

Implementing occupational safety and health requirements in construction project

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ABSTRACT

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The probability of the construction accident to happen is high due the nature of Construction work that involves complex activities, methods, machineries, materials and hazards. The occupational safety and health (OSH) law and regulations are mandatory for every construction project to uphold. Responsibilities to ensure the safety and health at the workplace lies with those who create the risk and with those who work with the risk. The owner or client of the construction project has the upper hand in determining the standard of OSH implementation in their project through contract documents. If the contract documents comprehensively spell out OSH requirements and cover all OSH cost, then the issues of contractor not implementing OSH measures could be minimized. The objective of this study is to identify Occupational Safety and Health requirements (OSH) in the contract document of selected construction projects. To achieve this objective, a total of seven contract document was collected from several construction companies. The qualitative analysis was performed to identify the extent of OSH requirements and costs are being mentioned in the contract documents. The finding shows that most of the contract document contains very little emphasis on OSH requirements and budgeting. Only one contract contains, an appendix that spell out about the safe work practices for construction works. The visible allocated budget for OSH requirements for all seven contracts is very minute range from 0.21% to 1.99% of contract value. In order to ensure that occupational safety and health is properly implemented, safety needs must be included in the budget because implementation it is not free, this can be achieved by making it a permanent feature in all bills of quantity of the project.

Keywords:

Occupational safety and health,
Requirement, Cost, Contract,
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1. Introduction

Safety and health is a topmost area to control, especially in hazardous workplace like in construction sites. With a diversity of construction activities, risky workplace, property damage and

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working with plant and machineries, this increase the potential hazards for workers [1]. The construction industry has been hassled by a high incidence rate that causes fatalities. Although the various incidence occurs at construction sites, individuals are not normally mindful of such occasions and their real or potential outcomes due to underreporting and miss recorded of the incidence [2]. This has made the occupational safety and health (OSH) program, one of the important elements to be practiced in the construction industry. This organization provides safety management systems for continual improvement of safety working environment and preventive measures. Safe working environment is a responsibility of employers by providing practicable steps to manage hazards. In construction client is responsible to issue a contract that has provision of safety requirement, while the contractor need to involve in the works. The client needs to issue a contract, particularly safeguard the safety and health during each contract stage [3].

The regulation of safety and health by not only responsibilities to the client and this do not relieve individual workers and contractor to ignore the safety requirements. The contractor needs to appropriately arrange and deal with the work amid the construction phase in order to keeping in mind the end goal to guarantee the hazard is legitimately controlled and should consent to the obligations under the OSH requirement [4]. The effort devoted to planning and managing safety and health should be comparable with the risks and complexity of the project.

The occupational incident and fatality rate in Malaysia have shown a continuous slight drop from the year 2013 to 2014. The rate related to work accidents has reduced from 3.28 to 3.10 for every 1,000 workers in the year 2013 and in the year 2014 respectively. In the same period, the rate of casualties has dropped slightly bigger compared to the incident rate from 4.62 to 4.21 for every 100,000 workers in the year 2013 and in the year 2014 respectively. However, this does not address that our construction industry has succeeded in overcoming the safety problem. According to Department of Occupational Safety and Health (DOSH), in the year 2015, our construction industry has the highest number of fatality rate of 88 numbers compared to other sectors. This showed that our objective of accident prevention at the workplace still needs improvement in applying the OSH standard in our construction industry [5].

In the construction industry, many of the clients do not consider to be in construction team thus giving less impact on safety and health program. The work accident at construction site commonly arises problem from contractor in managing the safety requirement as they had not integrated planning of their safety and health system as required. Furthermore, in implementing safety and health programs at construction sites can be costly, thus client should appoint well-qualified contractor with good safety and health personnel [6]. Previous researchers also stated that safety planning is a key position in the industry, although it is carried separately from project design and planning phase [7]. Most of the contractors know well about their construction work, but fail to comply with OSH policy requirement. They also lack of safety knowledge and might not capable to provide practicable safety, health and welfare to their workers.

The aim of this study is to examine Occupational Safety and Health requirements and cost in a construction contract. The study is limited to the selected construction companies in the Johor Bahru area.

