



**COST OF ACCIDENTS AND INVESTMENT ON
SAFETY IN CONSTRUCTION INDUSTRY - A CASE
STUDY IN SRI LANKA**

MASTER OF BUSINESS ADMIN STRATI ON
IN
PROJECT MANAGEMENT

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2009

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Abstract

Construction accidents cause considerable damages to the contractor as well as the project and employees. It has a direct financial cost to the contractor and other indirect costs as well as social cost to the country. This study attempts to collect and analyze data regarding the safety investment and cost of accidents in construction industry. Altogether, 32 projects and 75 accidents including 9 fatal were investigated to find out the safety investment and the cost of accident in each project. On each site, the safety investment was calculated by dividing the total safety investment by contract sum and accidents loss ratio was calculated by dividing the total financial loss caused to contractor due to accidents by contract sum. The total accident loss ratio was calculated by dividing the total of financial loss caused to contractor and social cost related to accidents by contact sum of the projects.

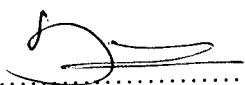
It was found that the average investment on safety in construction projects is 0.66 % of contact sum and the relationship between safety investment and contact sum to use as a guide line to calculate the amount required for safety performance.

The average accident loss ratio, which includes only the direct financial cost borne by the contractor, was found as 0.5% of contract sum and it increase up to higher than 1.2% in 10% of project mostly due to the fatal accidents. The average total accident loss ratio, which includes both direct cost borne by contractor and the social cost related with accidents, was found as 1.98 % of contract sum and it increase up to higher than 4% in 10% of projects. The relationships between accident loss ratio against safety investment ratio were found to have an idea about the effectiveness of safety investment for reducing of accidents

Only the investment of money on safety is not sufficient to reduce accidents. It is also depend on the component of management, worker's attitude and interference of government authority, client and consultant.

DECLARATION

“I certify that this thesis does not incorporate without acknowledgement, any material previously submitted for a degree or diploma in any University to the best of my knowledge and belief and it does not contain any material previously published, written or orally communicated by another person or myself except where due reference is made in the text. I also hereby give consent for my dissertation, if accepted, to be made available for photocopying and for interlibrary loans, and for the title and summary to be made available to outside organizations”



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To the best of my knowledge, the above particulars are correct.

UOM Verified Signature

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11-02-2009

Date

ACKNOWLEDGEMENT

I am pleased to acknowledge the people who helped me in many ways to bring this research to success.

First of all I would like to thank all the staff members in the department of Civil Engineering – University of Moratuwa. Special thank shall be given to Dr. (Mrs.) Chintha Jayasingha, Dr. Asoka Perera, and Dr. Lesly Ekanayake who guided and helped me in different ways. I thank all the academic staff of the MBA in Project Management, who spent their valuable time by providing and teaching subject matters.

Secondly, I would like to thank Eng. Basil Perera, the executive director of Transwater Engineering, who helped by giving advise for research and preparation of the dissertation.

Thirdly, I express my gratitude to Commissioner of Industrial Safety and Chief Factory Inspection Engineer, Mrs. Sujatha Wijesundara and specialist, factory inspection engineer on research and training Mr. Asoka Peris, of Industrial Safety Division – Ministry of Labour, who helped me by providing information regarding the fatal accidents, occurred in construction industry and other records of accidents. I wish to express my gratitude to staff members of library-University of Moratuwa, and library-IESL.

Finally I thank all the project managers, safety officers, engineers and other officials who responded by answering questionnaires. I express my gratitude to my friends and batch mates who coordinate to collect the data and helped me in different ways.

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List of Abbreviations

ALR	Accidents loss ratio
CITB	Construction Industry Training Board
CITP	Construction Industry Training Project
GDP	Gross Domestic Products
HRD	Human Resource Development
ICTAD	Institute for Construction Training and Development
ISD	Industrial Safety Division - Ministry of labour
LMIS	Labour Market Information System
SIR	Safety Investment Ratio
TALR	Total Accident Loss Ratio
TC	Total costs of site accidents in a project



1.0 Introduction

1.1 Background

By nature accidents are unplanned and uncontrolled events and in terms of operational probability, it is a class of events which incur at low level of expectancy, avoidability and intention (Laufer & Ledbttter, 1997). Accidents to workers in the Construction industry have broad and adverse impacts, which include personal suffering of the injured workers, construction delays and productivity losses incurred by the contractor, higher insurance premiums which result from costly injuries and possible liability suits for all parties involved in the project. There are many other impacts such as revenue losses on the part of the owner for late project completion, reduced morale of work force and so on.

To minimize the occurring of accidents and reduce their effects to the project, the proper safety regulation should be implemented. Peoples do not realize the financial cost of these accidents and do not have proper idea of amount which is necessary for implementation of proper safety regulations. Therefore it is important to have a study on this and provide the guide line and idea about safety investment and the financial loss of accidents.

1.2 Problem Identification

Normally, clients expect a contractor to finish the work within a specified period of time, at an agreed price, with a certain standard of workmanship and perform the work with maintaining safety. A Contractor must therefore attain the cost level as planned, meet the scheduled deadlines, achieve the required quality level and provide reasonable safety measures on sites (Tam & Ivan, 2000). However, many personnel in construction industry focus only on immediate problems, and view their top priorities as meeting the progress schedule, quality and cost targets. Only after achieving these objectives they provide some consideration to safety.

On the other hand, most of Sri Lankan Contractors including M1 category, do not make proper attention regarding the cost involvement for proper safety practice during the time of bidding. Some times Contractors purposely neglect this for making competitive price for their tenders and after winning the contract and during the implementation of project, they realize the cost of safety practice.

Also people do not realize the cost of accidents means the financial loss occurred due to these accidents. There are two kinds of loss occurred due to accidents and one is the direct visible cost such as compensation to injured persons, damage of machinery and finished goods or materials, idling of other labourers and machineries. In addition, there are some indirect costs such as delay in project progress, reducing of workers' moral which lead to low production rate, damage to the image of company and higher insurance premiums.

The cost of accidents is one of useful measures for determining the importance of accident prevention efforts. However, the cost of construction accidents are difficult to determine, because there are no proper recording system of data in most of construction sites and some monetary value of damages occur due to accidents are difficult to determine such as loss of workers moral due to accident and damage to the company image.

Investment on safety in construction site is also important factor to reduce accidents. For better safety practice it is compulsory to have investment for safety but most contractors do not realize this and they consider it as wasting of money.

There are few numbers of researches have been done on the safety issues of construction industry in Sri Lanka, but no one has considered the cost of accidents and the amount of money are invested on safety in construction sites. This research will be focused and quantified the magnitude of the cost of construction accidents and their implications.

1.3 Objectives of the Study

Based on the problems which have been identified, this research will be aimed at the following objectives to,

- Analyze the Investment on Safety and Cost of Accidents in construction projects in Sri Lanka.
- Determine the relationship between Cost of Accidents and Investment on Safety
- Make recommendations for investment on safety.

1.4 Scope of the Study

Construction accidents cause considerable damages to the Contactor as well as the project. It has a direct financial cost to the contactor, other indirect costs, and also social cost to the country. There are several reasons for neglecting safety practice such as financial issues, company culture and people's attitude.

This study attempts to identify and analyze data collected by survey on questionnaire produced to project/site managers, safety officers and other responsible officers in projects, on the financial cost born by accidents and the investment on safety of construction projects in Sri Lanka.

The collected data were analyzed to determine the average loss due to accidents as a percentage of contract sum and investment on safety as percentage of contract sum.

In addition to that the relationship between the cost of accidents and investment on safety were checked to identify the effect of safety investment to minimize the accidents and their cost. By using the above mentioned results, average safety investment for the construction project which is to be considered at the time of bidding was recommended.

1.5 Main Findings

From the study, the followings were found as main findings.

- The average safety investment is 0.66% of project value.
- The average direct cost of accidents is 0.5 % of project value.
- The average total cost (direct and social cost of accidents) of accidents is 1.98% of project value.
- Relationships between safety investment and cost of accidents are relatively weak

1.6 Chapter Outline

Chapter-1 gives a brief introduction of the study. It describes the problem identification, objectives of the study, and the scope of the study.

Chapter-2 describes the literature review. Under this chapter views of the construction industry of Sri Lanka, causes of accidents, reasons for poor safety practice and effect of company culture for safety practice. Findings from researches already done are also included. In addition, recommendations of previous researches, records of insurance claims and data related to construction accidents are also reported.

Chapter-3 gives the methodology of the research.

Chapter-4 shows the analysis and discussion of the data and findings. It addresses the objectives of the study.

Chapter-5 is on conclusion and recommendations. This chapter shows the summary of findings, policies and strategies to be followed by contactors, clients and government authorities related to industry for better safety practices and way of reducing construction accidents.

2.0 Literature Review

2.1 Construction Industry of Sri Lanka

Sri Lanka has a total land area of 25 322 square miles (half the size of England) with a population of 19.8 million. The construction industry in Sri Lanka is one of the largest industries, comprising more than 6% of the GDP and employing 4.7% of the total labour force of the country (Central Bank, 2005).

2.1.1 Authority for Construction Industry

With the liberalization of the economy by the government, construction investment substantially increased in both public and private sector after 1977. In 1981, construction was booming and the government established the Construction Industry Training Project (CITP), similar to the CITB in the UK in certain respects, with financial assistance from the World Bank aimed at training craftsmen and equipment operators to meet the human resource needs of the industry. By 1986, the demand for skilled workers was largely met and the CITP was renamed as the Institute for Construction Training and Development (ICTAD) and its activities were expanded to other areas of development. Today, ICTAD is the authority on construction industry operations in Sri Lanka. Its emphasis has shifted from producer to facilitator/enabler, and it is involved in several facets such as industry development, training research and development, registration of contractors and consultants, development of contract conditions and other standards for the industry. (Jayawardana & Gunawardana, 1998).



2.1.3 Skilled Work Force for Construction Industry

Training programmes provided by ICTAD and its predecessor CITP were guided by one-of manpower surveys (Teams, 1989a,b; Devenco, 1993), but HRD in the construction industry as a whole, was carried out haphazardly by a multitude of training authorities operating under government departments and providing training of varying quality at different levels.

However, a large number of young unemployed, particularly from rural areas, continued to enter the pool of construction workers, because it was the only industry which could provide employment for those without any qualifications even though continuous employment was not guaranteed. These youngsters initially worked as unskilled workers but quickly became 'skilled' or 'semi-skilled' craftsman following only a little on-the-job training. Consequently, the quality of workmanship deteriorated and clients, contractors and even politicians complained of the difficulty in finding sufficiently skilled craftsmen, not only for traditional trades but also for emerging specialists needs. Thus, a study was sponsored by ICTAD to address these problems and to develop a Labour Market Information System (LMIS) which aimed to capture periodic labour market signals with a view to assisting the process of policy making on various HRD aspects of construction workers in Sri Lanka (Jayawardana & Gunawardana, 1998).

Jayawardana & Gunawardana, (1998), stated that, approximately 80% of combined skilled work force have pass the year five schooling or beyond, which is in the line of national literacy rate. Although it is difficult to compare the education of workers from different countries due to lack of common basis, cursory examination reveals that Sri Lankan skill workers are less educated compared with counterparts in USA, where 80% have completed 12th grade or beyond. However, compared with Iran, where only 41% of workers are literate, Sri Lankan workers have a higher educational attainment.

A large percentage of plumbers and electricians have passed the General Certificate of Education Ordinary Level (GCE O/L) held at the end of year 10 and significant

proportions have passed General Certificate of Education Advance Level (GCE A/L). There are two main reasons for this. First, the traditional trades like masonry and carpentry are considered to be of low social standing in Sri Lanka compared with emerging specialist trade like plumbing which have higher reputation. Second, a significant proportion of plumbers and electricians are formally trained at relevant institutions which require some level of educational attainment as a pre requisite (Jayawardana & Gunawardana, 1998).

Approximately 99% of Sri Lankan skilled work force is male, compared with 94.8% in the USA, indicating a slightly more male dominated in Sri Lankan industry. Most of trades do not have any female but there are some participation specially in road and building construction under the category of unskilled labourers.

The study also indicated that over 60% of skilled workforce is not fully utilized, due to mainly lack of full time employment. It showed further that, 80% are informally trained, and that a large percentage require further training, either in their own or a new trades. This implies that in terms of size, the skilled work force is adequate, albeit informally trained and having low level of education, training and skill (Jayawardana & Gunawardana, 1998).

Now a days, there is a good demand for skilled construction workers in foreign counties specially in Middle East and Singapore. Due to this migration issue, construction industry is now facing a problem with shortage of skilled labourers. This issue leads to poor quality of work, delays, as well as unsafe working conditions. Salaries of workers who involve in construction, are fairly high in comparing with other industry such as plantation, garments and some public services.

2.2 Construction Accidents

The term 'Accident' has been defined by Laney (1982) as "an uncontrollable occurrence which results injuries or damages". Another definition that has gained popularity is "an unplanned not necessarily injurious or damaging even that interrupts or disrupts the completion of an activity"

The construction industry is identified as one of the most dangerous industry as is evidenced by the number of accidents that occurred yearly in countries around the world in both developed and developing. The number of accidents has proven higher in developing countries, due to weak safety code and standards, lack of personal protective equipment, inadequate safety training, poorly designed facilities and substandard material quality (Edward, Jaselsks and Guillermo, 1994).

2.2.1 Root Causes of Accident

The root causes of accidents were found to be the carelessness, ignorance and lack of training lack of discipline, distractions, and poor communication of the people involved. The two main frequent modes of accidents were fall of persons and fall of objects on persons. The majority of people affected were found to be labourers. (Jayawrdana & Sadadcharan, 1996).

Studies also reveals that a considerable proportion of contractors are unaware of the legal aspects, and insurance policies, safety and health recommendations applicable to the construction industry. Thus the required precautionary measures and facilities are not effectively provided.

It was also observed that most of the contractors were reluctant to reveal the insufficient safety precautions and facilities they provide for employees because of the fear on their reputation in the industry.

Another important factor mentioned by the majority of contractors is the financial problem. It is clear that none of the contractors had shown any intention to spend additional money for the purpose of safety health and welfare on their construction sites. Thus, most contractors believe that this additional money is paid by their clients. And also most of the contractors operate their project with very tight financial situation so that they can not make their proper attention on the safety practices and worker's welfare. This situation leads to accident and occurring of accident make more damage to cash flow of the projects as well as time schedule.

2.2.2 Comparison with Other Industries

The number of fatal accidents in construction industry is high compared to the other industries. Although the fatal accidents in all the other industries have a decreasing trend, construction industry shows opposite in certain period. According to the data reported to the Industrial Safety Division (ISD) of Ministry of labour, more than 20% accidents occurred in construction industry out of total industrial fatal accidents. The following table shows the reported industrial fatal accidents during eight years period from 2000 to 2007.

Year	2000	2001	2002	2003	2004	2005	2006	2007	Total
Total Industrial Fatal Accident	43	32	44	51	42	52	84	77	425
Fatal Accident In Construction	10	10	7	15	8	19	24	27	120
Percentage (%)	23.26%	31.25%	15.91%	29.41%	19.05%	36.54%	28.57%	35.06%	28.24%

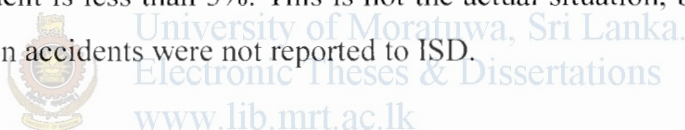
Table 2.1- Summary of fatal accidents reported to Industrial Safety Division (ISD) - Ministry of labour for year 2000 to 2007

The data from all the district offices have been compiled to a national database at the ISD. Following table illustrates the summary of non fatal accident reported to ISD during year 2000 to 2007.

Year	2000	2001	2002	2003	2004	2005	2006	2007	Total
Total Industrial Non Fatal Accident	2253	2122	1907	1742	1522	1688	1894	1750	14878
Non Fatal Accident In Construction	79	87	56	93	78	67	82	65	606
Percentage (%)	3.5%	4.0%	2.9%	5.3%	5.1%	4.0%	4.3%	3.7%	4.1%

Table 2.2- Summary of non fatal accidents reported to Industrial Safety Division (ISD) - Ministry of labour for year 2000 to 2007

The above table shows that the percentage of construction accidents with reference to the total industrial accident is less than 5%. This is not the actual situation, because most of non fatal construction accidents were not reported to ISD.



