21%	29%	8%		
5	Is allocated amount in B.O.Q of your current construction project(s), sufficient to implement health and safety policy?	34	66	24	19		143	24%	46%	17%	13%		
6	Do you think that project managers have enough time to concentrate on health and safety issues?	83	30	24	5		142	58%	21%	17%	4%		
7	Do you think that your technical staff has been given enough training with respect of health and safety?	24	77	42			143	17%	54%	29%			
8	Do you think that construction workers are reluctant to adopt safety measures?	125	2	16			143	87%	1%	11%			
9	According to your experience on current practice, do you believe that additional cost incurred in safety will cause to loose the job?	11	113	19			143	8%	79%	13%			
10	Do you believe that adopting safety practices will reduce the efficiency of the employees?	18	95	30			143	13%	66%	21%			
11	According to your experience, do you believe that safety wears are not fit to Sri Lankan climate?	24	91	28			143	17%	64%	20%			
12	Do you think that consultants are not strict on health and safety issues?	66	42	30			138	48%	30%	22%			
13	Do you believe that your organization has enough resources to address the health and safety problems?	35	72	19	6	11	143	24%	50%	13%	4%	8%	
14	Are you shy to wear safety harnesses at site?		110	11		22	143	0%	77%	8%		15%	
15	Do your top management people use safety wears at the site?	50	43	43		7	143	35%	30%	30%		5%	

Question No.	Query	No. of Respond					Total	Percentage				
		01	02	03	04	05		01	02	03	04	05
16	According to your experience, do you believe that construction workers' education is enough to understand the importance of construction safety?	30	107	6			143	21%	75%	4%		
17	Do you satisfy of your safety equipments that have already been provided in your project/ projects?	24	65	54			143	17%	45%	38%		
18	Do you keep safety and health records which would facilitate the identification and resolution safety & health problems on the site?	45	64	34			143	31%	45%	24%		
19	Do you believe that client/engineer would consider the safety records of contractors at the time of tender evaluation?	17	41	35	35	6	134	13%	31%	26%	26%	4%
20	Do you believe that clients have a right to interfere the contractor's safety performance?	91	20	32			143	64%	14%	22%		
21	AS you believe, do you think that clients have to bear the cost of accident directly or indirectly?	37	31	18	19	3	108	34%	29%	17%	18%	3%
22	Are there dedicated safety officers in your project(s)?	50	24	55		14	143	35%	17%	38%		10%
23	Are there safety guide lines available in you project(s)?	55	43	39	6		143	38%	30%	27%	4%	
24	If the answer for Q 23 is Often, then do you follow those guide lines?	22	15	27	4	75	143	15%	10%	19%	3%	52%
25	Do you discuss about safety issues at contractor client meetings?	57	50	35			142	40%	35%	25%		
26	Do you conduct safety audits during the construction period?	45	51	20	21	6	143	31%	36%	14%	15%	4%
27	In your experience, how many projects were included safety guide lines in the body of the contract agreement?	37	39	49	18		143	26%	27%	34%	13%	
28	Do you obtain permission from safety officer prior to the potentially hazardous activities?	53	12	36	11	31	143	37%	8%	25%	8%	22%

Query 01: Do you believe that pre planning helps to improve the efficiency, quality, and reduce the cost of the project?

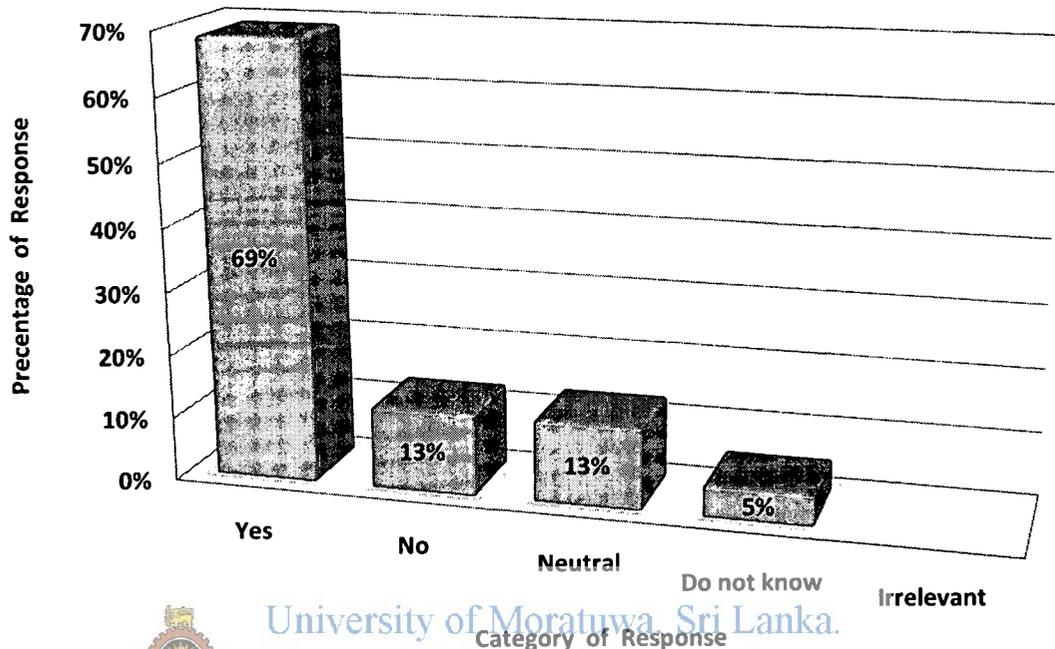


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Figure 21 – Respondents Behavior for Pre Planning of the Project

This is a straight forward query. The purpose of this query is to demonstrate that everybody knows the importance of preplanning.

Query 03: Do you believe that top management has committed in regard of health and safety?



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Figure 22 – Top Management Commitment

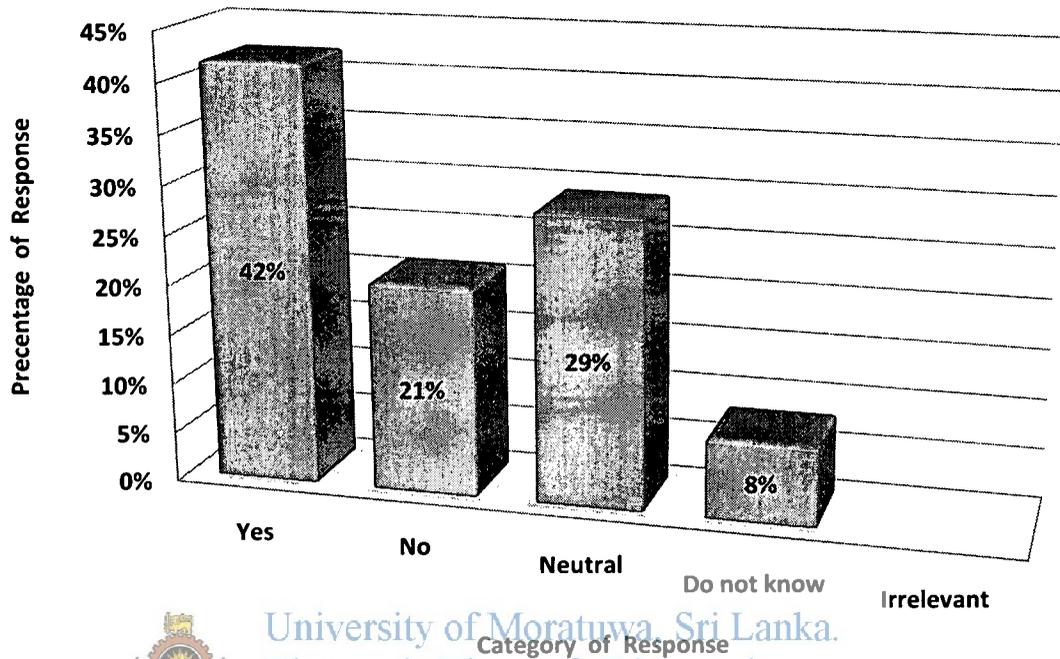
69% of respondents say that their top management has committed in regard of health and safety. Only 13% say no.

It is clear that most of the top management people concern about health and safety issues. This is mainly because of their education experience and age. They know the importance of health and safety.

On the other hand it is very difficult to maintain safe environment, without top management assistance. Top management must give the priority to health and safety issues and must ready to allocate required funds to maintain healthy and safe environment.

Result of this quarry implies that no problem with top management for maintaining better healthy and safe environment.

Query 04: Contractual clauses on health and safety in FIDIC and ICTAD condition of contract sufficient to cover the health and safety issues?



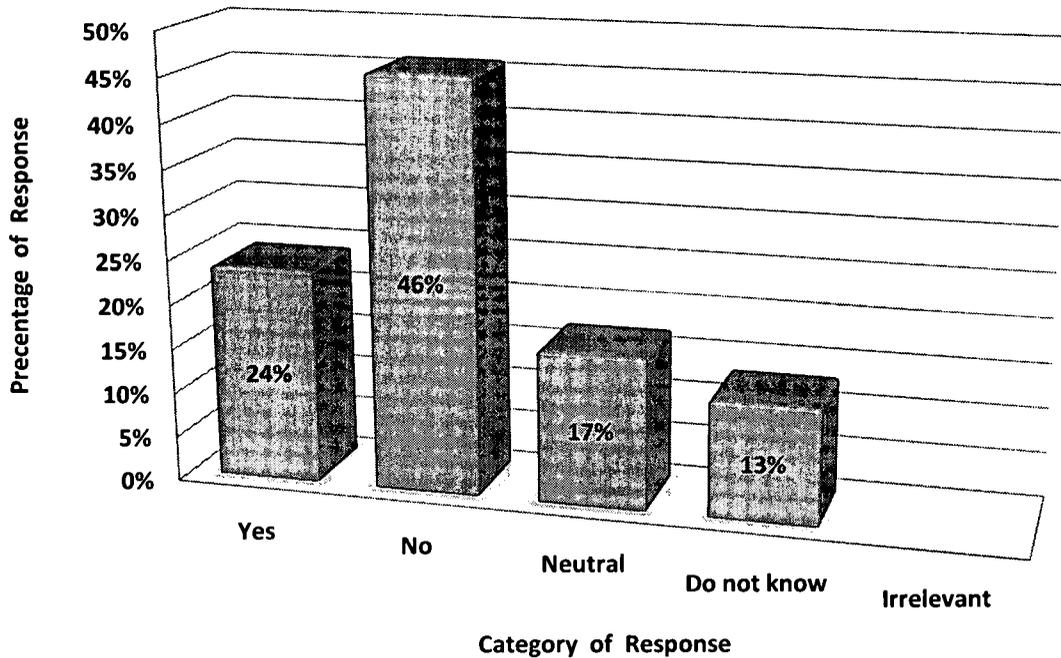
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Figure 23 – Contractual Clauses on Health & Safety in FIDEC and ICTAD Condition of Contract

42% of respondents say that FIDIC and ICTAD conditions are sufficient to maintain better health and safety environment at the site. That means majority believe if conditions are enforced situation can be improved. However 21% say that FIDIC and ICTAD conditions are not sufficient for better health and safe environment. Further some of them say that improvements are needed. Therefore it is suitable to find ways and means to improve the conditions of FIDIC and ICTAD so that to achieve intended target. Significant portion of the respondents (29%) are neutral. That means they are not much aware of the conditions.