2. Literature review

2.1. Safety management system in construction

A safety management system (SMS) contains various components, including establishment of safety policy measures, workplace hazard analysis, and safety and health mindfulness, etc. Occupational safety and management system was first prepared by the Health and Safety Executive

(HSE) in UK as a practical guideline for directors, managers, health and safety professionals, and employee or representatives who aim to improve safety and health in their organization [8]. This provides guidance for all construction personnel's including the client. SMS facilitates occupational safety and health management by requiring efficient thought for nonstop identification, assessment and control of hazards and dangers [9, 10]. Generally, most organizations established safety guidelines and policies that meet OSHA rules. Be that as it may, most incidents and injuries on construction sites are an immediate after effect of not holding fast to their set up of safety procedures. Therefore, to guarantee a fruitful safety program, HSE recommends that three conditions must exist namely management responsibility and initiative, safe working conditions, and safe work propensities by all representatives [11].

An effective safety program depends on the interest of both administration team and workers in policy making and in building up a criticism plan that drives constant change. Besides, administration commitment is one of an immediate connection between a safe work environment and the safety climate in construction [12]. This statement likewise was quoted by other researchers [13]. Apart from that safety management practices and procedures ought to be actualized in association's exercises to accomplish more secure work in development. Plus, to demonstrate the commitment and responsibility on safety and health issues, it is ought to be build up from top level of association [14].

2.2. Requirement in managing safety and health in construction

In Malaysia, basically there are three legislation Acts that govern the OH&S of works in the construction industry to shows the comprehensive provision for OSH standards and practice, namely, the Department Occupational Safety and Health Act 1994 (Act 514) (DOSH), the Factories & Machineries Act 1967 (Act 139) (FAMA) and the Construction Industry Development Act 1994 (Act 520) (CIDB). This shows the existing of commitment at nation level to helps in implement the safety and health requirements in the industry [2]. There are moral, legal and ethical reasons for managing safety and health in the construction industry. Workplace accidents and incidents cause pain and suffering to the individual and family, thus proactive management system promotes a safer working environment and results in avoidance of accidents and incidents [2]. Previous research also claims that, majority of accidents do not cause by careless workers, but by failures of management [15]. Additionally, another researcher underlined that, safety management is a strategy for controlling on-site safety approaches, procedures, and identifying safety practices in a construction development [16].

Safety and health prerequisites are procedural supporting self-control in which employers and workers needed to define and actualize safety and health policies and procedures to oversee safety and health framework. [17, 18, 19] Therefore, all construction members have to contribute to the safety and health of a project, including the clients, particularly those who not expert in construction to ensure no-one is harmed during the work and do not leave the responsibilities to the contractor alone. On the earlier studies on the safety in construction, the study conducted for the Business Roundtable, questionnaires were sent to clients of the project and also the contractors to identify safety requirements placed by owners on construction [20]. The result that were tied in with the findings much rely on contractors to provide safety in construction rather than the owner itself. The Findings are included: Providing the contractor with safety guidelines that must be followed, requiring the contractor to designate a responsible supervisor for safety coordination on the site, requiring the use of permits before performing potentially hazardous activities and so on.

Statistic published from the Osborne Clarke state that up to 85% businesses does not consider themselves to be in the construction industry (Clarke, 2015). Construction Design Management emphasis that to reduce safety and health risk of harm, it has to take into account everyone involved in a construction project, including those who have to build, use and maintain the building [21]. Hence this gives a clear view that the client has the responsibilities to manage the safety and health system in construction which is in line with the contractual OSH management system.

The Construction Design and Management (CDM) Regulation 1994 state the provision of minimum safety and health requirements at construction site are based as follows:

- 1) Safety is to be considered efficiently throughout the project life cycle.
- 2) All individual who contribute to the safety and health of a project are included.
- 3) Proper planning and coordination must be undertaken from the start of the project.
- 4) Provision of safety and health is to be inside the control of capable person.
- 5) Communication and the sharing of information between all parties must be included.
- 6) A formal record of safety information for future utilize must be made.

2.3. Responsibilities of client

Clients hold a noteworthy part to play in the headway of an ordered way to deal with the health and safety in construction whereby he set the tone of the project and settle on choices urgent to the project development. Proprietors of the project can give a huge impact on building safety by selecting safe contractors, encouraging project consultant to address safety issues in the design and also stress on safety requirement in making out the construction stream. To the extent of possible the owners should participate with the contractors in all project safety activities, meetings, audits, accidents investigation and other related safety programs [22]. There are various ways in which the owners can actively address safety [22], including:

- 1) Ensure that safety is addressed in project planning and design;
- 2) Consider safety execution when selecting a contractor;
- 3) Assign safety responsibility during construction; and
- 4) Participate in project safety during construction.

