

RICS CONSTRUCTION AND BUILDING RESEARCH CONFERENCE

SEPT 2008 RESEARCH

COBRA 2008



RICS

The mark of
property professionalism worldwide



COBRA 2008

**The construction and building research conference of the
Royal Institution of Chartered Surveyors**

Held at Dublin Institute of Technology, 4-5 September 2008

ISBN 978-1-84219-434-8

© RICS

12 Great George Street
London SW1P 3AD
United Kingdom

www.rics.org/cobra

September 2008

All papers submitted to COBRA were assessed by expert panel, drawn from the construction and building research community, The conference organisers wish to extend their appreciation to the members of the panel for their work, which is invaluable to the success of COBRA.

Kate Carter	Heriot-Watt University, UK
Keith Cattell	University of Cape Town, South Africa
Grace Ding	University of Technology Sydney, Australia
Tom Dunne	Dublin Institute of Technology, Ireland
Charles Egbu	University of Salford, UK
Chris Fortune	University of Salford, UK
Rod Gameson	University of Wolverhampton, UK
Louis Gunnigan	Dublin Institute of Technology, Ireland
Martin Hanratty	Dublin Institute of Technology, Ireland
Alan Hore	Dublin Institute of Technology, Ireland
Myles Keaveny	Dublin Institute of Technology, Ireland
Steven McCabe	Birmingham City University, UK
Kathy Mitchell	University of Cape Town, South Africa
Keith Potts	University of Wolverhampton, UK
David Root	University of Cape Town, South Africa
Kathy Roper	Georgia Institute of Technology, USA
Lloyd Scott	Dublin Institute of Technology, Ireland
Winston Shakantu	Nelson Mandela Metropolitan University, South Africa
Lorcan Sirr	Dublin Institute of Technology, Ireland
Suresh Subashini	University of Wolverhampton, UK
Stephen Walsh	Dublin Institute of Technology, Ireland
Sara Wilkinson	Deakin University, Australia

In addition to this, a specialist panel assessed paper for the session arranged by CIB W113.

John Adriaanse	London South Bank University, UK
Julie Adshead	University of Salford, UK
Rachelle Alterman	Technion, Israel
Jane Ball	University of Sheffield, UK
Michael Brand	University of New South Wales, Australia
Penny Brooker	University of Wolverhampton, UK
Ruth Cannon	Dublin Institute of Technology, Ireland
Alice Christudason	National University of Singapore
Paul Chynoweth	University of Salford, UK
Philip Chan	National University of Singapore
Sai On Cheung	City University of Hong Kong
Ron Craig	Loughborough University, UK
Jose Caramelo Gomes	University of Lusiada, Portugal
Asanga Gunawansa	National University of Singapore
Rob Home	Anglia Ruskin University, UK
Peter Kennedy	Glasgow Caledonian University, UK
Anthony Lavers	Keating Chambers, UK
Tim McLernon	University of Ulster, UK
Frits Meijer	TU Delft, The Netherlands
Jim Mason	University of the West of England, UK
Brodie McAdam	University of Salford, UK
Issaka Ndekugri	University of Wolverhampton, UK
Linda Thomas-Mobley	Georgia Tech, USA
Yvonne Scannell	Trinity College Dublin, Ireland
Cathy Sherry	University of New South Wales, Australia
Henk Visscher	TU Delft, The Netherlands

The Potential of Contract Document as Part of Occupational Safety and Health Management System

Sulaiman K¹
University of Malaya
khairsulaiman@um.edu.my

Sulaiman R¹
University of Malaya
rahasulaiman@um.edu.my

Salleh H¹
University of Malaya
hafez@um.edu.my

Hashim H. A¹
University of Malaya
Helena@um.edu.my

¹Construction Health and Safety Research Centre
Faculty of Built Environment
University of Malaya

Abstract

Construction site is dangerous by its nature and are prone to accidents. Extensive efforts have previously been taken in order to minimise its risk. There was a major change in legislation and regulations to OSH with the introduction of Malaysian Occupational Safety and Health Act (OSHA) 1994 by the government. However, it seems that the actions undertaken are still unsatisfactorily which statistic data shows little improvement in the number of accidents and fatalities. The construction activities need to be carried out in accordance to OSH best practice to avoid injuries and large significant financial loss. It is believed that these scenarios can be improved if the overall project cost and monitoring system can be embedded in the contract document. The aim of this research is to provide standard item for OSH requirements in Malaysian procurement documents for construction processes. The objectives are to propose guideline and detail requirements of OSH element for the inclusion of OSH component in planning and preparation of Tender Document that align with the requirement of Malaysian Public Works Department. This research will be carried out in collaboration of the industry, clients and construction professional.