This gives a clear message that numbers of managerial level persons are not aware about the contractual matters. This trend must be change.

Query 05: Is allocated amount in B.O.Q of your current construction project(s), sufficient to implement health and safety policy?

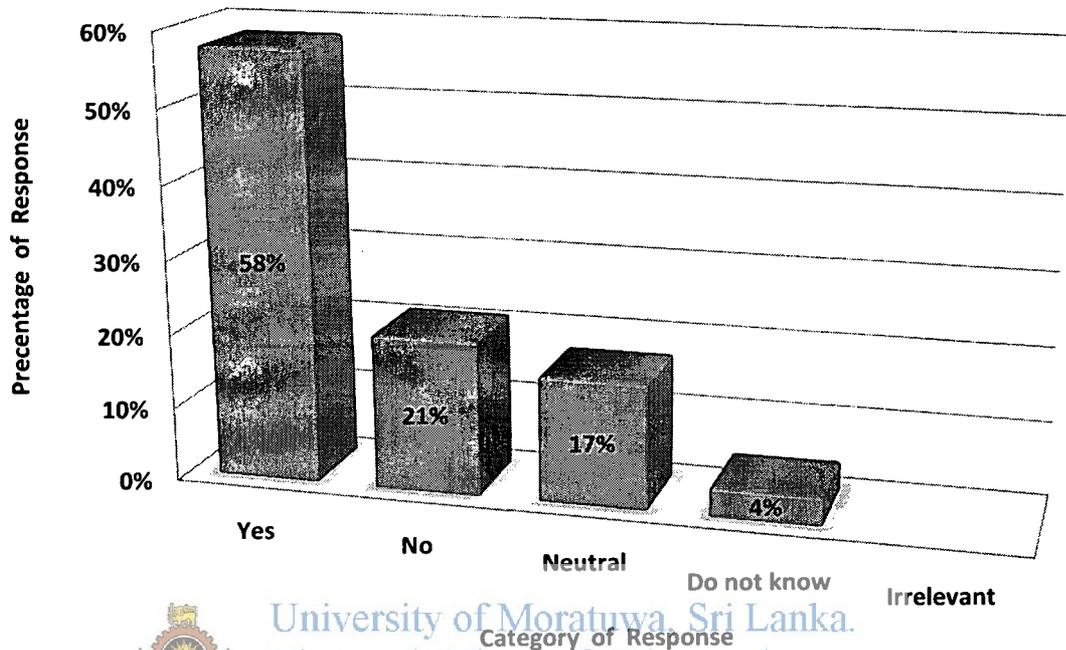


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 Figure 24 – Allocated BOQ Amount for Health & Safety
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Majority of respondents say that allocated amount is not sufficient to implement health and safety policy. It is clear in Sri Lankan context less priority has been given for health and safety issues. The reason for this is mainly due to the insufficient fund allocation. On the other hand 24% say allocated amount is enough. During this research author identified some companies implement health and safety measures on their own interest. These companies top management has allocated sufficient funds to implement the health and safety policy. 17% has said that they do not know whether allocated amount is enough or not. This is a serious issue. Project managers must know the allocated amount and its sufficiency for the project. Author could be identified that serious analysis are not carried out.

In addition to above; it can be said that this is interrelated with the organization's culture. Healthy culture means more concerns about the health and safety. Therefore it is important to stress on contractual clauses as well as improve the organization's safety culture. That will provide better results.

Query 06: Do you think that project managers have enough time to concentrate on health and safety issues?



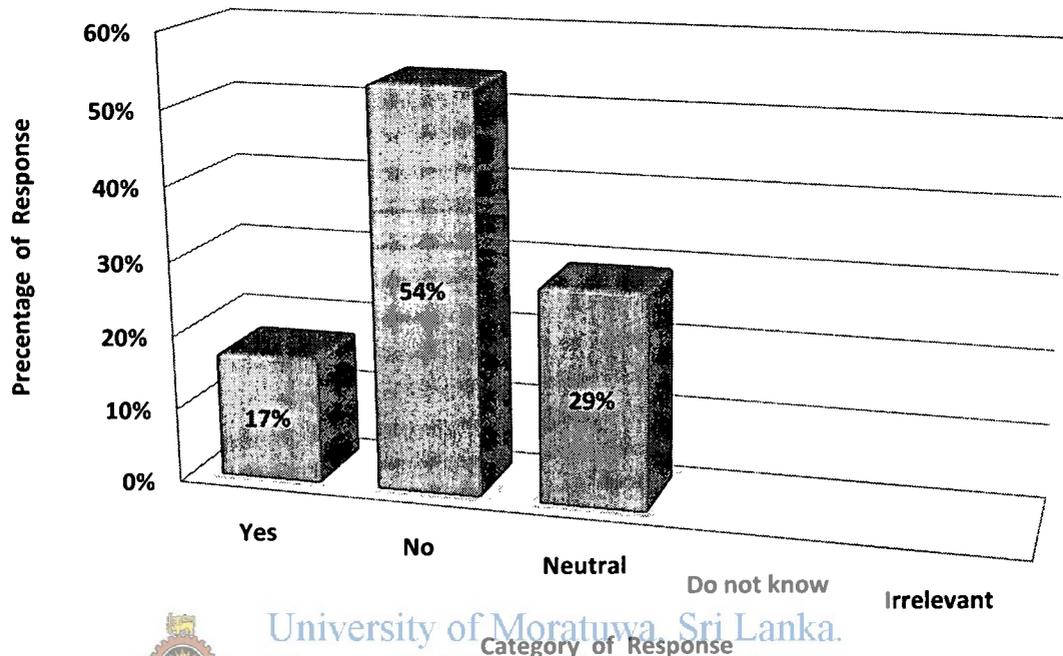
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Figure 25 – Project Manager's Concentration towards Safety & Health Issues

Actually this must be the part of the project management. However author was able to identify this matter during the preliminary discussions since less priority has been given by most of the project people think that they do not have enough time to address the health and safety issue. However majority (58%) say that they have enough time while 21% say they do not have and 17% Say they do not know. Their fore better education must be given regarding the safety first concept.

Further, project managers may concentrate on health and safety issues by assigning safety officer for the project. Then safety officer may take care of the health and safety issues on behalf of the project manager. This will ease the project manager's workload.

Query 07: Do you think that your technical staff has been given enough training with respect of health and safety?

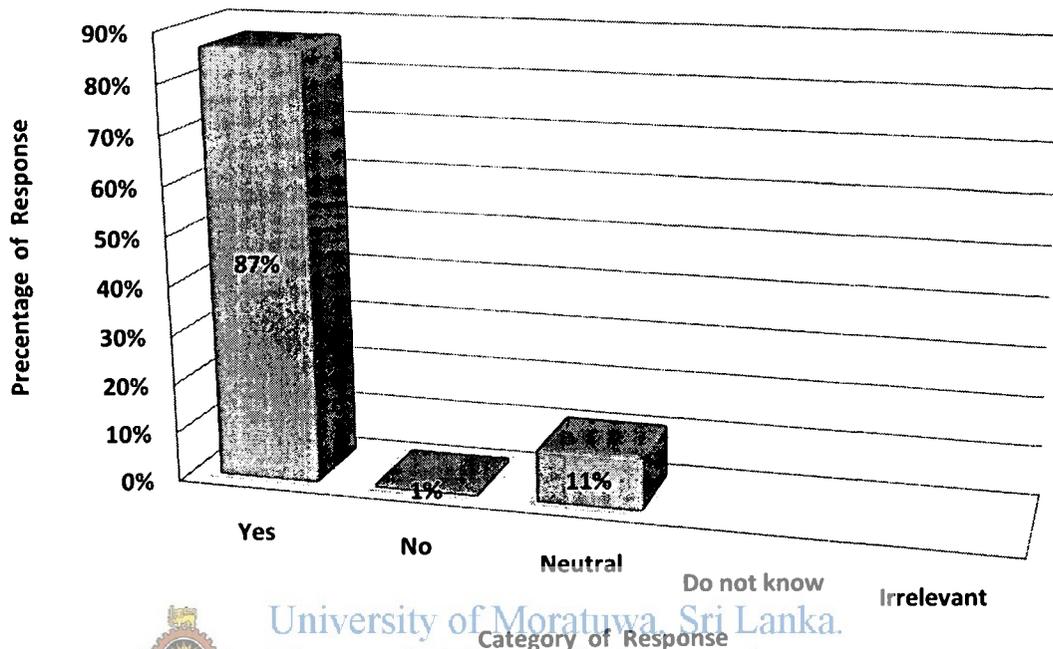


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Figure 26 – Training of Technical Staff

This query may be one of the serious issues and this had been identified even in the preliminary discussion. It is clear most of technical staff and other persons do not have enough training regarding the safety and health issues. 54% of the respondents say that their technical staff does not have enough training while 17% say they have. Some person said that more concentration must be given when designing academic curricula.

Presently, it is essential continual improvement in organization's standards to sustain. In company's point of view, better training gives much return to both the employee and employer. This may lead to reduce the accident related cost such as compensation, delaying the project completion time etc, and reduce the other cost like reduce the wastages and rework cost. Therefore companies must be encouraged to arrange at least minimum training period for each and every employer to harness the benefit of modern technology and concepts.

Query 08: Do you think that construction workers are reluctant to adopt safety measures?



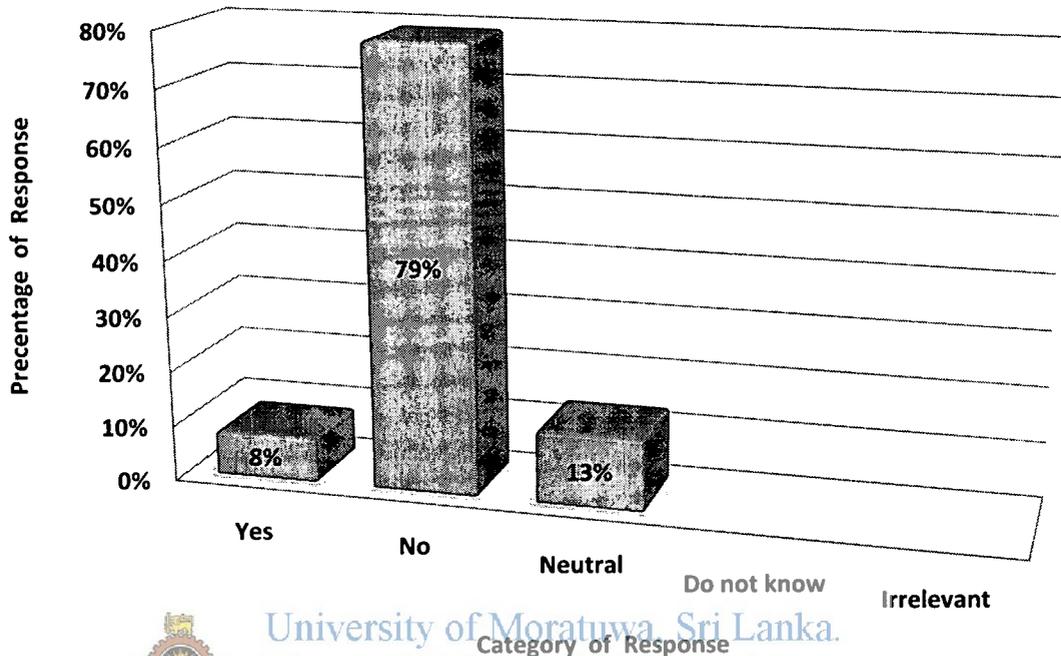
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Figure 27 – Construction Workers Preference to Adopt Safety Measures

This is the most vital issue. 87% of the respondents say that their workers are not willing to practice safe and health practices. This also identified during the preliminary discussions. Only 1% says that workers are willing to adopt safety practices while 11% are neutral. This is mainly due to the low education of the workers. Therefore worker must be educated to understand the importance of the health and safety. Otherwise it is pointless to discuss about how much funds are allocated or the dedication of top management.

