THE LEVEL OF COMPLIANCE TO SAFETY AUDIT IN CONSTRUCTION INDUSTRY

AHMAD FAUZI BIN AWANG

A project report submitted in partial fulfilment of the
requirement for the award of the degree of
Master of Science (Construction Management)

Faculty of Civil Engineering
Universiti Teknologi Malaysia

APRIL 2007

To my beloved Wife, my lovely kids, my late mother and father,
my lecturers and all my friends……
Thanks for all the love and encouragement.....

ACKNOWLEDGEMENT

First and foremost, grateful thanks to Allah S.W.T for guiding and helping me in the completion of this dissertation.

I would like to extend my deepest gratitude and appreciation to my supervisor, Assoc. Prof. Aziruddin Ressang for his continuous guidance, ideas, suggestion, support and valuable advices throughout the period of this Master Project and also to lecturers involved in Construction Management Course; Prof. Dr. Muhd. Zaimi Abd. Majid, Assoc. Prof. Dr. Mohamad Ibrahim Mohamad, , Assoc. Prof. Zainudin Mohamed Shamsudin Assoc. Prof. Dr. Abd. Hakim, Assoc. Prof. Dr. A.Aziz Saim, Assoc. Prof. Dr. Aminaton Marto, Assoc. Prof. Dr. Ahmad Baharudin, Dr. Ir. Rosli Mohamad Zin, Dr. Shaiful Amri Mansur, Dr. Aminah Mohd Yusof, Dr. Melati Ahmad Anuar, Dr. Arham Abdullah and Mr. Bachan Singh.

I am also thankful to the Department of Occupational Safety and Health for giving me the opportunity to further my study in Construction Management and also for providing the data for this research. Due appreciation also to the Public Service Department for sponsoring my study.

Last but not least is my appreciation and gratitude to my beloved wife, Che Zuriah Jusoh and my kids for their love, encouragement, support and also for believe in me. I would like to thank to my entire friend especially those providing me with all the materials required to complete all the assignments.

ABSTRACT

Construction activities have been identified as among the highest activity contributed to the accident at workplace in Malaysia. Safety on the construction site was assessed by the Department of Occupational Safety and Health by conducting safety audits during construction. A standard checklist was used to conduct the audit. This checklist included those items which are compliance to Occupational Safety and Health Act and Factories and Machinery Act and perceived to be important from the safety point of view. These are Occupational Safety and Health management, safety committee, machinery, scaffolding, working at height, public safety, workers quarters, storage facilities, formwork, excavation and shoring, personnel protective equipment, platform, floor opening, edge of open floor, access and egress, electrical safety, cleanliness, health and welfare, piling and demolition. A total of 2038 number of audited have been carried out on construction sites throughout Malaysia by the officers from the Department of Occupational Safety and Health for the years of 2004 and 2005. The data from those audits will be analyzed. The sites will be differentiated into high cost and low cost projects based on the cost of the project that reflected to the requirement of contractor to engaged a safety officer if the project exceeding RM 20.0 millions and high-rise and low-rise projects based on the highness of the building. The objectives of this research are to assess the level of safety practiced at various construction projects in Malaysia, to determine the level of compliance to safety audit elements between high cost and low cost projects and between high-rise and low-rise constructions. The results of analysis revealed construction sites performed better due to the impact of safety audit carried out at their workplace. In term of category of projects, high-rise constructions performed better than low-rise construction. In term of cost of projects, high cost projects performed better than low cost projects simply due to the roles of safety officers engaged by high cost constructions.