Keywords: construction, contract and tender document, occupational safety and health

1. Introduction

Construction projects in any place across the globe are prone to accidents. To date there have been less attempts made to look back at any deficiency aspects across procurement processes that lead to accident occurrences. As there is a complexity of inter linkage factors starting from project inception

to construction stage that leads to accidents, it is difficult to trace them back under a dynamic system of procurement process. In many cases, preventing construction accidents are mainly considered as the contractor's responsibility. However, there is a possibility that construction accidents can be linked to the designers' responsibility (may it be architect or engineers) as well as the client's responsibility.

Extensive efforts have been taken in order to reduce the accident rates and further improve the image of the OSH. Whereas, Malaysia has introduced the Malaysian Occupational Safety and Health Act (OSHA) in 1994. Australian government also make an attempt to deal with OSH issues by introducing OSHA in 1981. However, it seems that these initiatives undertaken are still unsatisfactorily when each and every year the statistic data shows little improvement in the number of accidents and fatalities. The construction activities need to be carried out in accordance to OSH best practice as it will affect many aspects of the construction stages when there is lost of working days due to industrial injuries and large significant financial loss. One solution that can improve the OSH effectiveness in construction site is through sufficient allocation and provision of OSH specification in all stages stipulated in the contract document.

A contract document plays an important role in specifying the nature and scope of work to be carried out to the required specifications and standards while it also determines the agreed cost of the work (Foo Chek Lee, 2005). By having clear specification and OSH provision stipulated in documents, it is a must that the contractors have to provide sufficient cost for it and it will be counted as part of the agreed project cost and they will have a better indicator/instruction to implement sufficient site safety. Therefore, better documentation of OSH practices in the contract document of projects need to be developed to improve site safety and collaborations of the industry, clients, and construction professional need to be considered to make this a success.

1.2 Malaysian Scenarios in Construction Health and Safety

Safety issues in developing countries, such as Malaysia, are more crucial and complex. It seems that problems related to construction are concerned with the downstream or frontline players, e.g. contractors and operatives. In Malaysia, like any other developing countries, legislations are still focussed on the contractors or builders. The Malaysian Occupational Safety and Health Act (OSHA)1994 is an enabling act with the aim of promoting safety and health awareness, and establishes effective safety organisation and performance by introducing self-regulation schemes that are specifically designed to suit a particular industry or organisation. Under provisions of the OSHA 1994, contractors are "entrusted" to comply with the provisions of the act. However, safety problems are still a major issue of concern. The evidence shows that, as described in the following Table 1,

construction fatalities still remain high compared to other sectors while in Table 2, it indicates that construction summons are still occurred every year.

Table 1: Fatalities by sector

(Source: Master Plan for Occupational Safety & Health in Construction Industry 2005 – 2010)

YEAR	1999			2000			2001			2002			2003		
SECTOR	No of fatalities	Percentage of fatalities	Fatality rate per 100,000 Malaysian workers	No of fatalities	Percentage of fatalities	Fatality rate per 100,000 Malaysian workers	No of fatalities	Percentage of fatalities	Fatality rate per 100,000 Malaysian workers	No of fatalities	Percentage of fatalities	Fatality rate per 100,000 Malaysian workers	No of fatalities	Percentage of fatalities	Fatality rate per 100,000 Malaysian workers
1	146	3.1	54	159	3.3	57	89	2.0	28	88	1.8	25	95	2.0	26
2	132	1.0	53	115	1.0	47	75	0.6	29	69	0.7	27	40	0.6	16
3	232	0.6	17	282	0.7	20	243	0.7	16	214	0.6	14	213	0.7	13

Notes

- 1 Construction
- 2 Agriculture, Forestry and Fisheries
- 3 Manufacturing

Table 2: Types of notices given on construction site throughout Malaysia during the 2/2006 operation (Source: DOSH Annual Report, 2006)