The safety records of the construction industry is considered to be very poor compared to other industries (Hinze & Appelgate, 1991). Davis and Tomasin (1990), have revealed three important reasons for this poor safety performance in the construction industry, which in turn has given rise to high rate of accidents. They are:

- short term and transitory nature of the industry
- lack of controlled working environment, and
- complexity and the diversity of size of organization within the industry

The research has been done by Raufdeen Raezdeen, Chaminda Pathirage and Saman Weerasuriya, (2003), to study the construction accidents in Sri Lanka and they summarized the results of study which examined the accidents that taken place at Sri Lankan construction sites as recorded in the Industrial Safety Division (ISD) of the

Ministry of Labour. They also provided a profile of construction accidents in Sri Lanka compared to other industries

The construction industry constitutes a problem area for occupational safety. There are many possible explanations for high accident rates in the construction industry, particularly the changing site conditions that require risk-taking. The study also revealed that for every 13 non-fatal accidents one fatal accident occurs in construction industry. The following table compares this ratio with other industries (Raufdeen & Chaminda, 2003).

Industry	Ratio of fatal: non-fatal accidents
Construction	1 : 13
All other industries combined	1 : 15

Table 2.3. Ratio of fatal and non fatal accidents in construction industry compared to other industries

2.2.3 Category of Accident

Even though accidents could be classified in several ways, the categorizations of Laufer & Ledbetter (1997), based on the level of injury or damage is the most popular. They categorized accidents into four types as follows:



- Lost day cases- Cases which the victims make absence from their work.
- Doctor's cases- No any day lost but it is required a doctor to treat the victim
- First aid cases- None lost day cases but it is required first aid treatment
- None injury cases- 'Accident' not resulting in personal injury but including property damage or productivity disruption

2.2.4 Causes of Construction Accidents

Davis and Tomasin (1990), have identified the followings as causes of accidents:

- Fall
- Struck-by or struck-against objects
- Lifting and carrying; over-extension
- Machinery
- Electricity
- Transport
- Fire and explosion

According to this categorization 'fall' included people falling from one level to another, falling of plant and material including collapse of a structure or part of it. Langford etal. (2000) identified the factors behind construction accidents as psychological and environmental. The environmental factors are:

- Site conditions
- Site tidiness
- Availability of technology and resources

- Control and supervision of work
- Effectiveness of long term planning
- Role and position of safety officers and safety representatives
- Payment structure

Whereas, the psychological factors consist of:

- care and attention by the individuals
- skill and experience brought to the job
- safety training
- accuracy of subjective risks evaluation
- origins of safety norms
- perceived responsibility
- feeling of competent autonomy of fatalism

When accidents are recorded in the ISD, they are code in to one of seven types, falls, struck by, struck against, caught in between, electrocution, exposure to harmful substance and other. Figure 2.1, shows percentage of construction accidents in each of event types.

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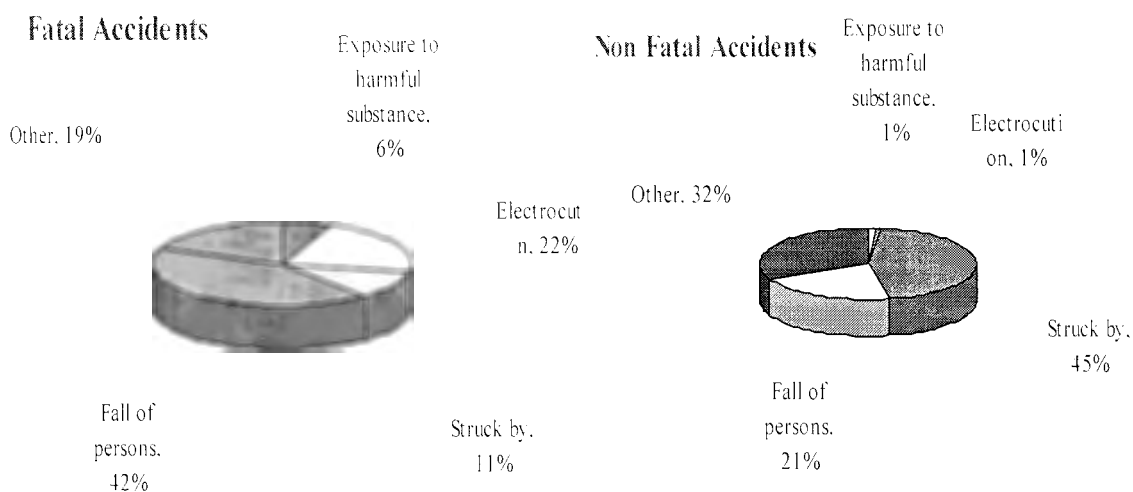


Figure 2.1 Percentage of construction accidents in each of event types

Source - Raufdeen & Chaminda, (2003).

2.3 Costs of construction accidents

There are number of studies concerning accident costs (e.g. Heinrich et al., 1980; Levit and Samelson, 1993; Lee, 1991). A research has been done to study the safety cost optimization of building projects in Hong Kong by Tang & Lee, (1997), and under the following subsections, the cost of accident were surveyed in that research.

- Loss due to absence of injured persons from work and person's inefficiency after resuming work.
- Medical expenses
- Fine and legal expenses
- Loss of time of other employees
- Equipments and plants loss
- Lost due to damaged materials or finished product
- Others losses

By considering above sub sections, they found the direct cost of accidents in each project which considered as sample and expressed it as a percentage of contract sums. But in this case they did not consider the social cost related with these accidents.

2.3.1 Accident costs and safety performance

The total costs of accidents on a site depend greatly on project safety performance. If the safety performance is good, the accident costs will be low, and vice versa. In order to compare site accident costs of projects of different contract sums and carried out in different time (so that no inflation adjustment is necessary), a dimensionless quantity, the accident loss ratio (ALR), is employed. It is defined as follows;

$$ALR = \frac{TC}{\text{Contract sum}} \times 100\%$$

Where *TC* is total costs of site accidents in a project

The assumed general shape of accident loss ratio versus safety performance is shown in Figure 2.2. An exponential relationship seems to form a useful “rule of thumb”, but it is not based on derivation of theory.



Figure 2.2: Assumed general shape of accidents loss ratio (ALR) versus safety performance. Source: Tang & Lee, 1997

2.4 Safety investment in construction Site

Safety investment is generally aimed at protecting the health and physical integrity of the workers and the material assets of the contractor.

It has three major investment components, namely safety administration personals, safety equipment, and safety training and promotions.

Safety administration personnel comprise site staff and head office staff. Some large scale contractors also employ safety managers and/or senior safety officers at their head offices to direct and coordinate site safety staff. The salaries of these personnel and their supporting staff such as clerks and typists are also part of safety investment.

Safety equipment investment includes purchasing of safety boots, goggles, helmets, safety fences, first-aid facilities, and any other equipment that has to do with the provision of safety.

Costs spent on safety training and promotion is also considered to be part of safety investment. As per Tang and lee, Contractors in Hong Kong usually organize safety training courses quite regularly for their employees. Safety promotion includes the providing of pamphlets and posters, production of safety campaigns, the monetary rewarding of individual workers or sub-contractors who achieve a good safety standard of work, and so on.

2.4 .1 Safety investments and safety performance

The safety performance of construction sites varies with the amount of the safety investment in the project. In general, the higher the safety investment, the better the safety performance will be, and vice versa.

The assumed general shape of safety investment calculated as percentage of contract sum versus safety performance curve is shown in Figure 2.3 this is a “rule of thumb” relationship rather than a theoretical curve.



Figure 2.3: Assumed general shape of SIR versus safety performance curve

Source: Tang & Lee, 1997.

By considering the above, Tang & Lee, (1997), found that optimal safety investment on a building project to be about 0.6% of the contract sum. The total cost to the contractor (accident loss+safety investment) was found to be 0.82% of the same.

In addition, Tang & Lee, (1997), stated that, it is not the intention to give an inhuman impression that 0.6% is the optimal figure and so no safety investment of more than 0.6% is necessary. In fact, 0.6% should be regarded as a minimum amount of safety investment in a building project. A safety investment greater than 0.6% will result in intangible benefits, such as greater peace of mind of workers, better reputation of the company, greater job satisfaction and so on, which although not considered in this mathematical model, will definitely be valuable assets to the contractor.

2.5 Social cost of accidents

Darshi & Tang, (2005), stated that, the direct financial costs of accidents are the tip of the iceberg when compared to the indirect costs. Notwithstanding the difficulties involved, it is very important to estimate the indirect costs borne by society, and the non-material losses due to pain, suffering and loss of enjoyment of life undergone by the victim. They did study to investigate the pain and suffering costs (non-material losses) of the victims of construction accidents in Hong Kong based on relevant High Court personal injury case judgments in the years 1999-2003. The 54 non-fatal accident cases and 14 fatal accident cases analyzed by them and indicate that the average percentage of compensation awarded for non-material damages (pain, suffering and loss of enjoyment of life) to that for material damages (loss of earnings, medical and traveling expenses, etc.) during those years is about 30%.

This result enables estimating the pain and suffering costs of the society for a particular year if the total material losses of all construction accidents in that year are known.

Based on previous research in which the material losses in Hong Kong were evaluated for the years 1999, 2000 and 2001, Darsi and Tang estimated the corresponding pain and suffering costs as 219 million, 150 million and 107 million Hong Kong dollars, respectively (US\$1.00 = HK\$7.80).

Financial losses of most accidents are associated with contractors, but not all, are also social costs. Some social costs are not incurred by contractors, but by the society. Tang & Ying, (2004), have gathered social costs of construction accidents in Hong Kong for years 1999-2001. The safety investments made by both contractors and society are also identified based on data assembled for these three years. These social costs and safety investments were identified from 119 construction projects involving 1414 accidents and from 18 government departments in Hong Kong. The data shows that there was an increasing trend in social safety investments and a decreasing trend in social costs of construction accidents from 1999 to 2001.

During this period, for every extra \$1 of social safety investments made, a reduction of \$2.27 of social costs on construction accidents was achieved in Hong Kong (Tang & Ying, 2004).

2.6 Legal Provisions and Insurance Policies for safety and health in Sri Lanka

There are basically three different legal provisions available to safeguard the safety, health and welfare aspects of the construction organizations as well as the workers. The first one is the “Factories Ordinance” No.45 of 1942 and its subsequent amendments. The second one is the “Workmen’s Compensation Ordinance” No.19 of 1934 and its subsequent amendments. The third one is the requirement of various insurance policies as set out in conditions of contract.

2.6.1 Awareness among contractors of legal aspects, safety policies and recommendations



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Although there are several legal provisions and requirements pertaining to the construction industry on safety, health and welfare aspects, most of the contractors including a few large scale contractors are not aware of them. For example, it is required that all new sites (like factories) be registered with the Chief factory Inspecting Engineer or District Factory Inspecting Engineer of the Department of Labour according to the Factories Ordinance. But this does not happen in the construction industry as the word “factory”, usually misleads the construction industrialists. Therefore they feel completely free from the obligation under some of these legal provisions (Jayawardana & Sadacharan, 1996).

Furthermore Jayawardana & Sadacharan, (1996), stated that, if an accident occurs at a site which causes loss of life to a person employed on that site or disable any such person for more than three days, or makes any such person unconscious as a result of heat, exhaustion, electric shock or inhalation or irrespirable or poisonous fumes or gases, a

written notice of the accident should be sent to the District Factory Inspecting Engineer. But it was noted that most of the contractors were not aware of this and that it has not been a practice in the construction industry.

This is the reason which shows the percentage of construction accidents against to total industrial accidents, is less than 5%. But in the case of fatal accidents, percentage of construction accidents is higher than the 20%. Therefore it is reasonable to assume that only 25% of non fatal are reported to ISD.



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3.0 Methodology

The construction industry of Sri Lanka is developing day by day, but safety practices and the worker's welfare was not improved in parallel. Due to the high competition in obtaining construction contracts, contactors always tend to reduce the expenditure and to offer low bids to face competition. As result of cost cut down, the investment for safety practices and worker's welfare get reduced and it leads to increase accidents in construction sites.

This study was done to find out the financial effect on the accidents and to ascertain the present investment on safety in construction sites.

3.1 Data collection

Altogether 75 accidents from 32 projects with total Contract sum of Rupees over seven billion, implemented during the last three years were investigated. Building projects of Grade M1 and other infrastructure development projects were selected for data collection. There is no proper recording system in most of the projects and most of the data related to accidents were taken from non-standard recordings, such as site supervisor's field books and from the facts retained in the memory of some workers.

There are 70 numbers of fatal accidents occurred during the last three years, recorded in industrial safety division (ISD) of ministry of Labour and out of which 09 accidents were investigated to detect the cost of fatal accidents.

Data were collected by Survey on questionnaire produced to Project/Site managers, safety officers and other responsible officers in projects. Questionnaires were sent to the category of above mentioned personals by Fax and E-mail but their response was very poor. Out of forty two numbers of projects, only eight numbers replied. Therefore data had to collect by inquiring from them by visiting and through telephone conversations

3.2 Direct Cost of Accidents

First objective of this study was to find out the direct cost of accidents cost of which directly borne by the Contractor. The following factors were considered in this connection.

- Loss due to absence of injured persons and their inefficiency after resuming duties.
- Medical expenses
- Fines and legal expenses
- Loss of time of other employees
- Equipments and plants loss
- Lost due to damaged materials or finished products
- Others losses



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The above factors are described in 3.2.1 to 3.2.9 and questionnaire No.01 attached as Appendix 02, was used to collect the above data. The summary of data collected from the survey on questioner No 1 is attached as Appendix 04.

3.2.1 Loss due to the injured person

This is the compensation paid to the injured person by the Contractor for example the wage of the injured person should be paid during the period of absence from work due to the injuries and in serious cases like permanent disability, a lump sum payment on compensation.

3.2.2 Loss due to the injured person even after resuming work

When the injured worker recovers and returns to work, he may not be able to work as previous with 100% efficiency. But until either the project or his contact for employment in over the Contractor has to pay his normal salary even though his production is less. The following formula was derived to calculate such losses

$$\text{Loss} = \text{Wage of injured worker} \times \text{Estimated duration of work} \times \% \text{ of Disability}$$

3.2.3 Loss due to medical expenses

The contractor has to pay all medical expenses for the injured worker, including the cost of transport to hospital and any other requirements such as keeping a person with victim to look after him.

3.2.4 Fines and legal expenses

For serious or fatal accidents, the Contractor has to follow the legal requirements prevailing in the country followed by the court case. All the expenditure related with this process has to be borne by the Contractor.

3.2.5 Loss of time of other employees

When an accident occurs, the safety officer is responsible for connected activities. Apart from him the site agent, the site engineer and the foreman are also involved. These people may not directly help the injured, may be involved in carrying out works relating to the accident, such as accident investigation and accident report writing.

For example when serious accident occurs, the site agent and site engineer have to spend 0.25 days on the accident. Some times the foreman or work supervisor has to spend more than half days on this and it depends on the time and situation of the victim. Apart from the time lost by site agent, site engineer and site foreman or work supervisor, other

workers working with the injured person also lost their time of working due to the accident. When an accident occurs, the injured person is immediately helped by other workers nearby. After the accident occurred, other workers working with victim do not work as normal during the balance working period of the day due reducing of there moral as well as wasting the time by discussing the situation of victim and some other things with each other . In the case of fatal accident, whole work site has to be closed for the period of three to four days and during this period of time all the peoples who are not paid by daily basis have to be paid. The above figures are the average values were counted based on the experience of the site safety staff who were interviewed by the authors. Although there may be variations from case to case, the assumed figures are about right on average.

3.2.6 Equipment or plant loss

Besides injury to workers, accidents may cause damages to plant and equipments.

3.2.7 Loss due to damaged material or finished work

This loss includes the replacement costs of any materials damaged as a result of the accident, and of any damaged finished work.

3.2.8 Loss due to idling of machinery or equipment

After an accident occurs, the workers tend to stop work temporarily. The idling machines and equipment lead to a loss.

In the case of unavailable data, a formula was derived to calculate such loss on follows is

$$Loss = \frac{Contract\ sum \times 20\% \times 2\%}{No.\ of\ working\ days}$$

This formula based on the assumption that 20% the contract sum is attributable to plants and equipment and that 2% of the plants and equipment will be idle on the day of accident.

3.2.9 Other losses

Any other costs not mentioned above but to be born by the Contractor will also be recorded.

3.3 Social Cost of Accidents

Second objective of this study is to find out the social cost involve with these construction accidents. The following points were considered to find out the social cost of accident.

- Cost of services
- Loss of future production of injured persons
- Cost of reflecting pain and grief
- Other social costs



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The above factors are described in 3.3.1 to 3.3.4 and cost of them were determined in the previous study done by Rathnayaka & Jayasingha,(1996).