Further to above, social influence also causes to refrain from wearing safety wears. Therefore attitudinal change is required to change this trend.

Query 09: According to your experience on current practice, do you believe that additional cost incurred in safety will cause to lose the job?



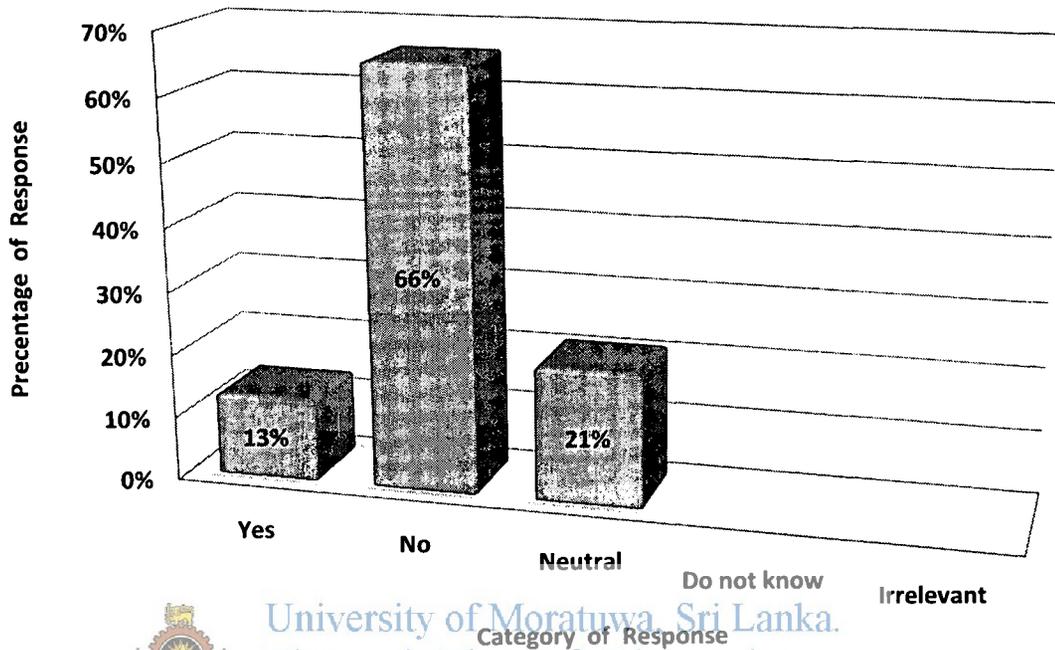
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Figure 28 – Respondents Attitudes of Additional Cost Incurred In Safety

Result of this query says that construction industry believes that cost of the health and safety is not an issue to lose the job. 79% of the respondents believe that additional cost may not cause to lose the job. This is a positive point with respect to the health and safety environment.

On the other hand, though it is mentioned as additional cost, ultimately it will be a saving by reducing cost of accidents and other related cost. It is important to note that project cost means overall cost of the project, not the individual item cost. Therefore project managers must be innovative with modern concepts rather than strive in to conventional criteria. Then they may realize that costing little bit for the health and safety gives much to both the employee and the employer.

Query 10: Do you believe that adopting safety practices will reduce the efficiency of the employees?

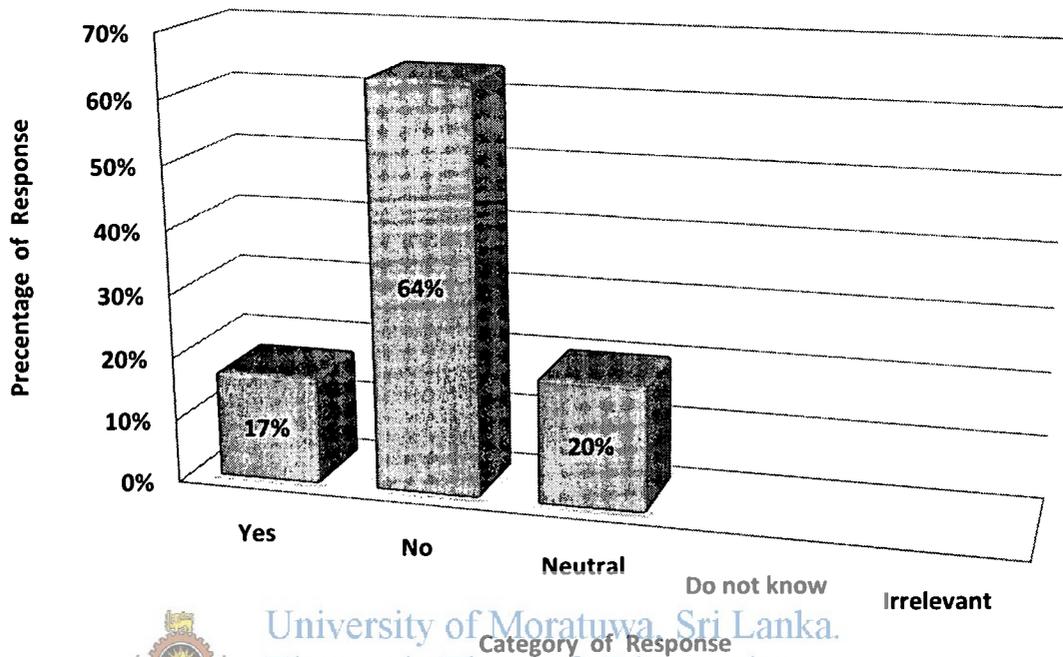


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Figure 29 – Adopting Safety Practices against Efficiency of the Employees

66% of the respondents believe that adopting safety practices will not a cause to reduce the efficiency of the workers. This query was entered; in preliminary discussions some persons said that adopting safety practices may lead to reduce the efficiency. However result of the query gives positive point, because if project managers believe that safety practices may affect the efficiency of the workers it will give negative impact.

Query 11: According to your experience, do you believe that safety wears are not fit to Sri Lankan climate?



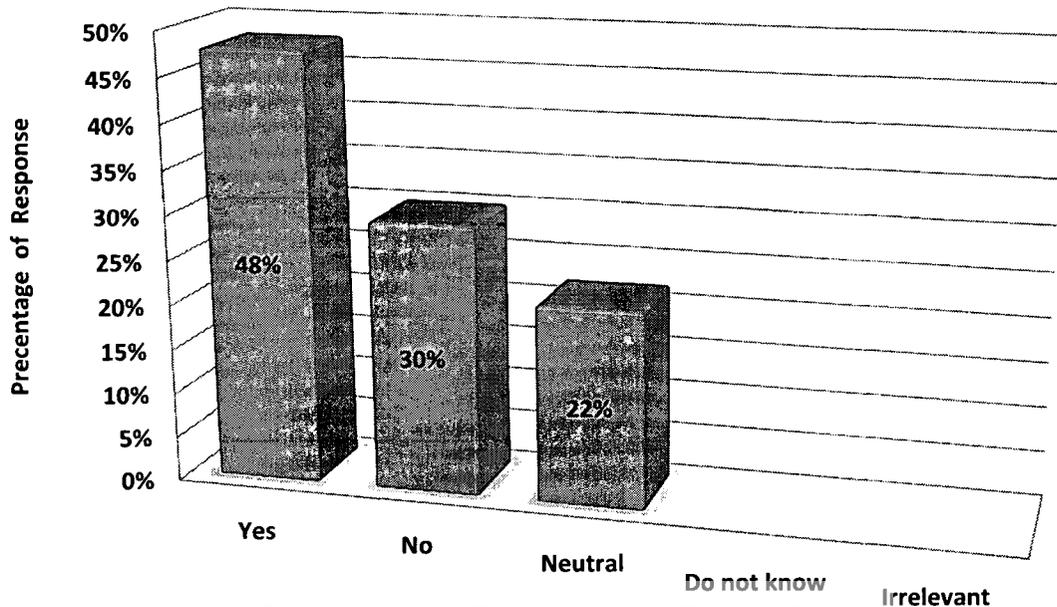
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Figure 30 – Suitability of Safety Wears To Sri Lankan Climate

64% of the respondents believe that safety materials are fit for Sri Lankan climate while 17% disagree. This is a positive factor; if workers say safety wears are uncomfortable it will be a negative impact. Therefore it maybe believed that safety wears, which are provided to workers, are fit to Sri Lankan condition.

On the other hand it is manager’s responsibility to provide quality safety wears to their employees to enhance the standards of the construction industry. In preliminary discussions some expertise raised this issue. According to their view, there must be standardization of safety wears when importing them. In practice, regulations are restricted mere to writings. Therefore importers tend to import low quality safety wears to concur the competition.

Query 12: Do you think that consultants are not strict on health and safety issues?

