

**BEST PRACTICES IN SAFETY MANAGEMENT FOR CONVENTIONAL  
CIVIL CONSTRUCTION INDUSTRY IN MALAYSIA**

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

Faculty of Civil Engineering  
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**BORANG PENGESAHAN STATUS TESIS\***

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CONVENTIONAL CIVIL CONSTRUCTION INDUSTRY  
IN MALAYSIA**

SESI PENGAJIAN: **2007/2008**

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Specially dedicated to my beloved wife, Zainum, my cheering sons, Muhammad Khairul  
Amirin, Iskandar Zulkarnain, Muhammad Danial, Muhammad Danish and  
my only and dearest daughter, Siti Fatimah.  
For everlasting love and care.....

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## ABSTRACT

For the past few years, poor safety records in the conventional civil construction industry has tarnished its reputation and image. In addition to that, better safety management and practices in the oil and gas construction industry as compared to conventional civil construction industry are primely due to contractual requirements and consistent drives by the clients/project owners. Hence, the aim of this study is to justify best safety practices in the oil and gas construction industry that can be adopted for the conventional civil construction industry. A total of 100 sets of questionnaire were prepared and distributed to targeted respondents from construction companies ranging from CIDB Grade G1 to G7 around localised areas such as Johor Bahru, Kuala Lumpur and part of Selangor. The feedbacks from 83 respondents were analysed using frequency and relative index analysis. Based on the survey findings, it shows an excellent trend in basic practices of construction safety management. Conversely, it shows very low commitment and concern on the importance of ERT in handling emergency situations. Finally, only 52.61% (slightly more than half) of the surveyed safety management practices implemented in the conventional civil construction industry. Overallly the respondents' perceptions are in the 'agree' and 'strongly agree' categories for the levels of key elements surveyed. Whereas they perceived '5-Excellent' and only '3-Good' for levels of overall safety management and practices in oil and gas and conventional civil construction industries respectively. The six (6) interview respondents have also given the similar ratings. There is a strong need for the company management to implement the improvement measures in order to further improve the construction safety management. The respondents also tend to 'strongly agree' that implementing all the proposed measures can improve the construction safety management, safety investment is a viable and worthy effort and safety indicators implementation is low. Among recommended safety best practices are guiding policies, certifications, good HSE plannings, programs, rules and practices, safety indicators and safety campaigns and celebrations.

## ABSTRAK

Untuk beberapa tahun yang kebelakangan ini, rekod-rekod keselamatan yang buruk dan kurang memuaskan yang dicatatkan telah banyak merosakkan reputasi dan imej kepada industri pembinaan awam konvensional. Selain dari itu, pengurusan dan amalan keselamatan yang lebih baik di industri pembinaan minyak dan gas jika dibandingkan dengan di industri pembinaan awam konvensional adalah terutamanya disebabkan oleh kehendak-kehendak kontrak dan usaha yang konsisten oleh pihak klien/pemilik projek. Oleh itu, tujuan kajian ini adalah untuk mengenalpasti amalan-amalan pengurusan keselamatan yang terbaik di industri pembinaan minyak dan gas yang boleh diadaptasikan ke industri pembinaan awam konvensional. Sebanyak 100 set kertas soal-selidik telah diedarkan kepada responden daripada firma-firma pembinaan berkelas CIDB gred G1 ke G7 disekitar Johor Bahru, Kuala Lumpur dan Selangor. Maklumbalas dari 83 responden telah dianalisa menggunakan kaedah frekuensi dan indeks relatif. Hasil kajian mendapati terdapat tren yang cemerlang dalam amalan keselamatan yang asas. Sebaliknya pula, terdapat komitmen yang sangat rendah dari segi kepentingan menangani situasi kecemasan. Hanya 52.61% sahaja daripada amalan-amalan keselamatan yang disoalselidik telah digunapakai di industri pembinaan awam konvensional. Secara puratanya, persepsi responden adalah 'setuju' dan 'sangat setuju' terhadap tahap elemen-elemen keselamatan yang telah disoalselidik. Dimana mereka memberikan '5-cemerlang' dan '3-baik' bagi tahap keseluruhan pengurusan dan amalan keselamatan di industri pembinaan minyak dan gas dan awam konvensional masing-masing. Enam responden yang telah ditemuduga juga memberikan tahap yang sama. Responden. juga 'sangat setuju' bahawa menggunakan semua cadangan penambahbaikan oleh pengurusan syarikat akan meningkatkan lagi tahap pengurusan keselamatan. Antara amalan-amalan keselamatan yang terbaik untuk digunapakai adalah polisi keselamatan, program keselamatan yang baik dan kempen keselamatan serta sambutan 'Hari Keselamatan'.