Type of Notice	NOP ¹	NOI ²	PLS ³ /NIP	PL ⁴ /NP
Total	68	344	78	84

Notes:

- ¹ OSHA Notice of Prohibition
- ² OSHA Notice of Improvement
- ³ Notices of Prohibition
- ⁴ Notices of Immediate Prohibition

With the determination to tackle safety problems, Malaysia has introduced three basic laws to achieve that purpose namely: The Factories and Machineries Act 1967; The Occupational Safety and Health Act 1994; and The Construction Industry Development Act 1994. For many years, various attempts have been made to respond to construction safety problems, such as imposing safety regulations, safety training, safety audits, safety campaigns and safety studies. However, research shows that numbers of non compliance performance can still be found even though laws and regulations have been imposed in Malaysia. Table 3 below indicates that there were some of the construction projects in 2 small states in Malaysia have not comply with the stipulated OSH laws and regulations.

Table 3: Non compliance of construction activities under safety laws and regulations at Kedah and Perlis state

Non Compliance Performance	Frequency	Percent
Section 15(2)(a)	3	7.7
Section 15(2)(a) OSHA	7	17.9
Section 15(2)(c) OSHA	4	10.3
Section 16 OSHA	1	2.6
Section 15(2)(b) OSHA	6	15.4
Section 15(2)(e) OSHA	4	10.3
Section 17(1) OSHA	1	2.6
Section 35(1) AKJ	8	20.5
Per 10(2), Per KB&KBK(BOWEC)	1	2.6
Per 22(1), (2) & (3), Per KB&KBK(BOWEC)	1	2.6
Per 106, Per KB&KBK(BOWEC)	1	2.6
Per 32(b) KKK 1970	1	2.6
Per 75(1), Per KB&KBK(BOWEC)	1	2.6
Total	39	100.0

With the scenarios as above, there is still gap that need to be fill in order to increase the effectiveness of OSH implementation in construction industries. Currently, there are no specific guidelines or master plan on the implementation of OSH program for the construction industry players to improve their performance. Section 4(d) in OSHA 1994 encourages the development of a system of regulation to operate the combination of act provision which has been designed to maintain or improve the standard OSH.

Recommended action in Safety and Health Enforcement/Legislation has been identified by the National Occupational Safety and Health Committee for construction industry to be implemented between year 2005 to 2010. There is a need to specify OSH requirements of the relevant legislation in the tender/contract document. The main issues that need to be highlighted is the requirements for client/project owner to allocate adequate funding in the contract sum for the Principal Contractor to make necessary arrangements pertaining to OSH matter including provision of adequate and suitable Personal Protective Equipment (PPE), tools and others related to safety and health for the workers.