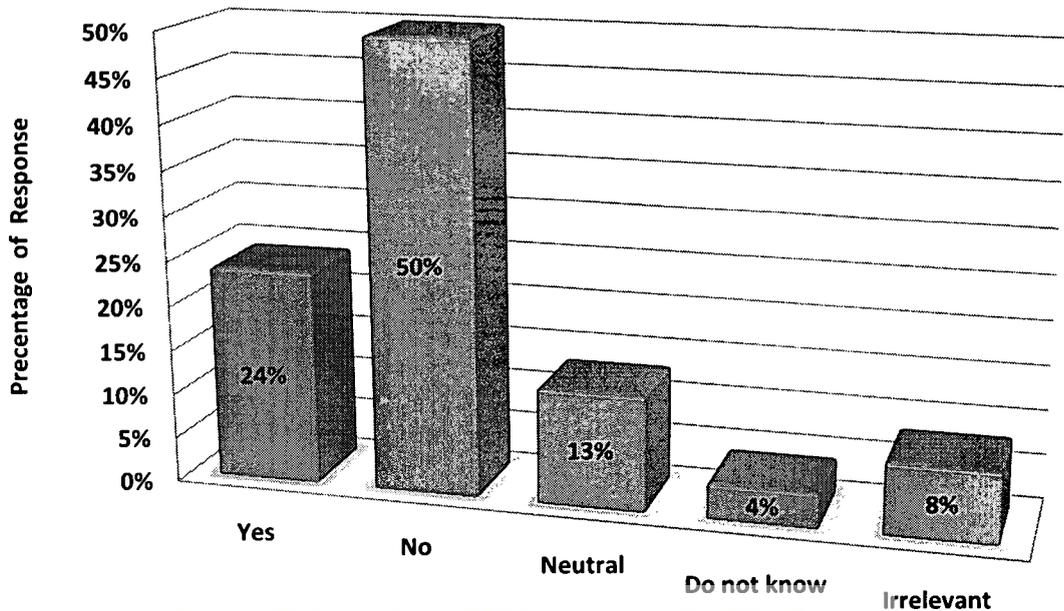


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Figure 31 – Consultant's Behavior Regarding the Health & Safety Issues

48% of respondents say that consultants are not strict on health and safety issues while 30% say they are strict. Again 22% are remaining in neutral. This is a vital factor. Most of expertise emphasis this issue at the discussions. This happens mainly due to project success are measured with respect to time, quality and costs. However these days project success is measured beyond these conventional criteria. New concepts, like zero accidents policy, have been introduced to construction industry. Sri Lankan construction industry must ready to absorb these concepts as quickly as possible for the betterment of the society. It is clear that consultant can play a major role regarding the health and safety issues. If they are strict on the subject, considerable improvement may be gained.

Query 13: Do you believe that your organization has enough resources to address the health and safety problems?



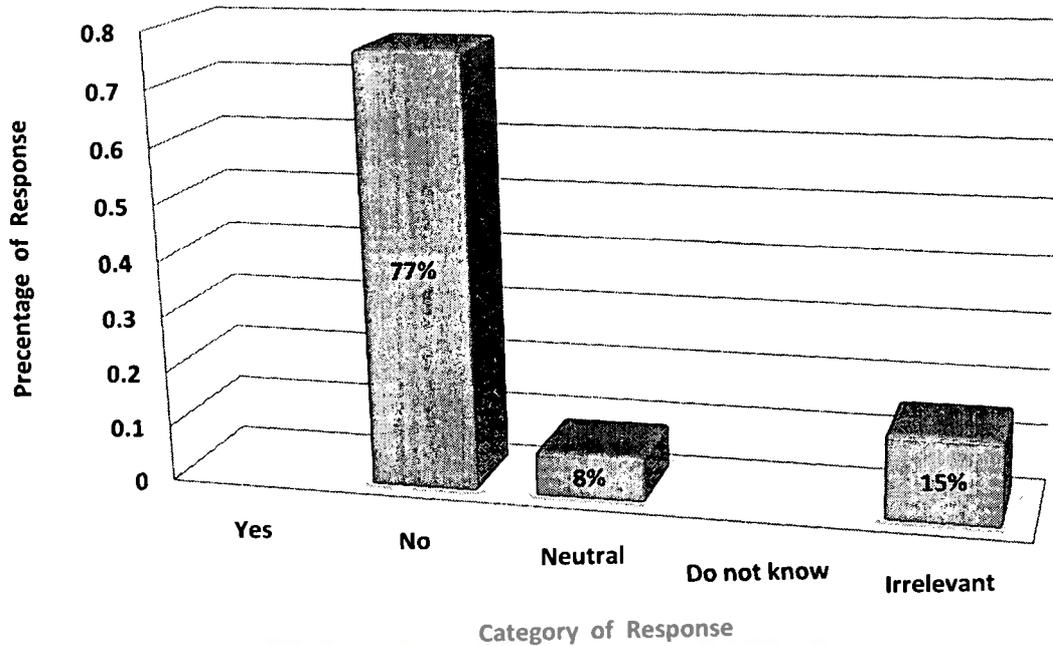
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Figure 32 – Resource Availability

This is an important issue. 50% say that they do not have enough resources to address the health and safety issues while 24% say no and 13% remain neutral. It is clear most of the projects suffer due to lack of resources. However positive factor is considerable amount has enough resources. This is mainly due to self-interest.

Most of managers reluctant to provide enough resources for health and safety as it do not give direct return in terms of profit. However it must be noted that this is a long term investment as it gives more benefits to both the employer and employee.

It is important to provide enough resource to projects to address the health and safety issues, otherwise it is pointless to talk about top management commitment, education or fund allocation since without resource nothing can be done.

Query 14: Are you shy to wear safety harnesses at site?

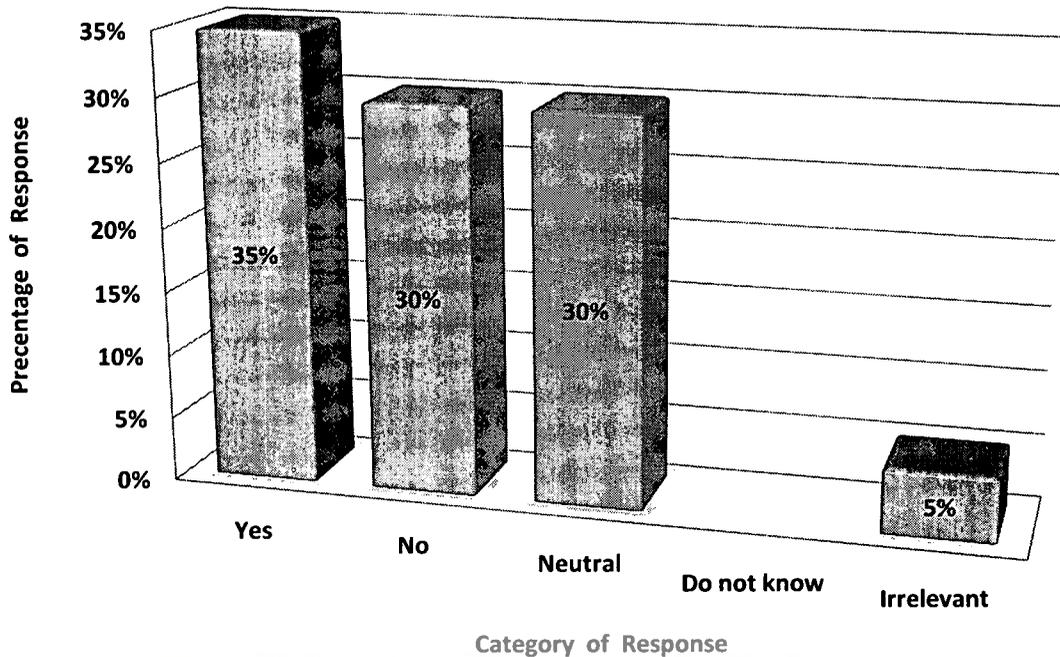


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This query was made since some persons said technical staff members are reluctant to wear safety due to shyness. However results of the quarry say that they do not shy. The important thing is, the technical staff must be an example to the workers.

Query 15: Does your top management people use safety wears at the site?



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Figure 34 – Top Management Willingness to Use Safety Wears

35% of respondent say that their top management people wear safety equipment While 30% say no and 30% remains neutral. Actually this is a negative factor. Top management people are the elite and educated people in the industry. When they hesitate to wear safety wears it reflects the attitudes of the society and the industry. Therefore it is an attitudinal change.

Leaders always must be an example. They are the people who guide the rest. Therefore it is important factor to adopt safety practices for the top management. 30% of respondents remain neutral. This is mainly due to that they do not wish to comment about their top management.

Query 16: According to your experience, do you believe that construction workers' education is enough to understand the importance of construction safety?

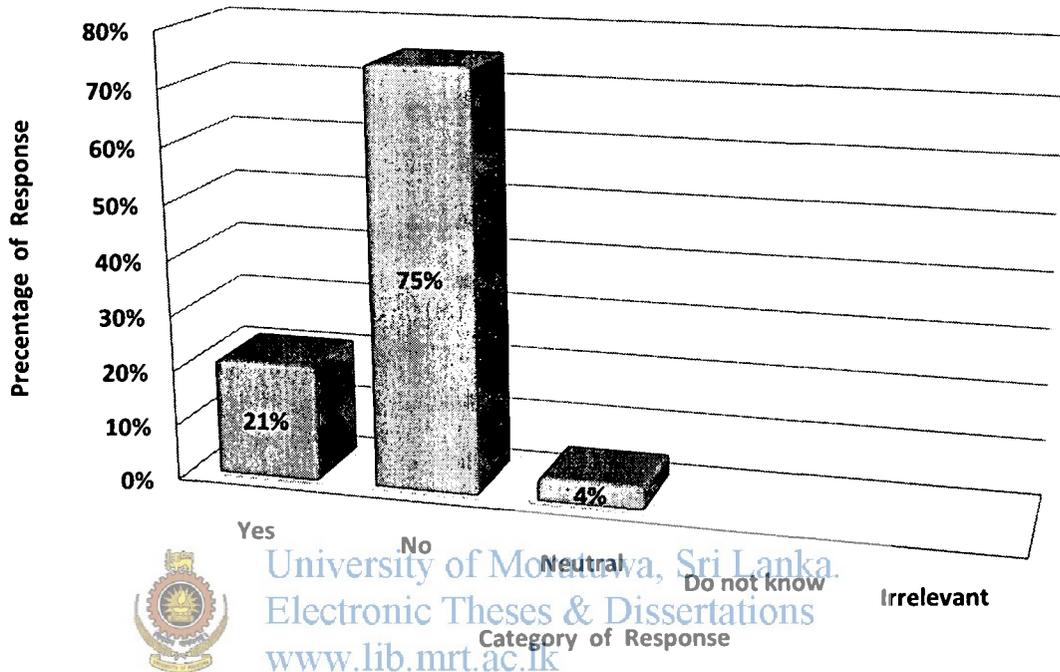
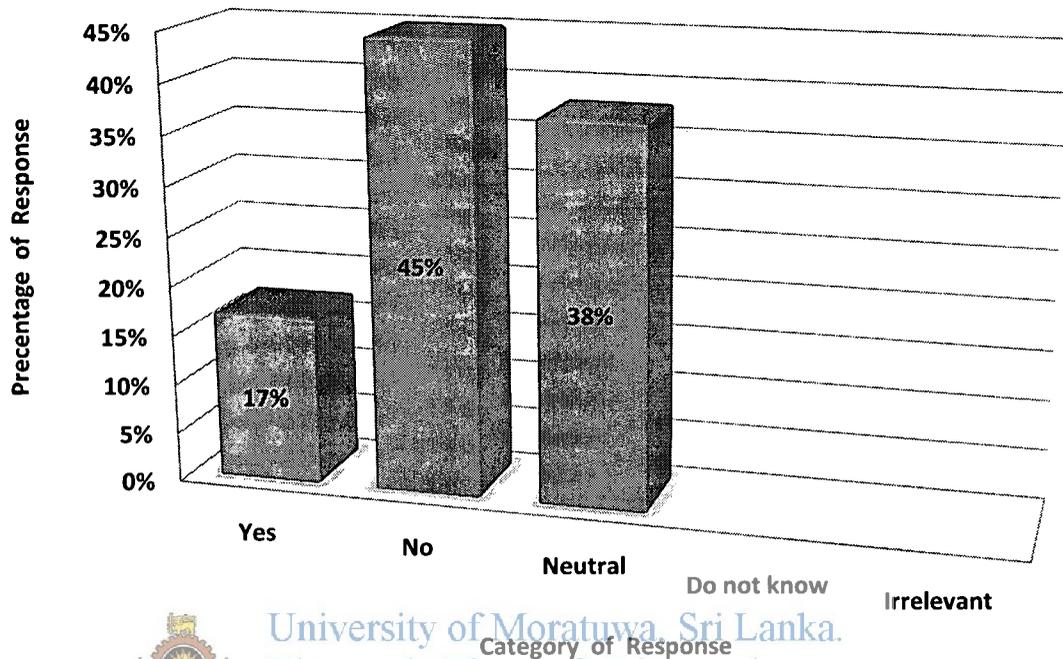


Figure 35 – Construction Workers Education Regarding the Health & Safety

75% of the respondents believe that workers education is not enough for better health and safety practices at the site while 21% believe it is enough. This is a negative impact for maintaining a better health and safe environment. Most of construction workers even technical staff members knowledge is not sufficient to understand the importance of health and safety of construction projects. It is common in Sri Lanka, least educated people involve in construction activities. They do not think of their own safety even.