3.3.1 Cost of services

Cost of services involved with accident, provided by the government such as, cost of hospitals, police, court (if necessary) and others

3.3.2 Loss of future production of injured persons

When the victim of the accident dies or become permanent to disable, his service will not be available for the country any more. Therefore to calculate this loss with a reasonable accuracy, certain assumptions have to be made such as average per capita income of Sri Lanka and average monthly income and retiring age of peoples as 55 years.

3.3.3 Cost of reflecting pain and grief

The cost related with reflecting pain and grief also considered as social cost. It is very difficult to quantify this in monetary terms and therefore it is taken as percentage of other cost and added. 20% of total cost is added to cover the cost for pain and grief, which is the percentage use in India. But in the case of UK, 65% of total cost is added to cover the cost of reflecting pain and grief.

3.3.4 Other social costs

Any other social costs relevant with accident and which are not counted with other cost factors, are considered as other social costs.

To find out above data, the result of the previous study done by Rathnayaka & Jayasingha,(1996), which was treated as social cost of traffic accident in Sri Lanka was used. The financial value of social cost of traffic accident found in year 1996 is brought to present value and considered it as the social cost of construction accident by assuming that the social cost of traffic accident and construction accident are same.

3.4 Safety Investment of Projects

To find out the safety investment of construction projects, the following factors were considered. The data were collected by questionnaire and interview with site managers.

project managers and other relevant officers in the project. Questionnaires were sent to the category of above mentioned personals by Fax and E- mail but their respond was very poor. Therefore it was necessary to visit those personals and fill the questionnaires by inquiring from them.

- Cost of safety training and administration
- Cost of supplying of safety equipment
- Time spent for safety meeting and others
- Cost of additional scaffolding and safety nets
- Other relevant costs

The above factors are described in 3.4.1 to 3.4.5 and questionnaire No.02 attached as Appendix 03 was prepared to collect the above data. The summary of data collected from the survey on questioner No 02, is attached as Appendix 05.

3.4.1 Cost of Safety Training and Administration

Safety administration personnel comprise site staff and head office staff. For better safety practice contactor should employ safety officers and safety supervisors on site to monitor safety related matters. Some times major contractors employ safety managers and/or senior safety officers at their head offices to direct and coordinate site safety staff. The salaries of these personnel and their supporting staff such as clerks and typists are also part of safety investment. Conducting of safety training programs for workers and safety officers, awarding of officers and workers who follow good safety practice is also coming under safety investments.

3.4.2 Cost of Supplying of Safety Equipments

Cost of supplying of safety equipments includes the purchasing of safety boots, goggles, helmets, safety fences and nets first-aid facilities, and any other equipment. Those will enhance safety on construction sites

3.4.3 Time Spent for Safety Meetings and Promotions

Cost of time spent on safety training and promotion are also considered to be part of safety investment. Some Contractors usually organize safety training courses quite regularly for their employees. Safety promotion includes the safety boards and posters, the production of safety campaigns, the monetary rewarding of individual workers or sub-contractors who achieve a good safety standard of work, and so on.

3.4.4 Cost of Additional Materials

The cost spent for the additional scaffoldings, handrails, safety nets are also kind of safety investment. For the preparation of safer working environment, these additional materials are more important.

3.4.5 Other Relevant Cost

Any kind of other investment which improves the safety in construction sites are also considered as safety investment



4.0 Analysis and Discussion of Results

4.1 Population and Sample of the study

As per the Contactors Association, more than 300 numbers of projects implemented during last three years. Out of that 32 projects were selected as sample for study. According to the ISD of Ministry of Labour, there were 70 numbers of fatal accidents occurred during the last three years out of which 9 projects with fatal accident were also included in the sample. The sample was selected by considering following factors.

- Availability of safety and accident records
- Possibility of data collection

The sample which was selected for study is not random sample, since it was selected by considering above factors. Therefore if it is possible to extend the study for whole population, the results may deviate from findings.



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4.2 Relationship between contract sum and safety investment

The data collected from the questionnaire 02 attached as appendix two, were used to calculate the safety investment of each project and the Safety Investment Ratio (SIR) was calculated using the following equation.

$$SIR = \frac{\text{Safety Investment}}{\text{Contract sum}} \times 100\%$$

As per the basic statistics from raw data, shown in Figure 4.1, the average investment on safety in Construction projects in Sri Lanka is 0.66 % of Contact Sum and it is most close to the optimum safety investment (0.6%) found by the Tang and Lee for the construction projects in Hong Kong.

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As per the basic statistics from raw data, shown in Figure 4.1, the average investment on safety in Construction projects in Sri Lanka is 0.66 % of Contact Sum and it is most close to the optimum safety investment (0.6%) found by the Tang and Lee for the construction projects in Hong Kong.

Even though the average safety investment is 0.66% of Contract Sum, there is a large variation of this percentage between projects. According to the data, 25% of Contactors invest less than 0.31% of Contact Sum and other 25% of Contactors invest more than 0.85% of contact sum for safety. Only 10% of contactors invest more than 1.23% of Contact Sum which is almost double of the value found by Tang and Lee as optimal safety investment. This high amount of investment made by Contactor who are mostly working under foreign main Contactor or under foreign Consultant who force to follow the standard of safety.

The Figure 4.2 shows the result of simple regression between the safety investment and the Contact Sum. According to the regression the relationship between safety investment against Contact Sum can be represented by $Y = 0.0037 X + 437087$.

According to the results of regression, the sample correlation coefficient between safety investment and Contract Sum is 0.4758, so that the relationship between two variables is relatively weak.



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Therefore the contactors do not consider the contact sum to greater extent or otherwise size of the project, when they invest the money on safety.

Some contractors make investment on safety of construction site with out realize real benefits of them but just to satisfy the requirement of client and consultant. Therefore client and the consultant should realize it as their responsibility and should take necessary actions to maintain regulations of safety.

Simple Regression

Safety Investment vs Contact Sum

Con. Sum	S. Invest	Error	Quantile	Z
X	Y			
80,000,000	63,750	-667641	0.182	-0.908
351,000,000	230,000	-1498345	0.030	-1.876
117,000,000	1,270,000	402493.5	0.756	0.699
240,000,000	2,807,000	1487001	0.879	1.169
184,000,000	2,262,000	1148014	0.848	1.030
139,000,000	3,000,000	2051560	0.970	1.876
160,000,000	550,000	-475694.8	0.303	-0.516
152,712,000	2,905,000	1906116	0.909	1.335
246,000,000	3,306,000	1963929	0.939	1.550
168,000,000	650,000	-405125.2	0.364	-0.349
215,000,000	1,253,000	2497134	0.697	0.516
122,000,000	850,635	352655.3	0.606	0.269
630,000,000	2,000,000	-754729.5	0.152	-1.030
146,890,675	986,000	8531729	0.667	0.431
92,560,780	456,000	-321599.6	0.455	-0.114
522,650,000	3,490,000	1130189	0.818	0.908
65,123,780	654,890	-21774.45	0.636	0.349
154,560,700	345,675	-660009.7	0.212	-0.799
70,670,000	564,000	-133067.9	0.576	0.191
185,650,000	125,000	-995056	0.09	-1.335
76,890,000	456,890	-263060	0.515	0.038
332,780,000	456,780	1204537	0.061	-1.550
274,650,170	1,765,900	318430.5	0.727	0.605
32,786,090	165,890	-391810.7	0.394	-0.269
121,210,980	1,456,000	573002.1	0.788	0.799
67,532,115	234,000	-451524.2	0.333	-0.431
78,021,382	435,220	-288892.1	0.485	-0.038
267,012,390	657,000	-762371.7	0.121	-1.169
106,210,600	654,000	-173814.5	0.545	0.114
53,112,650	134,000	-498477.9	0.273	-0.605
42,675,600	215,000	-379082.2	0.424	-0.191
231,780,125	657,400	-632359.3	0.242	-0.699

Confidence Interval for Slope

1-α	(1-α) C.I. for β ₁
95%	0.003679 + or - 0.002536

r² = 0.2264 Coefficient of Determination
r = 0.4758 Coefficient of Correlation

Confidence Interval for Intercept

1-α	(1-α) C.I. for β ₀
95%	437087.3 + or - 963422.5

s(b₁) = 0.001242 Standard Error of Slope
t = 2.963122
p-value = 0.0059

Prediction Interval for Y

1-α	X	(1-α) C.I. for Y given X
		+ or -

s(b₀) = 275880.2 Standard Error of Intercept

Prediction Interval for E[Y|X]

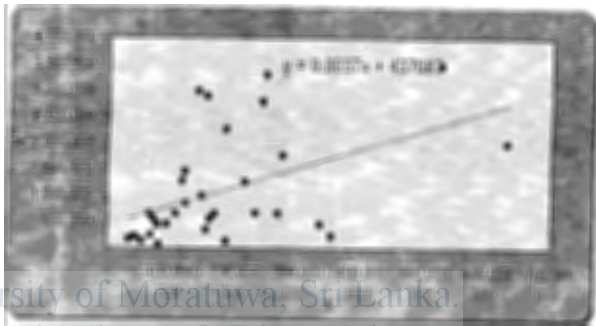
1-α	X	(1-α) C.I. for E[Y X]
		+ or -

s = 924879.8 Standard Error of prediction

ANOVA Table

Source	SS	df	MS	F	F _{critical}	p-value
Regn	7.51E+12	1	7.51E+12	6.78009	4.179877	0.0059
Error	2.57E+13	30	8.55E+11			
Total	3.32E+13	31				

Scatter Plot, Regression Line and Regression Equation



Residual Analysis

Durbin-Watson statistic
d = 1.45564

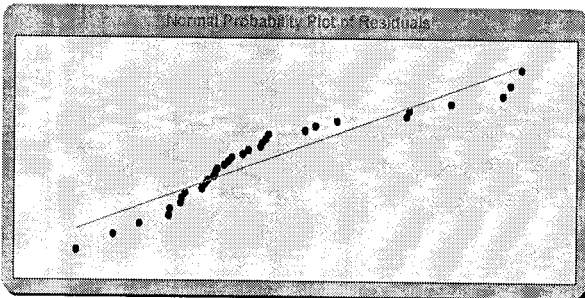
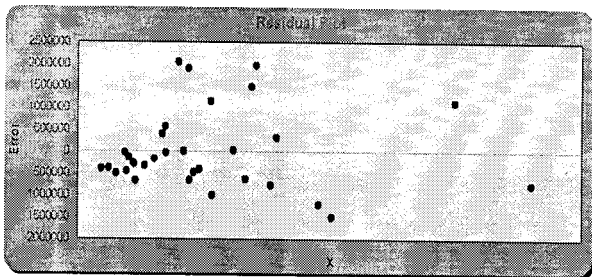


Figure 4.2: Result of simple regression between safety investment and contract sum.

4.3 Cost of Accidents

4.3.1 Direct Cost of Accidents

The data collected from the questionnaire 01 attached as appendix 02, were used to calculate the total financial lost due to accident in each project and the Accident Lost Ratio (ALR) was calculated using the following equation.

$$ALR = \frac{\text{Amount Loss Due to Accident}}{\text{Contract sum}} \times 100\%$$

The basic statistics from raw data for the cost of accident is shown below in Figure 4.3.

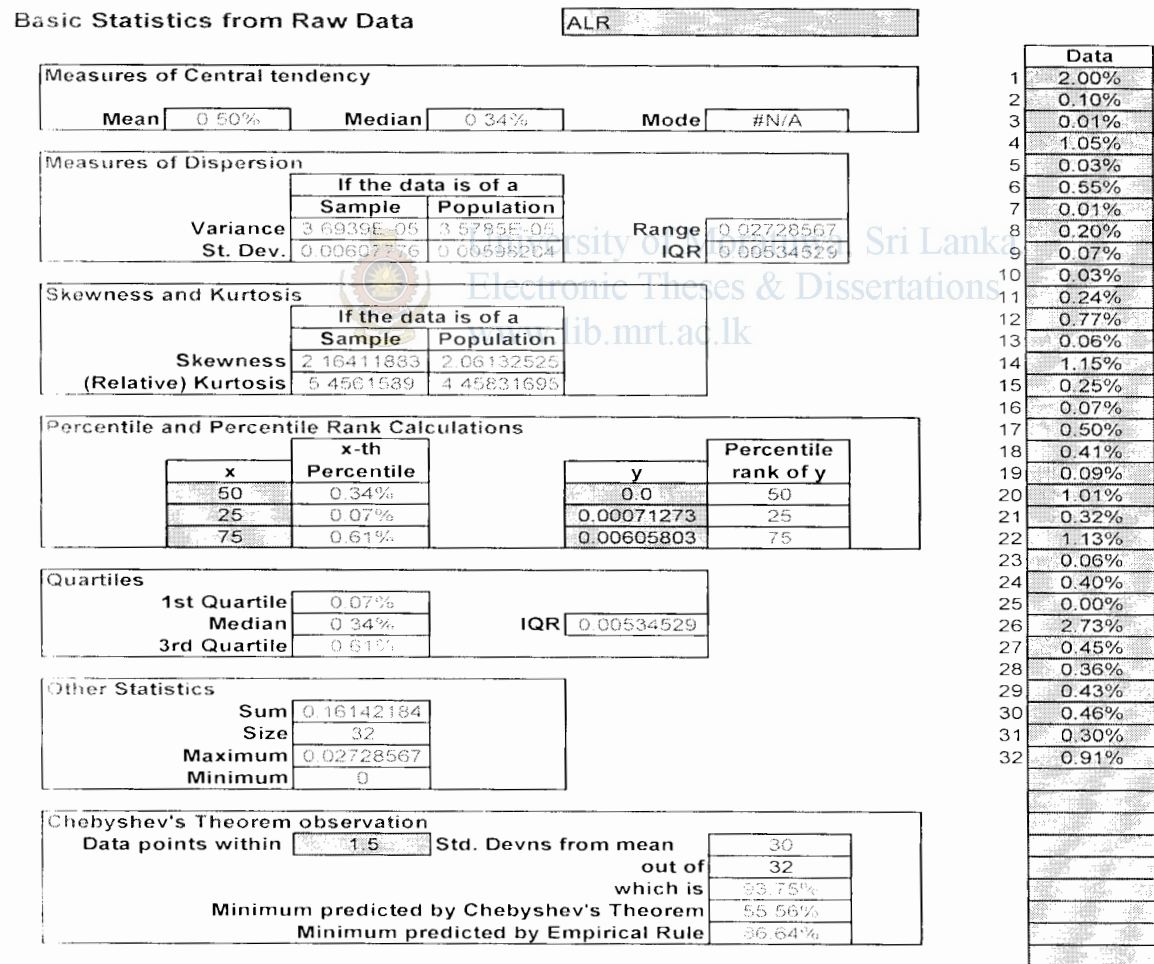


Figure 4.3 Basic statistics of direct cost of accidents

According to the results, the average accident loss ratio is 0.5% of contract sum. In 50% of projects the accident loss ratio is less than 0.34% of contract sum and it is less than 0.07% of contract sum in 25% of projects. The accident loss ratio is more than 0.61% of contract sum in other 25% of projects in Sri Lanka and it is higher than the 1.12% in 10% of projects which may be due to the occurring of fatal accidents.

4.3.2 Social Cost of Accidents

The social cost related with traffic accidents in Sri Lanka were delivered by Rathnayaka and Jayasingha, (1996). According to them the social cost per traffic accident in year 1996 are as follows.

Cost of Fatal accidents	= Rs.	788,043/=
Cost of Grievous accidents	= Rs.	372,871/=
Cost of Non Grievous accidents	= Rs.	3,401/=

By assuming the social cost of both traffic and construction accidents are similar, the above values were converted to the present value by using reasonable interest rate of 10%. Therefore the calculated present values of social cost in three categories of accidents are as follows.

Cost of Fatal accidents	= Rs.	2,473,194/=
Cost of Grievous accidents	= Rs.	1,170,220/=
Cost of Non Grievous accidents	= Rs.	10,674/=

The above values were multiplied by numbers of relevant accidents occurred in each project and determine the social cost of accidents occurred in each projects and expressed it also as percentage of contract sum.

4.3.3 Total Cost of Accidents

The total cost of accidents was calculated by adding both direct and the social cost of accidents and the Total Accident Loss Ratio (TALR) were calculated using following equation.

$$TALR = \frac{\text{Total Accident cost} \times 100\%}{\text{Contract Sum}}$$

Where the total accident cost = direct cost of accidents + social cost of accidents

Figure 4.4 shows the basic statistic of the Total costs involved in construction accidents as percentage of Contract Sum.