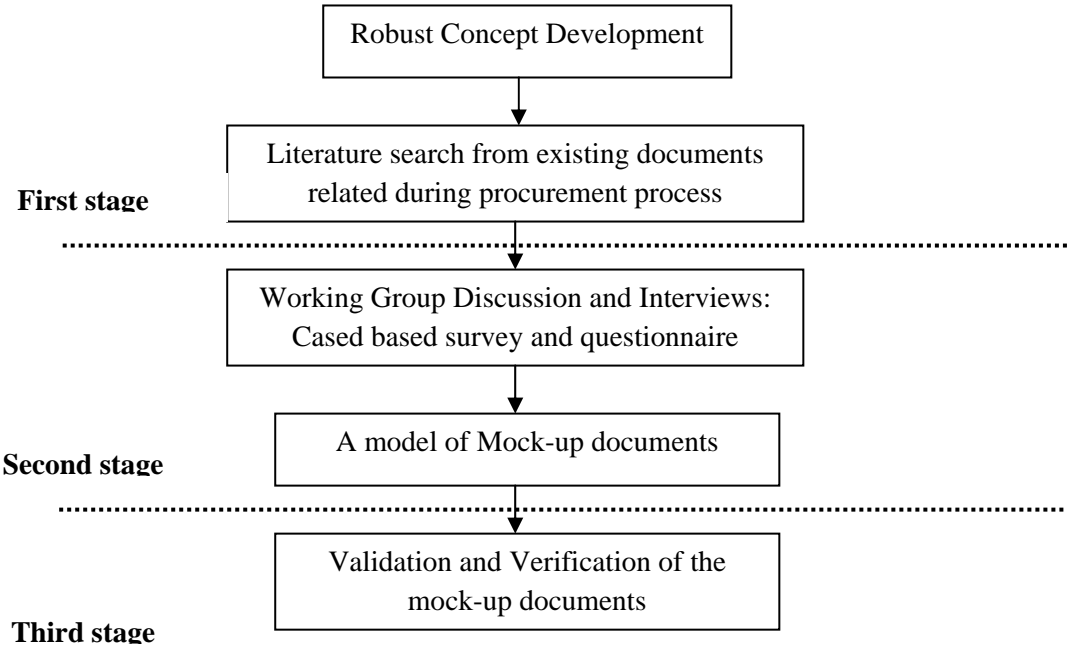
2.0 Problem Statement

The majority of the current efforts of health and safety evaluation approaches are mainly post-contract measures. Thus, the industries lack of project management guidelines to deal comprehensively throughout construction process; pre-contract and post-contract. No attempts have been made to look back any deficient aspects during the preparation of project documentation process leading to accident prevention. So far, there is less effort has been done to embedded the health and safety elements into contract documents leading to the less attention paid to the related issues during construction period.

According to the Master Plan for Occupational Safety and Health in Construction Industry 2005 – 2010 (MPOSH) produced by Department of Occupational Safety and Health, Human Resources Ministry and Construction Industry Development Board (CIDB), there is a need to specify health and safety requirements in the contract document for the nation. Such health and safety requirements may provide comprehensive guidelines and evidential analysis for any accident taking place on site. This may help anyone involved during construction to take any action in order to eliminate, avoid and reduce potential deficiencies leading to increased risk of accident.

3.0 Research Methodologies

Figure 1: Research methodologies framework



3.1 Research Framework

The framework of this research consists of three main stages (Figure 1). The first stage of research will focus on identification of project issues and review of existing tender documents from various parties. The next stage will be focused on working group's preparation and workshops. Data collected from first stage and second stage will be analysed to produce final report of draft one. At final stage, this research will provide the final mock-up of Contract Document, with OSH element that can be used as reference to construction industry.

3.2 Data Collection

Procurements in which accidents took place will be used as the case of research. Data of the research can be qualitative under existing documents. The data will be collected through case based working group discussion (WGD). The case based survey is on current and previous contract documents from Malaysian Public Work Document (PWD) for the government projects and Malaysian Architect Association (MAA) for the private projects. These data collection methods will then be reviewed through WGD of assigned expert panel.

3.3 Data Analysis

All of the information will be gathered and analyse qualitatively by comparing samples of contract document from PWD and MAA.

3.4 Product Development

The product development is concerned with the proposal of guideline and detail requirement of OSH elements in preparing the Tender Document that align with the requirement of PWD and construction at large. The final product development will be in a mock-up of a complete contract document with OSH element.

3.5 Product Verification

Final stage of the research is to verify the product through road show which is now in the progress. It is envisaged that there is a need to some extent how the product works well. The road show throughout the nation will be conducted to ensure that relevant parties in the construction industry are aware of the proposed contract documents. This will be a chance to improve the proposed mock-up documents if any malfunctioning of the system in place. For the purpose of this paper, no data will be available on product verification as it has not taken in place yet.

4.0 Results and Analysis

4.1 *The contents of current Contract Document with regards to OSH dimension*

Reviews on 43 contract documents with project cost range at RM2.8 million to RM 313 million shows that there is no standardization of OSH provision in any contract documents. Clients will prepare the specification of OSH to a minimum standard and the contractor will price the project based on client's needs. From Table 4 below, it indicates that the projects are 28.1% depending on the insurance coverage if there is a case of accident occurred on site. The research also shows that not all construction projects are aware on the importance of PPE where only 21.6% provide the PPE to their workers. With only these 11 issues covered currently in most contract documents, Malaysia aims to improve the standard of OSH in construction sites will still far behind from other developed countries.