Under above scenario, it is very important to educate the construction workers regarding the good health and safety practices. This must be a collective effort

Query 17: Do you satisfy of your safety equipment that have already been provided in your project/projects?

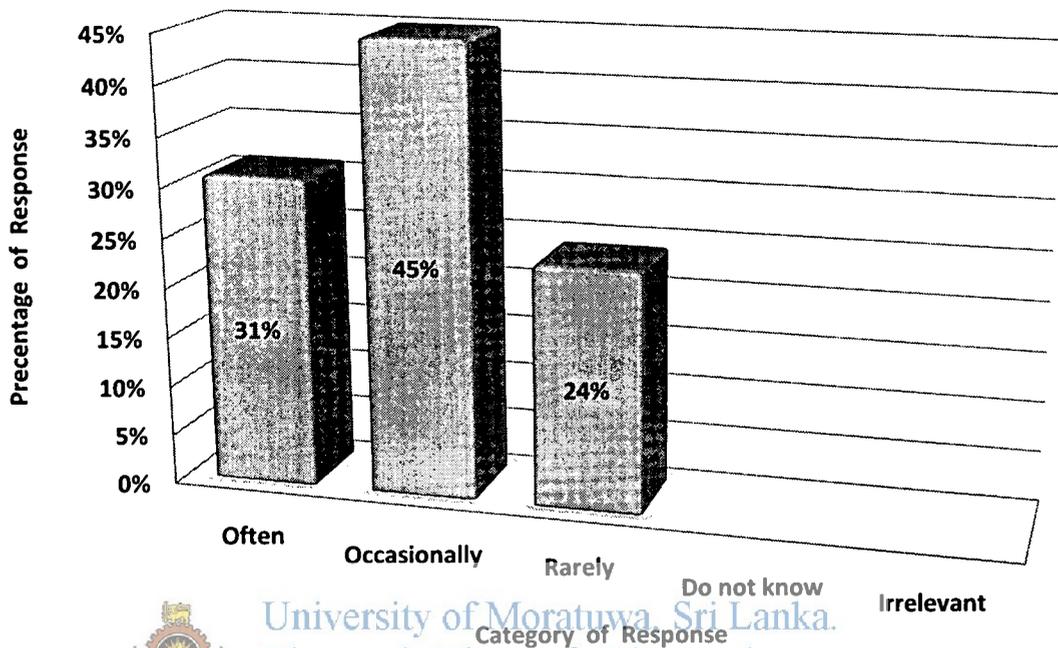


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Figure 36 – Respondents Satisfaction of Safety Equipment Which They Already Used

Only 17% of respondents are satisfying with their safety wears while 45% do not satisfy and 38% remains neutral. This may be the lack of concentration of their safety wears. However results of this quarry say that 83% of respondents are against with their satisfaction.

It is project managers' responsibility to provide quality safety wears to their workers, especially worm country like Sri-Lanka. On the other hand this quarry interrelates with other quarries like allocated amount for the safety, top management commitment etc. Project managers should keep in mind that productivity may be increased by providing comfortable products.

Query 18: Do you keep safety and health records which would facilitate the identification and resolution safety & health problems on the site?



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Figure 37 – Illustration of Record Keeping

31% of respondents say they keep safety and health records while 45% say they do not. Further, 24% say they do not know whether the safety records are maintained or not. This is very negative impact for good health and safety culture. It is essential to maintain health and safety records and analysis to find ways and means to mitigate the risk.

It is clear that any organization cannot be able to make a professional approach to mitigate the risk without past records. Past records more often help to analysis the current trends and take preventive actions. Only temporary solutions can be given without past records.

Query 19: Do you believe that client/engineer would consider the safety records of contractors at the time of tender evaluation?

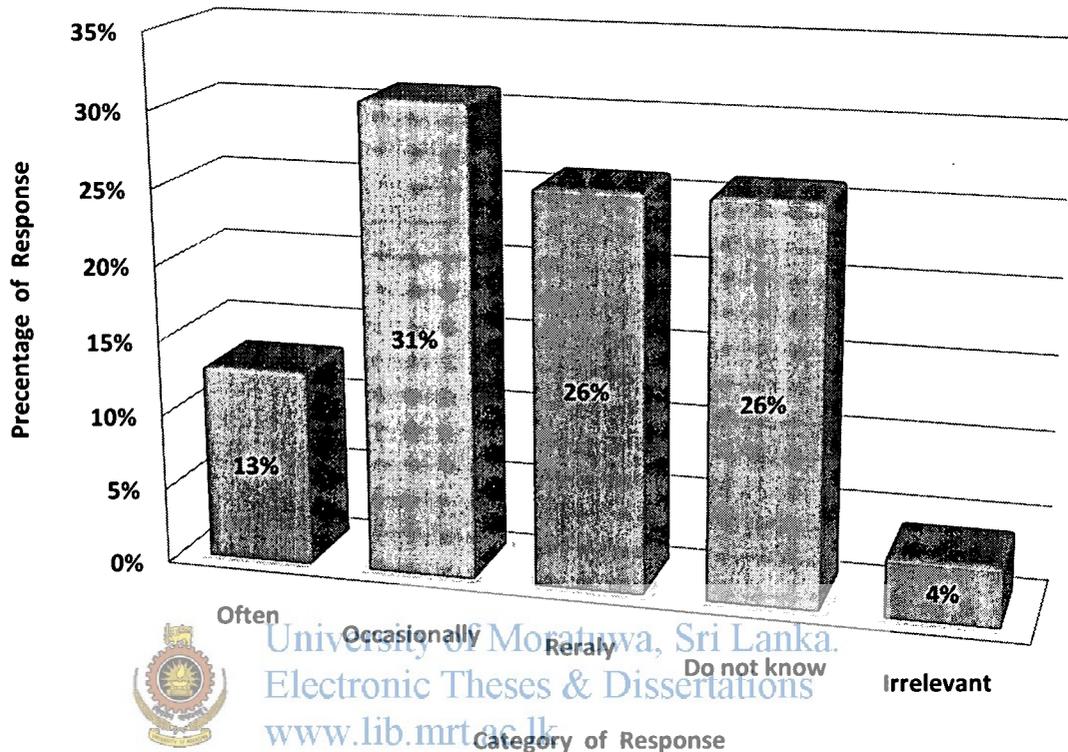


Figure 38 – Client/Engineer Behavior towards Health & Safety at Tender Evaluation

Only 13% believe that Client/ Engineer consider the safety records of contractors at the time of tender evaluation. 31% say that they do not believe Client/ Engineer consider the fact. While 26% remain neutral and 26% do not aware about the fact. This gives bad message to contractors. When they got to know that safety records are not an important issue for winning a job they simply neglect the matter. Therefore it is very important to consider the safety records of contractors at the time of tender evaluation. This may lead to keep better track record.

In client /engineer point of view, they should realize that selecting quality contractor leads to successful project completion selecting a quality contractor leads to successful project completion in terms of cost and quality. Therefore they must always consider the project end cost rather than the initial bid price.

Query 20: Do you believe that clients have a right to interfere the contractor's safety performance?

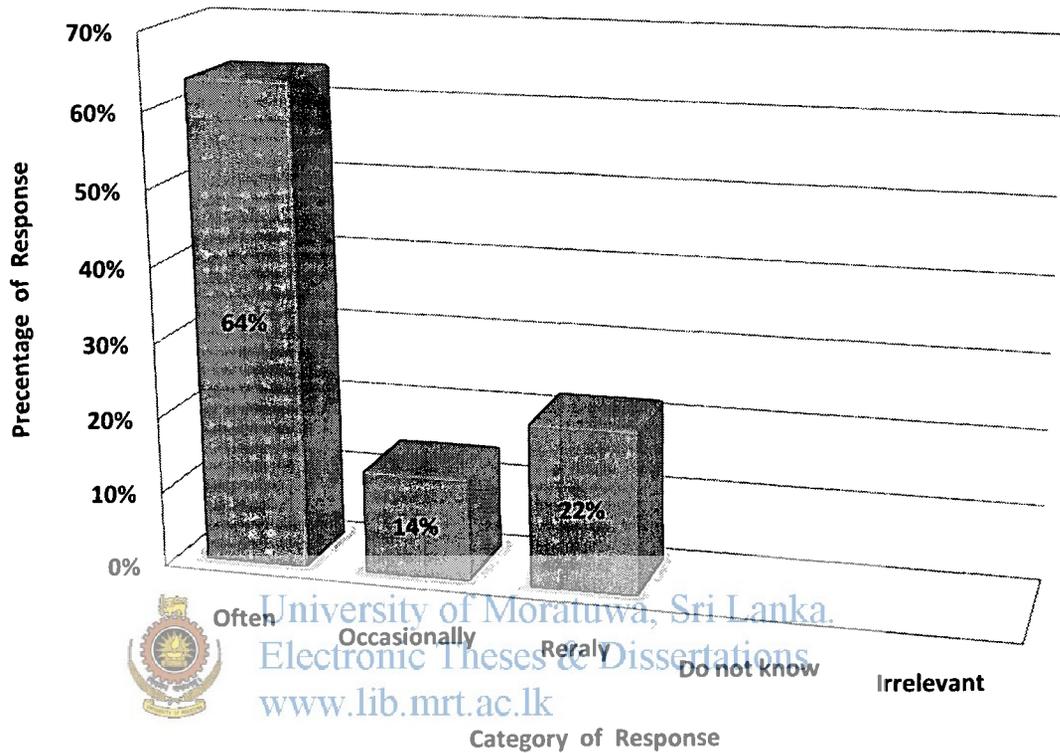
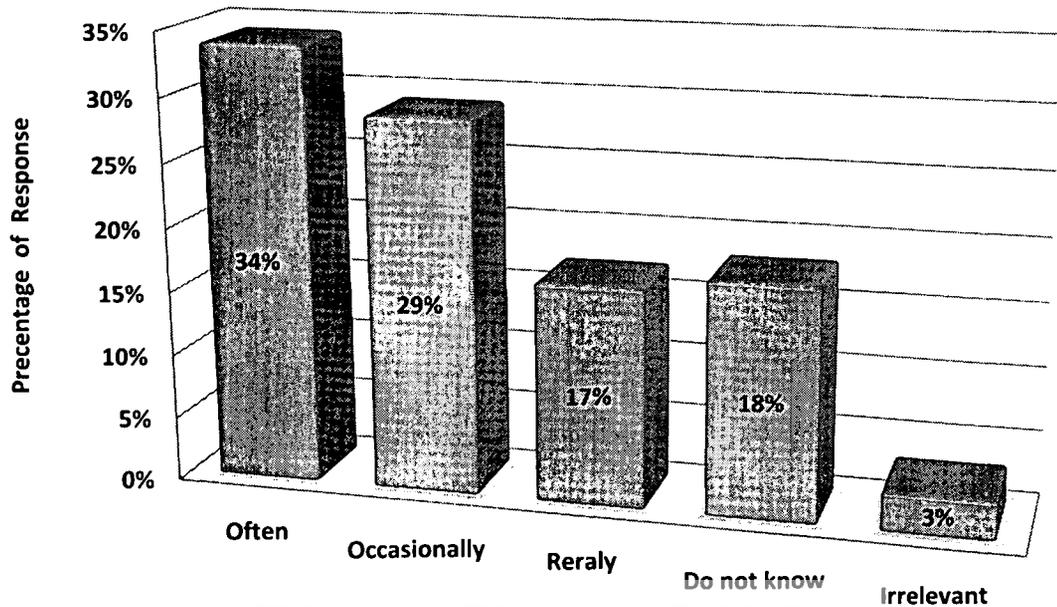