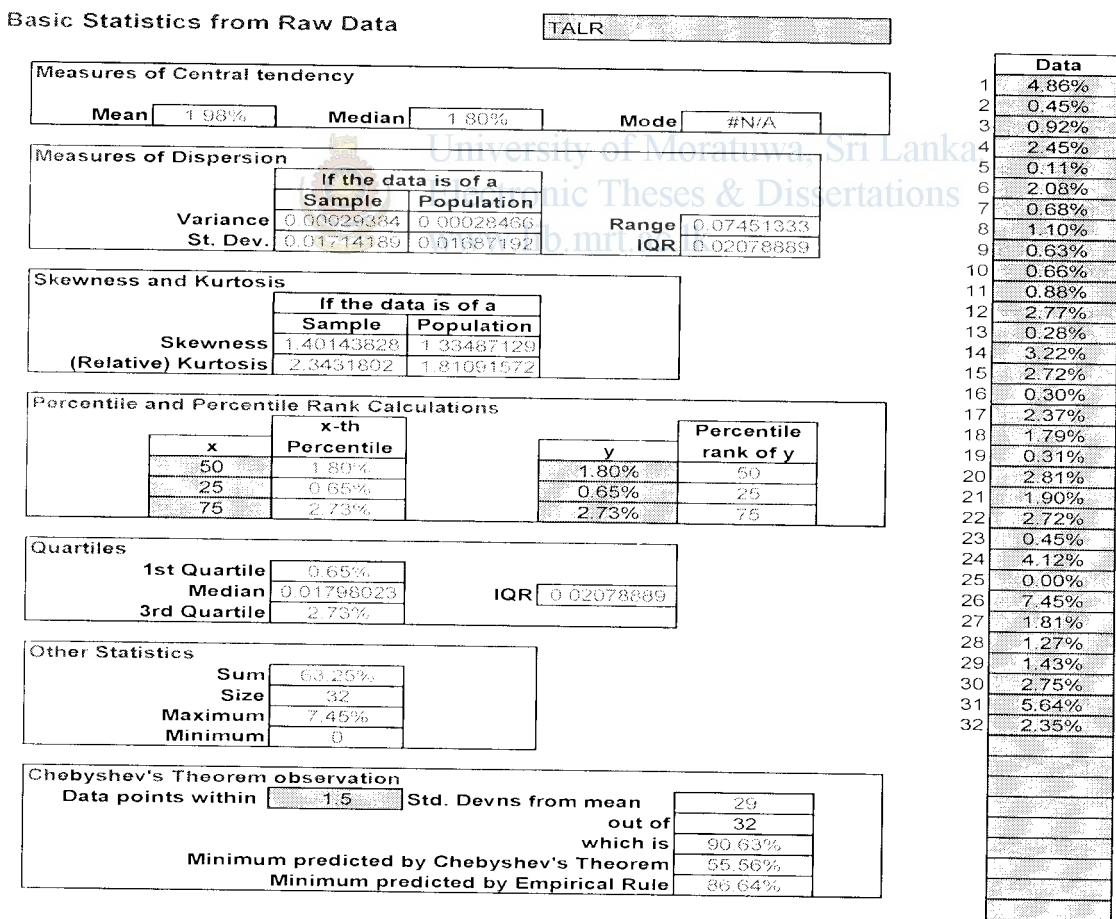


Figure 4.4 Basic statistics of total cost of accidents

According to the results, the average total accident loss ratio is 1.98 % of contract sum. In 50% of projects the total accident loss ratio is less than 1.80% of contract sum and it is less than 0.65% of contract sum in 25% of projects. The total accident loss ratio is more than 2.73% of contract sum in other 25% of projects in Sri Lanka and it is higher than 4.03% in 10% of projects which may be due to the occurring of fatal accidents.

4.4 Relationship between safety investments and cost of accidents

The following Figure 4.5 and 4.6, show the results of simple regression models of Safety Investment Ratio (SIR) vs Accidents Loss Ratio (ALR) and Safety investment Ratio (SIR) vs Total Accidents Loss Ratio (TALR).

As per the result show in regression model of SIR and ALR, there is a negative relationship between safety investment ratio and the accident loss ratio represented by the equation $Y = - 0.3202 X + 0.0072$. Since the sample correlation coefficient between safety investment ratio and accident loss ratio is **0.2664**, the relationships between two variables are considered as relatively weak relationship.

As per the results show in regression model of SIR and TALR, there is a negative relationship between safety investment ratio and the total accident loss ratio represent by equation $Y = - 0.9121 X + 0.02568$. Since the sample correlation coefficient between safety investment ratio and Accident loss Ratio is 0.2691, the relationships between two variables also are considered as relatively weak relationship.

Since the both relationship are relatively weak, it is clear that only the investing of money on safety is not sufficient or it is not the only factor to reduce the accident cost or occurring of accidents. There are some other components which are highly connected with the safety performance as well as the avoiding of accidents.

The site management is one of the important factors in safety performance. Site management should always place their proper attention on safety performance by utilizing safety investments in proper manner, supervising the safety performance and educating the workers the importance of safety measures. Videos which include the critical accidents and suffering of peoples as the result of accidents can effectively be used to educate the peoples. Maintaining of site cleanliness and tidiness and monitoring of safety meetings and safety promotion programmes also contribute to reduce the accidents in construction sites.

The implementation of monetary awarding systems for the workers and staff those who are following the safety regulation and the punishment scheme for the workers for not following critical safety regulation, can improve the safety measures in construction site.

When implementing the punishment scheme, special care to be taken to avoid the demoralization of work force.

The other important factor for reducing accidents is the attitude of workers towards safety. Even though the company provides safety equipment, but workers are not willing to use or wear them, then the safety investments become useless. Therefore the company has to make them aware and train them to use safety measures. By introducing awarding system as mentioned above and by educating them in proper manner, the attitude of workers towards the safety can be changed to positive way.

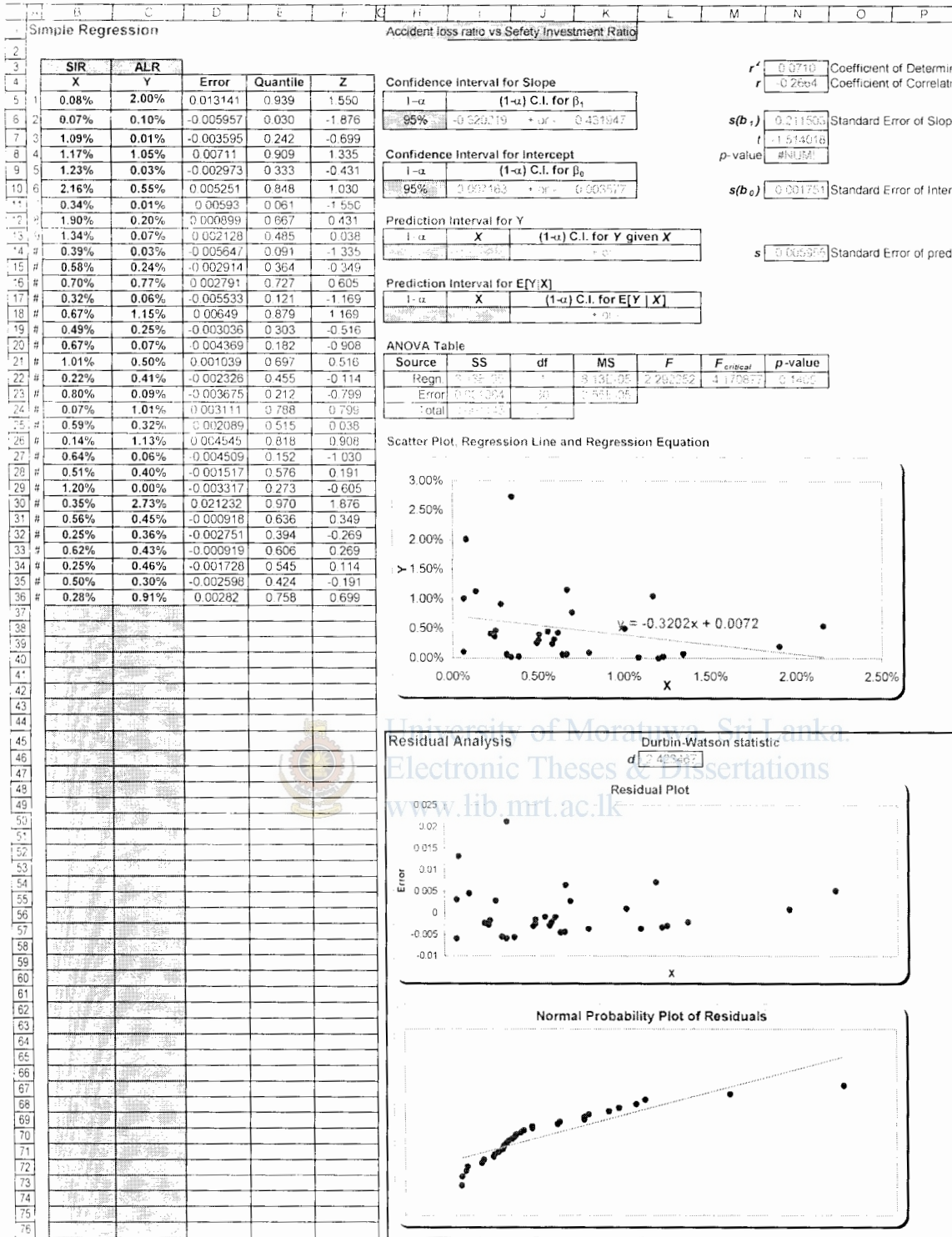


Figure 4.5: Result of simple regression between safety investment ratio and direct accidents loss ratio

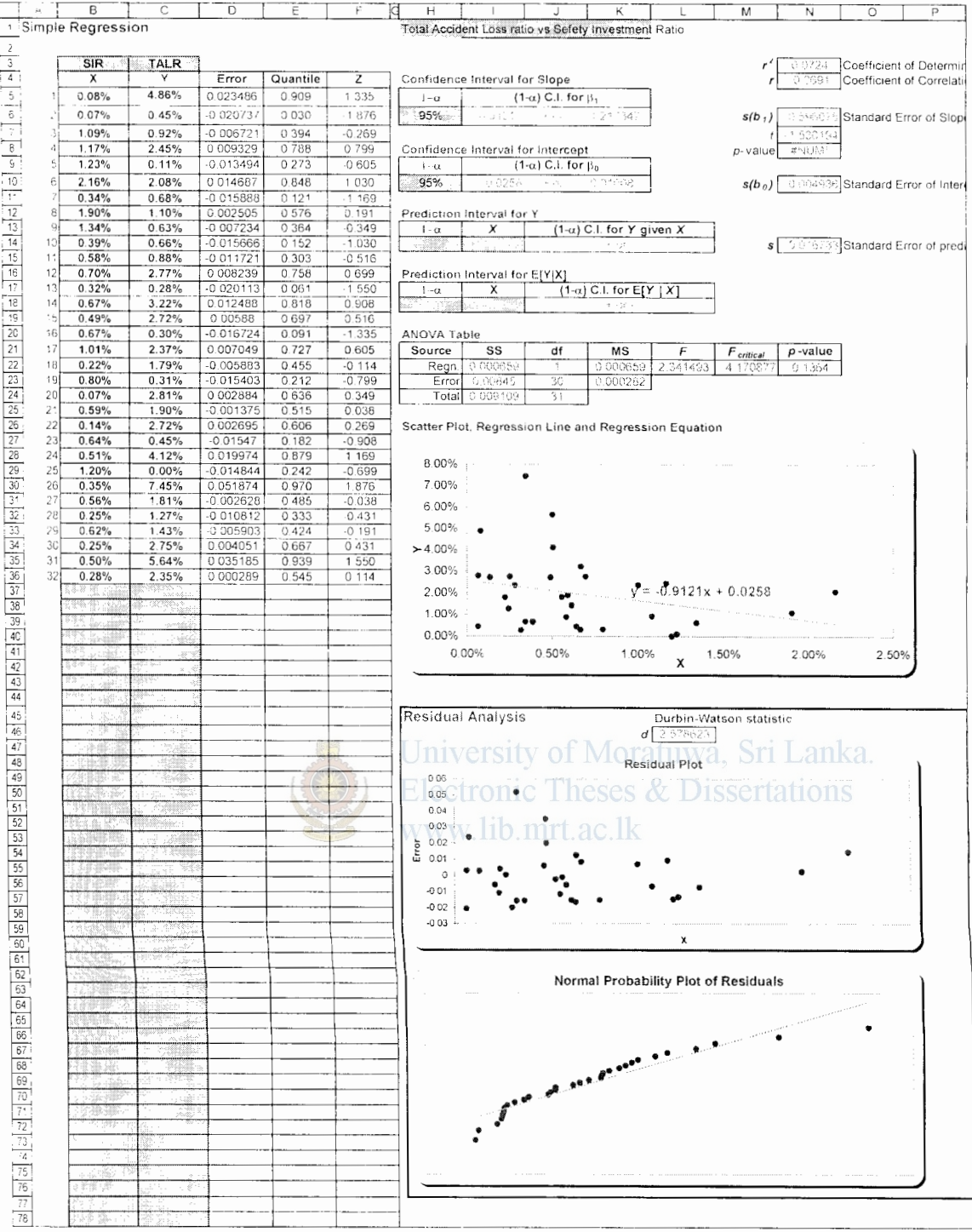


Figure 4.6: Result of simple regression between safety investment ratio and total accident loss ratio

The culture of company is also one of the important factors to reduce the accidents and increase the safety performances. Some Contactors always consider, safety is not an important factor, since they are always maintaining progress and site cash flow. This culture to be changed from top management to bottom and should focus attention on safety of people, welfare of them as well as quality of job.



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5.0 Conclusions and Recommendations

5.1 Conclusions

The construction industry of Sri Lanka is developing day by day, but safety practices and the welfare of workers are not improved in parallel. Due to the high competition in obtaining construction contracts, contractors always tend to reduce the expenditure and to offer low bids to face competition. As a result of cost cut down, the investment for safety practices and welfare of workers get to reduced and which leads to increase accidents in construction sites.

This study was done to find out the financial effect on accidents and to ascertain the present investment on safety in construction sites.

The average investment on safety in Construction projects in Sri Lanka is 0.66 % of contact sum and it is most close to the optimum safety investment (0.6%) detected by Tang and Lee for the construction projects in Hong Kong. There is a large variation of safety investment percentage between projects, so that 25% of contactors invest less than 0.31% of contact sum and other 25% of Contactors invest more than 0.85% of contact sum on safety. Only 10% of contactors invest more than 1.23% of Contact Sum on safety and most of them are working under foreign main Contactor or foreign Consultant who force to follow standards of safety.

The relationship between safety investment against contact sum can be represented by the equation $Y = 0.0037 X + 437087$, which can be used as a guide line to find out the average safety investment required for the project at the time of bidding.

The average accident loss ratio, which includes only the direct financial cost borne by contactor is 0.5% of contract sum. This is less than 0.34% of contract sum in 50% of projects and it is less than 0.07% of contact sum in 25% of projects. The accident loss

ratio is more than 0.61% of contract sum in other 25% of projects in Sri Lanka and higher than the 1.12% in 10% of projects which may be due to fatal accidents took place.

The average total accident loss ratio, which including both direct cost borne by contractor and the social cost related to accidents is 1.98 % of contract sum. The total accident loss ratio is less than 1.80% of contract sum in 50% of projects and less than 0.65% of contract sum in 25% of projects. The total accident loss ratio is more than 2.73% of contract sum in other 25% of projects in Sri Lanka and higher than 4.03% in 10% of projects which may be due to fatal accidents took place.

The relationship between safety investment ratio and the accident loss ratio is represented by the equation $Y = -0.3202 X + 0.0072$ and relationship between safety investment ratio and the total accidents loss ratio is represented by equation $Y = -0.9121 X + 0.02568$.

Since the correlation coefficients of both relationships are less than 0.5, both relationships are considered as relatively weak.



Therefore, it is clear that only the investing of money on safety is not sufficient or it is not the only factor to reduce the accident cost or occurring of accidents. There are some other components which are highly connected with the safety performance as well as the avoiding of accidents such as site management, attitude of workers towards safety and culture of the company.

In this study, accidents occurred due to natural causes such as flooding, cyclone, fires are not considered. The future studies can be extended to analyze implication of these facts on cost.

It is also important to study the utilization of safety investment and make recommendation, to achieve proper safety performance with zero accidents in construction sites.

Risk analysis in construction industry including accidents is also the topic for future studies.

And also this study was limited to the projects with scale of ICTAD grade of M1 and similar size, the future studies can be extend to cover the whole scales of projects and can obtain the results for whole industry.