Table 4: Content of OSH provision in selected 43 contract documents

No	OSH Provision	Frequencies	Percentage
1	Insurance coverage	43	28.1
2	Safety tools – PPE	33	21.6
3	First Aid	28	18.3
4	SOCSO	25	16.3
5	OSH Planning and Policy	9	5.9
6	Workmen Compensation	7	4.6
7	Safety Equipment – signage, dust prevention, etc	3	2
8	Work Insurance Policy in LA	2	1.3
9	Safety and Maintenance of Existing Building	2	1.3
10	Safety Health and Welfare	1	0.6
11	TOTAL	153	100

4.2 *The actual cost of OSH practice in the entire construction value chain and in various categories of project and look on current practice on pricing OSH requirement*

We have identified the common OSH provision in contract documents where it seems that there is still lack of OSH provision and specification in it. From the results above, another analysis identified another dilemma of OSH practice in Malaysian construction projects. From the total of 43 identified projects, none of it has allocate sufficient budget for OSH implementation where Table 5 below indicates that safety allocation is in between of 0.0 % to 0.90% from the total project cost, not even achieved 1%. This is far behind from the action plan in MPOSH where the client/project owners need to allocate sufficient funding from the contract sum for OSH necessary arrangements. The current practice shows that 60% of 43 projects allocate about 0 to 0.3% where from the example, one project in Kuching, Sarawak at project cost of RM 313 million only allocate about 0.12% or RM 410,312.00 for OSH activities.

Table 5: Safety allocation in percentage from total costs in selected projects

Percentage of safety allocation from overall project cost	No. of projects	Percentage
0.0 - 0.30	18	60
0.31 - 0.50	7	23.3
0.51 - 0.70	3	10
0.71 - 0.90	2	6.7
Total	30	100.0

4.3 Malaysian PWD requirement in Contract Document with respect to OSH

Malaysian PWD is the main government agencies to control the construction projects development in the country under yearly Malaysia Plan. They have identified several items that need to be included in the contract documents as listed below:

- i. Provision for the compliance of OSH laws and regulation including all necessary documents
- ii. Site safety plan with policy and emergency respond
- iii. Competent S&H officer and supervisor where necessary
- iv. Approved S&H committee for the duration of the contract
- v. Conduct site S&H meeting, audit, inspections and reports
- vi. Conduct regular larvaeciding operation including the supply of tools, equipments and chemicals
- vii. Supply and usage of the approved suitable Personal Protective Equipment
- viii. Supply, install and construct including maintenance and dismantling netting, barricade, platform, strutting and overhead protection
- ix. Supply, maintenance and removal suitable safety signage, tools and equipments.

The contractor will have to provide in lump sums for each and every list above.

4.4 Initiatives from industries to produce guideline and detail requirement of OSH element in planning and preparation of Tender Document

4.4.1 Previous research and proposal

Initiatives done by other construction players where an initial framework of contract documents with the inclusion of OSH provision will be discussed in this part. The Malaysian DOSH has submitted

very extensive Contract Documents proposal with the inclusion of OSH requirements to PWD in 2005.

Meanwhile, the Master Builder suggested that in order to ensure OSH is properly implemented; safety needs must be included in the budget. This can be achieved by including a full list of the provisions of safety and health elements in the Bill of Quantity and these items should be provided for under ‘provisional sum’ instead of eliminating them due to competitive bidding and is a permanent feature in all Bills of Quantity of the project. The differences of the proposals are as Table 6 below.