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## LIST OF ABBREVIATIONS

<b>ABBREVIATIONS</b>	<b>FULL NAME</b>
<b>CIDB</b>	Construction Industry Development Board of Malaysia
<b>DOSH</b>	Department of Occupational Safety and Health Malaysia
<b>NIOSH</b>	National Institute of Occupational Safety and Health
<b>NCOSH</b>	National Council For Occupational Safety and Health
<b>OSH</b>	Occupational Safety and Health
<b>OSHMS</b>	Occupational Safety and Health Management System
<b>HSE</b>	Health Safety and Environment
<b>PPE</b>	Personal Protection Equipments
<b>SHO</b>	Safety and Health Officer
<b>OSHA</b>	Occupational Safety and Health Act
<b>DFM</b>	Department of Factory and Machinery
<b>ILO</b>	International Labour Organisation
<b>OHSAS</b>	Occupational Health and Safety Assessment Series
<b>ISO</b>	International Standard Organisation
<b>SPSA</b>	Self Performance Self Assessment
<b>OSFAM</b>	Offshore Structures Fabricators Association of Malaysia
<b>JSA</b>	Job Safety Analysis
<b>QA/QC</b>	Quality Assurance/Quality Control
<b>DOE</b>	Department of Energy (United States of America)
<b>IPO</b>	Intervention Preventive Observation
<b>NOSP</b>	NIOSH-OSFAM Safety Pass

## CHAPTER I

### INTRODUCTION

#### 1.1 Introduction

Construction industry has traditionally been recognised as one of the major economic forces that has contributed vastly in developing Malaysia on becoming a developed nation by the year 2020. Unfortunately its reputation and image has been tarnished by high rates of accidents and fatalities incidences that have occurred on sites. According to the statistics reported by the Social Security Organisation (SOCSO) (please refer to Table 1.0 below), the number of fatality cases in the construction industry among the 10 categorised industries, has only dropped from second highest ranking in the year 2000 to fourth highest ranking in the year 2004. Thus, it is still being regarded as a highly risky and hazardous industry in country. Certainly, there is a need to look into some ways and methods in improving its tarnished image.

The unsatisfactory safety record of construction industry has always been highlighted since the safety management system is neglected area and has not been pursued and implemented systematically in the construction industry. Safety at workplace is an issue affecting all businesses since most companies do not feel that it is vital to the success and are afraid of possibility of prosecution (Bakri *et al*, 2006).

INDUSTRIAL SECTOR / YEAR	2000	2001	2002	2003	2004
1. Agriculture, Forestry and Fishery	115	75	69	40	62
2. Mining and Quarry	11	7	12	8	8
3. Manufacturing	282	243	214	213	195
4. Electrical, Gas, Water and Cleaning	8	13	14	8	10
<b>5. Construction</b>	<b>159</b>	<b>89</b>	<b>88</b>	<b>95</b>	<b>77</b>
6. Trade	151	192	134	151	143
7. Transportation	98	91	90	108	73
8. Finance and Insurance Institutions	11	6	9	7	5
9. Services	72	106	87	84	65
10. Public Services	97	136	141	108	131
<b>TOTAL</b>	<b>1,004</b>	<b>958</b>	<b>858</b>	<b>822</b>	<b>846</b>

**Table 1.0 :** Number of death cases reported from 2000 – 2004

Although the safety regulations imposed in the construction industry by Department of Safety and Health (DOSH) are quite comprehensive, the level of awareness and practicability of it are generally lower than expected over the last five (5) years ( Abdul Hamid *et al*, 2003).