The client engagement in construction of the project can be confirm through their choice of safe temporary workers and legally binding security prerequisites, and proactive participation in safety management during project implementation. The benefit of enlightening health and safety management by method for the controls begins with a commitment to make a project team that have the capability and assets to do the assignment with no absurd to any unreasonable danger to safety and health in construction site as right on time as would be prudent [15].

2.4. Responsibilities of project team

Managing Occupational safety and Health (OSH) at the workplace has become more important due to higher client expectation. Although the client is not expected to actively supervise the safety and health system, the client has a big influence over the way the work is carried out. The client decision will have an impact on the safety and health system. The responsibilities according to particular roles from client mainly as follows [23]:

- (1) The regulations apply to all clients of construction projects, regardless of whether a man is acting in the course or facilitation of a business.
- (2) The role of CDM coordinator has been evacuated and different obligations have been recast including client obligations and general obligations

(3) A client required to select an essential creator and also a primary temporary worker in any venture.

The contractor is no longer with the sole responsibility in safety and health management [15]. The responsibilities are divided to all project teams such as (1) Client, (2) Planning supervisors, (3) Designers, (4) Principal contractors and (5) Contractor with an additional safety plan, such as the safety and health plan, health and safety file, and enforcement of the policy [24].

2.5. Elements of occupational safety and health in construction

The allocation cost of safety requirements needs to be identified to make sure its availability to prevent and control risk. The previous researcher stated that the adoption of safety regulation relates to the introduction of a safety framework purposely to prevent and control work safety and helps reduce the number of workplace accidents and their economics [25, 26, 27]. In OSH Guidelines on Contract Management stated that, the requirement of items in implementing OSH is as follows but not limited to:

- (1) OSH forums/meetings
- (2) OSH induction and training
- (3) Medical facilities and safety equipment
- (4) OSH incentive and rewards schemes
- (5) Personal protective equipment
- (6) Emergency response resources
- (7) Safety signage and posters
- (8) OSH personnel

3. Methodology of study

Data collection for this study was conducted using a questionnaire that was distributed to the respondents the vicinity of Johor Bahru and it was achieved through comparison of seven contract documents that specified about safety and health requirements. Qualitative analysis was performed in order to pin point the extent of OSH requirements being mentioned either in the form of contract, condition of contract, appendices, addenda, general condition and preliminaries.

4. Results and discussion

This study is to determine the term and condition in contract document which defines or specified about Occupational Safety and Health requirements (OSH). A set of interview questionnaire were developed to be distributed to seven construction projects in Johor Bahru area. The term and condition in contract document which defines or specified about safety and health requirement were identify, seven documents were searched and made comparisons. Table 1 shown the data collected from the study.

The respondents of this study are among Safety and Health Officer and Site Supervisor for construction project as shown in Table 1 where the contract documents form a basis for fulfilment of the study objective.

Table 2 shows the generally the term and condition in contract document which defines or specified about safety and health requirement were in general condition and preliminaries, the item is preliminaries according to safety and health requirement as listed in the table.

Table 1

List of construction project

Project	Title	Client	Value
1	Construction of 3 storey –Two block of ‘Academic Suite’, Taman Mount Austin Mukim Tebrau, Daerah Johor Bahru, Johor Darul Takzim,	AH Sdn. Bhd.	RM54,000,000
2	Proposed Construction And Completion Of Phase 1 Consisting Of: 32 Unit Of Semi Detached Factory With 3 Storey Office & 3 Unit Sub-station, Jalan Skudai / Jalan Kempas Lama, Mukim Tebrau, Daerah Johor Bahru, Johor Darul Takzim	FB Sdn. Bhd.	RM63,692,927
3	Proposed Construction And Completion Of 57 Unit Of 3 Storey And 5 Storey Shop Office (Parcel A), Jalan Mutiara Emas 8, Taman Mount Austin, Johor Bahru, Johor	DH Sdn. Bhd	RM19,967,900
4	Proposed Construction of 64 Unit two storey cluster house And 64 Unit 3 storey cluster house, Jalan Mutiara Emas Utama/Jalan Mutiara Emas 8, Taman Mount Austin, Mukim Tebrau, Daerah Johor Bahru, Johor Darul Takzim.	DH Sdn. Bhd	RM42,707,380
5	Proposed Construction and completion of 26 two storey house, Taman Pelangi Indah, Mukim Tebrau, Daerah Johor Bahru, Johor Darul Takzim	YD (PTE) Limited	RM8,802,407
6	Proposed Construction And Completion Consisting Of 2 Storey Warehouse, 2 & 3 Storey Showrooms, single Storey Warehouse With 3 Storey Office, 2 Storey Office, Sub-station, Bin centre And Pump House, Kawasan Perindustrian Tebrau III, Mukim Tebrau, Daerah Johor Bahru, Johor Darul Takzim	JBMS Sdn. Bhd.	RM11,868,301
7	Proposed Construction of 80 Unit three storey Factory Shop lots, Mukim Tanjung Kupang, Daerah Johor Bahru, Johor Darul Takzim (IPARC Tanjung Pelepas)	MSP Sdn. Bhd.	RM58,797,266