5.2 Recommendations

It is clearly visible that the safety investment and the loss due to accidents are important issues in the construction industry and should be highly considered. The following recommendations are made towards the achievement of this objective. Since this study was limited to ICTAD Grade M1 and similar scale projects, the recommendation made on this study also relevant only for same scale of projects.

- A separate item for BOQ should be given in the bill for preliminaries to price the expenditure for site safety and the item should clearly describe safety standards which should be followed from the time of commencement of the project.
- Client / Consultant should monitor it and should not allow to work with out following safety requirements.
- The government authorities which issue the development permit or any approval for construction work should check the availability of sufficient allocation for safety practices without which no approval should be granted.

- The contractor should consider the safety investment and add that amount to their bid at the time of bidding. The average amount for safety investment can be calculated using $Y = 0.0037 X + 437087$.

Where Y – Safety investment

X – Contract sum of project

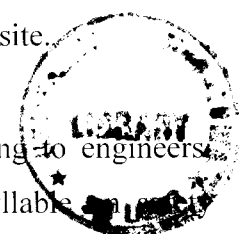
- The site management has to initiate proper action to maintain safety standards and no one should be allowed to work without following safety procedures. Monetary rewarding system for best safety followers as well as punishment system for those who are not following safety rules should be implemented in the site.
- A separate section should be established in the Labour Department to deal with health, safety and welfare problems in the construction industry. The present coverage of the construction industry by the Factories Division is insufficient.
- Safety audit report for construction companies should be introduced and issued by Industrial Safety Division in Ministry of labour or the separate section established in labour department as above recommendation. It should be assessed at the time of renewal the ICTAD registration.
- Further, the Labour Department together with ICTAD must enforce the legal aspects in the construction industry and also to employ safety monitoring officers at each and every site depending on the number of workers in the site.
- All professional institutions and trade schools providing training to engineers, technicians and supervising staff and skilled workers have syllable measures and procedures.



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- ICTAD as the premier state organization for construction training and development should take necessary action to incorporate safety aspects, and safety practices in existing training programmes for all in the construction industry.
- Most contractors have a wrong attitude that it is uneconomical to invest on safety, without realizing the cost of accidents, organization reputation and the loss to the national economy. Thus, the Labour Department with the assistance of ICTAD should take necessary actions to educate contractors and promote relevant practices.



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Summary of Results

Project No (1)	Contractor Grade (2)	Contract Sum (3)	No of Accident (4)		Contract period (5)	Total Man Day lost due to accident(6)	Total Man Day of Project (8)	Safety investment (9)	Direct cost of Accident (10)	Social Cost of Accidents (11)	Total cost of Accident (10)+(11)	SIR (9)/(3)	ALR (10)/(3)	TALR (12)/(3)
			Injured	Fatal										
1	M1	80,000,000	2	1	540	88	29,073	63,750	1,603,950	2,494,543	4,098,493	0.08%	2.00%	5.12%
2	Foreign	351,000,000	2		720	12	127,559	230,000	350,000	1,180,894	1,530,894	0.07%	0.10%	0.44%
3	M1	117,000,000	1		120	9	42,520	1,270,000	10,850	1,170,220	1,181,070	1.09%	0.01%	1.01%
4	M1	240,000,000	3	1	720	852	87,220	2,807,000	2,526,800	3,664,762	6,191,562	1.17%	1.05%	2.58%
5	M1	184,000,000	1		360	12	66,869	2,262,000	46,749	10,674	57,423	1.23%	0.03%	0.03%
6	M1	139,000,000	1	1	360	42	50,515	3,000,000	765,000	2,483,868	3,248,868	2.16%	0.55%	2.34%
7	M1	160,000,000	1		660	3	58,147	550,000	21,300	1,170,220	1,191,520	0.34%	0.01%	0.74%
8	M1	152,712,000	3		720	27	55,498	2,905,000	301,000	1,191,568	1,492,568	1.90%	0.20%	0.98%
9	M1	246,000,000	3		720	15	89,400	3,306,000	180,000	1,191,568	1,371,568	1.34%	0.07%	0.56%
10	M1	168,000,000	1		660	8	61,054	650,000	46,600	1,170,220	1,216,820	0.39%	0.03%	0.72%
11	M1	215,000,000	3		540	32	78,134	1,253,000	512,360	1,191,568	1,703,928	0.58%	0.24%	0.79%
12	M1	122,000,000	4		360	46	44,337	850,635	942,000	2,361,788	3,303,788	0.70%	0.77%	2.71%
13	Foreign	630,000,000	3		1,440	16	228,952	2,000,000	387,000	1,191,568	1,578,568	0.32%	0.06%	0.25%
14	M1	146,890,675	1	1	720	196	53,382	986,000	1,689,860	3,643,414	5,333,274	0.67%	1.15%	3.63%
15	M1	92,560,780	3		360	23	33,638	456,000	235,987	2,351,114	2,587,101	0.49%	0.25%	2.80%
16	M1	522,650,000	2		720	21	189,939	3,490,000	342,760	1,180,894	1,523,654	0.67%	0.07%	0.29%

Summary of Results

Project No (1)	Contractor Grade (2)	Contract Sum (3)	No of Accident (4)		Contract period (5)	Total Man Day lost due to accident(6)	Total Man Day of Project (8)	Safety Investment (9)	Direct cost of Accident (10)	Social Cost of Accidents (11)	Total cost of Accident (10)+(11)	SIR (9)/(3)	ALR (10)/(3)	TALR (12)/(3)
			Injured	Fatal										
17	M1	65,123,780	2		360	14	23,667	654,890	324,500	1,180,894	1,505,394	1.01%	0.50%	2.31%
18	M1	154,560,700	2		720	18	56,170	345,675	637,000	2,340,439	2,977,439	0.22%	0.41%	1.93%
19	M1	70,670,000	1		240	10	25,683	564,000	65,900	10,674	76,574	0.80%	0.09%	0.11%
20	M1	185,650,000	3	1	720	213	67,468	125,000	1,867,340	3,664,762	5,532,102	0.07%	1.01%	2.98%
21	M1	76,890,000	2		300	15	27,943	456,890	243,890	1,180,894	1,424,784	0.59%	0.32%	1.85%
22	M1	332,780,000	3	2	720	564	120,938	456,780	3,750,182	6,137,956	9,888,138	0.14%	1.13%	2.97%
23	M1	274,650,170	1		180	6	99,812	1,765,900	163,570	1,170,220	1,333,790	0.64%	0.06%	0.49%
24	M1	32,786,090	2		360	16	11,915	165,890	132,000	1,180,894	1,312,894	0.51%	0.40%	4.00%
25	M1	121,210,980			720		44,050	1,456,000				1.20%	0.00%	0.00%
26	M1	67,532,115	2	1	240	348	24,542	234,000	1,842,659	3,654,088	5,496,747	0.35%	2.73%	8.14%
27	M1	78,021,382	1		540	7	28,354	435,220	347,890	1,170,220	1,518,110	0.56%	0.45%	1.95%
28	M1	267,012,390	4		720	22	97,037	657,000	967,890	2,361,788	3,329,678	0.25%	0.36%	1.25%
29	M1	106,210,600	1		720	9	38,599	654,000	453,790	1,170,220	1,624,010	0.62%	0.43%	1.53%
30	M1	53,112,650	2		120	15	19,302	134,000	245,790	1,180,894	1,426,684	0.25%	0.46%	2.69%
31	M1	42,675,600	3		180	18	15,509	215,000	126,000	2,351,114	2,477,114	0.50%	0.30%	5.80%
32	M1	231,780,125	3	1	360	435	84,233	657,400	2,103,400	3,664,762	5,768,162	0.28%	0.91%	2.49%
		5,727,480,037	66	9	16,740	3,112	2,081,459	35,057,030	23,234,017	60,068,705	83,302,722	0.61%	0.41%	1.45%

Questionnaire for Accident Cost

Research :- Cost of Accident and Investment on Safety in Construction Industry – A Case Study in Sri Lanka

Note:-The following form is designed for the filling of ONE accident. For more than one accident, please photocopy the form for others

1 Injured person (job nature: _____)			
- No of Day Loss		Days	
- Amount of Compensation (Wage X No of day lost)		Rs.	
- % of Disability if any		%	
- Disability Compensation if any		Rs.	
2 Loss from injured person (after resuming work)			
- Estimated duration of work in the project or company		Days	
- * Equivalent Loss		Rs.	
3 Medical services and expenses			
- Hospitalization/medical expenses		Rs.	
- Others		Rs.	
4 Fines and legal expenses			
- Fines by court and solicitor fees		Rs.	
- Others		Rs.	
5 Lost time of other employees (time taken by other employees in assisting the injured person)			
Post	Monthly wages	Time incurred	Amount
-Site Manager	Rs. _____	Days _____	Rs. _____
- Site Engineer	Rs. _____	Days _____	Rs. _____
- Site Foreman	Rs. _____	Days _____	Rs. _____
-Other Labourers	Rs. _____	Days _____	Rs. _____
6 Equipment or plant loss			
- Damaged / replacement cost		Rs.	
- Repairing Cost		Rs.	
- Others		Rs.	
7 Damaged material or finished work			
- Cost of damaged material		Rs.	
- Cost of damaged finished work		Rs.	
- Others		Rs.	
8 Idling of machinery/equipment Idle machinery/equipment			
		Rs.	
9 Other costs items			
		Rs.	
TOTAL			Rs. _____

- * Equivalent Loss = Wage of Injured worker x Estimated duration of work X % of Disability

Questionnaire for Safety Investment on the Project

Research :- Analysis of Cost of Accident and Investment on Safety in Construction Industry – A Case Study in Sri Lanka

Contract Sum of Project :- Rs. _____
Contract Period of Project :- Months _____

1 Investment on safety administration personnel

1.1 On -site investment

Post	Number	Monthly wage
Safety Supervisor	_____	Rs. _____
Safety Officer	_____	Rs. _____
Others:	_____	Rs. _____

1.2 Head-office investment

Post	Number	Monthly wage
Safety manager	_____	Rs. _____
Chief safety officer	_____	Rs. _____
Senior safety officer	_____	Rs. _____
Secretary/typist/clerk	_____	Rs. _____
Others:	_____	Rs. _____

Sub total for the month _____

Sub total for the Project (Sub total for month x No of Months for project) _____

2 Safety equipment investment on the project

2.1 Cost Safety Equipment	Rs. _____
2.2 Cost Additional Scaffolding and Safety net etc	Rs. _____
Sub Total	_____

3 Safety training cost

3.1 Safety training cost	Rs. _____
3.2 Cost of time spend for the safety meeting etc	Rs. _____
Sub Total	_____

4 Safety promotion cost

4.1 Safety promotion cost	Rs. _____
Sub Total	_____

Other costs

5 i.	Rs. _____
ii.	Rs. _____
iii	Rs. _____
Sub Total	_____

TOTAL SAFETY INVESTMENT Rs. _____

Appendix 04

Summary of Data from Questionnaire I

Cost of Accidents

Project Number		i			
Accident number		1	2	3	Total
1	Injured persons (job nature:)				
	- No of Day Loss	Days			
	- Amount of Compensation (Wage X No of day lost)	Rs.	7,800	20,800	28,600
	- % of Disability if any	%		Fatal	-
	- Disability Compensation if any	Rs.	200,000	1,000,000	1,200,000
2	Loss from injured person (after resuming work)				
	Estimated duration of work in the project or comp	Days			
	- * Equivalent Loss	Rs.			
3	Medical services and expenses				
	- Hospitalization/medical expenses	Rs.	28,000	22,000	2,200
	- Others	Rs.	2,500	2,500	4,000
4	Fines and legal expenses				
	- Fines by court and solicitor fees	Rs.		12,760	12,760
	- Others	Rs.			
5	Lost time of other employees (time taken by other employees in assisting the injured person)				
	Post				
	-Site Manager	Rs.	608	1,216	3636
	- Site Engineer	Rs.	1,020	2,045	4090
	- Site Foreman	Rs.			3409
	-Other Labourers	Rs.	650	1,707	2909
6	Equipment or plant loss				
	- Damaged / replacement cost	Rs.			
	- Repairing Cost	Rs.			
	- Others	Rs.			
7	Damaged material or finished work				
	- Cost of damaged material	Rs.			
	- Cost of damaged finished work	Rs.	24,000		24,000
	- Others	Rs.			
8	Idling of machinery/equipment				
	Idle machinery/equipment	Rs.	12,100	226,000	238,100
9	Other costs items	Rs.		18,000	18,000
TOTAL		Rs.	64,578	262,368	1,277,004
					1,603,950

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		2		
Accident number		1	2	Total
1	Injured persons (job nature:)			
	- No of Day Loss	Days		
	- Amount of Compensation (Wage X No of day lost)	Rs.	12,000	17,600
	- % of Disability if any	%		-
	- Disability Compensation if any	Rs.		35,000
2	Loss from injured person (after resuming work)			-
	estimated duration of work in the project or comp	Days		-
	- * Equivalent Loss	Rs.		-
3	Medical services and expenses			-
	- Hospitalization/medical expenses	Rs.	13,600	22,900
	- Others	Rs.	5,000	5,000
4	Fines and legal expenses			-
	- Fines by court and solicitor fees	Rs.		-
	- Others	Rs.		-
5	Lost time of other employees (time taken by other employees in assisting the injured person)			-
	Post			-
	-Site Manager	Rs.	1,000	1,000
	- Site Engineer	Rs.	850	850
	- Site Foreman	Rs.	600	600
	-Other Labourers	Rs.	8,000	6,400
6	Equipment or plant loss			-
	- Damaged / replacement cost	Rs.		-
	- Repairing Cost	Rs.		-
	- Others	Rs.		-
7	Damaged material or finished work		187,444	187,444
	- Cost of damaged material	Rs.		-
	- Cost of damaged finished work	Rs.		-
	- Others	Rs.		-
8	Idling of machinery/equipment			-
	Idle machinery/equipment	Rs.	12,400	16,356
9	Other costs items	Rs.	2,000	2,000
				-
	TOTAL	Rs.	55,450	294,550
				350,000



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Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		3			
Accident number		1	Total	1	2
1	Injured persons (job nature:)				
	- No of Day Loss	Days			
	- Amount of Compensation (Wage X No of day lost)	Rs.	7,600	7,600	9,800
	- % of Disability if any	%		-	
	- Disability Compensation if any	Rs.		-	20,000
					50,000
2	Loss from injured person (after resuming work)				
	Estimated duration of work in the project or comp	Days		-	
	- * Equivalent Loss	Rs.		-	
3	Medical services and expenses				
	- Hospitalization/medical expenses	Rs.		-	15,000
	- Others	Rs.		-	10,000
4	Fines and legal expenses				
	- Fines by court and solicitor fees	Rs.		-	
	- Others	Rs.		-	
5	Lost time of other employees (time taken by other employees in assisting the injured person)				
	Post				
	-Site Manager	Rs.		-	2,500
	- Site Engineer	Rs.		-	1,500
	- Site Foreman	Rs.	600	600	800
	-Other Labourers	Rs.	1,400	1,400	13,000
					18,000
6	Equipment or plant loss				
	- Damaged / replacement cost	Rs.		-	
	- Repairing Cost	Rs.		-	
	- Others	Rs.		-	
7	Damaged material or finished work				
	- Cost of damaged material	Rs.		-	60,000
	- Cost of damaged finished work	Rs.		-	70,000
	- Others	Rs.		-	
8	Idling of machinery/equipment				
	Idle machinery/equipment	Rs.		-	
9	Other costs items	Rs.	1,250	1,250	
	TOTAL	Rs.	10,850	10,850	122,600
					159,050



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Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		4			5	
Accident number		3	4	Total	1	Total
1	Injured persons (job nature:)					
	- No of Day Loss	Days				
	- Amount of Compensation (Wage X No of day lost)	Rs.	14,000	30,800	9,600	9,600
	- % of Disability if any	%		Fata		
	- Disability Compensation if any	Rs.	100,000	1,000,000	12,500	12,500
2	Loss from injured person (after resuming work)					
	estimated duration of work in the project or comp	Days				
	- * Equivalent Loss	Rs.				
3	Medical services and expenses					
	- Hospitalization/medical expenses	Rs.	25,000	50,000		
	- Others	Rs.		200,000	9,600	9,600
4	Fines and legal expenses					
	- Fines by court and solicitor fees	Rs.				
	- Others	Rs.		25,000	1,800	1,800
5	Lost time of other employees (time taken by other employees in assisting the injured person)					
	Post					
	-Site Manager	Rs.	3,000	10,400	17,900	650
	- Site Engineer	Rs.	1,000	12,800	16,600	400
	- Site Foreman	Rs.	600	32,000	34,150	
	-Other Labourers	Rs.	25,000	360,000	416,000	4,000
6	Equipment or plant loss					
	- Damaged / replacement cost	Rs.				
	- Repairing Cost	Rs.				
	- Others	Rs.				
7	Damaged material or finished work		150,350	280,350		
	- Cost of damaged material	Rs.				
	- Cost of damaged finished work	Rs.				
	- Others	Rs.		25,000		
8	Idling of machinery/equipment					
	Idle machinery/equipment	Rs.		261,000	8,200	8,200
9	Other costs items	Rs.				
TOTAL		Rs.	318,950	1,926,200	2,526,800	46,750