Khalid (1996), stressed that although the construction industry involved a very complex process, it should emphasis on finding a management strategy and resolution in reducing the rate of accident occurrence at construction site.

According to him, good safety programs would certainly help in reducing injuries at construction site and also to minimise construction costs, increase productivity and profitability and more importantly it could save lives of workers and consequently contribute positively to construction industry and nation as a whole.

The unsatisfactory Occupational Safety and Health (OSH) record of construction industry has always been highlighted since the OSH management system is neglected area and has not been pursued and implemented systematically in the construction industry. OSH at workplace is an issue affecting all businesses since most companies do not feel that it is vital to the success and are afraid of possibility of prosecution (Bakri *et al*, 2006).

Although the safety regulations imposed in the construction industry by Department of Safety and Health (DOSH) are quite comprehensive, the level of awareness and practicability of it are generally lower than expected over the last five (5) years ( Abdul Hamid *et al*, 2003).

Hinze and Harrison (1981), have identified that good safety program practised in a big company can help to reduce the injury rate at construction site. The success of a big company in tackling safety aspects is due to the fact that there are safety competency certificate holders exist among its workers notwithstanding any working level.

A part from that, providing a safe and healthy workplace is one of the most effective strategies in for holding down the cost of doing construction business. Accidents cause not only delays in operations and project deliverables but also directly and indirectly incur costs (Bakri *et al*, 2006). Therefore as required by the Occupational Safety and Health Act 1994 (OSHA), it is mandatory for all construction companies to provide a safe and conducive working environment for their workers and subcontractors at construction and fabrication sites.

## 1.2 Problem Statement

Most of construction companies especially in the conventional civil construction industry do not emphasize on the importance for having safety indicators in measuring safety targets and performances that can lead to promoting and inculcating good safety records within the industry itself. In addition to that, better safety management and practices in the oil and gas construction industry as compared to conventional civil construction industry are primarily due to contractual requirements and consistent drives by the clients/project owners such as Shell, Petronas, Exxon-Mobil, Qatar Petroleum and Talisman Energy.

Rahim (2001), concluded in her case study that although there were not so much differences if compared between safety management system in conventional civil construction industry and in oil and gas construction industry, but in terms of safety discipline and implementation aspects, it were more '*tight and stringent*' in the oil and gas construction industry.

Abd Hamid and Abd Majid (2006), concluded in their study on 'Construction Safety Benchmarking' that majority of construction companies surveyed were only at the very beginning stage of safety program implementation. They were not even close to be having an ultimate safety program driven by a safety culture.

Hence, there is a need to investigate the current practices and levels of some key elements of safety management in the conventional civil construction industry, so that some of the best practices from oil and gas construction industry can be adopted.

### **1.3 Aim and Objectives of the Study**

The aim of this study is to justify best safety practices in the oil and gas construction industry that can be adopted for the conventional civil construction industry.

Thus, to achieve the above aim, there are five (5) objectives that have been established as follows :

1. To identify the current practices of safety management in the oil and gas construction industry as practised by Sime Darby Engineering Sdn Bhd (SDESB).
2. To determine the current practices of safety management in the conventional civil construction industry.
3. To investigate the levels of some key elements in safety management in the oil and gas and conventional civil construction industries.
4. To investigate some measures that can be adopted to improve the safety management of the conventional civil construction industry.
5. To recommend some of the best practices in safety management for the conventional civil construction industry.