ABSTRAK

Aktiviti pembinaan telah dikenalpasti sebagai antara sector pekerjaan yang menyumbang kepada kadar kemalangan ditempat kerja yang tertinggi di Malaysia. Keselamatan di tapak pembinaan telah dinilai oleh Jabatan Keselamatan dan kesihatan Pekerjaan melalui perlaksanaan audit keselamatan semasa aktiviti pembinaan semasa kerja-kerja pembinaan dijalankan. Audit keselamatan dilaksanakan dengan berpandukan kepada satu senarai semak yang seragam. Senarai semak mengandungi perkara-perkara yang perlu mematuhi kehendak-kehenadak Akta Keselamatan dan Kesihatan Pekerjaan danAkta Kilang dan Jentera yang mana merupakan perkara penting kepada aspek keselamatan. Perkara-perkara itu termasuk pengurusan keselamtan dan kesihatan, jawatankuasa keselamatan, jentera, perancah, bekerja di tempat tinggi, keselamatan awam, kuarter penginapan pekerja, kemudahan penyimpanan, acuan, penggalian, alat perlindungan diri, platform, bukaan pada lantai, bukaan pada tepian, laluan keluar dan masuk, keselamatan elektrik, kebersihan, kesihatan dan kebajikan, kerja cerucuk, dan perobohan. Jabatan Keselamatan dan Kesihatan Pekerjaan telah melaksanakan audit keselamatan di 2038 tapak pembinaan di sepanjang 2004 dan 2005. Data daripada audit keselamatan ini akan dianalisa. Tapak pembinaan akan diklasifikasikan berdasarkan kepada kos pembinaan yang terdiri daripada projek berkos tinggi yang memerlukan penggajian pegawai keselamatan di tapak pembinaan yang bernilai sekurang-kurangnya RM 20 juta dan projek berkos rendah dan juga akan diklasifikasikan berdasarkan kepada ketegori ketinggian pembinaan iaitu pembinaan bangunan tinggi dan juga pembinaan bangunan rendah. Keputusan analisa mendedahkan prestasi tapak keselamatan bertambah baik kesan daripada audit keselamatan yang dijalankan. Dari segi kategori pembinaan didapati pembinaan bangunan tinggi lebih mematuhi keperluan keselamatan dan kesihatan berbanding pembinaan bangunan rendah. Dari segi kos pembinaan, projek berkos tinggi didapati lebih mematuhi keperluan keselamatan dan kesihatan berbanding projek berkos rendah disebabkan oleh peranan yang dimainkan oleh pegawai keselamatan dan kesihatan.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

ABBREVIATION	TITLE
BOWEC	Factories and Machinery (Building Operations & Work of Engineering Construction) Regulations, 1986
DOSH	Department of Occupational Safety and Health
FMS	Factories and Machinery (Fencing of Machinery and Safety) Regulations, 1970
FMA	Factories and Machinery Act 1967
ISRS	International Safety Rating System
MPOSHCI	Master Plan for Occupational Safety and Health in Construction Industy 2005 -2010
NODOOPOD	Occupational Safety and Health (Notification of Accident, Dangerous Occurrence, Occupational Poisoning and Occupational Disease) Regulations 2004
NOI	Notice of Improvement
NOP	Notice of Prohobition
PPE	Personal Protective Equipment
PRIMA	Process Safety Management
SHC	Safety and Health Committee
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Act, 1994
SHC	Occupational Safety and Health (Safety and Health Committee) Regulations 1996
SHW	Factories and Machinery (Safety, Health and Welfare) Regulations, 1970
SOCSO	The Social Security Organisation
SMG	Strategic Management Group

LIST OF APPENDICES

CHAPTER ONE

INTRODUCTION

1.1 Background

In profit-driven business, it is common for construction stakeholder; owner, contractor, sub-contractor or even supplier to concentrate exclusively on completing projects to meet the requirement of quality standard with focus more on completing the projects on time and allocated cost. Safety is usually treated as a secondary matter. The lack of motivation in fostering a safety culture has resulted in a poor safety record particularly in construction industries.

Throughout the world, construction industry is known as one of the most hazardous activities. Thousands of people are killed and disabling injury annually in industrial accident. Jannadi, O.A. and Bu-Khamsin, M.S. (2002) cited that the major causes of accidents are related to the unique nature of the industry, human behavior, difficult work-site conditions, and poor safety management, which result in unsafe work methods, equipment and procedures. Yränheikki, E. and Savolainen, H. (2000) claimed the leading causes of accident in Finland included solid objects or articles, working environment and structures, tools, machinery, and conveying or lifting gear. Tam, C.M. *et al.* (2004) revealed that the behaviors of contractors on safety management are of grave concern including the lack of provision of personal protection equipment, regular safety meetings and safety training. Haslam, R.A. *et al.* concluded the key factors in the accidents were problem arising from workers or the work team, workplace issues, shortcoming with personnel protective equipment, problems with suitability and condition of materials and deficiencies with risk management.