Figure 39 – Client Right to Interfere the Contractor's Safety Performances

64% of respondents believe that Client has such right. This is a positive factor. It is important Client's active participation of the project activities. He always has right to interfere the matter because more accidents lead to much damage to the Clients reputations.

Query 21: As you believe, do you think that clients have to bear the cost of accident directly or indirectly?

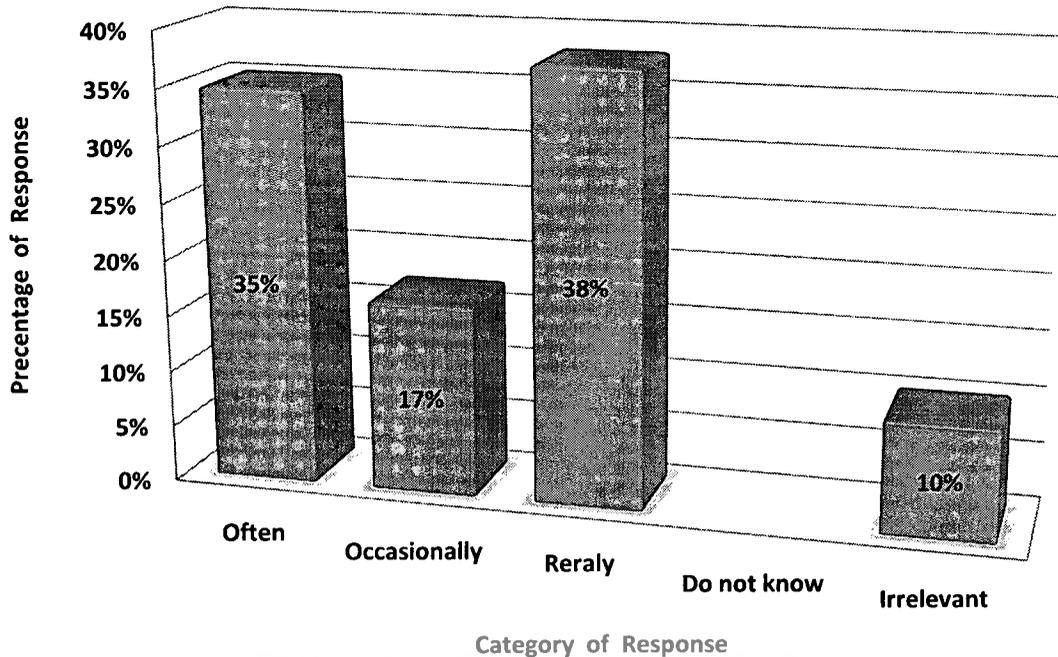


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Figure 40 – Illustration of Responses Received For Query 21

34% of the respondents believe that Client has to bear the cost of accidents directly or indirectly. 29% say Client has no responsible to bear the cost while 17% remain neutral and 18% say do not know. Actually Client has to bear the cost of accidents directly or indirectly. It may direct cost of accidents such as compensation, damages to the properties etc or indirect cost like delay in the project or damage to the reputation. Therefore if clients can be educated regarding this matter they may be actively involved.

Query 22: Are there dedicated safety officers in your project(s)?

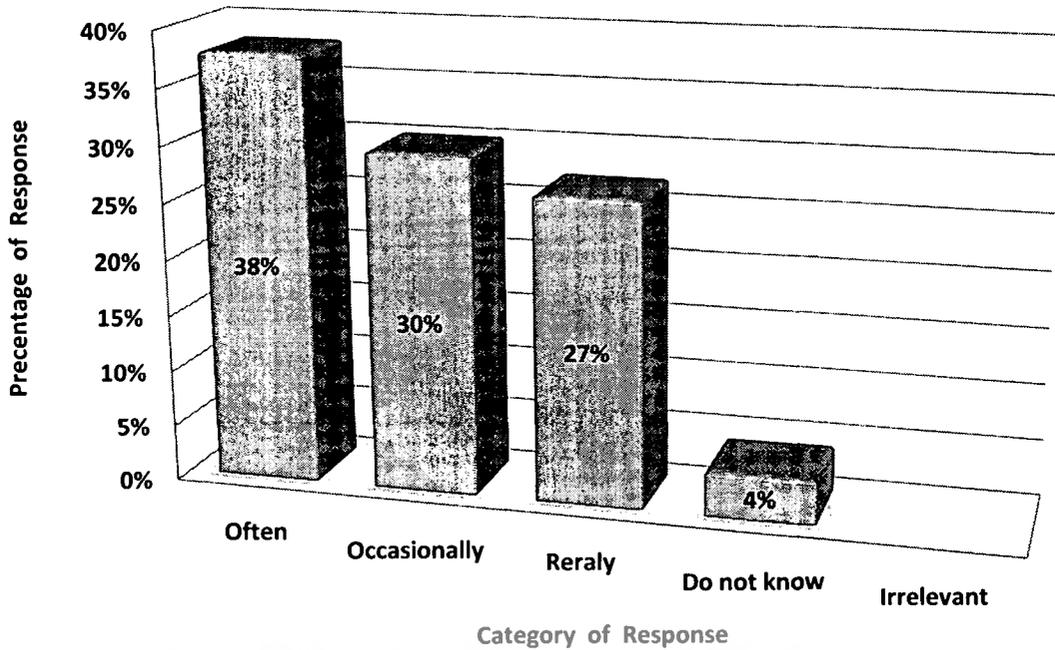


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35% say they have dedicated safety officers. 17% say don't have while 38% remain neutral. This is a serious issue. It is very important to assign a safety officer for each and every project. Then only proper planning and execution can be achieved. Otherwise it is pointless how much fund is allocated or how much resources are available. In Sri Lankan context, it is very difficult to find a safety officer for each and every project. If full time safety officers are available for projects they can plan, execution, maximize resource utilization and corrective and preventive action can be taken.

Project managers should be aware that investing for a safety officer may not be expenditure since he can save more than what expend for him by proper utilization of recourses, and minimizing accidents, reworks etc.

Query 23: Are there safety guide lines available in you project(s)?



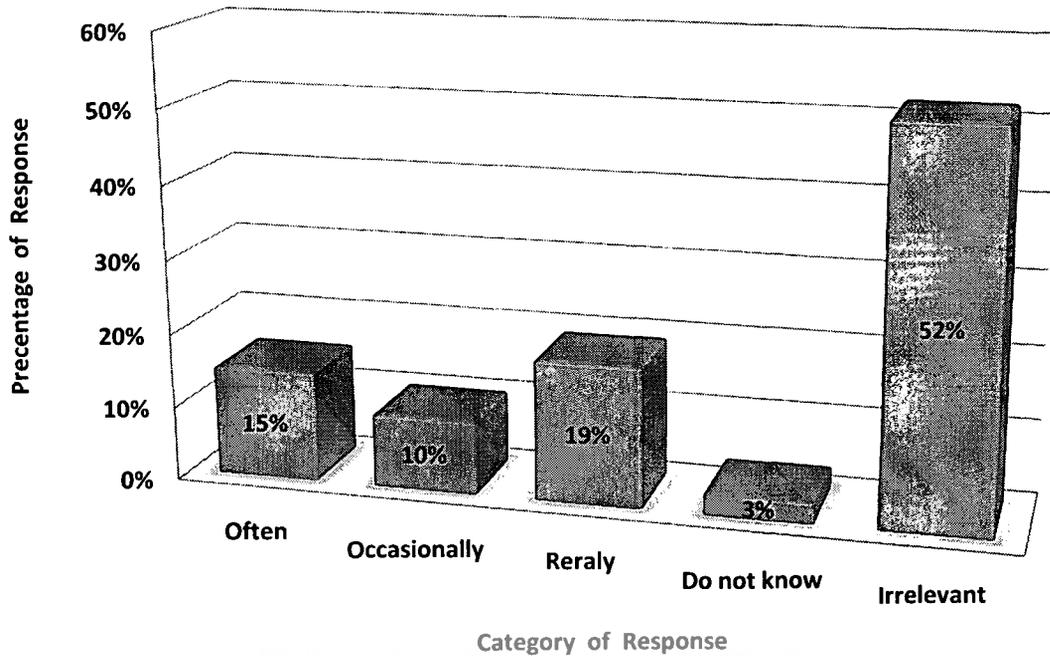
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Figure 42 - Availability of Safety Guide Lines

Only 38% say that they have safety guide lines. Collectively 62% say they do not have. This is negative factor. It is very difficult to maintain a healthy and safe environment without a good safety guide line. Safety officer cannot do a proper plan or execute the plan without a safety guide line. Therefore safety guide line must be available for each and every project.

Safety guide line is a very important tool for a project to prevent accidents. Therefore it must be mandatory. It is safety officer's responsibility to educate the site personals regarding the safety guide lines. He should ensure that project activities are carried out according to the safety guide lines.