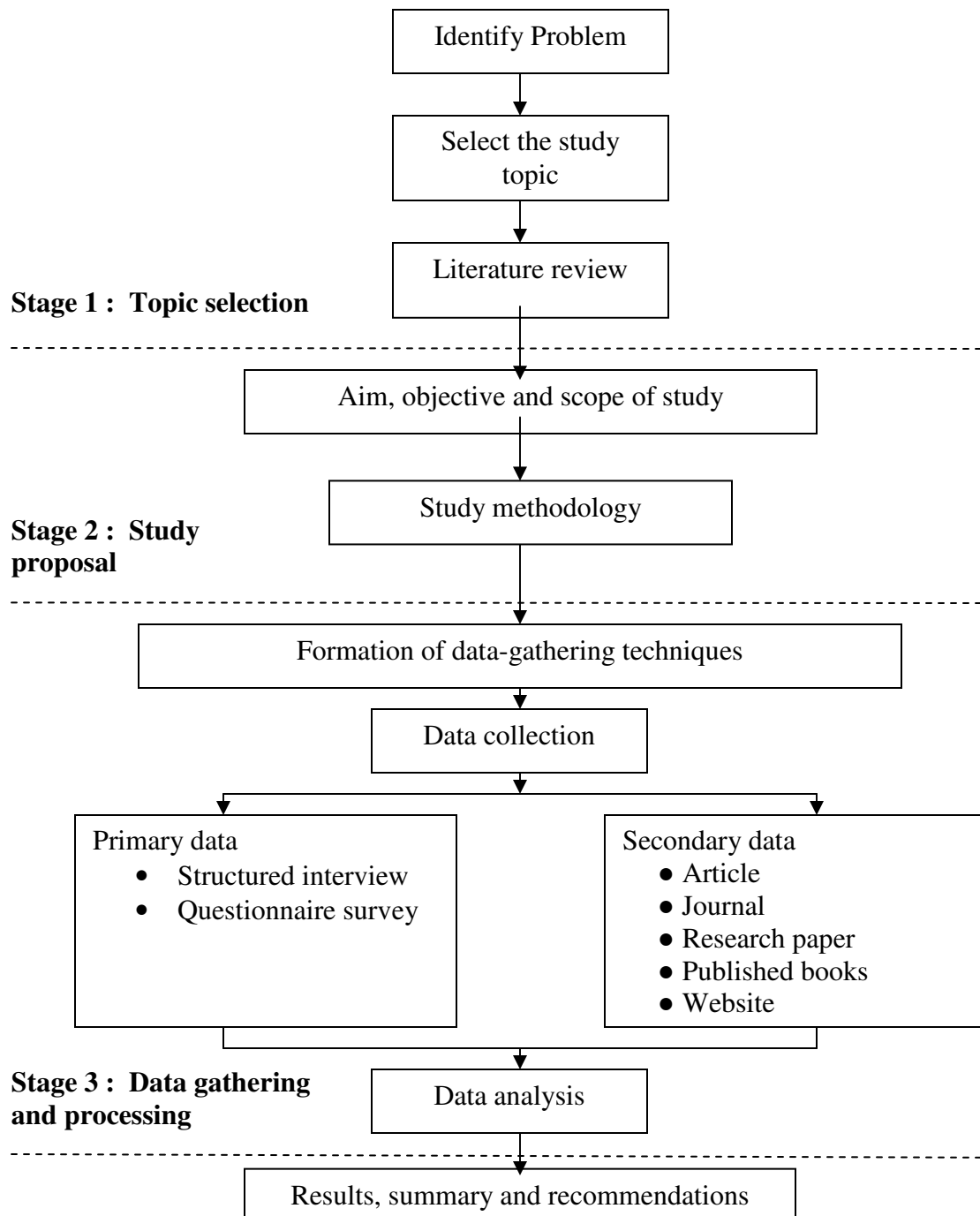
### **1.4 Scope and Limitation of the Study**