Laitenen, H. and Ruohomaki, I. (1996) revealed the rate of fatal accidents in Finland has been about 0.1 in construction, and 0.05 per 1000 man-years in manufacturing. The construction industry has been identified as one of the most hazardous industries in the United States whereas occupational falls have been identified as the common cause of fatal injury in the industry (Cattledge H.G, *et al*.,1996; Janicak, C.A. ,1998 and Behm, M. 2005) . Lingard, H. and Rowlinson, S. (1997) reported in 1993, 87% of worker losing lives in the course of their employment contributed by construction industries and in 1994; construction industries recorded an accident rate of 280 accidents per thousand workers in Hong Kong. Haslam, R.A. *et al.* (2005*)* acknowledged that construction industry in Great Britain accounts for one third of all work fatalities, with a similar poor performance for injuries and ill health. Kartam, N.A. and Bouz, R.G. (1998) confirm that construction is the most hazardous industry in Kuwait with accidents accounting for 48%, 38% and 34% of all disabling injuries and 62%, 38% and 42% of all fatalities in 1994, 1995 and 1996 respectively whereas in China, Tam, C.M. *et al.* (2004) reported in 1999 alone, 1097 construction workers lost their lives.

Rowlinson, S. (2004) gathered the statistics of fatal accidents in construction industries in selected countries worldwide from 1991 to 2000 as shown in Figure 1.1 in which revealed the extent of the problems in construction industries worldwide;

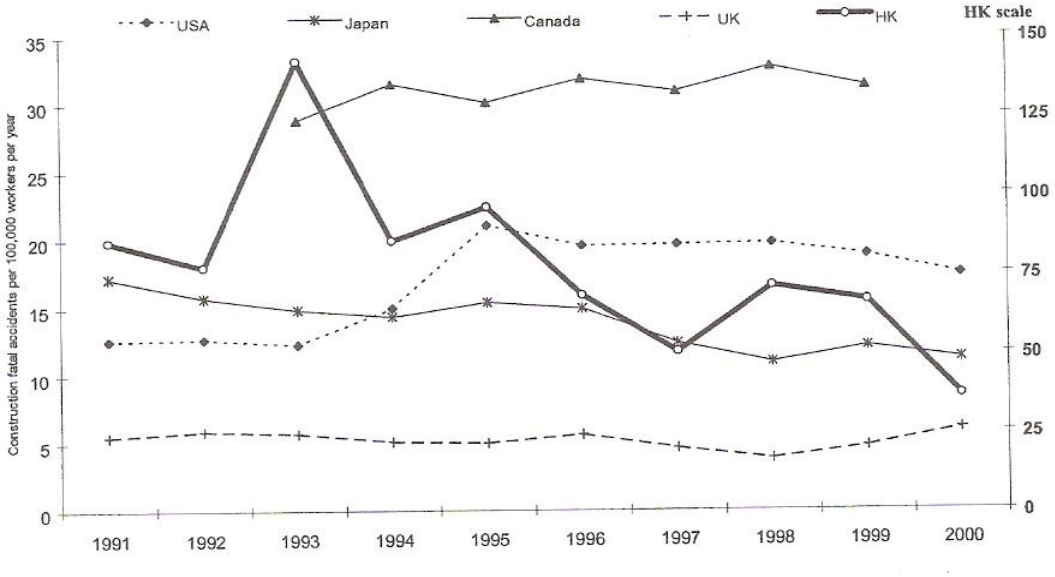

Figure 1.1: Fatal Accidents per 100,000 Construction Workers per Year
Source: Rowlinson S. (2004)

There are many ways where the safety in construction industries being control in order to reduce the number of accidents subsequently reducing the numbers of fatality and injuries to the workers and damage to the equipments. Governments worldwide have maintained an on-going commitment towards establishing a working environment free of injury and disease. This commitment is reflected by establishing performance-based workplace health and safety legislation which sets generalized performance objectives and provides a system of clearly stated responsibilities to encourage greater self-regulation for the construction industry (Mohamed, S., 1999).

Some countries depend totally on government in controlling safety at worksite. The practice of safety in construction in the USA is regulated by governmental agencies such as the Occupational Safety and Health Administration (OSHA), which provides strict rules and regulations to enforce safety and health standards on job site (Jannadi, M.O. and Assaf, S., 1998). The practice of safety in Kuwait is regulated by two government agencies, Kuwait Municipality (KM) and Ministry of Public Work (MPW) in addition to the High Committee for Safety and Security at the state level (Kartam, N.A. and Bouz, R.G., 1998). The ministry of Construction takes the overall

responsibility in overseeing the construction industry in China in which the roles include implementing the new strategies and policies such as preparing development programs, regulating construction markets and construction institutions and monitoring construction safety (Tam, C.M. *et al.*, 2004)