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		6			7	
Accident number		1	2	Total	1	Total
1	Injured persons (job nature:)					
	- No of Day Loss	Days				
	- Amount of Compensation (Wage X No of day lost)	Rs.	10,200	10,200	4,200	4,200
	- % of Disability if any	%	Fatal	-		-
	- Disability Compensation if any	Rs.	500,000	500,000		-
2	Loss from injured person (after resuming work)					
	Estimated duration of work in the project or comp	Days		-		-
	- * Equivalent Loss	Rs.		-		-
3	Medical services and expenses					
	- Hospitalization/medical expenses	Rs.		-		-
	- Others	Rs.	4,600	18,850	7,800	7,800
4	Fines and legal expenses					
	- Fines by court and solicitor fees	Rs.		-		-
	- Others	Rs.	6,830	8,600	15,430	-
5	Lost time of other employees (time taken by other employees in assisting the injured person)					
	Post					
	-Site Manager	Rs.	700	2,800	3,500	750
	- Site Engineer	Rs.	500	2,850	3,350	-
	- Site Foreman	Rs.				400
	-Other Labourers	Rs.	6,400	46,270	52,670	6,700
6	Equipment or plant loss					
	- Damaged / replacement cost	Rs.		-		-
	- Repairing Cost	Rs.		-		-
	- Others	Rs.		-		-
7	Damaged material or finished work					
	- Cost of damaged material	Rs.		-		-
	- Cost of damaged finished work	Rs.		-		-
	- Others	Rs.		24,000	24,000	1,450
8	Idling of machinery/equipment					
	Idle machinery/equipment	Rs.	8,400	124,000	132,400	-
9	Other costs items	Rs.				
	TOTAL	Rs.	37,630	727,370	765,000	21,300

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		8				
Accident number		1	2	3	Total	1
1	Injured persons (job nature:)					
	- No of Day Loss	Days				
	- Amount of Compensation (Wage X No of day lost)	Rs.	6,800	12,800	15,600	35,200
	- % of Disability if any	%				-
	- Disability Compensation if any	Rs.	100,000		45,000	145,000
2	Loss from injured person (after resuming work)					
	Estimated duration of work in the project or comp	Days				
	- * Equivalent Loss	Rs.				
3	Medical services and expenses					
	- Hospitalization/medical expenses	Rs.				
	- Others	Rs.	6,700	10,300	24,500	41,500
4	Fines and legal expenses					
	- Fines by court and solicitor fees	Rs.				
	- Others	Rs.	3,000	3,000	3,000	9,000
5	Lost time of other employees (time taken by other employees in assisting the injured person)					
	Post					
	-Site Manager	Rs.	700	700	700	2,100
	- Site Engineer	Rs.	450	450	450	1,350
	- Site Foreman	Rs.				
	-Other Labourers	Rs.	5,800	6,400	12,540	24,740
6	Equipment or plant loss					
	- Damaged / replacement cost	Rs.				
	- Repairing Cost	Rs.				
	- Others	Rs.				
7	Damaged material or finished work					
	- Cost of damaged material	Rs.				
	- Cost of damaged finished work	Rs.				
	- Others	Rs.	1,600	8,600	5,400	15,600
8	Idling of machinery/equipment					
	Idle machinery/equipment	Rs.	6,700	8,640	11,170	26,510
9	Other costs items	Rs.				
TOTAL		Rs.	131,750	50,890	118,360	301,000
						46,700

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		9			10	
Accident number		2	3	Total	1	Total
1	Injured persons (job nature:)					
	- No of Day Loss	Days				
	- Amount of Compensation (Wage X No of day lost)	Rs.	7,900	12,400	31,200	7,800
	- % of Disability if any	%			-	-
	- Disability Compensation if any	Rs.	50,000		50,000	11,000
2	Loss from injured person (after resuming work)					
	Estimated duration of work in the project or comp	Days				
	- * Equivalent Loss	Rs.				
3	Medical services and expenses					
	- Hospitalization/medical expenses	Rs.				
	- Others	Rs.	5,000	9,000	21,000	7,000
4	Fines and legal expenses					
	- Fines by court and solicitor fees	Rs.				
	- Others	Rs.				
5	Lost time of other employees (time taken by other employees in assisting the injured person)					
	Post					
	-Site Manager	Rs.	760	760	2,280	1,500
	- Site Engineer	Rs.	540	540	1,620	750
	- Site Foreman	Rs.				
	-Other Labourers	Rs.	3,200	12,400	22,100	13,000
6	Equipment or plant loss					
	- Damaged / replacement cost	Rs.				
	- Repairing Cost	Rs.				
	- Others	Rs.				
7	Damaged material or finished work					
	- Cost of damaged material	Rs.				
	- Cost of damaged finished work	Rs.				
	- Others	Rs.				
8	Idling of machinery/equipment					
	Idle machinery/equipment	Rs.	16,000	14,800	51,800	5,550
9	Other costs items	Rs.				
TOTAL		Rs.	83,400	49,900	180,000	46,600

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		11				
Accident number		1	2	3	Total	
1	Injured persons (job nature:)					
	- No of Day Loss	Days				
	- Amount of Compensation (Wage X No of day lost)	Rs.	22,000	21,000	20,000	63,000
	- % of Disability if any	%				-
	- Disability Compensation if any	Rs.	65,000	50,000	45,000	160,000
2	Loss from injured person (after resuming work)					
	Estimated duration of work in the project or comp	Days				-
	- * Equivalent Loss	Rs.				-
3	Medical services and expenses					
	- Hospitalization/medical expenses	Rs.				-
	- Others	Rs.	18,000	15,000	14,000	47,000
4	Fines and legal expenses					
	- Fines by court and solicitor fees	Rs.				-
	- Others	Rs.				-
5	Lost time of other employees (time taken by other employees in assisting the injured person)					
	Post					
	-Site Manager	Rs.	2,500	1,800	2,000	6,300
	- Site Engineer	Rs.	1,800	900	1,600	4,300
	- Site Foreman	Rs.				-
	-Other Labourers	Rs.	19,000	20,000	19,000	58,000
6	Equipment or plant loss					
	- Damaged / replacement cost	Rs.	20,520	18,000	14,000	52,520
	- Repairing Cost	Rs.				-
	- Others	Rs.				-
7	Damaged material or finished work					
	- Cost of damaged material	Rs.				-
	- Cost of damaged finished work	Rs.				-
	- Others	Rs.	3,000	7,379	7,861	18,240
8	Idling of machinery/equipment					
	Idle machinery/equipment	Rs.	48,000	35,000	20,000	103,000
9	Other costs items	Rs.				-
TOTAL		Rs.	199,820	169,079	143,461	512,360

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		12					
Accident number		1	2	3	4	Total	
1	Injured persons (job nature:)						
	- No of Day Loss	Days					
	- Amount of Compensation (Wage X No of day lost)	Rs.	45,000	42,000	26,000	33,000	146,000
	- % of Disability if any	%					-
	- Disability Compensation if any	Rs.	25,000	42,000	35,000	29,000	131,000
2	Loss from injured person (after resuming work)						-
	Estimated duration of work in the project or comp	Days					-
	- * Equivalent Loss	Rs.					-
3	Medical services and expenses						-
	- Hospitalization/medical expenses	Rs.					-
	- Others	Rs.	25,000	33,000	29,000	53,000	140,000
4	Fines and legal expenses						-
	- Fines by court and solicitor fees	Rs.					-
	- Others	Rs.					-
5	Lost time of other employees (time taken by other employees in assisting the injured person)						-
	Post						-
	-Site Manager	Rs.	5,000	4,500	4,500	4,000	18,000
	- Site Engineer	Rs.	2,600	1,800	1,600	1,400	7,400
	- Site Foreman	Rs.					-
	-Other Labourers	Rs.	40,000	38,000	26,000	33,000	137,000
6	Equipment or plant loss						-
	- Damaged / replacement cost	Rs.	42,000	75,000	41,000	52,000	210,000
	- Repairing Cost	Rs.					-
	- Others	Rs.					-
7	Damaged material or finished work						-
	- Cost of damaged material	Rs.					-
	- Cost of damaged finished work	Rs.					-
	- Others	Rs.		17,000	15,880	60,000	92,880
8	Idling of machinery/equipment						-
	Idle machinery/equipment	Rs.	22,640	10,460		26,620	59,720
9	Other costs items	Rs.					-
							-
	TOTAL	Rs.	207,240	263,760	178,980	292,020	942,000

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		13					
Accident number		1	2	3	Total	!	
1	Injured persons (job nature:)						
	- No of Day Loss	Days					
	- Amount of Compensation (Wage X No of day lost)	Rs.	31,000	28,000	26,000	85,000	
	- % of Disability if any	%				-	
	- Disability Compensation if any	Rs.			56,000	56,000	
						21,000	
2	Loss from injured person (after resuming work)					-	
	Days					-	
	Estimated duration of work in the project or comp					-	
	- * Equivalent Loss	Rs.				-	
3	Medical services and expenses					-	
	- Hospitalization/medical expenses	Rs.				15,000	
	- Others	Rs.	26,000	20,000	16,000	62,000	
4	Fines and legal expenses					-	
	- Fines by court and solicitor fees	Rs.				-	
	- Others	Rs.				8,000	
5	Lost time of other employees (time taken by other employees in assisting the injured person)					-	
	Post					-	
	-Site Manager	Rs.	4,000	3,000	2,500	9,500	
	- Site Engineer	Rs.	1,300	1,200	1,100	3,600	
	- Site Foreman	Rs.				-	
	-Other Labourers	Rs.	26,000	13,000	16,000	55,000	
						41,160	
6	Equipment or plant loss					-	
	- Damaged / replacement cost	Rs.				-	
	- Repairing Cost	Rs.				-	
	- Others	Rs.				-	
7	Damaged material or finished work					-	
	- Cost of damaged material	Rs.				-	
	- Cost of damaged finished work	Rs.				-	
	- Others	Rs.		12,000	20,000	32,000	
						41,000	
8	Idling of machinery/equipment					-	
	Idle machinery/equipment	Rs.	36,630	15,160	32,110	83,900	
						42,000	
9	Other costs items	Rs.				-	
						-	
						-	
	TOTAL	Rs.	124,930	92,360	169,710	387,000	
						215,360	

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		14		15		
Accident number		2	Total	1	2	3
1	Injured persons (job nature:)					
	- No of Day Loss	Days	Fatal			
	- Amount of Compensation (Wage X No of day lost)	Rs.	46,000	25,000	14,000	22,000
	- % of Disability if any	%	-			
	- Disability Compensation if any	Rs.	1,000,000			50,000
2	Loss from injured person (after resuming work)		-			
	Estimated duration of work in the project or comp	Days	-			
	- * Equivalent Loss	Rs.	-			
3	Medical services and expenses					
	- Hospitalization/medical expenses	Rs.	25,000	18,000	11,000	9,000
	- Others	Rs.	-			
4	Fines and legal expenses					
	- Fines by court and solicitor fees	Rs.	-			
	- Others	Rs.	40,000		32,000	15,000
5	Lost time of other employees (time taken by other employees in assisting the injured person)					
	Post					
	-Site Manager	Rs.	4,000	2,000	1,100	1,000
	- Site Engineer	Rs.	6,500	4,200	900	850
	- Site Foreman	Rs.	9,000	3,200	650	700
	-Other Labourers	Rs.	80,000	13,635	7,226	4,526
6	Equipment or plant loss					
	- Damaged / replacement cost	Rs.	-			
	- Repairing Cost	Rs.	-			
	- Others	Rs.	25,000			
7	Damaged material or finished work					
	- Cost of damaged material	Rs.	-			
	- Cost of damaged finished work	Rs.	-			
	- Others	Rs.	40,000			
8	Idling of machinery/equipment					
	Idle machinery/equipment	Rs.	225,000			
9	Other costs items	Rs.	20,000			
TOTAL		Rs.	1,474,500	66,035	66,876	103,076

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		16				
Accident number		Total	1	2	Total	1
1	Injured persons (job nature:)					
	- No of Day Loss	Days				
	- Amount of Compensation (Wage X No of day lost)	Rs.	61,000	12,000	16,000	28,000
	- % of Disability if any	%	-			-
	- Disability Compensation if any	Rs.	50,000	26,000	19,000	45,000
2	Loss from injured person (after resuming work)		-			-
	Estimated duration of work in the project or comp	Days	-			-
	- * Equivalent Loss	Rs.	-			-
3	Medical services and expenses		-			-
	- Hospitalization/medical expenses	Rs.	38,000	31,000	36,000	67,000
	- Others	Rs.	-			-
4	Fines and legal expenses		-			-
	- Fines by court and solicitor fees	Rs.	-			-
	- Others	Rs.	47,000	42,000	26,000	68,000
5	Lost time of other employees (time taken by other employees in assisting the injured person)		-			-
	Post					
	- Site Manager	Rs.	4,100	4,000	3,500	7,500
	- Site Engineer	Rs.	5,950	5,000	4,000	9,000
	- Site Foreman	Rs.	4,550	4,500	4,200	8,700
	- Other Labourers	Rs.	25,387	18,000	19,000	37,000
6	Equipment or plant loss		-			-
	- Damaged / replacement cost	Rs.	-	21,156	9,404	30,560
	- Repairing Cost	Rs.	-			-
	- Others	Rs.	-			-
7	Damaged material or finished work		-			-
	- Cost of damaged material	Rs.	-			-
	- Cost of damaged finished work	Rs.	-			-
	- Others	Rs.	-	42,000		42,000
8	Idling of machinery/equipment		-			-
	Idle machinery/equipment	Rs.	-			-
9	Other costs items	Rs.	-			-
TOTAL		Rs.	235,987	205,656	137,104	342,760
						178,475

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		17		18			
Accident number		2	Total	1	2	Total	
1	Injured persons (job nature:)						
	- No of Day Loss	Days					
	- Amount of Compensation (Wage X No of day lost)	Rs.	12,000	27,000	9,500	21,690	31,190
	- % of Disability if any	%		-		-	
	- Disability Compensation if any	Rs.	11,000	28,000	200,000	150,000	350,000
				-		-	
2	Loss from injured person (after resuming work)						
	Estimated duration of work in the project or comp	Days					
	- * Equivalent Loss	Rs.		-		-	
				-		-	
3	Medical services and expenses						
	- Hospitalization/medical expenses	Rs.	18,000	44,000	23,000	56,000	79,000
	- Others	Rs.		-		-	
				-		-	
4	Fines and legal expenses						
	- Fines by court and solicitor fees	Rs.		-		-	
	- Others	Rs.	42,000	98,000		-	
				-		-	
5	Lost time of other employees (time taken by other employees in assisting the injured person)						
	Post						
	-Site Manager	Rs.	2,800	6,300	4,000	4,500	8,500
	- Site Engineer	Rs.	2,500	5,500	3,500	3,900	7,400
	- Site Foreman	Rs.	1,600	4,200	2,800	3,000	5,800
	-Other Labourers	Rs.	17,000	36,000	18,000	19,000	37,000
				-		-	
6	Equipment or plant loss						
	- Damaged / replacement cost	Rs.	14,000	25,000	13,110	57,000	70,110
	- Repairing Cost	Rs.		-		-	
	- Others	Rs.		-		-	
				-		-	
7	Damaged material or finished work						
	- Cost of damaged material	Rs.		-		-	
	- Cost of damaged finished work	Rs.		-		-	
	- Others	Rs.	25,125	50,500		48,000	48,000
				-		-	
8	Idling of machinery/equipment						
	Idle machinery/equipment	Rs.		-		-	
				-		-	
9	Other costs items	Rs.		-		-	
				-		-	
TOTAL		Rs.	146,025	324,500	273,910	363,090	637,000