This study focused on identifying the current practices of safety management in the oil and gas construction industry as practised by Sime Darby Engineering Sdn Bhd (SDESB) and determination of the current practices of safety management in the conventional civil construction industry in Malaysia. The so-called 'conventional civil construction industry' includes all civil constructions in the areas of infrastructures and buildings like roads, bridges, highways, dams, ports, low and high rise buildings and others. Data collection was gathered through questionnaire survey which was conducted

around localised areas in Johor Bahru, Kuala Lumpur and part of Selangor state. It was also gathered through structured interviews conducted with experienced personnel from safety-related regulatory bodies and authorities like DOSH, CIDB, NIOSH and SOCSO in Johor, insurance company and also professional like senior university lecturer from UTM itself.

## **1.5 Study Methodology**

The proposed study was carried out in three (3) stages as shown as overall flowchart of the methodology, please refer to Figure 1.0 as attached.



**Figure 1.0 :** Flow Chart of Study Methodology



## **1.6 Arrangement of the Report**

Chapter I describes the general overview on the whole study. In this chapter, the problem statement is clearly defined which leads to the aim and objectives of the study. The scope and limitation of the study are also clarified to avoid any confusion and misconception arisen. Lastly the three (3) stages of study methodology from problem identification to concluding results and recommendations is clearly shown in a form of flow chart as attached in Figure 1.0.

Chapter II discusses on the importance of safety in construction and failure factors in safety implementation at site. It also elaborates the function and responsibility of the construction stakeholders related to safety such as client/project owner, consultant, contractor and the existing safety regulatory bodies and authorities like Department of Occupational Safety and Health (DOSH), Construction Industry Development Board (CIDB) and National Institute Occupational of Safety and Health (NIOSH). It also discusses the current provisions and regulations such as Petroleum Act 1984, Occupational Safety and Health Act 1994 (OSHA) and Factories and Machineries Act 1967 which regulate our present practices in the construction industry. Finally it elaborates on the Health, Safety and Environment Management System (HSE-MS) as practised by Sime Darby Engineering Sdn Bhd (SDESB).

Chapter III describes in more details on the study methodology being used in this project report. This chapter will clearly state how the related informations and sample data are being collected such as through literature review, questionnaire survey and also structured interviews. It also discusses the procedure and techniques of analyzing the collected data.

Chapter IV explains the results and discussion of the literature review, questionnaire survey and interview findings in relation to the five (5) objectives of the study as stated above.

## REFERENCES

- Abd. Majid, M. Z. and McCaffer, R. (1997). *Assessment of Work Performance of Maintenance Contractors in Saudi Arabia*. Journal of Management in Engineering, ASCE, Vol. 17 No. 1:91.
- Abdul Aziz Hussin (2004), ‘ *Isu Keselamatan di Tapak Pembinaan* ’, Majalah Industri Pembinaan.
- Abdul Ghani Khalid (1996), *Construction Site Injuries : The Case of Malaysia*. Faculty of Built and Environment, UTM, Skudai, Malaysia.
- Abdul Rahim Abdul Hamid and Muhd Zaimi Abd Majid (2006), *Construction Safety Benchmarking*, Proceedings of the International Conference In The Built Environment In The 21<sup>st</sup> Century (ICiBE 2006), 13-15 June, 2006, Kuala Lumpur.
- Abdul Rahim Abdul Hamid, Wan Zulkifli Wan Yusuf and Bachan Singh (2003), *Hazards at Construction Sites*. Proceedings of the 5<sup>th</sup>. Asia-Pacific Structural Engineering and Construction Conference (APSEC 2003), 26-28 August, 2003, Johor Bahru, Malaysia.
- Ahmadon Bakri, Rosli Mohd Zin, Mohd Saidin Misnan and Abdul Hakim (2006), *Occupational Safety and Health (OSH) Management Systems : Towards Development of Safety and Health Culture*. Proceedings of the 6<sup>th</sup>. Asia-Pacific Structural Engineering and Construction Conference (APSEC 2006), 5-6 September, 2006, Kuala Lumpur, Malaysia.
- Annual Report 2006, DOSH Malaysia.
- Course Schedule for the Year 2007 – 2008, NIOSH Malaysia.