Countries such as the United Kingdom, Singapore and Hong Kong have adopted a self regulatory approach to safety, whereby proprietors (including contractors) are required to develop, implement and maintain safety management system (Ng, S.T. *et al.*, 2005). In Singapore, the construction site safety legislation is governed by the requirements stipulated under the Factories Act (Chapter 104) and the Factories (Building Operations and Work of Engineering Construction) Regulation requires all occupiers of construction worksites, which have contract values of S$10 million or more to implement a Safety Management System specified under the 1999 Code of Practice for Safety Management System for Construction Worksites (CP 79) (Teo, E.A.L et al., 2005). In Finland, occupational safety is the responsibility of the employer, while the occupational safety and health laws are enforced by the Labour Inspection Service, an organization of the state (Yränheikki, E. and Savolainen, H., 2000).

The practice of safety in Saudi Arabia is not regulated by any government agency but becomes an area of responsibility of the top management of the organization (Jannadi, M.O. and Assaf, S., 1998).

Construction industries in Malaysia also have been identified as one of the most hazardous activities. SOCSO reported out of the total of 73858 industrial accidents recorded in 2003, 4654 were came from the construction industry in construction industries with 2.0 percent or 95 cases resulted in death. Figure 1.2 shows the number of accident reported to SOCSO from 1993 to 2003 whereas figure 1.3 shows the number of fatalities in construction industries for the same period.