Table 6: Previous research and proposal of OSH provision in contract document

Discussion	MBAM	DOSH
OSH Provision and specification	The compliance of S&H laws and regulation	Part 1: General – itemized on related act, measured item, pricing, work schedule program, quantities and cost, non compliance, safety manager appointment, safety committee, designers, SH officer and supervisor, sub-contractor, SH plan, meeting, SH statement, PPE, training, management, report and records, audit and inspection, signage, permit, licensed, related documents, filing, policy and procedure, controlling, checklist, investigation
	Supply of usage of suitable PPE	
	Temporary works to meet safety environment	
	Supply, maintenance and removal of suitable safety signage, tools and equipments	Part 2: General duties of the contractor – itemized on SH management, welfare, plant, provision and maintenance, operation, handling and storage, instruction, training and supervision, ingress and egress, working environment
	Prepare and submit all the necessary documentation as per DOSH requirements	
	Site safety plan with policy and emergency respond plan	Part 3: Amenities and fatalities – itemized on facilities for washing, toilets, drinking water, first aid, accommodation, lighting, maintenance and ventilation
	Provide competent site safety officer or supervisor where necessary	
	Provision of approved site safety committee	
	Conduct site safety meeting, audits, reports and inspections	Part 4: Prevention of fall at workplace – itemized on height over 2m, perimeter working platform, guardrails, safety nets, fail arrest system, working on roofs, ladders, abseiling, scaffolding
	Notification of accident, dangerous occurrences, occupational poisoning and disease	
	Conduct site accident investigation, induction course and regular Tool Box meeting	Part 5: Electrical – itemized on safety, temporary switchboard, inspection and clearance
	Conduct regular larvaeciding operation	
	Provision of DOSH inspection and approval for the special plants, tools and equipment	Part 6: Hazardous chemicals and materials – itemized on medical program, skin hazards, safe use, explosive, asbestos, cutting and welding, lead
	Supply and usage of approved suitable PPE	
	Supply, construct, design, erection and installation of temporary works by a professional to ensure safety	Part 7: Machinery – itemized on portable machinery and power tools, hoists, cranes and rigging equipment, protective structure, fastening tools
	Scaffolding design by a professional and approval of the engineer	
Supply, erect and dismantling by competent person	Part 8: Special work situations – itemized on confined space, roads, excavations, tunneling, concrete works, diving, demolition	
Supply, install and construct including maintenance and dismantling with the approval engineer for netting, barricade, platform, strutting and overhead protection		
Supply, install, maintain, replace and remove the safety signs, tools and equipments		
		Part 9: Public and general safety – itemized on noise, manual handling, fire protection, material handling, storage, use and disposal, public protection and adjoining properties

Pricing	Contractor's amount will be based on provisional sum	Contractor's amount will be based on unit, rate and quantity for each itemized specification.
----------------	--	---

In the working group discussion, the expert panel identified that the elements of OSH specification proposed by the MBAM and DOSH are very details and might be difficult to price it as construction stages are different from one project to another. Even though the proposed contract document has been submitted to PWD, it still need to be improved and upgraded in order to make it acceptable and practicable to all construction players especially to the clients and the contractors.

4.4.2 Initiatives from best practice

Apart from previous research and proposals from MBAM and DOSH, two best practices from private companies have been identified where the Safety Minimum Standard is used and be part of the contract documents.

WTW Bovis Sdn Bhd

The worldwide company commenced its project management service in Malaysia on 1984. The company's aim is to operate Incident and Injury Free (IIF) and believe that all accidents and incidents are preventable. The company also believes that reducing incidents and injuries significantly reduces project costs significantly. To ensure a successful implementation of Environmental Health and Safety (EHS) and IIF, it is imperative that the client, consultant as well as contractors are fully committed to the cause.

Prior to commencing work on site, the contractor must make itself aware of all the requirements for the Works and the Site relating to EHS matters including all relevant legislation, codes of practice and the minimum EHS standards for the project and including company's Global Minimum Requirements. In this connection and without limitation, the Contractor shall comply with all the EHS Requirements which shall be deemed a fundamental condition of Contract.

In the contract, the company provides General Master Plan on EHS Management System where all contractors have to obey. The contractor will provide lump sum cost dedicated for OSH provision in the contract document, apply 'Safety Minimum Standard' as part of the contract document and contractors awarded need to comply with the requirements of Global Minimum Requirement which is separate document and will be submitted with Contract Document.

Putrajaya Holdings

Putrajaya Holding is a developer which responsible to manage, develop and maintain the Putrajaya cities, the new administrative hub for Malaysian government agencies. The company's construction

site safety unit/HSE Department has prepared its own itemised safety and health requirements for contractor's safety allocation. There are about 23 items that contractors need to rate it based on quantity and unit. The simplified items are as tabulated in Table 7.