Edward J. Jaselski et al (1996), *Strategies for Achieving Excellence in Construction Safety Performance*. Journal of Construction Engineering and Management, March 1996, ASCE, USA.

Guidelines on Occupational Safety and Health Management Systems ( ILO – OSH 2001 ), ILO, Geneva, Switzerland, December 2001.

Hinze and Harrison (1981), *Safety Programs in Large Construction Firm*. Journal of Construction Engineering and Management, ASCE, 107(3), 455-467.

Holt, G. D., Ololoaiye, P.O. and Harris, F. C.,(1996). *Tendering Procedures, Contractual Arrangements and Latham : The Contractors' View*, Engineering, Construction and Architectural Management, pp97-105.

*OSH Profile in Various Sectors*. Retrieved from [http://www.mtuc.gov.my/osh\\_pro.htm](http://www.mtuc.gov.my/osh_pro.htm), 29 May 2007.

L. S. Tey (1999). ‘ *Pengurusan Keselamatan dan Kesihatan di Tapak Pembinaan*’, Masters Project, Faculty of Civil Engineering, UTM, Skudai, Malaysia.

Laws of Malaysia (1994). *Lembaga Pembangunan Industri Pembinaan Malaysia Act 1994*, Kuala Lumpur, Percetakan Nasional Malaysia Berhad.

Laws of Malaysia (2000). *Factories and Machinery Act 1967 ( Act 139 ) and Regulation and Rules*, Kuala Lumpur, International Law Book Services.

Laws of Malaysia (2000). *Occupational Safety and Health Act 1994 (Act 514) and Regulation and Orders*, Kuala Lumpur, International Law Book Services.

Malaysian Construction Industry Directory 2006-2007, April 2006, CIDB Malaysia.

Master Plan for Occupational Safety and Health in Construction Industry 2005 – 2010, 10th. December, 2007. CIDB and DOSH Malaysia.

- Minute of Main HSE Committee Meeting # 2/2007 dated 6th.April, 2007. Sime Darby Engineering Sdn Bhd, Pasir Gudang, Johor.
- Nur Aishah Rahim (2001). '*Keselamatan dan Kesihatan di Dalam Industri Pembinaan dan Industri Petroleum (Kajian Kes)*', Degree Project, Faculty of Civil Engineering, UTM, Skudai, Malaysia.
- Occupational Health and Safety Assessment Series - OHSAS 18001 : 2007
- Ong, C. K. (2002). *Implementing Lean Production in Malaysian Construction Industry*. Universiti Teknologi Malaysia: Masters Project.
- Ruziah Hussin (2000). '*Pandangan Pekerja Terhadap Isu-Isu Keselamatan dan Kesihatan Pekerjaan di Tapak Bina di Negeri Johor*'. UTM : Masters Project.
- Samelson N. M. and Levitt R.E. (1982), *Owners Guidelines for Selecting Safe Contractors*, Journal of Construction Engineering and Management, ASCE, 108(4), pp 617-623.
- Shell International Exploration and Production B.V. *HSE MS Self Assessment Questionnaire*, EP 95-0105 Rev 01.1, November 2001, Postbus 663, 2501 CR Den Haag, The Netherlands.
- Social Security Organization ( SOCSO ) 2005, Number of death cases reported from 2000 – 2004. Retrieved from <http://www.perkeso.org.my/statistik2.asp>, 6 June 2007
- Syed M. Ahmad et al (2000), *Site Safety Management in Hong Kong*. Journal of Management in Engineering, December 2000, ASCE, USA.
- U.S. Department Of Energy, *Safety Management System Policy*, DOE P 450.4, Washington, D.C., 15th. October, 1996.

Za'im Basiran (2007), *Educating Early Awareness of Construction Philosophy*,  
UTM : Masters Project.