Query 24: If the answer for Q 23 is Often, then do you follow those guide lines?

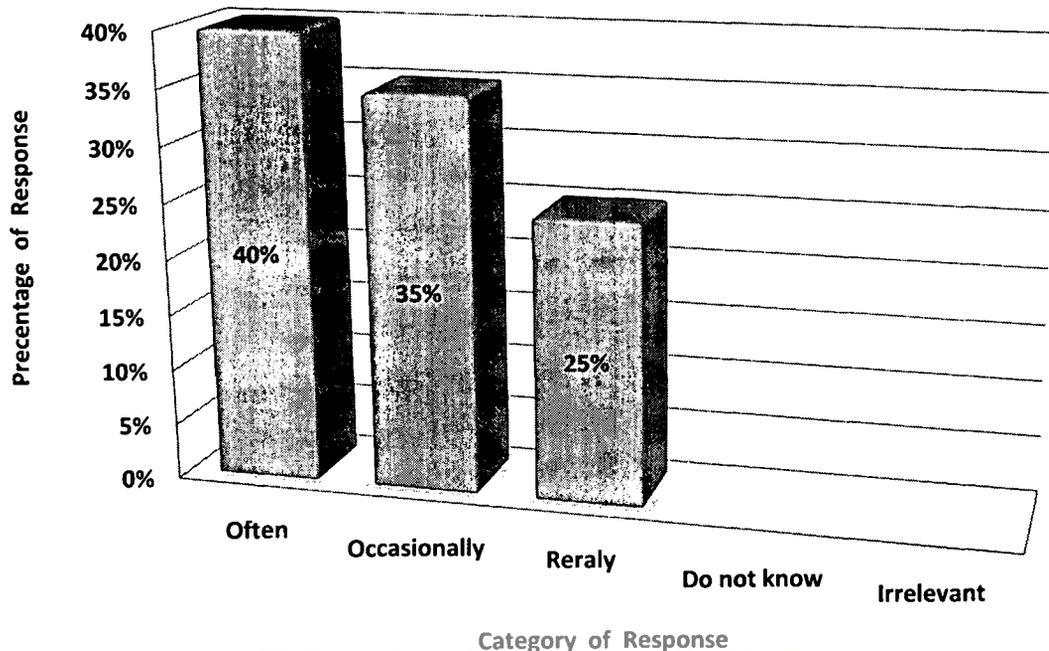


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Figure 43 – Follow up of Safety Guide Lines

This query is interrelating to previous query. Only 15% of the respondents say that they practice the safety guide line. This implies the poor performance of the projects. It is pointless to keep safety guide lines without practicing. This is mainly due to the unavailability of dedicated safety officers. Most of construction projects, no body is responsible for the safety issues. All the persons are targeting the physical progress and profit. It is very essential to ensure that maintaining the safety guide line and practicing those guides as well.

Query 25: Do you discuss about safety issues at contractor client meetings?



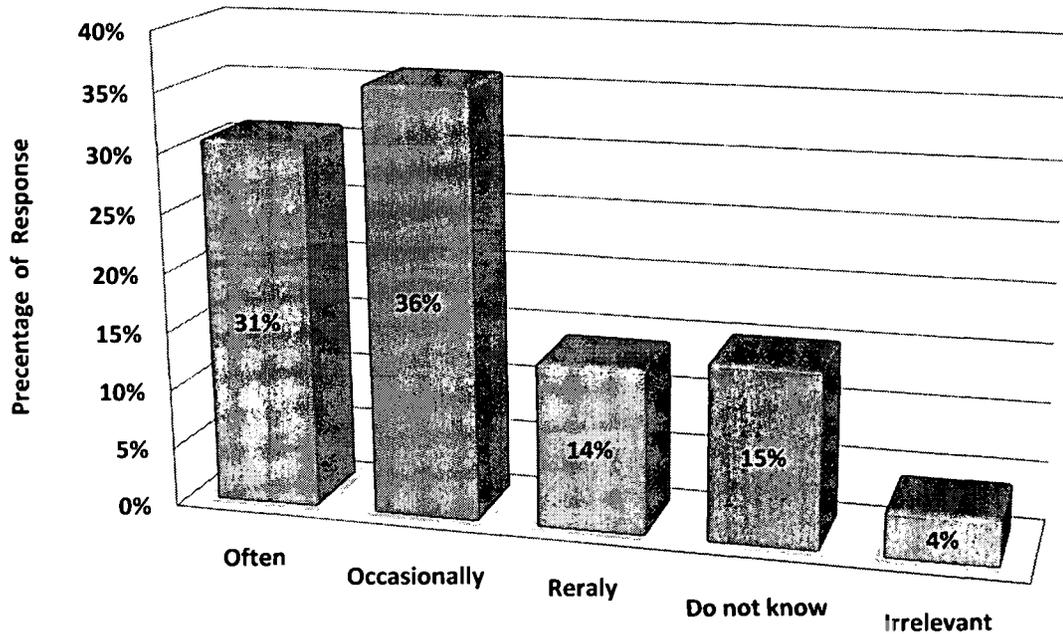
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Results of this quarry highlight the interest of the Client, Engineer and Contractor regarding the health and safety issues. Collectively 60% are not aware of the health and safety issues at the meetings. If these parties are concerned about health and safety, definitely it should be discussed about the non-conformities. Then effective decisions can be taken at that meeting. These decisions are more effective since all parties agree to those decisions.

Query 26: Do you conduct safety audits during the construction period?



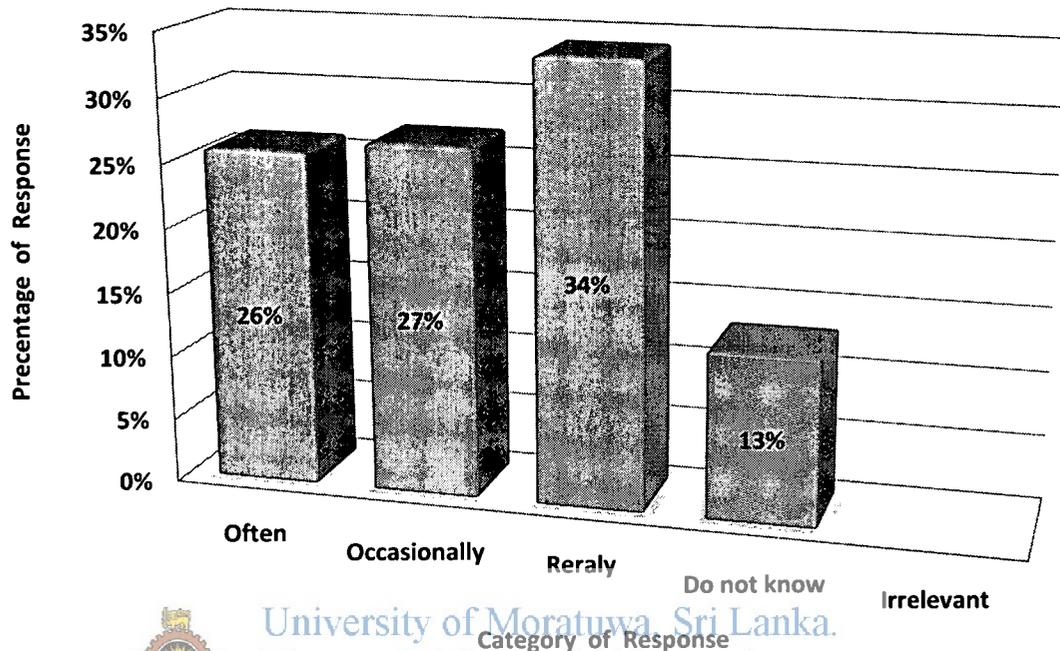
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Figure 45 – Practicing of Safety Quality

Only 31% say that they conduct safety audit during the construction period. 36% say they do not conduct while 14% remain neutral. Safety audit is very essential during project period. It will help to identify the shortcoming and lapses of the safety guidelines and practical problem when implementing. However results give negative impact that only 31% conduct audit.

When safety audits are carried out in regular intervals project management can ensure that projects are in line with the safety program. Top management can review all the audit reports of their organization in order to make necessary policy decisions to improve the condition of safety within the organizations.

Query 27: In your experience, how many projects were included safety guide lines in the body of the contract agreement?



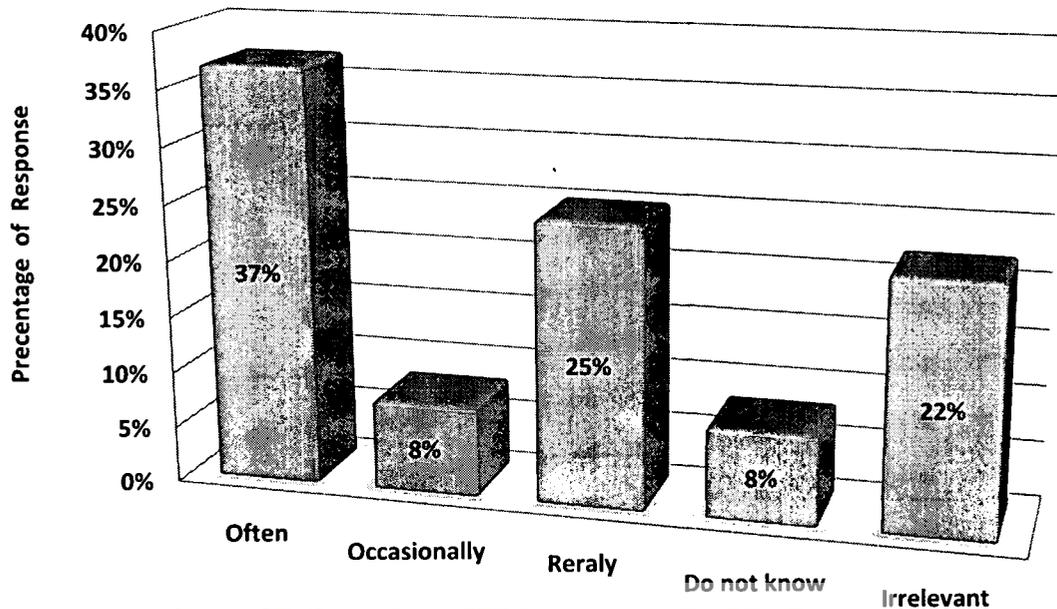
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Figure 46 – Inclusion of Safety Guide Lines in the Body of Contract Agreement

Only 26% say that safety guide lines are often included while others in negative side. This result implies that consultants are not strict in health and safety issues. This creates a loop hole for contractors to escape from health and safety issues.

By including safety guide lines in the body of the contract agreement, engineer may have wider space to influence the contractor in respect of the health and safety issues. On the other hand contractors have to pay attention on health and safety when preparing cost proposals since they know that they are liable to health and safety.

Query 28: Do you obtain permission from safety officer prior to the potentially hazardous activities?