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		19		20		
Accident number		1	Total	1	2	3
1	Injured persons (job nature:)					
	- No of Day Loss	Days		12,500	28,200	16,400
	- Amount of Compensation (Wage X No of day lost)	Rs.	9,500	9,500		
	- % of Disability if any	%		-		
	- Disability Compensation if any	Rs.	20,000	20,000	25,000	
2	Loss from injured person (after resuming work)					
	Estimated duration of work in the project or comp	Days		-		
	- * Equivalent Loss	Rs.		-		
3	Medical services and expenses					
	- Hospitalization/medical expenses	Rs.		-		
	- Others	Rs.		4,500	20,000	15,000
4	Fines and legal expenses					
	- Fines by court and solicitor fees	Rs.		-		
	- Others	Rs.		3,500	4,000	4,000
5	Lost time of other employees (time taken by other employees in assisting the injured person)					
	Post					
	-Site Manager	Rs.	2,500	2,500	650	650
	- Site Engineer	Rs.	4,000	4,000	400	400
	- Site Foreman	Rs.	1,200	1,200	650	650
	-Other Labourers	Rs.	16,000	16,000	8,000	13,200
6	Equipment or plant loss					
	- Damaged / replacement cost	Rs.		-		
	- Repairing Cost	Rs.		-		
	- Others	Rs.		-		
7	Damaged material or finished work					
	- Cost of damaged material	Rs.		-		
	- Cost of damaged finished work	Rs.		-		
	- Others	Rs.	12,700	12,700		
8	Idling of machinery/equipment					
	Idle machinery/equipment	Rs.		-	15,000	13,600
9	Other costs items	Rs.		-		
TOTAL		Rs.	65,900	65,900	45,200	105,100
					68,300	

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		22			
Accident number		1	2	3	4
1	Injured persons (job nature:)				
	- No of Day Loss	Days			
	- Amount of Compensation (Wage X No of day lost)	Rs.	22,800	15,600	20,400
	- % of Disability if any	%			
	- Disability Compensation if any	Rs.		1,100,000	110,000
2	Loss from injured person (after resuming work)	Days			
	Estimated duration of work in the project or comp	Days			
	- * Equivalent Loss	Rs.			
3	Medical services and expenses				
	- Hospitalization/medical expenses	Rs.		20,000	
	- Others	Rs.	11,000	12,000	15,000
4	Fines and legal expenses				
	- Fines by court and solicitor fees	Rs.		150,000	
	- Others	Rs.			
5	Lost time of other employees (time taken by other employees in assisting the injured person)				
	Post				
	-Site Manager	Rs.	2,500	3,500	3,000
	- Site Engineer	Rs.	2,100	2,800	2,700
	- Site Foreman	Rs.	1,900	2,000	1,600
	-Other Labourers	Rs.	23,000	25,000	24,000
6	Equipment or plant loss				
	- Damaged / replacement cost	Rs.			
	- Repairing Cost	Rs.			
	- Others	Rs.			
7	Damaged material or finished work				
	- Cost of damaged material	Rs.			
	- Cost of damaged finished work	Rs.			
	- Others	Rs.			
8	Idling of machinery/equipment				
	Idle machinery/equipment	Rs.	42,000	25,000	20,282
9	Other costs items	Rs.			
TOTAL		Rs.	105,300	85,900	1,654,100
					196,982



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Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		5		23	
Accident number			Total		Total
1	Injured persons (job nature:)				
	- No of Day Loss	Days			
	- Amount of Compensation (Wage X No of day lost)	Rs.	58,800	15,000	15,000
	- % of Disability if any	%	-		-
	- Disability Compensation if any	Rs.	1,200,000	51,000	51,000
2	Loss from injured person (after resuming work)		-		-
	Estimated duration of work in the project or comp	Days	-		-
	- * Equivalent Loss	Rs.	-		-
3	Medical services and expenses				
	- Hospitalization/medical expenses	Rs.	20,000	16,000	16,000
	- Others	Rs.	38,000		-
4	Fines and legal expenses				
	- Fines by court and solicitor fees	Rs.	120,000	12,000	12,000
	- Others	Rs.	-		-
5	Lost time of other employees (time taken by other employees in assisting the injured person)				
	Post				
	-Site Manager	Rs.	2,500	2,500	2,500
	- Site Engineer	Rs.	6,000	1,900	1,900
	- Site Foreman	Rs.	9,000	1,500	1,500
	-Other Labourers	Rs.	146,400	19,000	19,000
6	Equipment or plant loss				
	- Damaged / replacement cost	Rs.	-		-
	- Repairing Cost	Rs.	-		-
	- Others	Rs.	-		-
7	Damaged material or finished work				
	- Cost of damaged material	Rs.	-		-
	- Cost of damaged finished work	Rs.	-		-
	- Others	Rs.	-		-
8	Idling of machinery/equipment				
	Idle machinery/equipment	Rs.	224,000	44,670	44,670
9	Other costs items	Rs.	-		-
	TOTAL	Rs.	1,707,900	3,750,182	163,570

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		24			25	
Accident number		1	2	Total	1	
1	Injured persons (job nature:)					
	- No of Day Loss	Days				
	- Amount of Compensation (Wage X No of day lost)	Rs.	12,000	13,000	25,000	45,000
	- % of Disability if any	%			-	
	- Disability Compensation if any	Rs.	21,000	20,000	41,000	
2	Loss from injured person (after resuming work)					
	Estimated duration of work in the project or comp	Days			-	
	- * Equivalent Loss	Rs.			-	
3	Medical services and expenses					
	- Hospitalization/medical expenses	Rs.			-	131,000
	- Others	Rs.			-	
4	Fines and legal expenses					
	- Fines by court and solicitor fees	Rs.			-	
	- Others	Rs.			-	
5	Lost time of other employees (time taken by other employees in assisting the injured person)					
	Post					
	-Site Manager	Rs.	3,000	2,500	5,500	1,500
	- Site Engineer	Rs.	2,500	1,900	4,400	1,200
	- Site Foreman	Rs.	2,100	1,700	3,800	2,500
	-Other Labourers	Rs.	18,800	23,000	41,800	6,000
6	Equipment or plant loss					
	- Damaged / replacement cost	Rs.			-	60,000
	- Repairing Cost	Rs.			-	
	- Others	Rs.			-	
7	Damaged material or finished work					
	- Cost of damaged material	Rs.			-	36,137
	- Cost of damaged finished work	Rs.			-	
	- Others	Rs.			-	
8	Idling of machinery/equipment					
	Idle machinery/equipment	Rs.		10,500	10,500	4,500
9	Other costs items	Rs.			-	
TOTAL		Rs.	59,400	72,600	132,000	287,837

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		26			27	
Accident number		2	3	Total	1	Total
1	Injured persons (job nature:)					
	- No of Day Loss	Days	Fatal			
	- Amount of Compensation (Wage X No of day lost)	Rs.		68,000	20,000	20,000
	- % of Disability if any	%		-		-
	- Disability Compensation if any	Rs.	900,000	900,000		
2	Loss from injured person (after resuming work)					
	Estimated duration of work in the project or comp	Days				
	- * Equivalent Loss	Rs.				
3	Medical services and expenses					
	- Hospitalization/medical expenses	Rs.	28,000	185,000	125,000	125,000
	- Others	Rs.	42,000	42,000		
4	Fines and legal expenses					
	- Fines by court and solicitor fees	Rs.				
	- Others	Rs.				
5	Lost time of other employees (time taken by other employees in assisting the injured person)					
	Post					
	-Site Manager	Rs.	1,500	8,000	5,000	5,000
	- Site Engineer	Rs.	1,200	6,400	4,000	4,000
	- Site Foreman	Rs.	2,000	11,000	2,300	2,300
	-Other Labourers	Rs.	4,800	92,800	21,000	21,000
6	Equipment or plant loss					
	- Damaged / replacement cost	Rs.	22,445	110,445	22,000	22,000
	- Repairing Cost	Rs.				
	- Others	Rs.				
7	Damaged material or finished work					
	- Cost of damaged material	Rs.		85,269	36,000	36,000
	- Cost of damaged finished work	Rs.				
	- Others	Rs.				
8	Idling of machinery/equipment					
	Idle machinery/equipment	Rs.	8,200	208,745	77,590	77,590
9	Other costs items	Rs.		125,000		
TOTAL		Rs.	91,145	1,463,677	1,842,659	312,890

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		28					
Accident number		1	2	3	4	Total	
1	Injured persons (job nature:)						
	- No of Day Loss	Days					
	- Amount of Compensation (Wage X No of day lost)	Rs.	8,000	9,000	26,500	12,000	55,500
	- % of Disability if any	%					-
	- Disability Compensation if any	Rs.	25,000	225,000		28,000	278,000
2	Loss from injured person (after resuming work)						-
	Estimated duration of work in the project or comp	Days					-
	- * Equivalent Loss	Rs.					-
3	Medical services and expenses						
	- Hospitalization/medical expenses	Rs.	45,000	21,000	32,000	22,000	120,000
	- Others	Rs.					-
4	Fines and legal expenses						
	- Fines by court and solicitor fees	Rs.					-
	- Others	Rs.					-
5	Lost time of other employees (time taken by other employees in assisting the injured person)						
	Post						
	-Site Manager	Rs.	1,200	1,200	1,200	1,200	4,800
	- Site Engineer	Rs.	650	650	650	650	2,600
	- Site Foreman	Rs.	4,000	4,000	2,200	2,500	12,700
	-Other Labourers	Rs.	4,850	6,800	5,200	3,500	20,350
6	Equipment or plant loss						
	- Damaged / replacement cost	Rs.	25,000			165,000	190,000
	- Repairing Cost	Rs.					-
	- Others	Rs.					-
7	Damaged material or finished work						
	- Cost of damaged material	Rs.					-
	- Cost of damaged finished work	Rs.			104,250		104,250
	- Others	Rs.					-
8	Idling of machinery/equipment						
	Idle machinery/equipment	Rs.	38,436	46,609	55,267	39,378	179,690
9	Other costs items	Rs.					-
TOTAL.		Rs.	152,136	314,259	227,267	274,228	967,890

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		29		30		
Accident number		1	Total	1	2	Total
1	Injured persons (job nature:)					
	- No of Day Loss	Days				
	- Amount of Compensation (Wage X No of day lost)	Rs.	20,000	18,000	16,000	34,000
	- % of Disability if any	%				
	- Disability Compensation if any	Rs.	275,000		55,000	55,000
2	Loss from injured person (after resuming work)					
	Estimated duration of work in the project or comp	Days				
	- * Equivalent Loss	Rs.				
3	Medical services and expenses					
	- Hospitalization/medical expenses	Rs.	46,000	32,000	45,000	77,000
	- Others	Rs.				
4	Fines and legal expenses					
	- Fines by court and solicitor fees	Rs.				
	- Others	Rs.				
5	Lost time of other employees (time taken by other employees in assisting the injured person)					
	Post					
	-Site Manager	Rs.	2,500	2,800	2,600	5,400
	- Site Engineer	Rs.	1,900	1,900	1,500	3,400
	- Site Foreman	Rs.	1,700	1,500	1,200	2,700
	-Other Labourers	Rs.	21,000	13,000	16,000	29,000
6	Equipment or plant loss					
	- Damaged / replacement cost	Rs.	46,000			
	- Repairing Cost	Rs.				
	- Others	Rs.				
7	Damaged material or finished work					
	- Cost of damaged material	Rs.				
	- Cost of damaged finished work	Rs.				
	- Others	Rs.				
8	Idling of machinery/equipment					
	Idle machinery/equipment	Rs.	39,690	11,237	18,053	29,290
9	Other costs items	Rs.			10,000	10,000
TOTAL		Rs.	453,790	453,790	80,437	165,353
						245,790

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		31				
Accident number		1	2	3	Total	
1	Injured persons (job nature:)					
	- No of Day Loss	Days				
	- Amount of Compensation (Wage X No of day lost)	Rs.	7,000	8,500	7,500	23,000
	- % of Disability if any	%				-
	- Disability Compensation if any	Rs.		32,500		32,500
2	Loss from injured person (after resuming work)					
	Days					
	Estimated duration of work in the project or comp					
	- * Equivalent Loss	Rs.				-
3	Medical services and expenses					
	- Hospitalization/medical expenses	Rs.	7,000	6,500	8,000	21,500
	- Others	Rs.				-
4	Fines and legal expenses					
	- Fines by court and solicitor fees	Rs.				-
	- Others	Rs.				-
5	Lost time of other employees (time taken by other employees in assisting the injured person)					
	Post					
	-Site Manager	Rs.	2,000	2,500	2,300	6,800
	- Site Engineer	Rs.	1,500	1,800	1,900	5,200
	- Site Foreman	Rs.	1,200	1,100	1,300	3,600
	-Other Labourers	Rs.	16,680	7,440	9,280	33,400
6	Equipment or plant loss					
	- Damaged / replacement cost	Rs.				-
	- Repairing Cost	Rs.				-
	- Others	Rs.				-
7	Damaged material or finished work					
	- Cost of damaged material	Rs.				-
	- Cost of damaged finished work	Rs.				-
	- Others	Rs.				-
8	Idling of machinery/equipment					
	Idle machinery/equipment	Rs.				-
9	Other costs items	Rs.				-
TOTAL		Rs.	35,380	27,840	62,780	126,000

Appendix 04

Summary of Data from Questionnaire 1

Cost of Accidents

Project Number		32				Total
Accident number		1	2	3	4	
1	Injured persons (job nature:)					
	- No of Day Loss	Days				
	- Amount of Compensation (Wage X No of day lost)	Rs.	28,000	25,000	30,000	83,000
	- % of Disability if any	%				-
	- Disability Compensation if any	Rs.			1,300,000	1,300,000
2	Loss from injured person (after resuming work)					-
	estimated duration of work in the project or comp	Days				-
	- * Equivalent Loss	Rs.				-
3	Medical services and expenses					-
	- Hospitalization/medical expenses	Rs.		22,500	24,850	45,000
	- Others	Rs.				-
4	Fines and legal expenses					-
	- Fines by court and solicitor fees	Rs.				-
	- Others	Rs.				-
5	Lost time of other employees (time taken by other employees in assisting the injured person)					-
	Post					-
	-Site Manager	Rs.	5,000	4,500	3,800	6,000
	- Site Engineer	Rs.	4,800	4,200	3,500	4,500
	- Site Foreman	Rs.	3,000	2,800		7,000
	-Other Labourers	Rs.				33,000
6	Equipment or plant loss					-
	- Damaged / replacement cost	Rs.	150,000			158,000
	- Repairing Cost	Rs.				-
	- Others	Rs.				-
7	Damaged material or finished work					-
	- Cost of damaged material	Rs.				-
	- Cost of damaged finished work	Rs.				-
	- Others	Rs.				-
8	Idling of machinery/equipment					-
	Idle machinery/equipment	Rs.				187,950
9	Other costs items	Rs.				50,000
TOTAL		Rs.	190,800	59,000	62,150	1,791,450
						2,103,400

Appendix 05

Summary of Data from Questionnaire 2

Safety Investments

Project Number		1	2	3
Contract Sum of Project	Rs.	80,000,000	351,000,000	117,000,000
Contract Period of Project	Months	18	24	4
1 Investment on safety administration personnel				
1.1 On -site investment				
Post				
Safety officers _Monthly wages	Rs.			60,000
Safety Supervisors _Monthly wages	Rs.			40,000
Others: _Monthly wages	Rs.			20,000
1.2 Head-office investment				
Post				
Safety manager _Monthly wages	Rs.			
Chief safety officer _Monthly wages	Rs.			
Senior safety office _Monthly wages	Rs.			
Secretary/typist/cle _Monthly wages	Rs.			
Others: _Monthly wages	Rs.			
Sub total for the month	Rs.	-	-	120,000
Sub total for the Project	Rs.	-	-	480,000
2 Investment on safety equipmenton				
2.1 Cost Safety Equipment	Rs.	33,750	200,000	500,000
2.2 Cost Additional Scaffolding and Safety net etc	Rs.	15,000		
Sub Total	Rs.	48,750	200,000	500,000
3 Safety training cost				
3.1 Safety training cost	Rs		30,000	120,000
3.2 Cost of time spend for the safety meeting etc	Rs			170,000
Sub Total	Rs	-	30,000	290,000
4 Safety promotion cost				
4.1 Safety promotion cost	Rs	15,000		
Sub Total	Rs	15,000	-	-
Other costs				
5 i.	Rs.			
ii.	Rs.			
iii	Rs.			
Sub Total	Rs.	-	-	-
TOTAL SAFETY INVESTMENT	Rs.	63,750	230,000	1,270,000