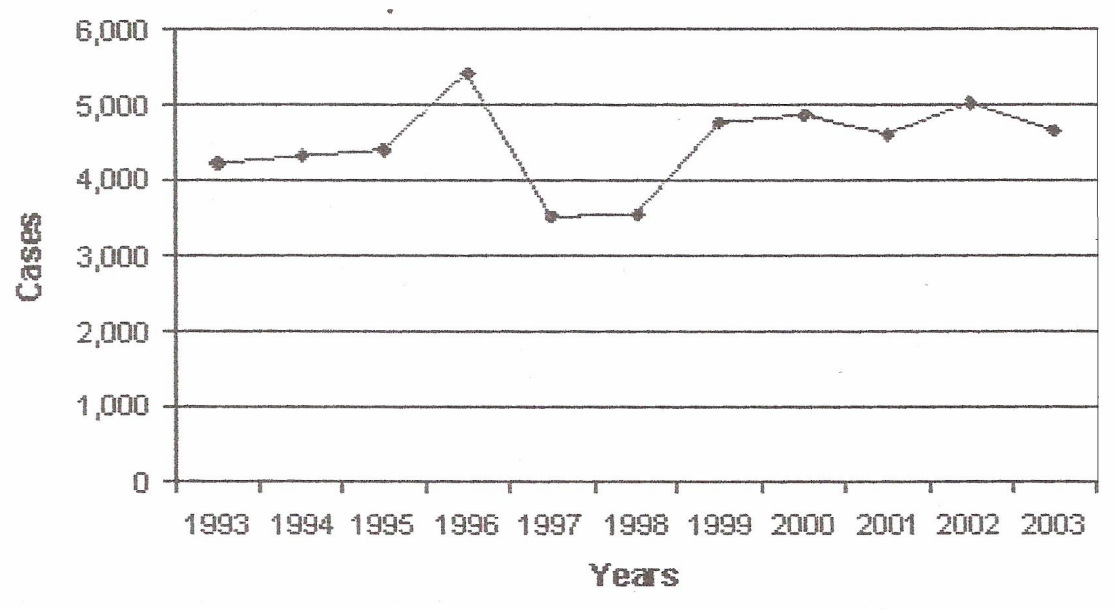

Figure 1.2: Number of Industrial Accident 1993 - 2003

Source: SOCSO Annual Report

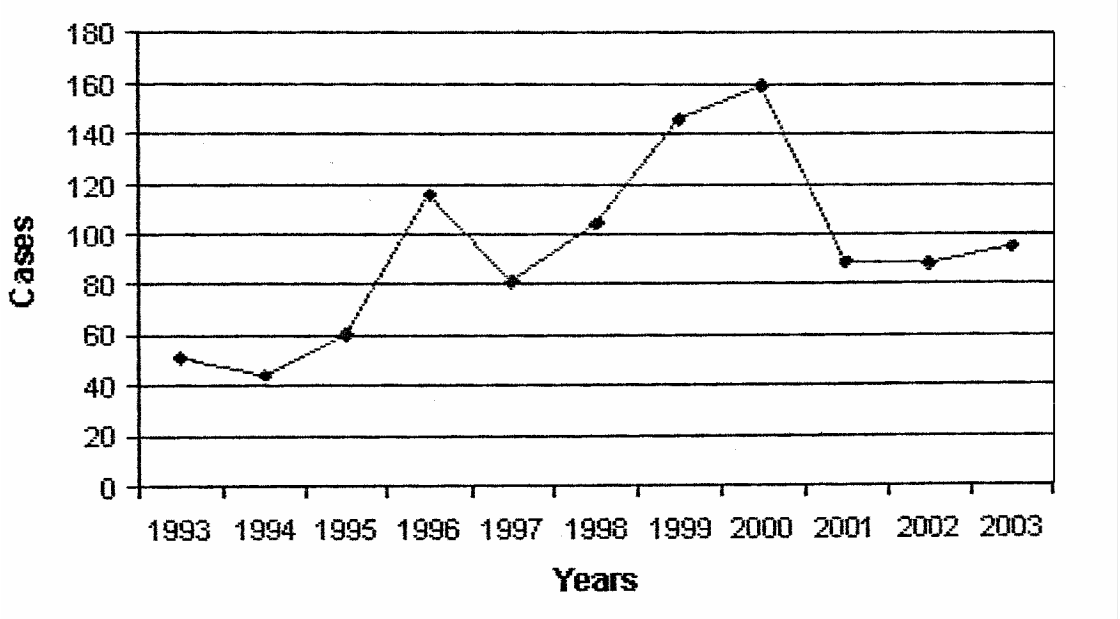

Figure 1.3: Number of Construction Fatalities 1993 - 2003

Source: SOCSO Annual Report

Fatality reported to DOSH as per table 1.2 proved that the safety at construction sites still remain one of the leading causes of death in the workplace. In addition, figure 1.4 confirmed the construction activity as second contributor to fatality at workplace.

In Malaysia, the practice of safety including at construction sites is regulated by two main Acts. The Factories and Machinery (FMA) Act, 1967 is widely used by the Department of Occupational Safety and Health (DOSH) to make sure the safety, health and welfare at workplace. One of the regulations under the act, Building Operation of Work Engineering and Construction (BOWEC) is created specially to focus on the activities at construction industries. The act clearly emphasized on the safety and health at different elements of construction such as machineries, working and load platform, scaffolding, floor opening, electrical safety and etc. Indeed the FMA only enforceable to factories and machinery in which it is considered as prescriptive, rigid and too dependant to government enforcement that make it ineffective in controlling the issues of occupational safety and health at workplace.

The Occupational Safety and Health Act 1994 (OSHA) has been enacted in 1994 as a reinforcement to the FMA. The objectives of the act are to secure the safety health and welfare of person at work, to protect person (other than person at work) at a place of work against hazard, to promote the occupational environment adaptable to the person's physiological and psychological needs and to provide the means towards a legislative system based on regulations and industry codes of practice in combination with the provisions of the act. The philosophy of the act is the responsibilities to ensure safety and health at the workplace lies with those who create the risk and with those who work with the risk. In respect to the above philosophy, construction industries are expected to comply with the provision of the act such as general duty of employer and employee, the requirement of safety officer regulations, the requirements of safety and health committee and responsibilities of reporting of accident and dangerous occurrences.

Occupational Safety and Health Act, 1994 (OSHA) covers almost all economic activities as specified in the table 1.1 and is created in such a way that the provisions of the act will prevail any conflicting or inconsistent provisions of other written law relating to occupational safety and health. OSHA practicing self regulation approach focused on consultation and cooperation in which the employer and employee are the party responsible to ensure safety at workplace while the government will act as consultant.

No.	Industries
1	Manufacturing
2	Mining and Quarrying
3	Construction
4	Agriculture, Forestry and Fishing
5	Utilities (a) electricity; (b) gas (c) water; and (d) Sanitary Service
6	Transport, Storage and Communication
7	Wholesale and Retail Trades
8	Hotels and Restaurants
9	Finance, Insurance, Real Estate and Business Services
10	Public Services and Statutory Authorities

Table 1.1: Industries under Occupational Safety and Health Act Jurisdiction
Source: Occupational Safety and Health Act 1994 (Act 514)

One of the economic activities comes under the Department of Occupational safety and Health (DOSH) jurisdiction is construction industry. Construction industry

has been identified by DOSH as among the highest activity contributed to the accident at workplace. The Master plan for Occupational Safety and Health in construction industry for 2005 – 2010 highlighted the construction industries as the second highest industries contributed to the fatality rate. Figure 1.4 shows the number of fatality in three highest sectors recorded from 1999 to 2003.