Table 2

List of general term and condition in contract document

Item	General terms and conditions
1	Workmen’s compensation insurance
2	Personnel Protective Equipment
3	First aid kits
4	Temporary scaffolding and staging
5	Existing roads and traffic safety
6	Temporary hoarding
7	Prevention of mosquitoes breeding
8	Site fire prevention and firefighting facilities
9	Safety measures for construction of building <ol style="list-style-type: none"> a) Provide and install all necessary protective netting b) Define mark and maintain safe passages throughout c) Provide barricades, screens and safety hatches to openings d) Proper signs and notices e) Submit method and design of the safety measures f) The contractor shall be solely responsible for the adequacy of safety measures implemented.

The weakness of the traditional bidding system will give impact on safety budgeting. This allocation of money for safety construction depends on the nature of the project. Generally, the higher the amount of safety cost, the better the safety performance. The contractor who provides safety budgeting did not take into account on the project complexity and usually estimate on a main safety item in lower cost otherwise the contractor might not be able to get the project. The existing safety budgeting practice normally cause budget overrun. This scenario happens due to inaccuracy in the safety budgeting estimate. The contractor usually estimate the safety budget based on their pass experiences with minimum justification regarding the estimation. Table 3 shown the comparison the term and condition which defines OSH in contract document.

Table 3

The comparison the term and condition which defines OSH in contract document

Project/ Clauses	Form of Contract	Condition of Contract	Appendices	Addendum	General Condition & Preliminaries	Amount (RM)
Project 1 (case study)	X	X	X	X	-Personnel Protective Equipment	2,600.00 15,500.00
					-Workmen's compensation insurance	108.00 80,400.00
					-First aid	6,200.00
					-Existing roads and traffic safety	949,800.00
					-Prevention of mosquitoes breeding	15,000.00
					-Scaffolding & staging	
					-Safety measure for construction building	
					Safety budgeting amount	1,069,608.00
					Project value	54,000,000.00
					Percentage of total contract value	1.981%
Project 2	X	X	X	X	-Safety measure for construction building	50,000.00
					-Workmen's compensation insurance	25,500.00 60,000.00
					-Temporary hoarding	
					Safety budgeting amount	135,500.00
					Project value	63,692,927.00
					Percentage of total contract value	0.213%
Project 3	X	X	X	X	-Personnel Protective Equipment	1,000.00 5,300.00
					-Workmen's compensation insurance	1,000.00 1,000.00
					-First aid	-
					-Existing roads and traffic safety	-
					-Safety regulation / safety of workmen	3,000.00 60,000.00
					-Safety measure for construction building	
					-Prevention of mosquitoes breeding	

					-Scaffolding & staging	
					Safety budgeting amount	71,300.00
					Project value	19,967,900.00
					Percentage of total contract value	0.357%
Project 4	X	X	X	X	-Personnel Protective Equipment	1,000.00
					-Workmen's compensation insurance	11,327.00
					-Safety regulation / safety of workmen	3,000.00
					-First aid	1,000.00
					-Prevention of mosquitoes breeding	9,600.00
					-Scaffolding & staging	98,816.00
					-Safety measure for construction building	5,000.00
					Safety budgeting amount	129,743.00
					Project value	42,707,380.00
					Percentage of total contract value	0.304%
Project 5	X	X	X	X	-Site prevention and firefighting facilities	-
					-Safety measure	-
					-Workmen's compensation insurance	4,000.00
					-PPE & First aid facilities	4,000.00
					-Prevention of mosquitoes breeding	5,000.00
					-Scaffolding & staging	5,000.00
					Safety budgeting amount	18,000.00
					Project value	8,802,407.00
					Percentage of total contract value	0.204%
Project 6	X	X	X	X	-Workmen's compensation	8,000.00
					-Temporary hoarding	30,000.00
					Safety budgeting amount	38,000.00
					Project value	11,868,301.00
					Percentage of total contract value	0.320%
Project 7	X	X	Safe works for practices for construction works	X	-Personal Protective Equipment	3,500.00
					-Workmen's compensation insurance	18,000.00
					-Safety, health welfare for work people	120,000.00
					-Scaffolding & staging	160,000.00
					-Site prevention and firefighting facilities	-
					Safety budgeting amount	301,500.00
					Project value	58,797,265.62
					Percentage of total contract value	0.513%