Appendix 05

Summary of Data from Questionnaire 2

Safety Investments

Project Number		4	5	6
Contract Sum of Project	Rs.	240,000,000	184,000,000	139,000,000
Contract Period of Project	Months	24	12	12
1 Investment on safety administration personnel				
1.1 On -site investment				
Post				
Safety officers _ Monthly wages	Rs.	25,000	45,000	30,000
Safety Supervisors _ Monthly wages	Rs.	18,000	25,000	40,000
Others: _ Monthly wages	Rs.			
1.2 Head-office investment				
Post				
Safety manager _ Monthly wages	Rs.		15,000	
Chief safety officer _ Monthly wages	Rs.			
Senior safety office _ Monthly wages	Rs.			
Secretary/typist/cleaner _ Monthly wages	Rs.			
Others: _ Monthly wages	Rs.			
Sub total for the month	Rs.	43,000	85,000	70,000
Sub total for the Project	Rs.	1,032,000	1,020,000	840,000
2 Investment on safety equipmenton				
2.1 Cost Safety Equipment	Rs.	1,200,000	810,000	400,000
2.2 Cost Additional Scaffolding and Safety net etc	Rs.		342,000	1,500,000
Sub Total	Rs.	1,200,000	1,152,000	1,900,000
3 Safety training cost				
3.1 Safety training cost	Rs		80,000	100,000
3.2 Cost of time spend for the safety meeting etc	Rs	375,000		
Sub Total	Rs	375,000	80,000	100,000
4 Safety promotion cost				
4.1 Safety promotion cost	Rs	200,000	10,000	130,000
Sub Total	Rs	200,000	10,000	130,000
5 Other costs				
i.	Rs.			30,000
ii.	Rs.			
iii	Rs.			
Sub Total	Rs.	-	-	30,000
TOTAL SAFETY INVESTMENT	Rs.	2,807,000	2,262,000	3,000,000

Appendix 05

Summary of Data from Questionnaire 2

Safety Investments

Project Number		7	8	9
Contract Sum of Project	Rs.	160,000,000	152,712,000	246,000,000
Contract Period of Project	Months	22	24	24
1 Investment on safety administration personnel				
1.1 On -site investment				
Post				
Safety officers _Monthly wages	Rs.		18,000	22,000
Safety Supervisors _Monthly wages	Rs.	15,000	2,000	2,000
Others: _Monthly wages	Rs.			
1.2 Head-office investment				
Post				
Safety manager _Monthly wages	Rs.			
Chief safety officer _Monthly wages	Rs.			
Senior safety office _Monthly wages	Rs.			
Secretary/typist/cle _Monthly wages	Rs.			
Others: _Monthly wages	Rs.			
Sub total for the month	Rs.	15,000	20,000	24,000
Sub total for the Project	Rs.	330,000	480,000	576,000
2 Investment on safety equipmenton				
2.1 Cost Safety Equipment	Rs.	200,000	1,450,000	1,740,000
2.2 Cost Additional Scaffolding and Safety net etc	Rs.		500,000	500,000
Sub Total	Rs.	200,000	1,950,000	2,240,000
3 Safety training cost				
3.1 Safety training cost	Rs	20,000	200,000	200,000
3.2 Cost of time spend for the safety meeting etc	Rs		195,000	195,000
Sub Total	Rs	20,000	395,000	395,000
4 Safety promotion cost				
4.1 Safety promotion cost	Rs			95,000
Sub Total	Rs	-	-	95,000
Other costs				
5 i.	Rs.		80,000	
ii.	Rs.			
iii	Rs.			
Sub Total	Rs.	-	80,000	-
TOTAL SAFETY INVESTMENT	Rs.	550,000	2,905,000	3,306,000

Appendix 05

Summary of Data from Questionnaire 2

Safety Investments

Project Number		10	11	12
Contract Sum of Project	Rs.	168,000,000	215,000,000	122,000,000
Contract Period of Project	Months	22	18	12
1 Investment on safety administration personnel				
1.1 On -site investment				
Post				
Safety officers _ Monthly wages	Rs.		32,000	24,000
Safety Supervisors _ Monthly wages	Rs.	18,000	12,000	13,000
Others: _ Monthly wages	Rs.			
1.2 Head-office investment				
Post				
Safety manager _ Monthly wages	Rs.			
Chief safety officer _ Monthly wages	Rs.			
Senior safety office _ Monthly wages	Rs.			
Secretary/typist/clei _ Monthly wages	Rs.			
Others: _ Monthly wages	Rs.		8,000	
Sub total for the month	Rs.	18,000	52,000	37,000
Sub total for the Project	Rs.	396,000	936,000	444,000
2 Investment on safety equipmenton				
2.1 Cost Safety Equipment	Rs.	150,000	250,000	240,000
2.2 Cost Additional Scaffolding and Safety net etc	Rs.		60,000	150,000
Sub Total	Rs.	150,000	310,000	390,000
3 Safety training cost				
3.1 Safety training cost	Rs	90,000	7,000	16,635
3.2 Cost of time spend for the safety meeting etc	Rs			
Sub Total	Rs	90,000	7,000	16,635
4 Safety promotion cost				
4.1 Safety promotion cost	Rs			
Sub Total	Rs	-	-	-
Other costs				
5 i.	Rs.	14,000		
ii.	Rs.			
iii	Rs.			
Sub Total	Rs.	14,000	-	-
TOTAL SAFETY INVESTMENT	Rs.	650,000	1,253,000	850,635

Appendix 05

Summary of Data from Questionnaire 2

Safety Investments

Project Number		13	14	15
Contract Sum of Project	Rs.	630,000,000	146,890,675	92,560,780
Contract Period of Project	Months	48	24	12
1 Investment on safety administration personnel				
1.1 On -site investment				
Post				
Safety officers _Monthly wages	Rs.	28,000	26,000	23,000
Safety Supervisors _Monthly wages	Rs.	12,000	6,000	
Others: _Monthly wages	Rs.			
1.2 Head-office investment				
Post				
Safety manager _Monthly wages	Rs.			
Chief safety officer _Monthly wages	Rs.			
Senior safety office _Monthly wages	Rs.			
Secretary/typist/cleaner _Monthly wages	Rs.			
Others: _Monthly wages	Rs.			
Sub total for the month	Rs.	40,000	32,000	23,000
Sub total for the Project	Rs.	1,920,000	768,000	276,000
2 Investment on safety equipment				
2.1 Cost Safety Equipment	Rs.	80,000	188,000	160,000
2.2 Cost Additional Scaffolding and Safety net etc	Rs.			
Sub Total	Rs.	80,000	188,000	160,000
3 Safety training cost				
3.1 Safety training cost	Rs		30,000	20,000
3.2 Cost of time spend for the safety meeting etc	Rs			
Sub Total	Rs	-	30,000	20,000
4 Safety promotion cost				
4.1 Safety promotion cost	Rs			
Sub Total	Rs	-	-	-
Other costs				
5 i.	Rs.			
ii.	Rs.			
iii	Rs.			
Sub Total	Rs.	-	-	-
TOTAL SAFETY INVESTMENT	Rs.	2,000,000	986,000	456,000

Appendix 05

Summary of Data from Questionnaire 2

Safety Investments

Project Number		16	17	18
Contract Sum of Project	Rs.	522,650,000	65,123,780	154,560,700
Contract Period of Project	Months	24	12	24
1 Investment on safety administration personnel				
1.1 On -site investment				
Post				
Safety officers _Monthly wages	Rs.	26,000	23,800	
Safety Supervisors _Monthly wages	Rs.	33,000	14,940	
Others: _Monthly wages	Rs.			
1.2 Head-office investment				
Post				
Safety manager _Monthly wages	Rs.			
Chief safety officer _Monthly wages	Rs.			
Senior safety office _Monthly wages	Rs.			
Secretary/typist/cle _Monthly wages	Rs.			
Others: _Monthly wages	Rs.			
Sub total for the month	Rs.	59,000	38,740	-
Sub total for the Project	Rs.	1,416,000	464,880	-
2 Investment on safety equipmenton				
2.1 Cost Safety Equipment	Rs.	1,420,000	180,000	300,000
2.2 Cost Additional Scaffolding and Safety net etc	Rs.	350,000		
Sub Total	Rs.	1,770,000	180,000	300,000
3 Safety training cost				
3.1 Safety training cost	Rs.	154,000		43,675
3.2 Cost of time spend for the safety meeting etc	Rs.	100,000		
Sub Total	Rs.	254,000	-	43,675
4 Safety promotion cost				
4.1 Safety promotion cost	Rs.	50,000	10,000	2,000
Sub Total	Rs.	50,000	10,000	2,000
Other costs				
5 i.	Rs.			
ii.	Rs.			
iii	Rs.			
Sub Total	Rs.	-	-	-
TOTAL SAFETY INVESTMENT	Rs.	3,490,000	654,880	345,675

Appendix 05

Summary of Data from Questionnaire 2

Safety Investments

Project Number		19	20	21
Contract Sum of Project	Rs.	70,670,000	185,650,000	76,890,000
Contract Period of Project	Months	8	24	10
1 Investment on safety administration personnel				
1.1 On -site investment				
Post				
Safety officers _Monthly wages	Rs.			27,000
Safety Supervisors _Monthly wages	Rs.	16,000	5,000	12,000
Others: _Monthly wages	Rs.			
1.2 Head-office investment				
Post				
Safety manager _Monthly wages	Rs.			
Chief safety officer _Monthly wages	Rs.			
Senior safety office _Monthly wages	Rs.			
Secretary/typist/cleaner _Monthly wages	Rs.			
Others: _Monthly wages	Rs.			
Sub total for the month	Rs.	16,000	5,000	39,000
Sub total for the Project	Rs.	128,000	120,000	390,000
2 Investment on safety equipmenton				
2.1 Cost Safety Equipment	Rs.	200,000	5,000	50,000
2.2 Cost Additional Scaffolding and Safety net etc	Rs.	130,000		
Sub Total	Rs.	330,000	5,000	50,000
3 Safety training cost				
3.1 Safety training cost	Rs	106,000		16,890
3.2 Cost of time spend for the safety meeting etc	Rs			
Sub Total	Rs	106,000	-	16,890
4 Safety promotion cost				
4.1 Safety promotion cost	Rs			
Sub Total	Rs	-	-	-
Other costs				
5 i.	Rs.			
ii.	Rs.			
iii.	Rs.			
Sub Total	Rs.	-	-	-
TOTAL SAFETY INVESTMENT	Rs.	564,000	125,000	456,890

Appendix 05

Summary of Data from Questionnaire 2

Safety Investments

Project Number		22	23	24
Contract Sum of Project	Rs.	332,780,000	274,650,170	32,786,090
Contract Period of Project	Months	24	6	12
1 Investment on safety administration personnel				
1.1 On-site investment				
Post				
Safety officers _Monthly wages	Rs.		32,000	
Safety Supervisors _Monthly wages	Rs.	16,000	42,000	
Others: _Monthly wages	Rs.			
1.2 Head-office investment				
Post				
Safety manager _Monthly wages	Rs.			
Chief safety officer _Monthly wages	Rs.			
Senior safety office _Monthly wages	Rs.			
Secretary/typist/cle _Monthly wages	Rs.			
Others: _Monthly wages	Rs.			
Sub total for the month	Rs.	16,000	74,000	-
Sub total for the Project	Rs.	384,000	444,000	-
2 Investment on safety equipmenton				
2.1 Cost Safety Equipment	Rs.	45,000	920,000	106,000
2.2 Cost Additional Scaffolding and Safety net etc	Rs.		142,000	40,000
Sub Total	Rs.	45,000	1,062,000	146,000
3 Safety training cost				
3.1 Safety training cost	Rs	27,780	230,000	19,890
3.2 Cost of time spend for the safety meeting etc	Rs		30,000	
Sub Total	Rs	27,780	260,000	19,890
4 Safety promotion cost				
4.1 Safety promotion cost	Rs			
Sub Total	Rs	-	-	-
Other costs				
5 i.	Rs.			
ii.	Rs.			
iii	Rs.			
Sub Total	Rs.	-	-	-
TOTAL SAFETY INVESTMENT	Rs.	456,780	1,766,000	165,890

Appendix 05

Summary of Data from Questionnaire 2

Safety Investments

Project Number		25	26	27
Contract Sum of Project	Rs.	121,210,980	67,532,115	78,021,382
Contract Period of Project	Months	24	8	18
1 Investment on safety administration personnel				
1.1 On -site investment				
Post				
Safety officers _Monthly wages	Rs.	26,000		
Safety Supervisors _Monthly wages	Rs.	12,000	15,600	14,670
Others: _Monthly wages	Rs.			
1.2 Head-office investment				
Post				
Safety manager _Monthly wages	Rs.			
Chief safety officer _Monthly wages	Rs.			
Senior safety office _Monthly wages	Rs.			
Secretary/typist/cle _Monthly wages	Rs.			
Others: _Monthly wages	Rs.			
Sub total for the month	Rs.	38,000	15,600	14,670
Sub total for the Project	Rs.	912,000	124,800	264,060
2 Investment on safety equipmenton				
2.1 Cost Safety Equipment	Rs.	312,000	100,000	120,000
2.2 Cost Additional Scaffolding and Safety net etc	Rs.	120,000		
Sub Total	Rs.	432,000	100,000	120,000
3 Safety training cost				
3.1 Safety training cost	Rs	90,000		48,000
3.2 Cost of time spend for the safety meeting etc	Rs	22,000		
Sub Total	Rs	112,000	-	48,000
4 Safety promotion cost				
4.1 Safety promotion cost	Rs		9,200	3,000
Sub Total	Rs	-	9,200	3,000
Other costs				
5 i.	Rs.			
ii.	Rs.			
iii	Rs.			
Sub Total	Rs.	-	-	-
TOTAL SAFETY INVESTMENT	Rs.	1,456,000	234,000	435,060

Appendix 05

Summary of Data from Questionnaire 2

Safety Investments

Project Number		28	29	30
Contract Sum of Project	Rs.	267,012,390	106,210,600	53,112,650
Contract Period of Project	Months	18	24	4
1 Investment on safety administration personnel				
1.1 On -site investment				
Post				
Safety officers _ Monthly wages	Rs.		22,000	
Safety Supervisors _ Monthly wages	Rs.	18,000		
Others: _ Monthly wages	Rs.			
1.2 Head-office investment				
Post				
Safety manager _ Monthly wages	Rs.			
Chief safety officer _ Monthly wages	Rs.			
Senior safety office _ Monthly wages	Rs.			
Secretary/typist/cleaner _ Monthly wages	Rs.			
Others: _ Monthly wages	Rs.			
Sub total for the month	Rs.	18,000	22,000	-
Sub total for the Project	Rs.	324,000	528,000	-
2 Investment on safety equipmenton				
2.1 Cost Safety Equipment	Rs.	288,000	110,000	95,000
2.2 Cost Additional Scaffolding and Safety net etc	Rs.	45,000		21,000
Sub Total	Rs.	333,000	110,000	116,000
3 Safety training cost				
3.1 Safety training cost	Rs		16,000	18,000
3.2 Cost of time spend for the safety meeting etc	Rs			
Sub Total	Rs	-	16,000	18,000
4 Safety promotion cost				
4.1 Safety promotion cost	Rs			
Sub Total	Rs	-	-	-
Other costs				
i.	Rs.			
ii.	Rs.			
iii	Rs.			
Sub Total	Rs.	-	-	-
TOTAL SAFETY INVESTMENT	Rs.	657,000	654,000	134,000

Appendix 05

Summary of Data from Questionnaire 2

Safety Investments

Project Number		31	32
	Contract Sum of Project	Rs. 42,675,600	231,780,125
	Contract Period of Project	Months 6	12
1	Investment on safety administration personnel		
	1.1 On -site investment		
	Post		
	Safety officers _ Monthly wages	Rs.	
	Safety Supervisors _ Monthly wages	Rs.	12,000
	Others: _ Monthly wages	Rs.	
	1.2 Head-office investment		
	Post		
	Safety manager _ Monthly wages	Rs.	
	Chief safety officer _ Monthly wages	Rs.	
	Senior safety office _ Monthly wages	Rs.	
	Secretary/typist/clei _ Monthly wages	Rs.	
	Others: _ Monthly wages	Rs.	
	Sub total for the month	Rs.	12,000
	Sub total for the Project	Rs.	144,000
2	Investment on safety equipmenton		
	2.1 Cost Safety Equipment	Rs. 166,000	400,000
	2.2 Cost Additional Scaffolding and Safety net etc	Rs. 35,000	73,400
	Sub Total	Rs. 201,000	473,400
3	Safety training cost		
	3.1 Safety training cost	Rs 14,000	40,000
	3.2 Cost of time spend for the safety meeting etc	Rs	
	Sub Total	Rs 14,000	40,000
4	Safety promotion cost		
	4.1 Safety promotion cost	Rs	
	Sub Total	Rs -	-
5	Other costs		
	i.	Rs.	
	ii.	Rs.	
	iii	Rs.	
	Sub Total	Rs. -	-
	TOTAL SAFETY INVESTMENT	Rs. 215,000	657,400