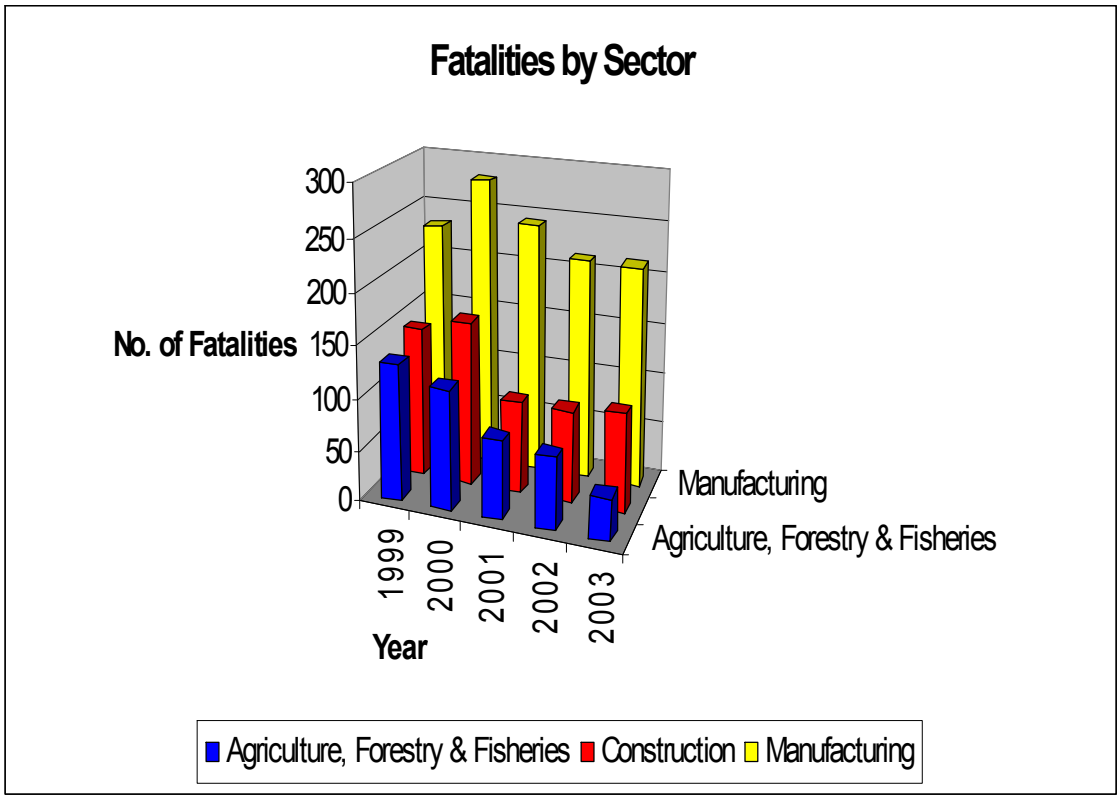

Figure 1.4: Fatalities in Three Highest Sectors
Source: The Master Plan for Occupational Safety and Health in Construction Industry for 2005 – 2010

Table 1.2 shows the statistic of fatality at construction site reported to DOSH from 1999 to 2004. The data shows there is increasing of fatality at construction site from 1999 to 2001 and uncertainty trend after 2001 in which it's demonstrate up and down rate up to 2004.

INDUSTRY	1999	2000	2001	2002	2003	2004	TOTAL
CONSTRUCTION	**51**	**52**	**62**	**45**	**40**	**46**	**298**
TYPE of ACCIDENT	**Number of Fatality**						
	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**TOTAL**
Fall	29	23	26	21	25	20	**144**
Struck by	5	12	11	7	6	10	**51**
Struck against	1	2		2		2	**7**
Caught in/between	2	1	2		1	1	**7**
Struck by Moving Vehicle		2	1	1	2	3	**9**
Gas Inhalation	1	10	3	2	2	2	**20**
Electrical Shock	2		4	1	2	2	**11**
Buried	8	2	8	5	2	4	**29**
Burnt	1		4	2			**7**
Drown			2	2		1	**5**
Others	2		1	2		1	**6**
Total	**51**	**52**	**62**	**45**	**40**	**46**	**298**

Table 1.2: Fatality at Construction Sites in Malaysia

Source: Department of Occupational Safety and Health

Since the accident rate contributed by the construction sector amongst the highest compared to in other sectors, DOSH has implemented few strategies in order to reduce the number of accident especially those involved fatality. One of the strategies is to carry out safety and health inspection or well known as construction safety audit at construction site at the interval of three monthly. The objective of the audit is to determine whether the OSH elements are in place, adequate and effective in protecting the safety and health of the workers and subsequently to prevent incidents.