Table 4 shown the additional safety and health requirements in contract project number seven. Only in project number seven (7) there have additional appendices specified about safety and health requirement, in the index there are forty-one (41) items in safe work practices for construction work that have been consider in the project which are as follows; -

Table 4

Additional safety and health requirements in project number seven

Item	Safety and Health Requirement	Item	Safety and Health Requirement
1	Introduction	22	Fall protection and overhead work
2	Fire prevention	23	Lifting devices (General)
3	Housekeeping/health/sanitation	24	Crane-safe erection/operation
4	Rubbish removal	25	Hoist
5	Site office and storage areas	26	Suspended cradles
6	Temporary power sources	27	Ropes, chains and cradles
7	Electricity	28	Ladders
8	Oxygen / acetylene / fuel gases	29	Solvents and chemical agents
9	Welding and burning	30	Painting
10	Locking-out equipment	31	Operation of mechanical equipment
11	Vehicles	32	Operation of tools
12	Excavation and trenching	33	Manual material handling
13	Guardrails, platforms, barricades	34	Air hoses
14	Temporary or permanent installation of Any equipment (lift, escalators/mechanical Services aids)	35	Laser survey equipment
15	Scaffolding and other temporary works	36	Concrete reinforcement starter bars
16	Mobile scaffold tower	37	Material guards
17	Demolition	38	Safety helmets
18	Roofing and sheet material laying	39	Footwear
19	Erection of structures	40	Consumption of alcohol and drugs
20	Mobile elevating work platforms	41	Arms, ammunition, offensive weapons and gambling
21	Clearance from overhear work		

From the comparison, most of the contract documents that very little emphasis is given to safety budgeting, there are no clear specifications or provisions mentioned about project site safety requirements. Most of the contractors provide a tiny allocation and in Project 6 none at all for site safety implementation. The financial aspect is utmost importance as nothing is of free in implementation of safety at site and someone has to pay for it.

5. Conclusion

The objective was to identify the term and condition in contract document which defines or specified about safety and health requirement. From the seven-contract document found that contractor will be pricing all elements of work based on the items contained in the tender document only, additional costs for the implementation of safety may jeopardize the contractor to get the job, thus the contractor had to ignore the additional costs to brighten the opportunities. Most of the contract document does not accurately state the provisions of safety and health costs, this will cause the contractor to overlook of the budgeting to be made in safety and health issues, this will cause

budget overrun. It is sad to say that although commitment on safety management and implementation was given, this is merely lip service as far as financial commitment is concerned.