Table 7: Itemised Safety and Health Requirements from Putrajaya Holdings

No	Description	Quantity	Unit	Rate	Amount
1	Safety and Health Supervisory Team				
2	The provision of DOSH recognised 3 rd party inspection and repair for cranes				
3	Course and training				
4	Health and Safety signage				
5	Supply of Personal Protective Equipment				
6	Equipment for fire prevention and fighting at site				
7	Safety and health statistic scoreboard at the entrance of workplace				
8	Welfare facilities at the workplace as required by law				
9	Competent person for lifting operation				
10	Edge Protection for completed floor's edge				
11	Thick solid plywood supported by plank to cover floor openings				
12	Wire mesh panel plugged to the wall to barricade a lift cores				
13	Safe working platform				
14	Edge protection for roofing works				
15	The protection of fall protection measures when building reached 2 nd floor				
16	Independent competent scaffolder				
17	Trained assistant scaffolder				
18	S&H promotion				
19	Site perimeter hoarding				
20	4 uniform guards				
21	Preparation of S&H plan and related work				

Apart from these itemised SH requirements, the contractors are also need to comply with SH Special Conditions (SHSC) as a supplement documents. However, if there is any conflict among these two documents, the SHSC shall prevail. The simplified content of the SHSC are as listed below.

- i. Project Safety & Health plan
- ii. Full time competent Safety Officer to monitor reporting, training and commencing physical works.
- iii. Permit for machinery and plant operational and high risk activities
- iv. Falling hazard prevention which indicate best practice for safety harness, hard barricade, lift core, floor opening, roofing works and perimeter external scaffold.
- v. Erection and dismantling of scaffolding
- vi. Induction to new worker
- vii. Safety briefing
- viii. Safety awareness programs

- ix. Penalty system
- x. Non compliance corrective action plan
- xi. Elevated working platform design
- xii. First aid facilities
- xiii. Housekeeping
- xiv. External access to top working floor
- xv. Non conformance reports
- xvi. Personnel Protective Equipment
- xvii. Safety committee meeting
- xviii. Safety budget
- xix. Demerit system
- xx. Monthly safety report

4.5 Framework of the contract document development

After comparing with these models (MBAM, DOSH, WTW and Putrajaya Holdings) and from feedback of key players in the Malaysian construction industry i.e. National Institute of Occupational Safety and Health (NIOSH), Consultancies, contractors and academicians; it is accepted that the model from WTW Bovis is very practical and can be adopted with necessary changes in the document to suit the size of construction projects. Even though it is a private company, but the project they deal with is a public job using the PWD FORM 203A contract form and they have success in implementing the safety requirements based on a Minimum Safety Standards which is separated from the Contract Document.

4.5.1 Amendments in the Standard Form of Contract relating to safety

This is the first instant whereby the tenderer is introduced and referred to the Safety Minimum Standards which form part of the contract and attached in another volume in the tender document.

The clause reads: Compliance with Safety Minimum Standards

The Contractor shall fully comply and shall cause all his sub-contractors, agents and employees to fully comply with all respect with the requirements of Safety Minimum Standards as set out in the Contract Documents at all times during the preparation or execution of the Works or any temporary works. The Safety Officer (SO) shall have the right to instruct the Contractor to introduce measures or to take actions or to rectify any non-compliance or to order suspension of works in areas of non-compliance and the decision of the S.O shall be final. The Contractor shall not

be entitled to claim for any extra cost or time for complying with this clause or the instructions of the S.O issued under this clause.

This clause gives a clear instruction and reference to the contractor for the standard of safety to be implemented and the Safety Minimum Standards or (SMS) is attached and form part of the tender document. The inclusion of SMS as part of the tender/contract document is a clearer instruction to the contractors about the standard of safety to be implemented. It will be very helpful that the SMS to be in colour to show a clearer picture of certain requirements.

Another important point in this clause is the power given to the S.O to ensure that the contractor comply with all the safety requirements. This in a way helps lessen the burden of safety officers from DOSH who comes once in awhile to check the site condition. With the power in the hands of the S.O, the work can be monitored closely every working day and at every stage of construction. On the part of the client it is important to have a competent safety personal to assist the S.O in monitoring the safety requirements as stipulated in the SMS.

Prior to the SMS there is also another section called Logistics, site Organisation and Regulations which deals with general principles for site operation, working hours, noise, pollution control, security etc which indirectly related to site safety. This section is also important to be included in tender/contract documents because it has direct impact on the day to day safety working conditions.