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Figure 47 – Illustration of Responses Received For Query 28

Only 37% say that they obtained prior permission from the safety officer while 63% in negative side. This implies that site activities are carried out without concerning the gravity of the hazardous activity. If the contractor follows safety guide lines and safety audits are conducted; these kinds of incidents may be avoided. Engineer could actively involve regarding this through method statements. They can seriously consider the statement whether the particular activity is carried out safely.

Query 29: It is clear that workers are willing to adopt safety practices when they work in foreign companies. Why is it?

Most of respondents say that this is due to the strict discipline and higher wages. It is difficult to survive without practicing proper health and safety practices. If the worker reluctant to obey the give instruction he may happen to vacate the job. But considering the wages, workers tend to obey the given instruction. Further it is learnt that these organizations are well equipped with enough resources.

4.3 Summery

Under this chapter analysis were done according to respondents' responses. Majority (36%) of respondents have 6-10 years experience and 16% of respondents have more than 20 years experience.

39% of respondents represents contractor while 32% represents engineer/consultant. In addition 71% of respondents have more than 20 years experience in construction industry.

This chapter focused on respondents attitudes and views. This was done because they are the persons who can influence the construction industry.

Further questionnaire was formulated to cover almost all the aspects of health and safety. Preliminary discussions were greatly helped when formulated questionnaire. It was included the areas such as education, training, legal requirement, top management commitment, availability of resources, contractual requirements etc.

CHAPTER 5

Conclusion and Recommendations



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CHAPTER 05 - Conclusion & Recommendations

5.1 Conclusion

During this research, author could identify that, though “safety first” concept must be given the most priority, probably it is the least. This is due to several reasons. It should be kept in mind that every project is unique and each and every project has its own characteristics. Not like conventional working environment, projects have ever changing environment, both physical and personal. In addition, author could learn from literature review that strong culture within the organization must be ensured to assure long lasting health and safety environment. Otherwise it’s mainly depending on personal character. Therefore every organization must focus to cultivate strong culture towards better health and safety environment.

It could be identified that considerable number of respondents believe that conditions of ICTAD and FIDIC are not enough to encourage contractors to perform better health and safety practices. However author leaves this area for future researchers. Further it was identified that allocated funds are not enough to implement good health and safety program.

It is learnt that both technical persons and workers have poor training and knowledge regarding the health and safety. Further, situation has been worsening by poor attention given by top management towards the training of health and safety.

Poor training and education implies that attitudes of site personnel are not positive for better health and safety environment. It is almost always negative. This is the main reason why construction personal reluctant to adopt safety measures.

Consultants are not strict on safety issues. Further it is revealed that most of consultants/clients do not consider contractors safety records at the time of tender evaluation period. They usually tend to select the lowest price proposal. In addition to above it is learnt that less priority has been given for health and safety issues at the monthly progress meetings. They always focus on conventional project successes criteria such as time, quality and cost. Most of contract agreements include the clause that contractor must obtain prior approval from the engineer before carrying out

hazards activities but it restricted to mere writing since both the engineer and the contractor do not consider it seriously.

Most of the projects run without having a safety officer. Therefore no proper coordination at health safety ends. This leads to improper planning and execution. It is common that projects run without safety guide lines. This situation may be avoided if dedicated safety officer available at the site. If so, he would have planned and execute the safety program. Informal discussion was revealed that safety programs are not updated or even safety guide lines are available but it is not practiced since nobody has been appointed to monitor the implementation. It is common that most of the workers are not aware of safety program or they do not even know that such a thing is available.

It was revealed that most of construction companies do not have enough resources to maintain a good health and safety environment. This is interrelate with the less allocation for health and safety in B.O.Q. most of top management people do not wear safety equipment at the construction site. Further it was revealed that most of site personal do not satisfy with provided safety wears.

In addition to above following reasons can be listed for occurring large number of accidents in Sri Lankan construction industry.

- Not being adaptable to strict control like in other countries.
- Sub contracting of parts of the project.
- Unfamiliarity of modern construction tools and practices.
- Poor education and lack of understanding of the construction nature.
- Restrains of spending on safety measures due to temporary nature of the work.
- Workmen are different at different stages of work and thus work proceeds without coordination, which affects the safety.
- The constant changes of the scene and location of construction sites and work site conditions.
- Temporary and casual workers are generally untrained and this leads to accidents at the work site.

5.2 Recommendations

Following recommendations are made as a result of this research.

- **Preparation of bill of quantities**

Provisions for safety and health items must be a mandatory item under the preliminaries in B.O.Q. Further allocated amount should be thoroughly evaluated whether allocated amount is good enough to implement the health and safety program.

- **Tender evaluation**

Current tender evaluation system must be revised. At present there is tendency to select lowest cost proposal. This would affect the quality of the project and contractors try to allocate the least amount or neglect the health and safety system of the project. To avoid this situation it is recommended to separate the OHS system amount from the main B.O.Q. Contractors may be instructed to produce their OHS system proposal and cost proposal along with the main bid. Then tender evaluation team may evaluate main bid and OHS system separately and finally these two can be joined together through some kind of point system. This system may be helpful for both contractors and consultant because project has been given clear OHS proposal and fund allocation.

In addition to above attention must be paid for followings.

- It is proposed to pay more attention on health and safety when designing academic curricula. It is very important to change the negative attitudes of the society towards health and safety. The best place for it is; academic institutes.
- Organization such ICTAD, IESL, and technical institutes may actively participate in health and safety by conducting more and more workshops, awareness program and short courses.
- It is recommended to appoint a dedicated safety officer for each and every project. Further health and safety guide line must be available for

each and every project too. Then safety officer shall be able to monitor the progress of health and safety.

- It is recommended that every technical person must undergo minimum number of training hours relating to health and safety. This might be help to enhance the condition of site.
- Designers must pay attention to health and safety when carrying out the design. Moreover they must pay attention not only construction phase but for maintenance too. Further this can be regularized by a law like Construction (Design and management) Regulation.
- It is recommended to establish a safety guide line, and code of practice at national level for client, Contractor and engineer. This will be helpful to eliminate most of lapses and shortcomings in construction industry with respect to the health and safety.
- Separate law for the construction industry must be introduced.

5.3 Recommendation for future research



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Further research can be focused on following research areas,

- Do a research to find how to revise the FIDIC and ICTAD documents to address the current lapses and the shortcomings
- This research can be further extended to other areas such as road construction, water resources and construction companies bellow C3 category.

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Appendices



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This is only for study purpose

Questionnaire Survey on Health and Safety matters in Construction Projects in Sri Lanka

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Supervised by Dr. L. L. Ekanayake

Section 1 – General Information of Yourself

Please note that you may refrain from answering query 1,3,4,5,6 if you wish to keep the confidentiality.

[1] Name:

[2] Designation:

[3] Organization:

[4] Address:

[5] Phone: Office:

Mobile:

[6] E-Mail:

[7] Your experience related to construction industry

0-5 Years 6-10 Years 11-15 Years 16-20 Years 20+ Years



Section 2 – General Information of Your Organization

[1] Your organization represents

Employer Engineer/Consultant Contractor Sub-Contractor

Other, please specify,

[2] How long do your organization in the field of construction?

0-5 Years 6-10 Years 11-15 Years 16-20 Years 20+ Years

[3] Present qualification (ICTAD Grade),

Please specify, if applicable,

Section 3 – Views on Construction Health and Safety

[1] Do you believe that pre planning helps to improve the efficiency, quality, and reduce the cost of the project?

Yes No Neutral Do not Know Irrelevant

[2] Why do your construction project / projects , truly want to have health and safety Policy? [You may tick one or more]

- Client's requirement
- Contractor's own interest
- Contractual requirement
- Legal requirement

Other,

pl.

specify,



[3] Do you believe that top management has committed in regard of health and safety?

Yes No Neutral Do not Know Irrelevant

[4] Are contractual clauses on health and safety in FIDIC and ICTAD condition of contract sufficient to cover the health and safety issues?

Yes No Neutral Do not Know Irrelevant

[5] Is allocated amount in B.O.Q of your current construction project(s), sufficient to implement health and safety policy?

Yes No Neutral Do not Know Irrelevant

[6] Do you think that project managers have enough time to concentrate on health and safety issues?

Yes No Neutral Do not Know Irrelevant



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[7] Do you think that your technical staff has been given enough training with respect of health and safety?

Yes No Neutral Do not Know Irrelevant

[8] Do you think that construction workers are reluctant to adopt safety measures?

Yes No Neutral Do not Know Irrelevant

[9] According to your experience on current practice, do you believe that additional cost incurred in safety will cause to loose the job?

Yes No Neutral Do not Know Irrelevant



[10] Do you believe that adopting safety practices will reduce the efficiency of the employees?

Yes No Neutral Do not Know Irrelevant

[11] According to your experience, do you believe that safety wears are not fit to Sri Lankan climate?

Yes No Neutral Do not Know Irrelevant

[12] Do you think that consultants are not strict on health and safety issues?

Yes No Neutral Do not Know Irrelevant

[13] Do you believe that your organization has enough resources to address the health and safety problems?

Yes No Neutral Do not Know Irrelevant



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[14] Are you shy to wear safety harnesses at site?

Yes No Neutral Do not Know Irrelevant

[15] Does your top management people use safety wears at the site.

Yes No Neutral Do not Know Irrelevant

[16] According to your experience, do you believe that construction workers' education is enough to understand the importance of construction safety?

Yes No Neutral Do not Know Irrelevant

[17] Do you satisfy of your safety equipments that have already been provided in your project / projects ?

Yes No Neutral Do not Know Irrelevant



[18] Do you keep safety and health records which would facilitate the identification and resolution safety & health problems on the site?

Often occasionally rarely Do not Know Irrelevant

[19] Do you believe that client/engineer would consider the safety records of contractors at the time of tender evaluation?

Often occasionally rarely Do not Know Irrelevant

[20] Do you believe that clients have a right to interfere the contractor's safety performance?

Often occasionally rarely Do not Know Irrelevant

[21] AS you believe, do you think that clients have to bear the cost of accident directly or indirectly?

Often occasionally rarely Do not Know Irrelevant



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[22] Are there dedicated safety officers in your project(s) ?

Often Occasionally rarely Do not Know Irrelevant

[23] Are there safety guide lines available in you project(s) ?

Often Occasionally rarely Do not Know Irrelevant

[24] If the answer for Q 23 is Often, then do you follow those guide lines?

Often Occasionally rarely Do not Know Irrelevant

[25] Do you discuss about safety issues at contractor client meetings?

Often Occasionally rarely Do not Know Irrelevant

[26] Do you conduct safety audits during the construction period?

Often Occasionally rarely Do not Know Irrelevant



[27] In your experience, how many projects were included safety guide lines in the body of the contract agreement?

Often Occasionally rarely Do not Know Irrelevant

[28] Do you obtain permission from safety officer prior to the potentially hazardous activities?

Often Occasionally rarely Do not Know Irrelevant

[29] It is clear that workers are willing to adopt safety practices when they work in foreign companies. Why is it?



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[30] What suggestion would you propose for future improvement in safety and health at your site?