References

- [1] Chin, Lok Siew, and Abdul Rahim Abdul Hamid. "The Practice of Time Management on Construction Project." *Procedia Engineering* 125 (2015): 32-39.
- [2] Annan, Joe-Steve, Emmanuel K. Addai, and Samuel K. Tulashie. "A call for action to improve occupational health and safety in Ghana and a critical look at the existing legal requirement and legislation." *Safety and health at work* 6, no. 2 (2015): 146-150.
- [3] Hamid, A.R.A., Singh, B. and Hisammuddin. I. "Work Related Stress Among Contractor Management Team at Construction Site." *Malaysian Journal of Civil Engineering* 27 Special Issue 2 (2015): 235-247.
- [4] Hamid, A.R.A., Singh, B. and Kadir. M.F.A "Safety Climate Among Contractors' Organizations." *Malaysian Journal of Civil Engineering* 27, Special Issue 2 (2015): 248-265.
- [5] Hamid, A.R.A., Singh, B. and Salleh, A.S.M. "Cost of Compliance with Health and Safety Management System Among Contractor in Construction Industry." *National Seminar on Civil Engineering Research (SEPKA2014)*, Training Center, UTM Skudai. FKA-PGSS FKA-UTM. 14-15 April (2014) 1-10.
- [6] Hamid, A.R.A., Clarence Botiti, D.M. and Mohandes, S.R. "Managing the Delayed Completion on Construction Project." *Journal of Advanced Research in Business and Management Studies* 1 (1) (2015) 14-24.
- [7] Zhang, Sijie, Kristiina Sulankivi, Markku Kiviniemi, Ilkka Romo, Charles M. Eastman, and Jochen Teizer. "BIM-based fall hazard identification and prevention in construction safety planning." *Safety science* 72 (2015): 31-45.
- [8] Health and Safety Executive (HSE). *Managing for health and safety*. London (UK): HSE; 3rd Ed. 2013.
- [9] International Labour Organisation (ILO) *ILO Guidelines on Occupational Safety and Health Management Systems (OHS.MS)*; Information Note, International Labour Organisation Office, Geneva, 2001.
- [10] Rondinelli, Dennis A., and Michael A. Berry. "Environmental citizenship in multinational corporations: social responsibility and sustainable development." *European Management Journal* 18, no. 1 (2000): 70-84.
- [11] Reese, C. and Eidson, J. *Handbook of OSHA construction Safety and Health*. New York: Lewis Publisher. 1999.
- [12] Mohamed, S. "Safety climate in construction site environments." *Journal of Construction Engineering and Management* 128, no. 5 (2002): 375-84.
- [13] Abdelhamid, T, Everett, J.G. "Identifying root causes of construction accidents." *Journal of Construction Engineering Management* 126, no. 1 (2000): 52-60.
- [14] Chan, Alan HS, W. Y. Kwok, and Vincent G. Duffy. "Using AHP for determining priority in a safety management system." *Industrial Management & Data Systems* 104, no. 5 (2004): 430-445.
- [15] Baxendale, Tony, and Owain Jones. "Construction design and management safety regulations in practice—progress on implementation." *International Journal of Project Management* 18, no. 1 (2000): 33-40.
- [16] Wilson, Joe M., and Enno "Ed Koehn. "Safety management: problems encountered and recommended solutions." *Journal of Construction Engineering and Management* 126, no. 1 (2000): 77-79.
- [17] Bluff, E., Gunningham, N. and Johnstone, R., *OHS Regulation for a Changing World of Work*, first ed. The Federation Press, Sydney, 2004.
- [18] Quinlan, Michael, Philip Bohle, and Felicity Lamm. *Managing occupational health and safety*. Palgrave Macmillan, 2010.
- [19] Walters, David, Richard Johnstone, Kaj Frick, Michael Quinlan, Geneviève Baril-Gingras, and Annie Thébaud-Mony. *Regulating workplace risks: a comparative study of inspection regimes in times of change*. Edward Elgar Publishing, 2011.
- [20] Business Roundtable. *Improving construction safety performance: The user's role*. A Companion Publication to Construction Industry Cost Effectiveness Project Rep. No. A-3, New York, 1982.
- [21] UK Government. *The Construction (Design and Management) Regulations 2015 (CDM 2015) - Designing Building, Designing Buildings*. Retrieved on May 2, 2016, from: www.designingbuildings.co.uk/
- [22] Gambatese, John A. "Owner involvement in construction site safety." In *Construction Congress VI: Building Together for a Better Tomorrow in an Increasingly Complex World*, pp. 661-670. ASCE, 2000.
- [23] UK Government. *The Construction (Design and Management) Regulations 2015*. The National Archives. Retrieved on May 2, 2016, from: www.legislation.gov.uk
- [24] UK Government. *The Construction (Design and Management) Regulations 2015-Explanatory Note*. The National Archives. Retrieved on May 2, 2016, from: www.legislation.gov.uk

-
- [25] Robson, Lynda S., Judith A. Clarke, Kimberley Cullen, Amber Bielecky, Colette Severin, Philip L. Bigelow, Emma Irvin, Anthony Culyer, and Quenby Mahood. "The effectiveness of occupational health and safety management system interventions: a systematic review." *Safety Science* 45, no. 3 (2007): 329-353.
- [26] Zeng, S. X., Vivian WY Tam, and Chi Ming Tam. "Towards occupational health and safety systems in the construction industry of China." *Safety science* 46, no. 8 (2008): 1155-1168.
- [27] Mansur, S. A., AR Abdul Hamidb, and N. A. Yusofc. "Rising Trend in Construction Cost and Housing Price." *Journal of Advanced Research in Business and Management Studies* 3: 94-104.