1.2 Problem Statement

The awareness of safety at workplace in Malaysia has emerged since 1967 with the introduction of the FMA. The Regulation of BOWEC under FMA came into force on 1986 with the aims to control the safety at construction sites. OSHA enacted in 1994 with the same purpose to strengthen the control of safety health and welfare at workplace. In 2001, DOSH began to implement occupational safety and health inspection at construction site (Building Construction Safety Audit) at the interval of every four month in order to ensure the OSH elements are in place, adequate and effective in protecting the safety and health of workers subsequently preventing incidents.

Unfortunately accidents and fatalities rate at construction industries still high. Malaysia recorded fatality rate of 26 per 100,000 workers in 2003 which is very far behind compared to developed countries like Japan, France and the USA with the rate of below 20 per 100,000 workers (MPOSHCI, 2005).

DOSH has taken a lot of effort to reduce the number of people who are killed, injured or suffering ill health as a result of construction work. All construction sites are required to register with the department before they can start any construction works in order to enable DOSH officer monitoring construction activities in regards to safety health and welfare issues throughout the project cycle.

Safety inspection and operations of safety audit at construction sites are carried out by DOSH regularly for the purpose of evaluating construction sectors performance towards occupational safety and health compliances. This operation is carried out without prior notice to the contractor and the coverage of the operations not only limited to registered sites but also unregistered sites.

Notice of Improvement (NOI) will be served for any work, plant, substance or process that is likely to be a danger whereas Notice of Prohibition (NOP) will be issued for any work, plant, substance or process that is likely to cause immediate danger to life or property for the offences committed under OSHA. These actions are taken to improve the occupational safety and health in construction site in order to reduce the risk of accident in workplace.

Although regulations in occupational safety and health in Malaysia are quite comprehensive and reinforced with strict safety inspection and audit by DOSH at regular of time, the accidents at construction site is still alarming. There is a need to determine why the number of accident and fatality still at unacceptable figure. It is very important to find any loop holes in enforcing the requirements of safety Acts or any weaknesses in inspecting and auditing construction sites. The level of compliance of safety audit by contractors will be analyzed to determine the effectiveness of safety audit in controlling the occupational safety and health issues at construction sectors.

1.3 Aim And Objective

The aim of this study is to determine the differences in the level of compliances of safety audit at construction sites. In achieving this aim, three objectives have been outlined;

a) To assess the level of safety practiced at various construction projects in Malaysia.
b) To determine the level of compliance to safety audit between high-rise construction with low-rise constructions.
c) To determine the level of compliance to safety audit between high cost (cost of projects exceeding RM 20.0 millions) and low cost projects.

1.4 Brief Methodology

The first step of the study was identifying research problem which covered the significance, objective and scope of study. Research problem identified through detail study of construction's accident statistics produced by DOSH and SOCSO and Master Plan of Construction Industries by CIDB. The research area then focused on the safety audit at construction sites that implemented by DOSH.

This is followed by exploratory research of the literature. Information was gathered mainly through journals, books, working papers, reports and author's experiences working with the Department of Occupational Safety and Health.

Secondary data used for this study was originated from the safety audit reports carried out by DOSH officers during building construction safety audit in 2004 and 2005. The data were compiled and analyzed by using the Statistical for Social Science (SPSS) program version 12.0. Figure 1.5 shows methodology flowchart used for this research.