4.5.2 Costing and Billing for Safety

All relevant items for safety are billed in the General Conditions and Preliminaries section of the Bills of Quantity. This is similar to the current practise but the important improvement is that the contractor must refer to the SMS in order to understand fully the safety requirements and price the bill. The calculations and costing for these items will be the Contractor's sole responsibility and it is important for the Contractor to really understand the required standard of safety.

This method of attaching a SMS is easy and practical because the client can be assured that the contract document covers the minimum standard and is clearly shown in detail all requirements. The standard can be applied to all size of projects. Smaller projects can used certain safety standards relevant to what is needed for that particular project. The onus in on the contractor and the client can easily refer to the safety minimum standard for costing purposes.

The responsibility of S.O is clearly stated in relation to safety issue-this will create more awareness and hopefully with this responsibility safety culture will be improved to all key players.

Another area included in the framework contract document is the Environment Memorandums. This section deals with environmental issues e.g. noise control, water pollution, waste management, hazardous substances etc. this is to ensure that the contractor comply fully with Environment Quality

Act (Act 174). The reason for this inclusion is that safety and environment issues are best deal with concurrently. Therefore it is recommended in any project this section to be included.

4.5.3 Advantages of using SMS

The responsibility of site safety is still on the contractor. All the costing of this section is to be done by the contractor. In the case of costing for site safety it is accepted that the contractor is the best party to give a realistic estimate based on experience. It is a paramount important to ensure all contractors to understand the safety standard before tendering to ensure fair and realistic pricing of the safety requirements. Therefore it is recommended a thorough briefing about the safety minimum standards to be done for all potential tenderers to ensure that they really understand the standard and price them reasonably and they understand the consequences of not pricing properly.

The SMS will cover all the necessary safety requirements for all types and cost of projects. In small projects the SMS can still be referred although not all the sections are relevant. The amount of safety requirements will depend on each type of project and specific requirements can be referred to the SMS.

4.5.4 The client's responsibility

It is important that the client understand the SMS and to be realistic about the cost of site safety requirements. It is important from the beginning that the client accepts that substantial amount of money needed in order for the contractor to really implement the required safety standards. Currently there is no reliable cost data to estimate safety requirements but as research shown, the current allocation for safety is not adequate and the amount shown in tendered B.Qs does not represent the true cost for safety.

4.5.5 Feedback

We are planning to have road-shows to present this safety document model to the construction industry players such as developer and contractors so that we can get feedback from all relevant parties and do necessary adjustments for the documentation.

5.0 Conclusion

From this research, it is found that there is lack of OSH best practice in Malaysian construction stages. Without proper strategic approach, OSH implementation will be left out and be the last things that will be addressed through out construction process. It is therefore, by embedding OSH provision in the contract document, all parties who involved in any construction projects will take this matter seriously as contract document is a legal document which nobody is allowed to breach its content. By having Safety Minimum Standard included in separated documents, it is hoped that all contractors will seriously take into account on safety and health in their all construction stages.

Some constraint that this research group need to be aware are the willingness of other parties involved in Malaysian construction industry to really implement the proposed document as they might concern that the total project cost will be increased and give some disadvantage to the small contractors companies.

Furthermore, certain issues that may limit the implementation of this mock up documents are when there are some parties who already have their own proposal and this would need further discussions with them on how to blend it to make sure that there will be only one contract document with OSH provision which will be endorsed by PWD.

It is therefore, further steps that need to be carried out by the research group is to have a series of road show in order to validate the proposed mock up documents among selected contractors companies and also to make sure that the item priced for OSH provision are clearly be defined.

6.0 Acknowledgement

We would like to thank the *Construction Research Institute of Malaysia (CREAM)* for the given research grant to the *Construction Health and Safety Research Centre (CHeSRe)*, Faculty of the Built Environment, University of Malaya and to all companies who contributed to this research.

7.0 References

Foo Cheek Lee (2005), Budgeting for Occupational Safety and Health Management and its Implementation, MBAM Annual Safety Conference, 28 – 29 November 2005, Malaysia

Master Plan for Occupational Safety and Health in Construction Industry 2005 – 2010, Malaysia

Occupational Safety and Health Act (1994), International Law Book Series, Malaysia