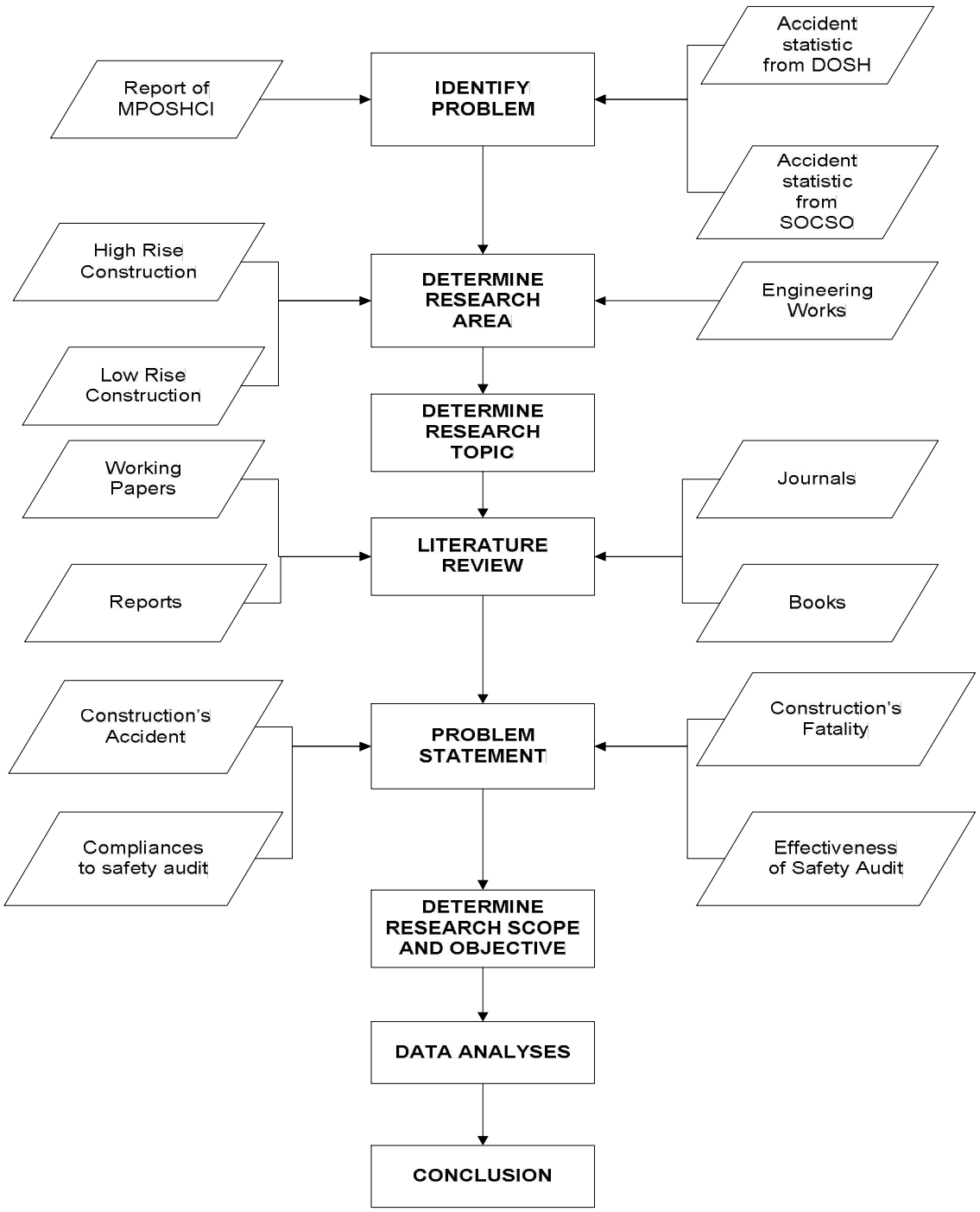

Figure 1.5: Methodology Flowchart

1.5 Scope Of Research

This research will analyzed the secondary data from safety inspection report (safety audit) at construction sites throughout Malaysia reported by trained, experienced and knowledgeable DOSH officers during Building Construction Safety Operations which are carried out four times a year. The building construction safety operations were initiated in 2001. However this research will be used data collected from 2004 and 2005 simply due to incomplete data recorded at early stage of the operations. Data for 2006 will not be used since there will be another operation planned sometimes in August or September 2006 and there are uncertainties in data compilation date.

The safety audit is prepared for three categories of project namely high-rise building construction, low-rise building construction and engineering works. This study only focused on assessing of safety audit on building construction hence the auditing data for engineering works are excluded.

1.6 Hypothesis

Hypothesis 1: There is a significant different on safety compliance between sites in 2004 and sites in 2005.

Hypothesis 2: There is a significant different on safety compliance between high-rise constructions with low-rise constructions.

Hypothesis 3: There is a significant different on safety compliance between high cost projects with low cost projects.